RCM radio control MODELER

49115 MARCH 1982 $2.25 U.S.

THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

BAR037 07/82
B M BARIBEAU
5019 GIDEON RD
HUNTINGTN WV 25705

VOLUME 19 NUMBER 3 USPS 509190 ISSN 0033-6866 MARCH 1982

R/C MODELER

From The Shop ..... *Don Dewey* 4
letter to jim mcneil, ama sect.-treas.

Cunningham On R/C ..... *Chuck Cunningham* 6
chuck tells about trip to england.

Flying Lowe ..... *Don Lowe* 11
some temperature effects on a/c.

Power Boating ..... *Howard Power* 12
howard shows a radio box vent sys.

Here's How ..... *Jerry Smith* 14
super smoke pumper hook-up.

Sunday Flier ..... *Ken Willard* 20
ken attends air show in miami.

RCM Product Review: F-16A 22
rcm builds hobby shack's .25 powered model.

Big Is Beautiful ..... *Dick Phillips* 26
building hints for quarter scale.

Force One ..... *L. Mikulasko* 32
superb .40 mid-engine delta.

RCM Product Review: E Z Fli 39
rcm reviews the flite line trainer.

Silent Power ..... *Jim Zarembski* 42
jim brings you up-to-date on electrics.

Soaring ..... *Al Doig* 44
trying to pinpoint a yaw problem.

Engine Clinic ..... *Clarence Lee* 46
engine questions and answers.

RCM Product Test ..... *Dick Tichenor* 51
northeast engineering's driver panel.

Schneider Trophy 50th Anniversary *David Boddington* 52
coverage of seaplane event.

Double Eagle "40" ..... *George R. Smith* 56
.40 size version of popular pattern ship.

Give It a Whirl ..... *John Gorham* 66
john covers the hovering problems.

Pit Stop ..... *Gene Husting* 68
2nd annual u.s. indoor championships.

"2 x 2" and 2S Tee/Vee ..... *Gene Wallock* 70
tail mods to h.o.b. sailplane.

RCM Product Review: F-15 Eagle 77
rcm builds circus hobbies' eagle.

A Redundant Power Source ..... *George Steiner* 78
the 2 x 5 project for rcm.

Sweepings From The Balsa Dust Factory *Paul Denson* 84
some neat how-to-do-it ideas.

Medical Hazards of R/C Modeling ... *R.L. Cahn, M.D.* 86
hidden hazards of modeling materials.

Showcase '82 88
new product announcements.

For What It's Worth 91
helpful hints for modelers

Readers Exchange 204
classified ads.

Advertisers Index 205
advertiser page listing.

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This Month's Cover

After many prototypes, the Force One, a mid-engine delta-wing, was conceived and designed by L. Mikulasko of Ontario, Canada. This model has superb flying characteristics, is easy to build, is good looking and is featured as a full size construction article this month beginning on page 32. Displaying the Force One is Miss Traci Szaz. Color transparency by Mr. S. Kurzowski.

R/C MODELER is published monthly by R/C Modeler Corporation, Don Dewey, President. Editorial and Advertising offices at 120 West Sierra Madre Boulevard, Sierra Madre, California 91024. Telephone: (213) 355-1476. Controlled Circulation postage paid at Los Angeles, California and Sierra Madre, California.

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All prices appearing in this magazine are subject to change without notice. All subscriptions will be taken at the prevailing rate. Postmaster: send address changes to R/C Modeler, P.O. Box 487, Sierra Madre, CA 91024.

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

FROM THE SHOP

Don Dewey

A rather interesting letter was printed in the Modulator, newsletter of the Pioneer R/C Club Inc., Santa Clara, California, Drew Allen, Editor. The following is reprinted with Mr. Allen's permission.

Jim McNeil
AMA Secretary-Treasurer
617 South 20 Avenue
Birmingham, Alabama 35205

With copies to:

John Worth, Executive Director
John Grigg, President
Carl Wheeley, Editor & Publisher
Jim Scarborough, District X V.P.

Dear Jim,

I write with an urgent concern for more timely publication of annual expenses and yearly budgets than is provided in the December issue of ***Model Aviation.***

We are faced with a 20% increase in dues for 1982 (12% if paid before Dec. 15). The increase is doubtless needed if the same programs are to continue as before. However, the decision for the increase came as a result of a projected 1982 budget which has not yet been seen by the membership. We are just now presented (November 5), with the expenses for 1980 and the budget for 1981. If the projections of expenses and the budget could be presented to the membership in a more timely fashion, we would have greater opportunity to give input to our District V.P. and make constructive suggestions regarding possible modifications to the budget.

Jim, I realize there are some delays in publishing, with magazine deadlines, etc. However, the December issue (received November 5) contains several references to the results of the R/C World Champs in Acapulco September 22-27. There is news less than six weeks old in Dave Browns column, page 95; in the Competition news, page 93; and in your own column New Flash, page 80.

I'm grateful for the information, and suspect it pushed right up to the deadlines to include the reports. Obviously not **all** *information can be treated in such a fashion, but eleven months!!! Come on, that is just far too slow in reaching us to be of benefit for us to help our district V.P. know our thoughts.*

And Jim, I do have some definite thoughts on the budget. There are some definite ideas to register on how the money is spent, and I plan to do so in a future letter. The pattern of the 1980 expenditures provides a place to start, but the 1982 budget has already been adopted (with a dues increase) before we know what the 1981 budget is!

We are continually asked to give input to our V.P. but in order to do so with any degree of credibility, we need **current** *information. Therefore, I am asking you, and/or your successor as the election may dictate, together with all other responsible parties such as John Worth and Carl Wheeley, to make much more timely information available to us. This will help us do the job in the clubs to provide the feedback for which our national officers so often ask. Every issue of* ***Model Aviation*** *contains several references to "Our" AMA and urgent requests to write and register our desires are expressed. I know those expressions are genuine heart-felt concerns so please help us have the relevant and current information necessary to respond to such invitations from our officers.*

Jim, (and editor Wheeley), it may be necessary to make a change in the ***Model Aviation*** *format to accomplish this request. I have noticed that there* **appears** *to be a limitation imposed on how many pages can be utilized for the AMA and Competition News section. I am not privy to administrative decisions about this, but have observed that many matters of current significance* **seem** *to be postponed to some future issue rather than printed as soon as the information is available. If my observation is mistaken, please forgive me. If it is correct, I offer some thoughts on the matter.*

The **basic** *purpose and reason for existence of the magazine has been stated to be for communication with the membership. Judging by the difference in an open full membership of $30.00 and a no publication family memberhip of $17.00, the cost of the magazine is $13.00 per member. Since the open limited membership which omits the magazine and receives only the AMA news section costs $26.00, the inescapable conslusion is that the AMA news section costs $9.00 and the rest of the magazine costs $4.00.*

My contention is that **all** *current information should be included in* ***Model Aviation*** *as* **soon as available.** *The basic purpose is for communication and over 69% of the cost to us is for the news communication section. Therefore such reports as the F.C.C petition which was extended over many months could well be included in one single printing. The budget, even the proposal, could be included. The rest of the magazine dealing with construction, contest reports, etc., could and should be changed in size as necessary to accomodate full and timely news dissemination.*

The December issue contained 140 pages, with 29 (pages 76-104) devoted to the News / Competition / Calendar section. The result is that nearly 70% of the total cost to us provided only 20.7% of the pages which constitute the basic reason for the magazine, and these pages were not even in the expensive color used in a number of the editorial pages.

The total **pages** *are spoken of on purposes, relaizing that advertising accounts for some of the remaining 79.3% of the pages. It is the editorial matter that should be adjusted as needed to give us as large a news section as may be necessary in any given month.*

Jim, for you and all the other officers who will be involved in discussion of this matter, I offer my gratitude in advance, for I am fully cognizant that your task is not light, your path easy, nor your moccasins comfortable if another tried to take a stroll in them.

Sincerely,
Drew Allen
AMA 2151

From Soaring Flight, S.O.A.R. Club newsletter, Stan Watson, Editor, we learned of the new FAI sailplane rules. We can't understand why the commerical model publications aren't privileged to timely dissimination of information from the AMA that effects modeling activities.

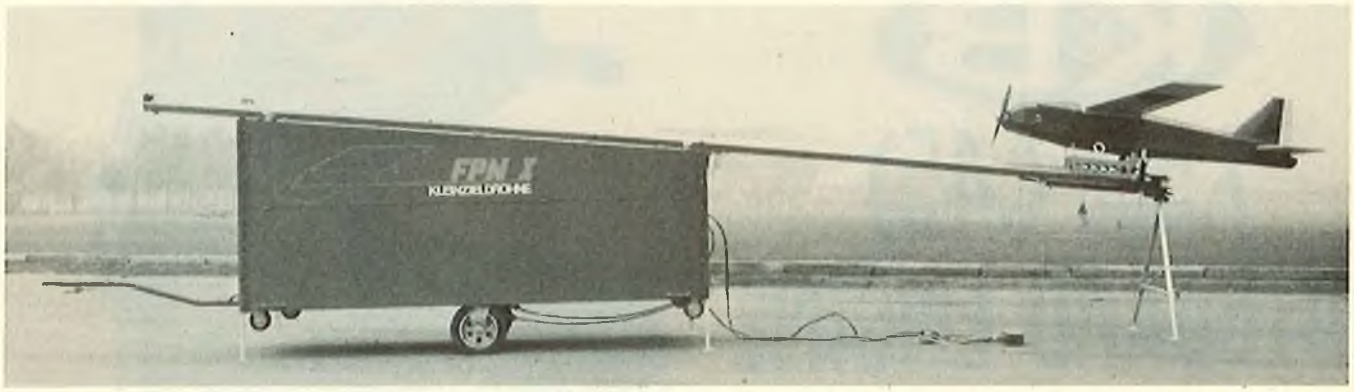
New FAI Rules: 4-Lap Speed! (As well as 110 lb. lines)

Dan Pruss just returned from Paris and the FAI rules session with the news that there has been a major change in the Speed event. Taking a cue from the L.S.F. as well as from the U.S. World 2-Meter Championship, both of which have flown the 4-lap event, the new rule will tend to popularize FAI flying among those who couldn't (or wouldn't) deal with the Kamakazee speed runs. The new

to page 192

CUNNINGHAM ON R/C

Chuck Cunningham



Swiss built R/C RPV for military application. Catapult launch.

The other day I was reading my copy of Sports Illustrated when I came to a full page ad for magazines. The heading was, "A magazine doesn't put a time limit on your creativity." The ending was, "Nothing opens your eyes like a magazine." Darned good ad, and very true words. Just stop and think where the sport of R/C would be without magazines. The magazines are the life blood and plus of R/C. New developments are reported to you, new ideas and designs are passed along, events and happenings are reported; in short, magazines keep you up to date on what's happening, and what you can do to get in on the fun.

So how come my wife (and your wife probably) keeps telling me that I've got to do something with my magazine collection, it's taking over the house. I don't have time to sit and re-read every old issue that I've got piled about, but every now and then I grab a stack and sift through looking for ideas that I want to think about one more time. Magazines --- they are really great. If you listen to your wife and pitch out back issues, you're making a big mistake. Save 'em, and re-read em.

♦

This past fall, Jan and I made another of our very enjoyable trips to Europe and England, searching for history, scenery, and an occasional modeler or two. We were very successful on all counts. I always like to visit hobby shops wherever we may be. This year we stopped in two hobby shops in Munich, West Germany, and spent about an hour browsing in each. Both were very well-stocked, with full supplies of kits, engines, radios, magazines, and accessories. English was not too widely spoken in either shop, but we managed to get along.

Several days later we were in Bern, Switzerland, and again stopped in two hobby shops. One was the typical hobby shop with a great inventory of goodies, and no one who spoke English. The other was equally as well-stocked, but this time the owner spoke English well; we struck up a fine conversation. As the talk progressed I discovered that the owner, Frank Peter Neuenschwander, had been deeply involved in the development of an RPV for military target practice. The aircraft is powered by a 100 cc engine (which was built from parts since no suitable engine of this size is currently available to them). The span of the aircraft is 2.5 meters, and the weight is 20 kilos. Flight time is 1/2 hour on 1.5 liters of fuel. Speed is 200 kilometers per hour. Launch is from a catapult. Power to the catapult is provided by many strands of surgical tubing, all wound up on a drum. The winding is accomplished by use of the same starter that is used to start the engine. All landings are by parachute. When the mission is completed (provided that the drone hasn't been blasted out of the sky by ground fire) the engine is cut and the chute popped out. The reason for using the chute rather than landing on a belly wheel is that most of the flying is done in very mountainous regions where it is impossible to set up any sort of landing field or site. Since the launch is from any location, via the catapult, the landing can be done in any terrain by way of the parachute. I was not able to see the aircraft in action but it sure did sound interesting. The aircraft must

to page 8

Swiss target drone with 100 cc engine.

from page 6

fly smoothly and at high speed in order to present a good target to the gunners. There is much more of this type of use of R/C aircraft going on all over Europe than there seems to be here in the U.S. Darned good market for inventive R/C applications. Just think, if you get a good profit on each sale, you're really cheering for the ground gunners to become good at their trade --- unlike the normal RC'er who constantly worries about getting "shot down."

The cost to the European modeler to enjoy his hobby is a good bit higher than we here in the U.S. have to face. Almost everything that I priced seemed one heck of a lot higher. Kits, mostly of German origin, range up to about 600 Marks (about $300). Engines, all of those really great ones such as Webra, HP, and HB, all cost more there than they do here. Plastic films for covering are higher, along with most accessories. Very few American imports were visible, though the Japanese items are quite numerous. The most universally sold item of U.S. make are American props, both Top Flite and Zinger. Items that I brought home included several styles of German made mufflers with adapters for a number of different engines, a couple of large canopies, and a collection of French, German, and British model magazines. I didn't realize until this trip that there is an RCM in each country. Not related to this publication, but a magazine going by the initials of RCM in France, Germany, and RCM&E in England.

When we moved on to England one of my stops had to be a visit with David Boddington. I had met David at the First All England Jumbo Fly-In back in 1979, and he had invited us to spend the day with him on our next visit. In 1980 we were in England for just one day, so when we made our plans for 1981 I made sure that we would have a day to spend with David. This was a very super day. Jan and I caught the train from London to David's home about 1½ hours away. From the train station our first stop was a visit to David's factory and see his latest projects. Now for a bit of background.

David has been writing about the R/C hobby for about the same length of time that I have. We write a similar, wide ranging column about R/C. His modeling interests range from the super large to the small, much as mine do. He is a licensed architect, while I studied architecture for a couple of years before switching to engineering. Dave has written several books on

various aspects of R/C. Several years ago he gave up his architectural practice to concentrate on R/C and started his own kit company, DB Models. His kits are mostly of the scale and semi-scale type with a couple of pure sport models in the line also.

The most fascinating facet of David's interests is his involvement with British TV. David has been engaged in the design, manufacture, and flying of radio controlled aircraft to be photographed as full size airplanes in a number of BBC productions and series. The day that Jan and I were there, David and his assistant, David Toyer (a very talented modeler too) were getting ready to go the next day to York, England, to begin filming the flying shots for the BBC production of "Wings," the story of a small independent airline's struggle to grow and survive. David's part was to provide five DC-3 aircraft for flying and static sequences. Each of the DC-3's have 10' wingspans, weigh about twenty-five pounds and are powered by two Speed Webra .61 engines. Rather than develop the mechanics of a retracting gear for these aircraft, one was built with landing gears already in the retracted position, and is launched from a drop-away dolly just like a U-control speed ship. All five of the aircraft are beautiful scale models, any one of which would do credit to a scale modeler. The fuselages are fiberglass and the wings are foam with 1/64" ply skins. DB Models offers a kit of the DC-3. This BBC story will probably find its way to Public TV sometime in the future.

An earlier Boddington effort was in providing the aircraft for the BBC production of "The Flombards," a

to page 179

FLYING LOWE

Don Lowe

The Mysterious Trim Changes:

I received an interesting letter from Clair Sieverling of Phoenix, and thought I would share his problem as well as some thoughts of my own with you.

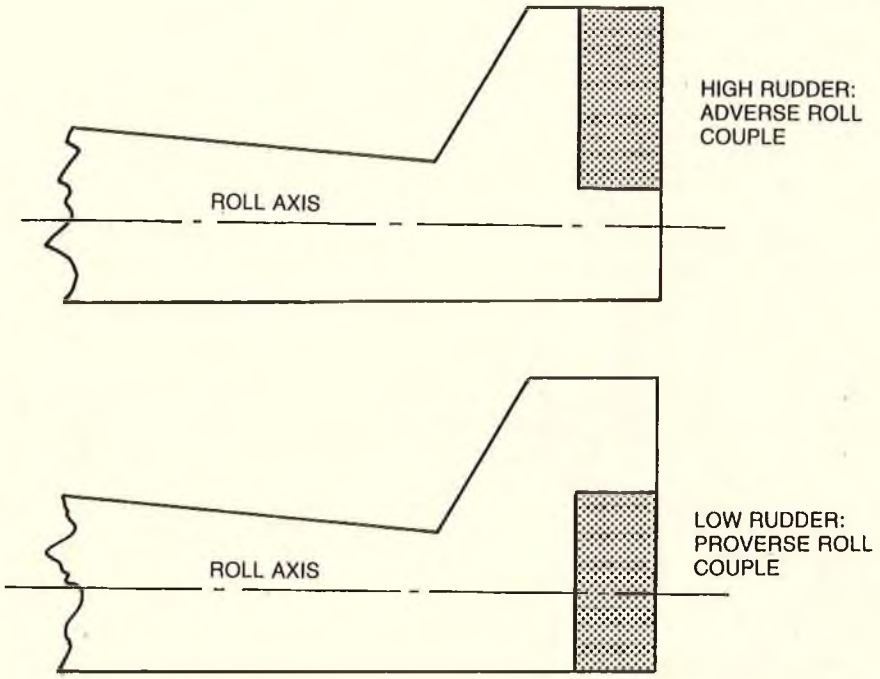
It seems that Clair is an old time retired modeler who used to battle it out in control line, and has now been severly bitten by the R/C bug. In fact, Clair is even back on the contest trail. It seems that he enjoys making built-up wings for his pattern type ships, but has been plagued with trim change problems. Clair writes in part:

I started modeling in 1944 and with this background I rather enjoy making built-up wings. Although I've done a few foam wings, I have built-up wings on a 2 yr. old Dirty Birdy, and a 40 Curare and my 60 Blue Angel (MK kit). All of them will change trim (aileron) some as temperatures change. The Blue Angel is fairly predictable — about 3-4 clicks left aileron for early morning (say 50° temp.), then gradually take it out as the day warms up to 80° or so. Question: Do you consider it normal to have to slightly retrim ailerons nearly every flight or do they stay put pretty well, assuming no other changes like props, cross wind, etc.? Do you suppose the foam wings are more stable in this regard?

If you have time I'd be interested in your comments on this. I notice that elevators are more stable unless the temperature varies a lot — then the fuselage (wood) shrinks faster than the steel pushrods with minor trim change.

I have never made a systematic study of built-up wings versus foam wings as far as temperature stability is concerned. I would suspect, however, that the built-up wing with its less rigid (torsionally) structure would be more influenced by temperature effects on the covering material and its ability to twist the wing. This would be particularly true where dark colors are used which absorb heat and reach higher temperatures. Incidentally, if you live in the hotter climes you should avoid dark colors, since the airframe and radio gear will reach hazardous temperatures when exposed to direct sunlight.

Pursuing Clair's inquiry further, I would suggest that he look closely at possible radio and linkage faults, also.



RUDDER AREA DISTRIBUTION

A sloppy aileron linkage can drive you batty. It will show up as a continuous trim change during a flight. A servo with poor resolution, or lots of deadband (say over 5 M Sec.) will also show apparent continuous trim change; and, remember, the deadband can be your transmitter, particularly low quality control stick pots. Dirty pots in the transmitter and servo will drive you nuts. Check your control system carefully on the ground; it must be quick, powerful, smooth, and absolutely tight. A ground check is not always the final word, however. Often vibration does funny things and can create a trim change, particularly where a marginal servo pot is the culprit.

The same airplane with two different control systems can fly completely different, so be careful in blaming the airplane too quickly. A pattern ship is **very** demanding of the highest possible quality control system. For example, I test flew an EU-1 recently for a friend. His control system is a popular brand sport series radio, the same that I have previously tried in one of my Phoenixes. The system simply has inadequate resolution for a pattern ship and gives a vague "wandering" feeling in roll. It was almost impossible to keep level and perform precision maneuvers. The best systems that I have seen to date for pattern ships employ the "coreless" motors in the servos and permit very tight deadband. My own JR system shows an average of about 2 MS. on each servo. The tightest we have been able to set up standard servos is about 4-5 MS. without dithering. I can't emphasize too strongly the importance of the **total** package in order to achieve good consistent performance. I have found that I rarely retrim the ailerons (or any other control) when flying a quality system.

Temperature effects on the fuselage can cause elevator and rudder trim changes. The worst to the best construction materials in this regard would be plastic, polyester/fibreglass, epoxy/fibreglass, and then wood, in that order. Once, years ago, I flew an ABS plastic ship in competition — temperature effects on the fuselage required elevator and rudder retrimming every flight. Wood is certainly the most stable in this regard. I have detected very little, if any, temperature trim influence flying the epoxy/fibreglass fuselages.

One last thought: temperature may

to page 177

POWER BOATING

Howard Power

A very interesting experiment is to be conducted this next racing season by the members of NAMBA District 9. District 9 includes boaters from Northern California, Nevada, and Utah. Like most districts in NAMBA and IMPBA, District 9 holds a series of point races which determines a district champion in each boat class. Last year the district held seven point races at which each race had an average of approximately 125 entries. I would guess that this district is one of the most active in model boating. At the last district meeting it was decided that most of the clubs hosting the point races would restrict the fuel used by each contestant to one containing 15% nitro. No fuel is to be brought to the race because each host club will supply all the fuel at a single, convenient fueling station located near the ready pits. A small fee of approximately two dollars an entry will offset the club's fuel expenses.

In these days of inflation, it's not difficult to see that the use of low nitro fuel will greatly decrease the operating expense of racing. As modelers, we can do little to control the cost of our motors, hulls, and other equipment. Since racing demands only the best equipment and continual research to "better the breed," we are locked into more expensive equipment than the average sport boater may be satisfied with. We can, however, control the operating cost of our activity by this low nitro requirement. The price difference between a gallon of 60% fuel and 15% fuel is approximately twenty dollars in our part of the country. Add to this the fact that motors should last longer and that replacement of those now expensive glow plugs after each heat should not be necessary. With lower operating costs it is hoped that people will get out and test run more which will give our hobby some needed exposure so that new boaters will be recruited into it. Low nitro and more testing should also improve reliability which may even make our racing better. It's really no fun to race around dead boats on the course.

You may well be asking yourself, "why not go all the way and require FAI fuel (no nitro) like the Europeans?" The answer to this question is that by supplying a moderate amount of nitro in the fuel, burning is better kindled when compared to FAI fuel. This should allow the use of our present engines and pipes without extensive modifications. Some performance will be lost but experiments made by knowledgable racers indicate that only 3 to 5 mph in top speed is lost even when you don't change your set-up and just replace the high nitro fuel with 15% fuel. They have found that their boats run great just by pulling the pipe out or by going down one size in the propeller. I would guess that we can get back at least half this speed difference by working on combustion chambers that are better suited to low nitro fuel and other refinements. I would also guess that heat times will only be a few seconds higher than those achieved with high nitro. In any case, this experiment will give us all some hard facts with which to judge whether or not the benefits of low nitro fuel are worth the extra effort.

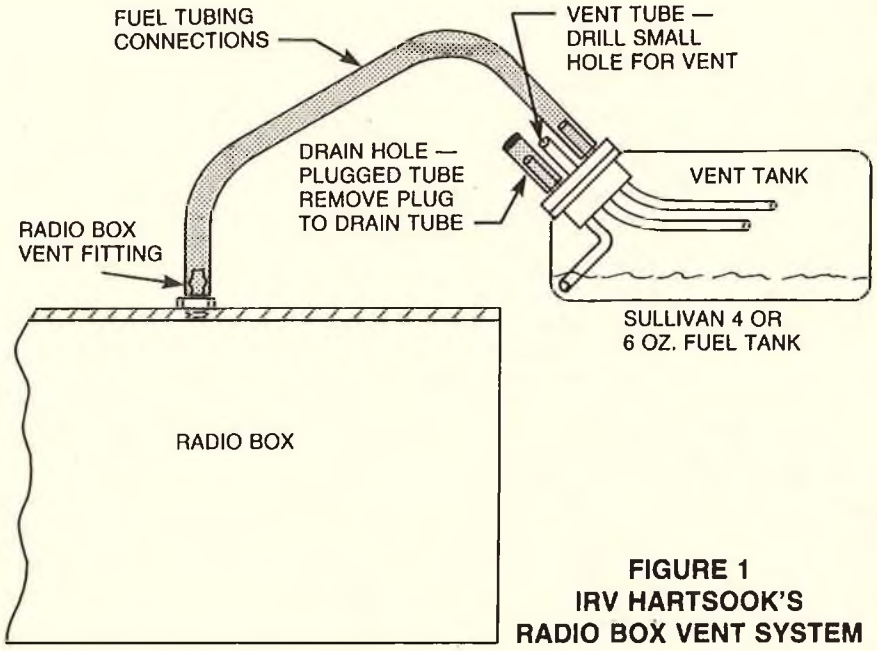


FIGURE 1
IRV HARTSOOK'S RADIO BOX VENT SYSTEM

I received a nice note from Irv Hartsook, the senior citizen model boater of District 9. Irv is quite a character — he always has a new joke and I've never seen him have anything but a good time racing boats. He always kiddingly inquires about a senior citizen discount toward his entry fees but this guy is one of the youngest boaters we have in many ways. Irv has been using the system as shown in Figure 1 with great success. Basically, the Sullivan fuel tank is used to vent the radio box while keeping out water. The top of the radio box is drilled and tapped for a water fitting or a K & B pressure fitting can be screwed into one of the radio box cover hold-down blind nuts. This fitting is connected to the vent tank as shown. The vent tank has three tubes: the drain tube is plugged until water is to be removed; the vent tube is soldered shut and a small hole the size of a pin is drilled to decrease flow of water into the tank; and the third tube is connected to the radio box vent. Be sure that the vent and third tube are centered in the tank so that if the boat is upside down these tubes will be out of any water acculumated in the vent tank.

The system works because it does not allow a low pressure to be developed in the radio box. Such a pressure literally sucks water into the box through the water tight fittings. While sitting in the sun the radio box heats up and internal pressure builds up, but the vent tank allows pressure equalization to atmospheric. When the boat flips, the cold water cools the radio box and this would develop a low pressure if the box were not vented. This suction could draw water into the box. As the suction is produced in the radio box, a small amount of water is sucked into the vent tank. Because of

the volume ratio of the radio box and vent tank the radio box pressure equalizes with the vent tank and prevents water leakage into the radio box. After the boat is retrieved, you can withdraw water from the vent tank using an old fuel squeeze bulb. Irv has had this system in all his boats and is very pleased with its operation.

I also received a very well-written contest report from Virginia Farber of Omaha, Nebraska. We met the Farbers at the Amarillo NAMBA Nationals and she mentioned that she would be sending some information on their racing program. I am including her report in this column to show those of you who are hesitant to compete, that model boat races are really fun. Don't hesitate to get out there and join the good people who race boats.

The Mutineers R/C Boat Club of Omaha, Nebraska, held their Annual Fun Race on August 22nd and 23rd. Fourteen competitors from Kansas City, Missouri, Norfolk, Nebraska, St. Paul, Minnesota, and the Omahans, enjoyed a sunny, breezy opening day with the tempeature in the low 80's. Sunday was not as conducive to enjoyable racing as the rainfall of 2" ended a three-week drought; however, the fourth round of all races was completed.

The race site at N.P. Dodge Park is a lagoon dredged from the Missouri River with a large campground in the park and overnight parking at the site for self-contained units or tents. The breeze was from the south into the drivers faces, which added spice to turn two and caused the Class A Hydros nothing but trouble. NAMBA rules were followed (and one IMPBA rule) however, the meet was not sanctioned.

A gala barbeque was held at Vice-Commodore Bill Jones' home Saturday evening, and the tall tales were really flying. While the competitors, the Mutineers, their wives and guests were enjoying the delicious dinner, SCUBA teams from Carter Lake and Lewis, Iowa, Fire Departments were out in the lagoon with underwater lights hunting for the Chi Farber's 7', 70 pound R/C Polaris submarine which unexpectedly sank while firing its missles (Estes 1/2A rockets with nose cones) during the opening ceremonies. They successfully brought it up after about a 15 minute dive. It would appear that this sub needs a larger sump pump in the missle bay. The divers really enjoyed the "practice" and their help was invaluable as the Scott brothers of the host club were unable to locate it using snorkels and fins.

The heats were hotly contested with ties for second after four rounds in classes C Hydro and A Mono. C.J. Van Voorhis of St. Paul and William Cooley, Sr. of Omaha, were too wet and cold for a tie-breaking race with their C Hydro Wing-Dings so drawn straws declared Cooley the 2nd place finish. Andy Anderson, Omaha, and Commodore Dave Haggart, perennial rivals, raced for 2nd and 3rd places in A Mono. Haggart's Streaker flipped in the third lap as Anderson's Pro-Glass finished just as the downpour returned.

There was a humerous moment during the Sunday drizzle as Gary Maxon's modified Hughey B rigger and Jay Putter's Hughey B Hydro disappeared into their rooster-tails in turn one and emerged with the rigger riding on top of the other hydro. Together they completed a half lap before they could be shut down. Gary was accused of trying to conserve fuel, but all he wanted was the "pick of the litter."

"Togetherness" was the key word during the awards ceremony as the drivers, pit crews, and officials all tried to get under the same canopy. The trophies were lucite desk top picture holders with plaques naming the race and position below the picture of the driver holding his winning boat. Luckily, Bill Jones had taken most of the Polaroid pics used in the trophies on Saturday while the contestants were smiling and dry. Non-winners were given their snap-shots as momentos of their efforts.

Dave Clark of the Kansas City R/C Boat Club was the High Total Points winner with 1st place finishes in the three events he entered. His Coyote rigger burned up the course with an OPS .65. This new rigger by Don Pinkert is a solid winner taking the turns with little side slip. With Dave's modifications to the turn and dagger fins, the boat appeared tethered to the course.

The Pro-Glass Deep Vee hulls, .21 and the new .40-.60, manufactured by Bob Hines Hobbies of Kansas City, are popular winners throughout the midwest, running well in choppy water. His brightly colored metal flaked decks make the sleek cigarettes real beauties which run as good as they look.

The Class B and C Deep Vee half-hour enduro was cancelled on Sunday as the hulls were filling with water before they left the starting stands.

Ten Futaba radios were used by the competitors along with four Kraft and one each of five other brands. The Futaba S-7 waterproof servos seem to be a deciding factor when purchasing a radio primarily for boating. All transmitters in use were dual stick. Many of us were fascinated by Steve Slusher's Proline Tx, set up to his design, with single channel dual sticks set at 45 degree angles and proportional isolated needle valve adjustments, dual rates, turn buttons, etc. About the only things missing on it were a servo-adjustable tuned pipe and an on-board tachometer read out. Several R/C boaters in Grand Island, Nebraska, are working on the latter and have it nearly perfected.

For a fun weekend of racing, with an emphasis on fun, in the midwest mark your '82 calendars for August 21 and 22 and write to Ginnie Farber, Sec./Purser, Mutineers R/C Boat Club, 690 North 59 Street, Omaha, Nebraska 68132, for information.

Dear Mr. Power,

I was wondering if you could help me on a subject which no one else can. First, I plan to run two OPS .65's in one hull, not geared but twin shafts. I have never heard of a hull of any design for a twin but have seen (in RCM features on NAMBA champs) a couple of people running twins. Are the hulls their own design or modified existing hulls? Hulls being rigger and hydro specifically.

How far apart should the props (contra rotating) be so that they don't interfere with each other? Would you suggest a separate cooling system to each engine or just pipe the water from one engine to its partner?

Does exhaust manifold cooling boost performance as my engines have been hopped up via modified piston and liner, backplate induction assemblies, rpm carb, rod and bearing cages fitted, or have I reached a limit by doing the above?

Thanks a lot for even considering this problem as twins are a whole new ball game, especially in boats.

By the way your article "Power Boating" in RCM is avidly read by most boaters over here including myself and we like the way in which you give a good general view into all the "always wanted to know that" bits. Thanks again.

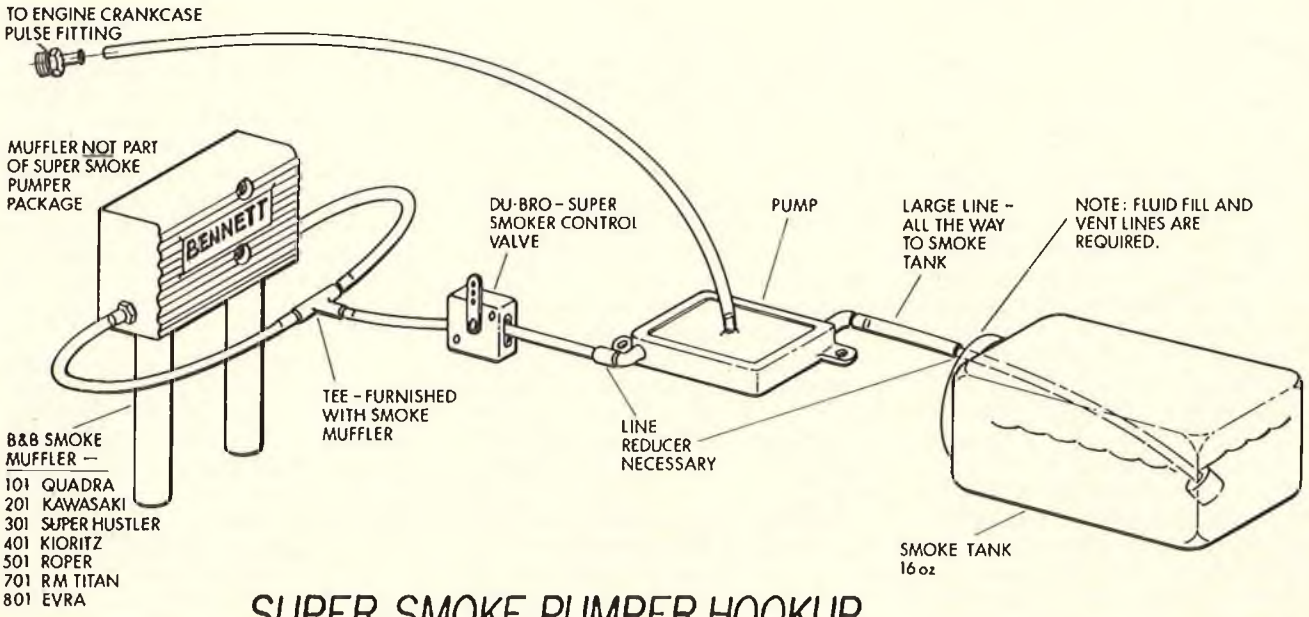
Safe and happy boating,
Nicholas Henderson,
Palmerston, New Zealand

Kits for twin engined hydros are available from Pinkert Custom Boats (the Thundergators), and from Precision Boat Mfg. (the Crapshooters). To my knowledge there are no other plans available from other sources for boats in this class. Twin propellers will interfere with each other even when mounted as far apart as is practical. Contra rotating the props eliminates their torque reaction. Rotating the props so that both prop blades enter the water when traveling toward the boat centerline will improve their

to page 170

HERE'S HOW

By Jerry Smith



SUPER SMOKE PUMPER HOOKUP

Since the advent of the biggies, smoke systems are becoming commmonplace with the aerial artist. It's a real show stopper when from out of the blue that gorgeous hunk of aerobatic contrivance begins to leave a long trail of thick, white, billowy smoke while carving trails in the sky to excite the onlookers. Yes, the smoke systems are definitely here.

I became interested in this new-found modeler's delight and decided to look into one such system being produced not too far from where I live. Space does not permit me to give you a long inspiring discussion on the merits of this particular smoke system, however, I will give you some idea of how it works.

The B & B Specialties Super Smoke Pumper, as it is called, works extremely well. It puts out mountains of billowy white smoke and also drinks up diesel oil like its going out of style up to 8 ounces a minute! The system, as packaged, consists of neoprene fuel line, a pump, a shut-off valve and fittings for necessary hook-up. The muffler, tee fitting and tank shown in the sketch are not part of this package.

The heart of the B & B smoke system is the pump which operates on pulsing pressure from the engine crankcase. The smoke tank is **not** pressurized to move the fluid to the muffler. No need to worry about a ruptured tank or a line coming off filling the inside of the fuselage with fluid. It is a sure-fire way of moving fluid from the tank — easy and simple. The pump is made by Mikuni of Japan and is mainly used to pump fuel on two cycle engines without a carb pump. In size it measures 1½" wide by 2¾" long by 5/8" thick and weighs a mere 3 ounces. A very light and compact unit indeed. It has two lugs for mounting and does not require vibration isolation. It can be easily mounted to the firewall of most any large Quarter Scale models available today.

A Du-Bro Super Smoker shut-off valve is supplied for controlling the smoke during maneuvers. The valve is compact enough to mount anywhere — in any position — and requires one extra servo to operate. It is so simple that it's ridiculous. A very positive, dependable, no leak, shut-off valve.

Now we finally come to the bottom line. How this system does its job. As the fluid flows from the shut-off valve it is distributed, through a tee, to **both** sides of the special smoke generating muffler permitting equal distribution of fluid over a larger area of hot metal, thereby allowing more volume of fluid to vaporize. I certainly cannot dispute this theory because I have actually seen it demonstrated in the air and on the ground (cough, cough).

The fluid lines from the pump to the muffler are standard 3/32" I.D. black neoprene. The lines from the tee to the muffler should be of equal length so as not to alter distribution. The fluid line from the pump to the tank and the line from the pump to the engine crankcase are 3/16" I.D.

The B & B Super Smoke Pumper system, as I have described it, does work extremely well. And, it will work with any of the large two cycle engines available on the market. Obviously, it would not be difficult, on your part, to put together such a system now that I have shown you the way. All of the items mentioned are easily obtainable on the market, and it's just a simple matter of putting them together, like many of you enjoy doing. However, to me it makes more sense, as a matter of convenience, to purchase these components as a complete package. You then have it all and are ready to install. Or, if you are interested in the pump only, B & B will be only too glad to send you one. You'll find them great people to do business with. Just write to B & B Specialties, 14234 Cleveland Road, Granger, Indiana 46530. Phone (219) 277-0499 or 272-1357. Ask for Dick Bennett and tell him to send you one of his Super Smoke Pumper Systems. You won't be sorry. □

SUNDAY FLIER

Ken Willard

"Life is what happens to you while you are planning to do something else."

Who said that first? I don't know, but it is a favorite quote of mine — and for good reason. It seems that just when you are all set to do something, and your plans are all made, something comes along and changes everything. Sometimes it screws up the works completely and makes you ask, "Why me?" Then again, it can be the other way around and make you ask, "How can I be so lucky?"

As I write this, it is the first week in December, 1981. When you read it, the odds are that it will be around the third week in February at the earliest. Take a look back at 1981 — how many of the things you planned to do did you actually accomplish? Did you build and fly all those great dream models you had planned back in January of 1981 — or are you now looking forward to finishing them up and flying them next spring. If so, why? "Well," you say, "Something came up." And each one of you will have a different tale to tell, like, "I spent so much time repairing my other models that I didn't have time to finish the new one." Or (and this ain't too funny), "I was getting a lot of static about how much time I was spending in the shop and at the field, and so I decided to cool it for a while." The variations are endless on the way life happens to you while you are planning something else.

A couple of projects I had planned for 1981 were delayed for various reasons, and now are on the schedule for 1982. Some of the reasons for delay were not pleasant; let's forget them. The others were the type of interruptions that you wish would happen more often. I told you all about one of them in the December issue — the unexpected trip to Hawaii. Well, maybe lightning doesn't strike twice in the same place, but unexpected trips can. At least to me; here's what happened.

In the September issue of RCM I outlined a way to present R/C air shows to the public. The general theme was, "Have a game plan, and stick to it." Well, I received a letter from Jack Coan, President of the Tropic Aeros R/C Club in Miami, Florida. He had been contacted by the local Channel 4 TV station to put together an R/C show. The club went to work. The general theme of the show was "Radio Controlled Airplanes Are Fun!" Jack set up a show which went all the way from giving a beginner (in this case the TV director) a lesson, up to the highly skilled performance of Mike Mas with his helicopter routine.

In the letter, Jack thanked me for giving him some ideas, and then added the clincher. "Come on down, and we'll put on another show!"

So I did. And what a show! Jack picked me up Saturday morning, and we drove down to the private field of the South Dade R/C Club. It's a beautifully kept grass field, located on Chuck Burr's famous strawberry farm. "Burr's Berries" are sold right on the property when they ripen, and I'm told the traffic jams at the stands are almost impassable, but, like everything else, if it's good it's worth waiting for. And Chuck Burr's berries are the best.

Chuck runs the farm, and has quite a bit of machinery to do it with. There's a big shed for the machinery, but no machinery in it. Instead, there's a beautifully maintained Cub, a Tri-Pacer, and a Piper Twin. The machinery sits outside. Chuck is an aviation buff, a pilot, and a great booster for R/C flying. Before we started the informal "show" Chuck took me up in the Cub; he has two flight strips on the farm (the R/C field is at one end of one of the strips). We flew around ("Here, you fly it," he told me) and looked over his farm, then, when we cam back to the field, we did a loop just for the fun of it, then came in and landed. It was the first time I had been at the controls of a light plane for about thirty years. Sure brought back the memories.

Then came the show. All the guys tried to out-do each other, with flat spins, low passes, and general hotdogging around, but the star of the show was the initial test flight of Gary Greksa's Quarter Scale Gee-Bee Sportster. Perfect! Take a look at photo No.1. That's Mike Mas, Gary Greksa, Jack Coan and me admiring the Gee-Bee following the successful test.

As most of you know, Mike Mas is a helicopter specialist. What most of you — including me — didn't know is that he is also deep into TV video recording, editing, and musical scoring. After the air show at Dade County R/C Club field, we went over to Mike's facility nearby, where Mike showed me his TV Equipment. I'm not an electronics buff, but it was apparent that Mike has gone all out to have first class equipment for filming, editing, and presenting TV documentation. In fact, he had been taping the activities at the field, and re-ran the tape for us. Later on, he will edit out the bad stuff (like when he inadvertently had the camera running as he walked out to shoot some take-offs — you never saw so much nervous grass) and add a musical sound track. He's a pro — not only with models, but with TV as well.

As long as I was in Florida, I wanted to see some of the other Miami area R/C club activities, so, on Sunday, my friend Vince Arias picked me up and we went first to the Tropic Aeros R/C field at Tamiami Park, then to the Aero Modellers of Perrine R/C field, and up to Broward County R/C field. Yes, R/C is alive and well in Miami.

Now before you all get too envious, let me tell you the rough part. I was gonna go fishing with Bob Bullen on Monday; instead I woke up with the most godawful bellyache and had to go to the doc. Diagnosis — kidney stone. (I'm a chronic at getting "stoned" — kidney, that is.) So, I spent the day in bed, totally doped up. Luckily, I managed to get rid of it Tuesday (Ow-w-woo!) so Bob and I went fishing Wednesday. As I said at the start, life is what happens to you while you're planning something else.

★

Recently I received a letter from Les Hard enclosing a copy of "High Flight," the official quarterly publication of the International Miniature Aircraft Association, "dedicated to the glory of giant model aircraft." Les took on the job of editor, and is doing his usual excellent job. However, there were a couple of things I thought might be worth mentioning for your consideration and/or amusement.

Some time ago I wrote Don Godfrey (he's President of IMAA) and reiterated my personal preference for the term "Grande Scale" as being more descriptive of the big, beautiful birds. I received a nice letter back, acknowledging the appropriateness of the term. But "giant it is, and giant it will be." So be it. I really don't care all that much, but somehow, I find it a bit incongruous — the International Miniature Aircraft Association, "Dedicated to The Glory of Giant Model Aircraft." I think of miniature aircraft as being

Photo #1

Photo #2

Photo #3

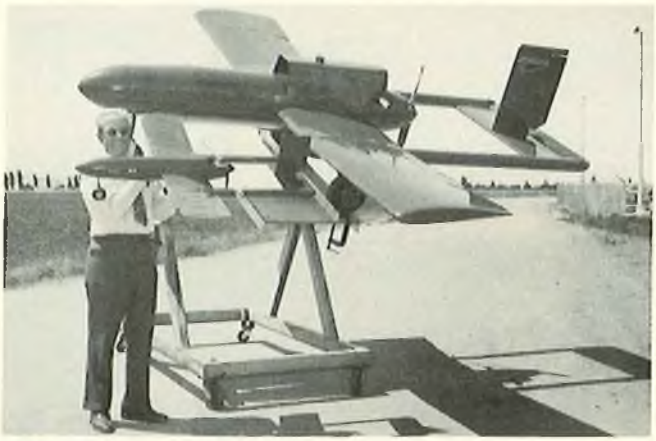


Photo #4

those like Courtney Bryant builds, or Flyline Models kits. Take a look at photo No. 2. That's Courtney's P-26 — a truly exquisite miniature aircraft. Just so you can get the scale effect, that propeller is a 6" diameter, 3" pitch prop! Now **that's** miniature.

Now look at this photo of Dick Enos with his Quarter Scale Curtiss F11C2 "Goshawk" (Photo No. 3). What a beauty; as the French would say, "C'est grande!" But can you imagine Dick saying, "This is my miniature giant scale Goshawk!" You can?

Just so you won't get the impression I don't fly the biggies, (which I don't very much) it isn't because I don't like them, or am intimidated by them. I do like them, and I can relate to the great pleasure which they provide to their builders and fliers. I just happen to enjoy the little jobs. But take a look at photo No. 4. Yep, that's your old Chief Sunday Flier, some nine years ago, holding a 1/3 Scale model of Lockheed's Remote Test Vehicle (RTV) standing alongside the full scale job — 12' span, 24 horsepower Hirsch engine, 340# weight, with 11 pounds/sq. ft. wing loading. Flew them both — and the full scale job was easier to fly than the 1/3 scale model!

Contrast that huge RTV with the peanut scale SE-5 shown in photo No.5. The biggie weighs 340 pounds;

Photo #5

the peanut scale weighs 8 ounces. The big one spans 12'; the peanut SE-5 spans 12½". Roughly speaking, the big one is twelve times the span of the little one — and the little one is twelve times harder to fly! Here's an idea you might try. If you are going to build a Quarter Scale model, and are a bit concerned about flying it, then first build a smaller version. If the quarter scale job spans 8', then make a quickie version that spans 4', and fly it. Then, when you build the big one and are ready to fly it, you will find that after flying the smaller job, the big one will be like flying in slow motion. Honest.

Meanwhile, let's all of us Sunday Fliers have fun flying our trainers, sport scale jobs, and original designs. That's the name of the game, isn't it? Have fun.

Maybe we should call ourselves the Funday Fliers.

(Editor's Note: The Sunday Flier has many letters from 1981. Those that were of general interest were used in the column and those that had SASE included were answered. If you want an answer, please include a SASE with your letter.) □

RCM PRODUCT REVIEW

Hobby Shack F-16A

SPECIFICATIONS

Name	F-16A
Aircraft Type	Stand-Off Scale Series
Manufactured By	Hobby Shack 18480 Bandilier Circle Fountain Valley, California 92708
Mfg. Suggested Retail Price	$89.95
Available From	Both Mfg. & Retail
Wingspan	35 Inches
Wing Chord	10.5" Avg.
Total Wing Area	367 Square Inches
Fuselage Length	44 Inches
Stabilizer Span	6.5" (each stab)
Total Stab Area	29 Sq. In. (per stab)
Mfg. Rec. Engine Range	.19-.25
Recommended Fuel Tank Size	6 Oz.
Recommended No. of Channels	3-5
Rec. Control Functions	Elev., Throt., Ail., Retract Gear, & Nose Steering
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply & Plastic
Wing	Balsa, Spruce & Ply
Tail Surfaces	Balsa & Spruce
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Futaba
Engine Make & Displacement	Super Tigre X25
Tank Size Used	6 Oz.
Weight, Ready to Fly	76.5 Oz.
Wing Loading	30 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

Complete hardware package, die-cut ply parts, parts match to plans, numbered parts, detailed and illustrated parts list, and quality of the kit.

WE DIDN'T LIKE THE:

Instructions.

The F-16A was designed as a multi-role fighter. To achieve this goal, the F-16A is stressed to maintain 7 G's and has a placard limit of a positive 9 G's. By using a computer controlled fly-by wire system, and a thrust to weight ratio that exceeds 1 to 1, the F-16A can display performance characteristics that were unheard of a few years ago.

Pilot somehow found a way to put all the required parts, bits, and pieces in a box that measures 36" long, 9½" wide, and 4" high. Inside the box we found some of the best packaging we had seen in a long time. All the fragile parts were protected. All hardware and machined parts were packaged individually, and the canopy was protected by tissue paper. All of the parts were easy to identify because of the complete parts list, and the silk screened numbers on all of the die-cut pieces. The hardware package included an aluminum prop spinner, engine mount, complete fuel tank assembly, formed wire landing gear, and complete flying stab linkage. There were enough nuts, bolts, and screws to put everything together with some left over.

Construction

Two plan sheets were included in the kit. One 35" x 47" plan is for general construction. It was well-drawn and shows all required detail including control travel and retract gear location. The other sheet measuring 25" x 37" was the construction guide, and the illustrated parts list. The construction guide was printed in two languages and included step-by-step pictures. The written instructions were very hard to follow due to incomplete sentences. We feel something was lost in the translation as usually happens in these cases.

The basic fuselage was built first. The structure was easy to complete with light ply sides and bulkheads. The top and bottom of the fuselage are planked to form the compound curves. Large balsa blocks form wing fillets that are installed and carved to shape after the wing is glued to the saddle.

to page 167

BIG IS BEAUTIFUL

Dick Phillips

Anyone who doubts the popularity, worldwide, of large models, should have the opportunity to go through my mail. It's a rare day that doesn't bring in a couple of pictures of someone's new (and often bigger) new model.

A case in point was a recent letter from Captain Gabriel Ferro of Bogota, Columbia. Captain Ferro has flown models for over thirty years and includes DC-3, DC-4 and 727 and 707 models in his experience and his model indicates he thinks big.

The model (see photos) is a Cessna 180 with a span of 167" --- that's just a shade under 14' for those of you who divide by twelve as slowly as I do! Length is 128" and the model tips the scales at 50 kilos, or a tad over a hundred pounds. Power is with a McCulloch engine of 100 cc (about 6 c.i.). Captain Ferro says the model is adequately powered, and if you keep in mind that his take-off altitude of 8355 ASL is a good deal higher than most of us even fly, then the power has to be pretty good.

The construction used is much like the full scale using .5mm aluminum, pop rivited together and includes a 15mm firewall of plywood and heavy aluminum angle engine mounts. The landing gear was fabricated from an automobile spring, so is able to absorb some of that 100 pound weight and still have a little give. The radio is an EK six channel with EWH servos which makes a good combination and is the same as I have used for some time now with good success.

The first flight was made in August of 1979 and Gabriel says he was expecting a "big show all around the sky" but found the model to be very docile, and easy to fly. Easier, he claims, than anything he has ever flown, including the other large models mentioned above. I can appreciate that flying in the Andes must result in a fair amount of 'white knuckle' flying and the 180 is apparently a good way to relax. My favorite comment on flying models, as compared to flying full scale is --- in the event of a crash, no one has to go to the hospital and the FAA doesn't come around asking a bunch of embarassing questions!

Gabriel's 180 is a most impressive bird as I am sure you'll agree and certainly points up that building big is not limited to any particular area nor limited to flying them at lower altitudes. The guys in Denver (who I visited earlier in 1981) were having trouble flying at 5000' plus; imagine the difficulties if you moved that up to over 8000'. My thanks to Captain Ferro for sharing his experience with us. I expect someone will have something to top the size within the next few months.

Gabriel Ferro, of Bogota, Columbia, and his almost 14' span Cessna. Model weighs over 100 pounds and flies on a 6 h.p. engine. How many guys do you know who can lean on the tip of their prop without leaning over? (More in text. Photos from Gabriel Ferro.)

Note the stance of the man holding the vertical fin, it looks as if he is working at keeping the Cessna in one place. Model is almost entirely made of aluminum.

★

Over the next few issues, I'm going to do a little reviewing for the benefit of those of you who have joined us recently. I'd like to introduce you to some building techniques which will take conventional plans or kits and assure their construction will tolerate the higher loadings and greater power when we use gas engines in them. There is no magic involved, just some commonsense and a compilation of things which have worked well for me over the years and which have been proven out by others in their building. Most of the material is contained in my newly revised booklet "Building Big Is Beautiful," and may be of some value to you if you are planning a large model or a brand new venture into Quarter Scale.

Let's assume we are building from a kit which was intended for a glow engine of .60 to .90 power, or a similar plan. Much of the material and techniques outlined in the plan or kit will be based on conventional model construction, but, as we are going to use a Quadra or other large engine, we wish to assure a safe and structurally sound model. I'm not going to suggest

to page 28

BIG IS BEAUTIFUL

from page 26

that we try to build to survive a crash as that's a fool's errand. Let's build to avoid a crash and that requires light, strong construction. Light is a relative term and what is light in a glider would be ridiculously so in Quarter Scale. What can be considered light in Quarter Scale would be rather heavy at 2" to the foot.

What I am going to do is take a model, a sub-assembly at a time, and give you as much information as I can on that sub-assembly. Next month we'll move on to another, and so on, until we have covered the entire construction phase. This month, let's start with an easy part, the tail feathers and much of what we learn will apply to other parts of the model as well.

Let's assume that the kit calls for balsa throughout, in various sizes, with 3/8"or 1/4" cut balsa parts for the outer edges of the tail surfaces. If the main elevator spar is 1/4" x 3/8" balsa, we should use this size, but change the material to spruce, or some comparable wood. Cedar will do, pattern pine, cottonwood, poplar (actually the same thing) or almost any of the common softwoods will do, so long as they are fairly tight grained, straight grained and without flaws such as knots or cracks in the wood. Hobby shop spruce is fine and Midwest is now producing this fine wood in lengths more appropriate to our construction and the samples they sent me are very good indeed. The spar in the stab and the leading edge of the elevator should be one of these woods, which will give us a bit of a problem later when it comes time to hinge the surfaces, but there will be significant advantages as well.

The interior members of the stab and elevator (and rudder, too, for that matter) may be made from the material supplied in the kit, but the spars should be able to support more than balsa might do under the loads we will likely be applying later in flight.

The outer perimeter of the tail feathers may be made of the material supplied in the kit, but there is a better (and much stronger) way to build than using balsa. That is to use very thinly cut spruce (or any of the others mentioned above) of the correct depth for the surfaces, and then these strips are laminated together to produce the shape required. This works extremely well when the surfaces have curved edges. The light strips will laminate to form almost any curve, wetted if the curves are tight, and it also makes a very strong outer edge to the tail feathers, highly resistant to damage and 'hangar rash.'

Straight areas of the control surfaces and stab and fin may be made from the softwood we are using, in combination with the laminated strips mentioned above. Using these woods will provide an outer edge that is both strong enough to take the loads we will eventually put on them, light enough to fly well, and tough enough to resist damage.

There will, of course, be a minor increase in weight with these alterations, and most of this weight (and possibly even more) will be quite useful at the time we mount our engine on the firewall. The gasoline fueled engines are a good deal heavier than the glow engine originally designed for. The tail feathers were kept light in order not to produce a tail heavy model which would require an inordinate amount of lead in the nose to get the C.G. in the right place before flying. The weight we have added to our construction in the tail will help to balance the added weight of the gas engine up front, and we may even have to add more to the tail in order to balance the several pounds of power we have added to the firewall. Don't be shy about a bit of extra weight aft; it would be pretty difficult to build a tail heavy model in this size.

Once the assembly has been removed from the building board, it can be sanded to the proper shape just as would have been the case had we made no changes at all. True, the sanding will not be as easy if the parts had been balsa, but, by the same token, they will be highly resistant to damage, built as described above.

Hinging, as mentioned earlier, is a bit more difficult in spruce than is making hinge slots in balsa. I start by drilling a few very small holes about where I want a hinge slot, being careful to feed the drill with a light touch as those little drills will break at a sneeze, so they must be handled carefully. Then, I use a short piece of a fret saw blade to clear the slot to take the hinge. It takes a fine hand and a careful touch but the advantage to be gained is that the hinge, once anchored, is in place to stay and no amount of over-stressing will cause it to pull out. I pin my hinges with those little wooden round cocktail toothpicks they serve appetizers on and, despite their rather gaudy colors, they are hardwood and they hold well when a small hole is drilled through the part to be hinged, through the hinge and, a glue soaked toothpick is driven through them both. The toothpick is then sawn off at the surface, the surface sanded and repainted, and the job is done and done very securely. (Hinging is done **after** covering and painting, of course.)

An alternative is to use the Klett hinges, only using a long piece of wire in place of all the little short hinge pins. This allows the halves of the hinges to be permanently mounted **before** covering, keeps the hinges aligned beautifully while being put in place, and also permits the removal of the control surface for repair, re-painting or whatever, at any time by removing the hinge 'axle' or piece of piano wire. The permament mounting of the hinges before covering and finishing gets around having to refinish the pinned areas after pinning the hinges. The piano wire hinge 'axle' will stay in place if the outer end is turned back on itself and stuck back into a small hole drilled in the edge of the surface being hinged to.

It's not a bad idea to provide struts supporting the stab and fin and tying back into the lower fuselage as these surfaces are pretty wide and subject to a fair amount of vibration with some of the engines we use. It's a simple matter to make small metal mounting plates on the stab and fin and connect them with adjustable wire braces using either turnbuckles or clevises. Be careful about metal to metal contact as it can create interference in your radio. I prefer to use the plastic clevises for this purpose. The small mounting plates can be bolted right through the stab and fin with quite prototypical looking small bolts which does not detract from the appearance of the model.

We talked about covering a couple of issues ago and we will review it again at some future date, but not right here and now.

One final word concerning glues to be used with the materials I have described. The aliphatic resins, such as Titebond, work well. If there is a drawback, it is the drying time required. Be aware, though, that they do not soak into the tighter grained woods previously described quite as well as they do into balsa, so there is a distinct advantage in using gussets as well in order to provide great strength and greater glued areas. These can be simple triangles of balsa glued in heavily stressed corners, or you may choose to cover with 1/32" or 1/64" ply overall, especially if the surface being modeled was covered in aluminum in the full scale version.

The cyanoacrylates are also good, I prefer the thicker ones which work well for me such as Hot Stuff's Super T, or Carl Goldberg's Super Jet. They permit faster building (which is important to me as my time is rather limited) by promoting faster drying and, therefore, greater throughout as industry describes it.

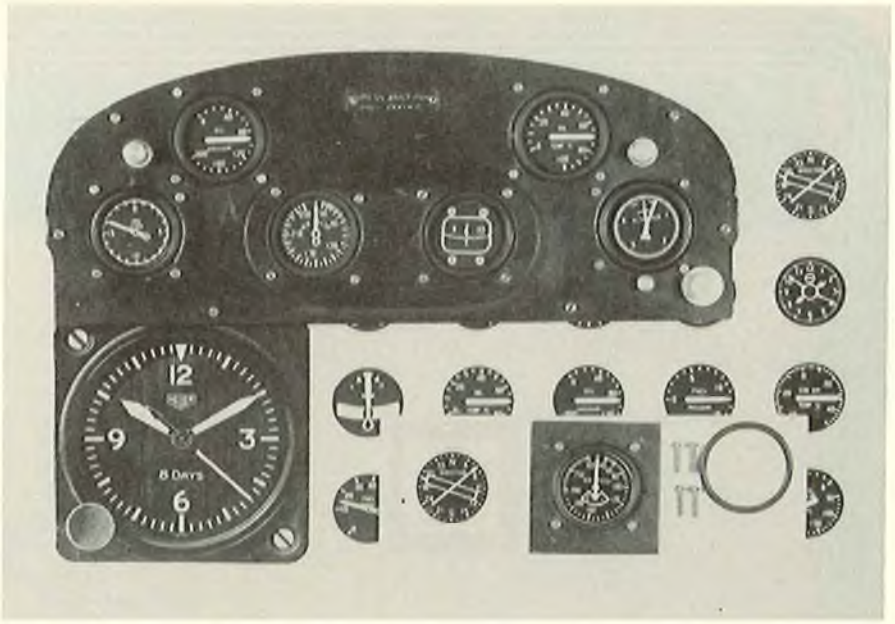
Sometimes I will also use the epoxies in regular construction, but only if I want to assure extra strength and if I am in a real hurry to get something done before quitting for the evening.

All the glues we use in conventional construction may be used in the type of building I have described with the minor reservation that penetration is not quite as deep with the woods mentioned as with balsa but that can be overcome as described.

So there are a few tip on tail feathers for you. Next month we'll talk about wings in about the same detail and I'll pass along some ideas for both kit or plans construction to help you build a safe, strong, but flyable model.

★

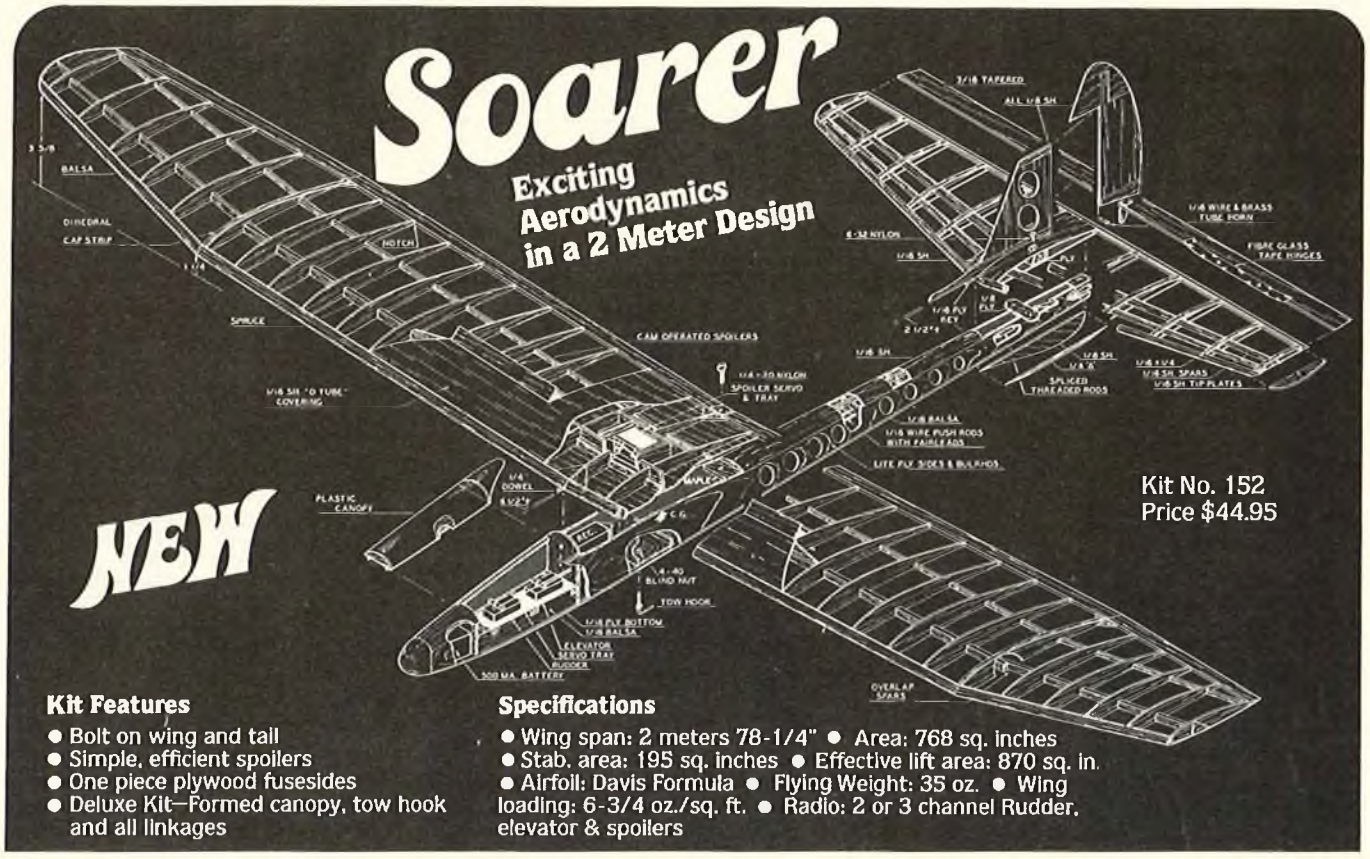
I have a Kioritz engine (the 2.44 c.i. version) on hand for some time now and, until recently, it had not been run. In preparation for flying a Godfrey Stearman, I have had the engine in a test stand for a few trial runs recently and have been impressed with its performance. It has perhaps two hours on it at present and I understand they reach top performance well after about three hours. We are currently getting a touch over 6000 on a 20/8 Zinger but that should improve a bit as it breaks in properly. It uses a three ringed piston and the rings will have to seat properly in order to produce the best results.



Instrument panel for Piper J-3 Cub built up by Ed Morgan. Full size 8 day clock shown for comparison. Instrument faces, Bezel rings, screws, etc., are available from International R/C Specialties, 2310 Cimarron Rd., Las Vegas, Nevada 89117.

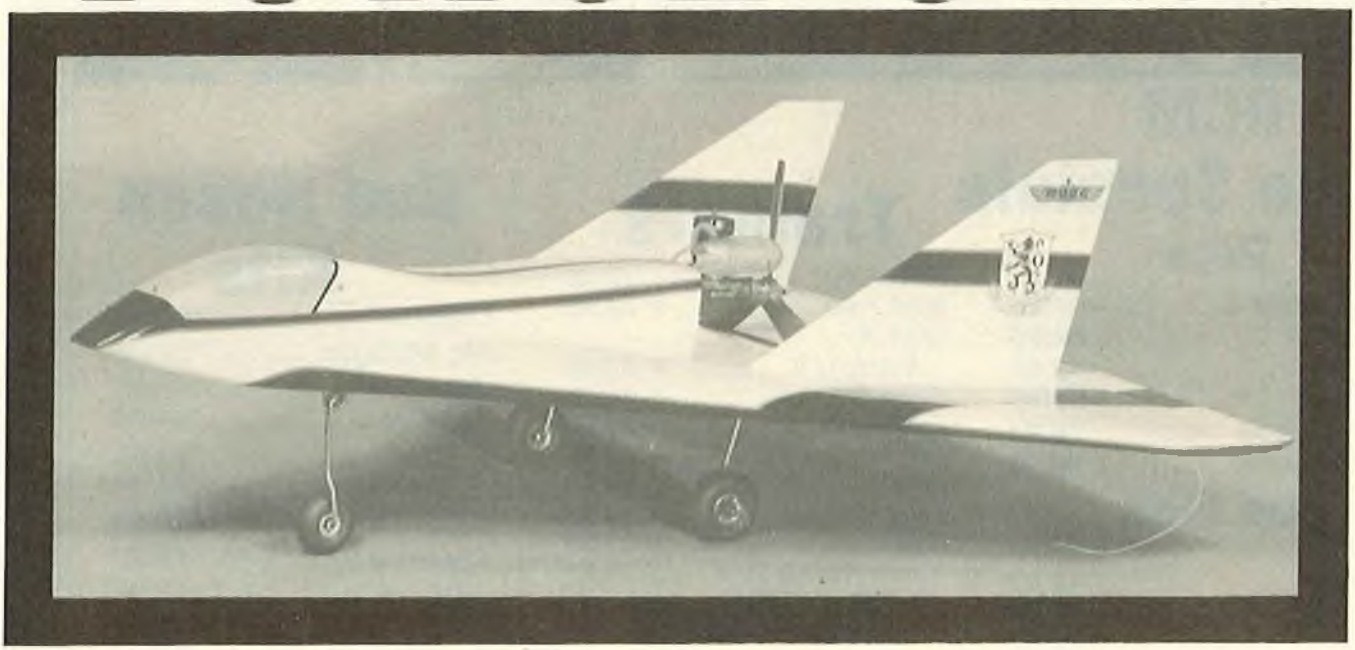
The interesting (and gratifying) thing about this engine is its extremely reliable idle. It ticks over at 1100 rpm, running very smoothly, without the vibration one would expect at that low speed. It's a delight to see this engine running at that speed with a complete lack of the shakes. It has been a revelation to others here in the club who have not

to page 160



MIDWEST PRODUCTS COMPANY, INC. 400 S. Indiana St., Hobart, Indiana 46342 (219) 942-1134 Send $1.00 for catalog.

FORCE ONE



After many prototypes, this mid-engine delta-wing is the designer's latest effort. It has superb flying characteristics, good looks and, best of all, easy to build.

By L. Mikulasko

All my modeling life, delta-winged airplanes have fascinated me. One of my first single channel models was a delta.

About ten years ago I designed a delta-wing model, from which a whole series of deltas was built. Each one had something improved. Most had the engine up front; some at the back.

The model I am introducing to you now is the first mid-engined effort. It has the best flying characteristics yet. It is easy to build, and the best looking, too.

This model is very fast at full throttle, but can fly so slowly that it almost hovers without stalling. Its small size makes it ideal for easy transportation. The model can be built and flown by any beginner with enough experience to be able to take-off and land a conventional aircraft by himself.

CONSTRUCTION

Study the plan. All parts are numbered and will be referred to by number in the construction article.

Cut out all of the parts. Drill all holes where shown. Make sure that the fuselage sides are cut from balsa of the same density. The 1/4" x 1/4" spruce stock must be straight.

To speed up construction, I use cyanoacrylate on everything except the firewall, nosegear mounts, and mains.

Wing:

Right on top of the plan, glue together the 1/4" x 1/4" spruce leading edge (1), trailing edge (3), and tips (2). Mark the location of the ribs on both the leading edge and trailing edges. This will be the basis of the frame for the wing.

When dry, lift the leading edge from the plan and put approximately 2" support under the nose, leaving the trailing edge on the bench. From now on, you don't have to build on top of the plan.

Glue the ribs (W3, W4, W5, W6, W7) into the frame after you have sanded the front of each rib to conform to the angle of the leading edge, for more gluing surface.

Now you will be building the leading and trailing edge of the propeller cutout. Take the small half-ribs (39), and glue them to the strip (18), and glue the half-ribs (40) to the strip (19). Sheet both sides with parts (12) and (13), and sand to a smooth finish.

Now take these two parts and glue them between the ribs (W2) on the positions marked for the leading and trailing edge of the cutout. Then glue the plywood stiffeners (8) on the inside of the two (W2) ribs. Glue the resulting sub-assembly into the main frame.

On the inside of the plywood ribs (W1), glue the triangular stock (5) in place where the 1/4" ply bulkhead (4) is going to be located.

Glue the plywood nosegear bulkhead (4), and the balsa bulkhead (21) between the ribs (W1), making sure that everything is square. Glue this sub-assembly into the frame.

Between the leading and trailing edge of the propeller cutout, glue the half-ribs (41).

Glue in the spars (7). When the glue is dry, cut the top spar off just inside the center ribs (W1).

Glue the trailing edge sheeting (9) on the top and bottom of the wing. Keep the trailing edge on a flat surface while the glue is drying.

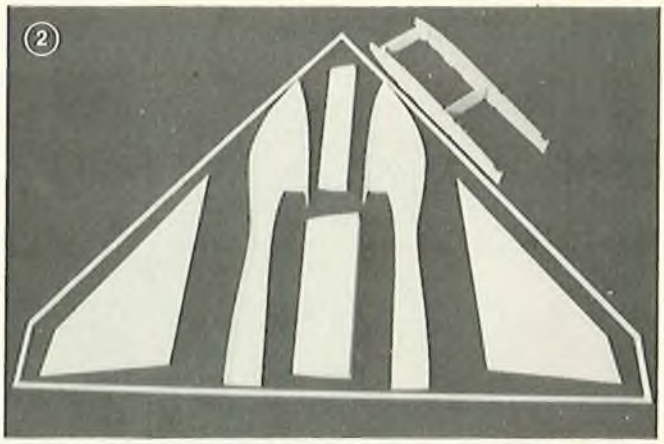
Glue the balsa strips (6) on both sides of the leading edge, top and bottom, and sand to the contour of the ribs.

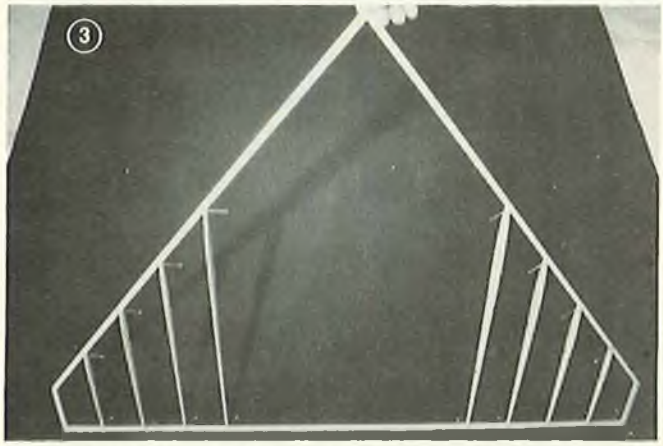
Glue on the leading edge sheeting (10). I suggest that you glue this sheeting at the leading edge first, top and bottom, making sure that the leading edge is straight. Then, when that glue is dry, glue the sheeting to the ribs. All of this can be done up in the air, without a jig.

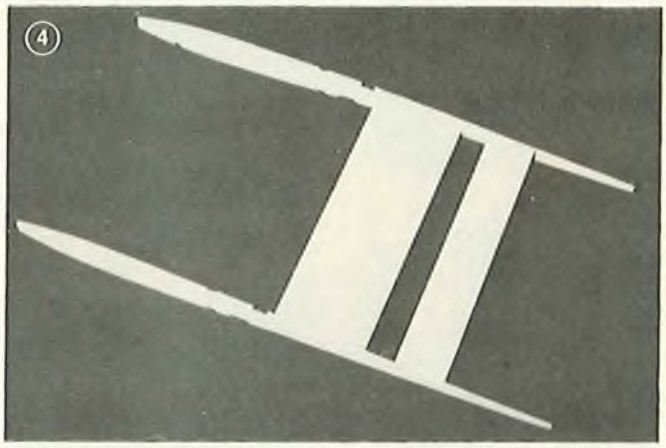
Glue in the hardwood block (20) for the main gear. This block should have the slots for the 5/32" piano wire already made.

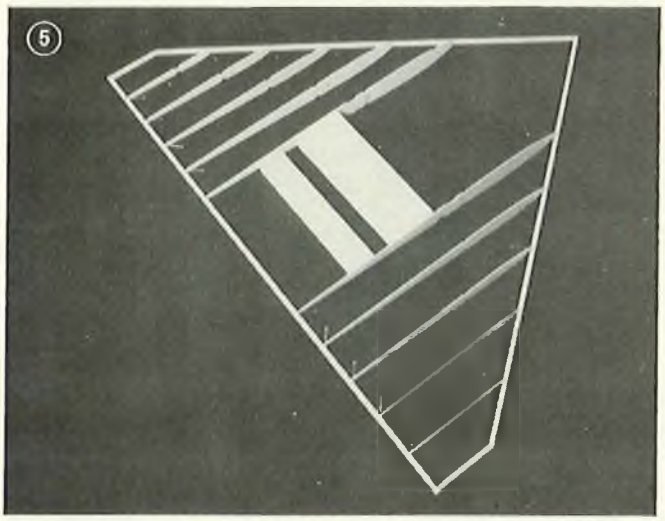
Glue the sheeting (11, 14) on the

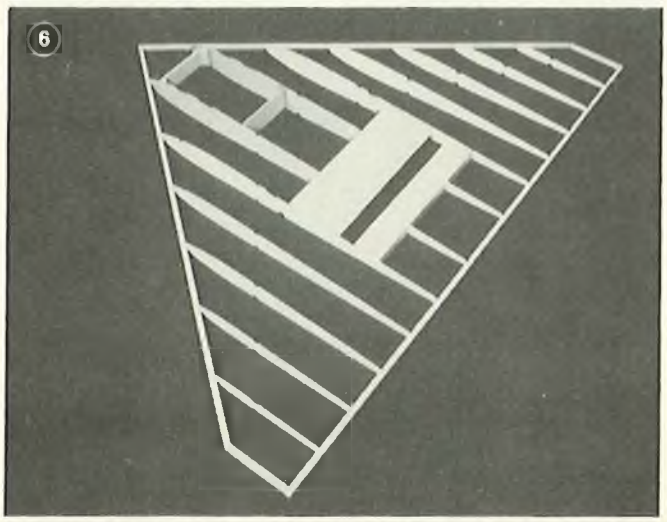
text to page 36

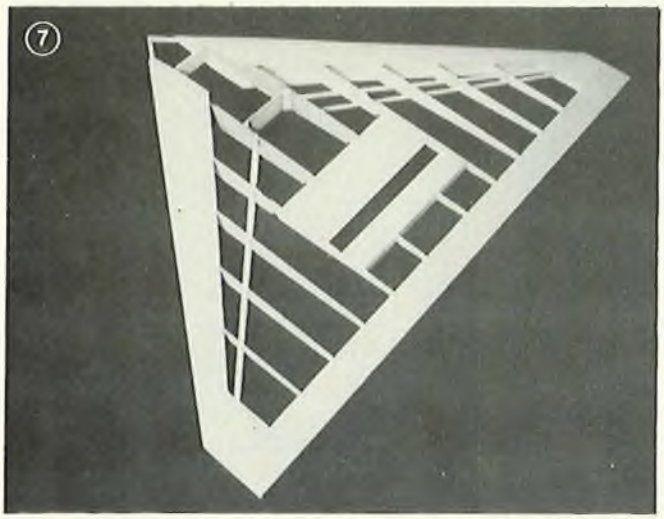




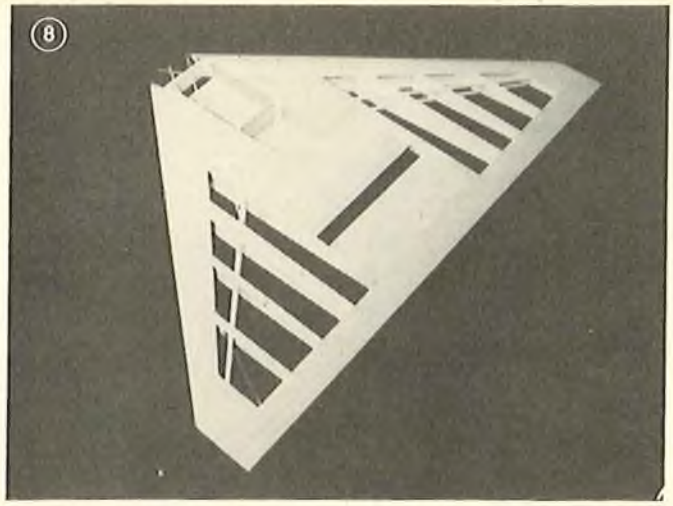


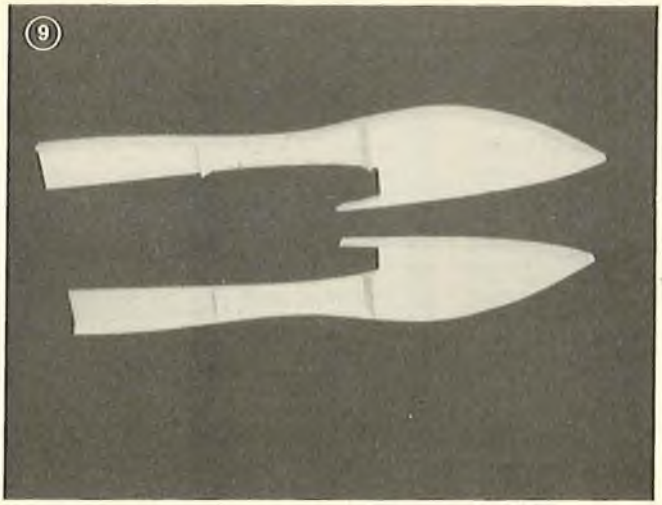


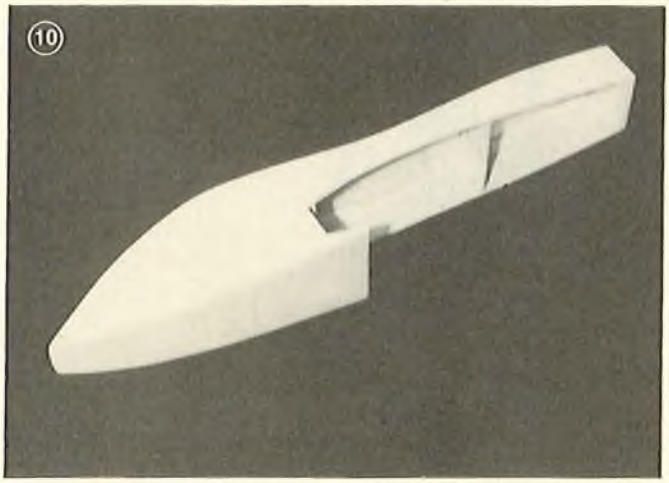


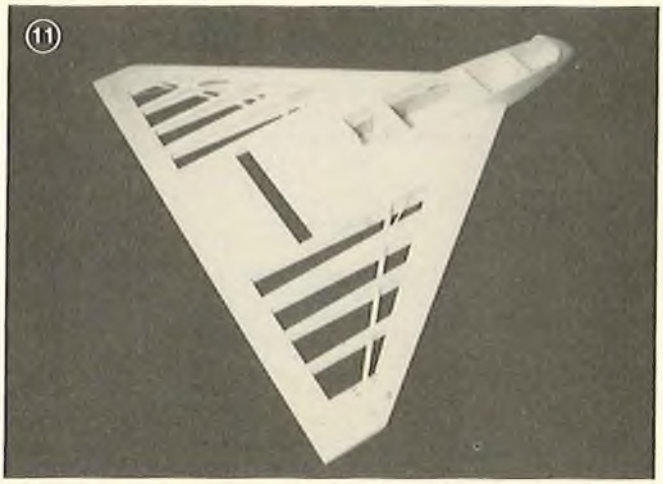


(1) Individual parts for Force One, assembled for inventory. (2) Wing frame, with fins, fuselage sides, leading and trailing edge of the propeller cut-out and wing center plywood subassembly. (3) Wing frame with some of the ribs glued into it. Note that it is raised off the board, keeping its shape without a jig. (4) Propeller cut-out subassembly. (5) Propeller cut-out subassembly in main frame. (6) Completed wing frame. (7) Spars and some sheeting applied to frame.

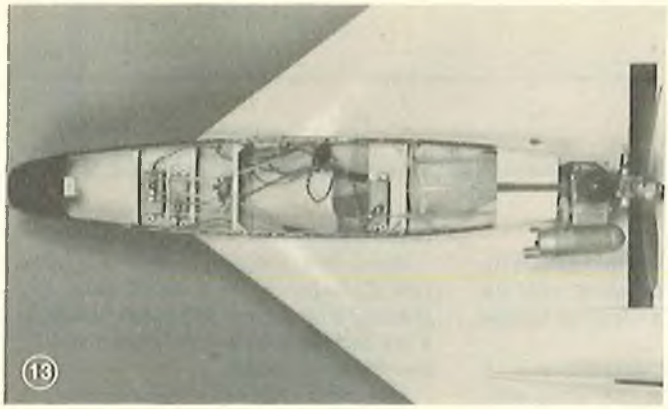


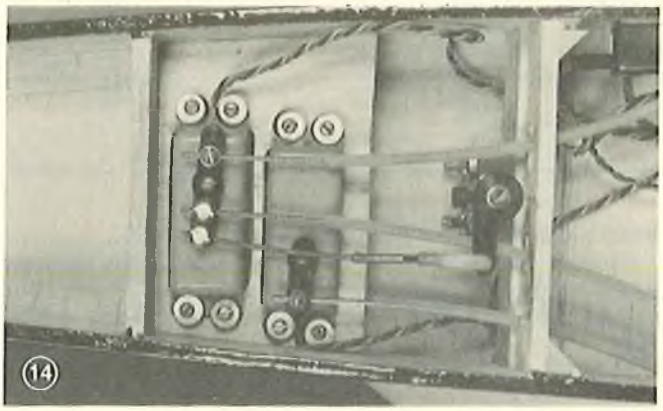


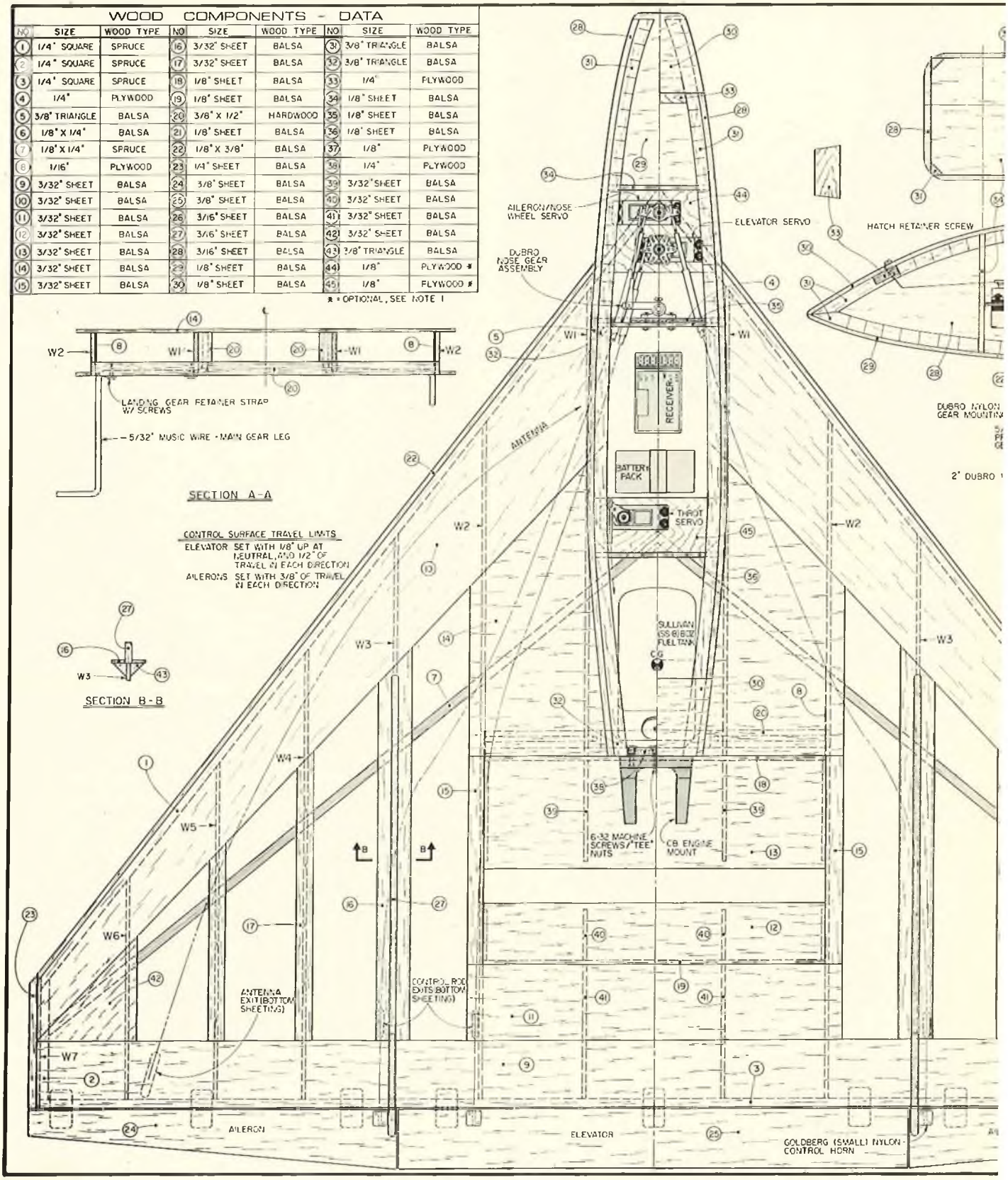




(8) Completed wing. Note leading edge trimmed back to the first bulkhead. (9) Fuselage sides with triangle stock in place. (10) Complete fuselage. (11) Fuselage in place, structure ready for covering. (12) Close-up of mounted O.S. .40 engine showing propeller cut-out. (13) Radio installation. Notice, battery and receiver just in front of throttle servo. Space in front of them should be filled with foam. (14) Close-up of radio installation.







bottom of the wing, between ribs (W2).

Glue in the pushrod tubes. Don't forget to glue in the NyRod outside tubing into one wing for the antenna wire.

Finish the sheeting on the top of the wing, and glue on all capstrips (16, 17).

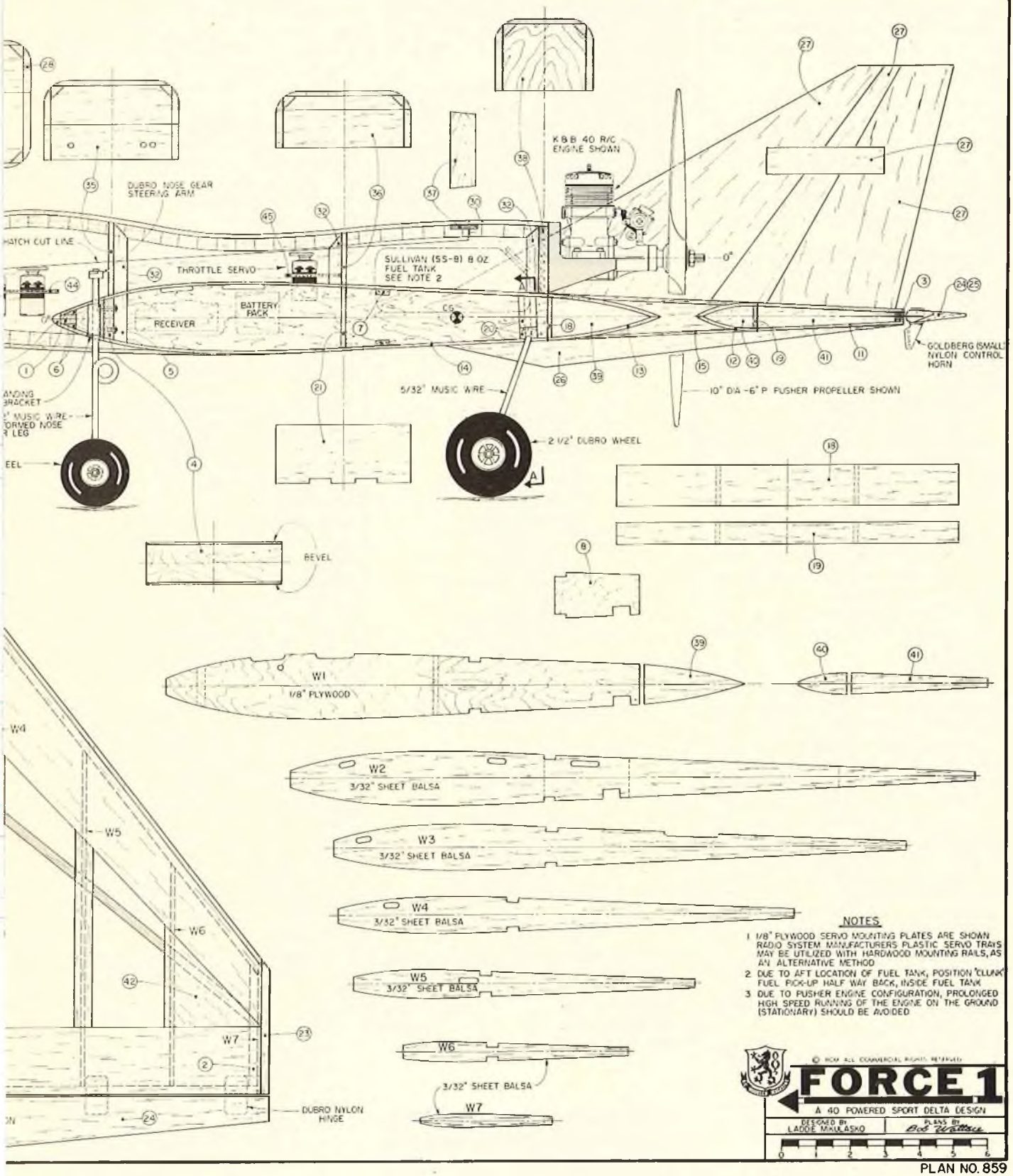
Under the top capstrips at rib (W3), glue in the triangular stock (43) on both sides to stiffen up the area for the fin. See cut B-B.

Glue in the balsa strips (22) on both leading edges and, at the wing tips, balsa sheet (42).

Sand the leading edge to a nice round shape. Note: Do **not** sand the leading edge sharp! This will result in a wicked high speed stall tendency in the finished model.

Cut away the leading edge sheeting

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



and 1/4" x 1/4" spruce between ribs (W1) back to bulkhead (4) where the fuselage will plug in.

Sand the whole wing ready for covering.

Glue the fins together and sand them with fine sandpaper.

Cut out the elevator (25) and ailerons (24) out of trailing edge stock. You can sand the aileron tips so that they have built-in washout.

Fuselage:

Before starting the fuselage construction, make the cuts in the fuselage sides (28) where the top hatch will be separated. Do not separate these hatch pieces from the fuselage sides. We will do this later. Just score the cuts deep enough to make them easy to separate when the structure is complete.

Make the indicated cuts into the triangle stock (31) about 1/2" apart, two-thirds of the way into the wood.

Glue this triangle stock on the inside of the fuselage sides, and triangle stock (32) to support bulkheads (35, 36).

Now glue in the two bulkheads (35, 36). These two bulkheads will have to be cut straight across where the top part will be in the hatch and the bottom half in the fuselage.

Glue in the engine firewall (38) and add the corner supports from triangle stock (32).

Glue in bulkhead (34), and squeeze in the nose of the fuselage so that it has the same width as shown on the plan, and then glue the top sheeting (30) and nose bottom sheeting (29).

Round the fuselage corners and sand the whole fuselage with fine sandpaper.

Now separate the hatch.

Place the fuselage in position on the wing and mark the inside contour of the fuselage on the wing sheeting. Then cut out the sheeting on these lines.

Mount the steerable nosegear bracket on plywood bulkhead (4).

Glue the fuselage to the wing and cut out the hole in the bottom for the nosegear to go through.

Glue the plywood piece (37) to the hatch, and the 1/4" plywood piece (33) to the fuselage.

Finishing:

Finish the model using your favorite method. I covered my wing with polyester lining material, purchased in a fabric store. This polyester fabric compares in strength and consistency with regular Coverite, but without the adhesive.

First, you brush on Balsarite or clear dope to the frame. Then, with a hot iron, you attach the fabric to the frame at the leading edge, trailing edge, tips and center.

Before you shrink the material, brush clear dope on the spots you just attached, so that they don't let go. When this has dried, go over the whole wing with a hot iron, set for very hot. You can now dope and finish the rest of the structure.

Cut out the slots in the top wing capstrips (16) for inserting the fins (27).

Glue the fins into these slots and glue the sub-fins (26) to the bottom of the wing.

Apply three coats of dope, sanding lightly between coats. If you need to fill some uneven spots, now is the time to do it.

Sand the whole model to your satisfaction, cut out the fabric around the pushrod holes, and make the slots for the hinges.

Fuelproof the tank compartment.

FORCE 1

Designed By: Laddie Mikulasko

TYPE AIRCRAFT
Sport Delta

WINGSPAN
36½ Inches

WING CHORD
16¾ Inches (Avg.)

TOTAL WING AREA
611 Sq. In.

WING LOCATION
Low Wing Delta Design

AIRFOIL
Symmetrical

WING PLANFORM
Tapering L.E.

DIHEDRAL, EACH TIP
None (Thickness Taper Only)

O.A. LENGTH
34 Inches

RADIO COMPARTMENT AREA
(L)10⅝" x (W)3½" Avg. x (D)3" Avg.

VERTICAL FIN HEIGHT
7¼ Inches

VERTICAL FIN WIDTH (Incl. rudder)
8 Inches Avg.

REC. ENGINE SIZE
.40 Cu. In.

FUEL TANK SIZE
8 Oz.

LANDING GEAR
Tricycle

REC. NO. OF CHANNELS
3

CONTROL FUNCTIONS
Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa, Ply, Spruce
Empennage (Rud)	Balsa
Wt. Ready To Fly	**72 Oz.**
Wing Loading	**16.9 Oz./Sq. Ft.**

Apply your favorite color finish. Note: make **sure** that the model has two distinctive colors, separating the top and bottom of the airplane. This will help you better recognize which way the model is flying.

Install the landing gear, servos, engine, etc., and pull the antenna through the NyRod provided for it.

Install the hinges and, when all movable surfaces are attached, pull out all the pins from the hinges, separating the movable surfaces from the wing.

With "Hot Stuff" or "Zap," glue each half-hinge into its place. Be careful not to get glue in the holes for the pins. To prevent this, I smear light oil on the hinge line and wipe off the excess.

Attach the elevator and ailerons to the wing with a single piano wire through all the hinges, and bend the ends up.

Connect the servos to the movable surfaces. The elevator, at neutral, should be 1/8" up. From there, the movement should be 1/2" travel, up and down. The aileron travel should be 3/8" either way.

Install the fuel tank. Fuel pickup is in the middle of the tank, at the bottom. Use the standard "clunk" arrangement.

Check the Center of Gravity. Use the battery pack to get the C.G. in the proper place. To prevent any surprises on the first flight, the C.G. must be as shown on the plan.

Flying:

This model does not have rudders because I found them to be ineffective, working together. Maybe if they moved independently, with the left one for turning left and the right one for turning right, they would be worthwhile to have. The model flies just fine without rudders, however.

For flying, you have to have a pusher propeller. The engine exhaust can be facing into the flight direction. It doesn't seem to affect engine performance.

Make some taxi runs so that you get used to steering on the ground with aileron stick movements. Make sure that the model runs straight with the aileron stick in neutral.

Face the model into the wind and give it full power. Let it run a few yards and then give a little up elevator. The model will get airborne in no time. You will find the model very stable at all speeds. It is capable of all maneuvers except spins and knife-edge flight. You'll be delighted at how easy it is to land this airplane. Just cut the throttle and point the aircraft where you want to land, and she will come down like she is on rails. Gently flare, and that's it.

Enjoy building and flying Force One. □

RCM PRODUCT REVIEW

Flite Line Products
E Z FLI

SPECIFICATIONS

Name	EZ FLI
Aircraft Type	Sport Trainer
Manufactured By	Flite Line Products 3207 34th Street Lubbock, Texas 79410
Mfg. Suggested Retail Price	$37.95
Available From	Both Mfg. and Retail
Wingspan	51 Inches
Wing Chord	10 Inches
Total Wing Area	510 Square Inches
Fuselage Length	39 Inches
Stabilizer Span	18 Inches
Total Stab Area	106 Square Inches
Mfg. Rec. Engine Range	.19-.40
Recommended Fuel Tank Size	6-8 Oz.
Recommended No. of Channels	3 or 4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Balsa & Ply
Wing	Foam, Balsa & Hardwood
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No (sketches on plans)

RCM PROTOTYPE

Radio Used	Airtronics X L 6 Ch.
Engine Make & Displacement	O.S. Max .25
Tank Size Used	6 Oz.
Weight, Ready to Fly	4 Lbs., 1 Oz.
Wing Loading	17 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Well-cut balsa, ease of construction.

WE DIDN'T LIKE THE:
Poorly cut wing spars, nose gear wire oversize (see text.)

The E Z Fli is produced by Flite Line Products, 3207 34th St., Lubbock, Texas 79410. It is a very attractive "aileron trainer or sport model" for 3 or 4 channels. The fuselage is balsa and plywood with a symmetrical foam wing using balsa leading and trailing edges and hardwood spars. Recommended power for the E Z Fli is .19 through .40 and at its advertised weight of 3½ pounds it should be wild with a .40 engine.

The E Z Fli is shipped in a box 34" long, 10½" wide, and 3½" deep. Although the packaging is a bit loose, everything inside was in good shape with the exception of the 3/16" balsa fin which had some dings from the metal parts in the parts bag. A bit of paper wrapped around the parts bag would have prevented the damage.

(Editor's Note: This is now being done on all kits, according to manufacturer).

All of the parts are easily identified, mainly because there aren't too many of them.

Construction:

The one sheet of plans, 23" by 35" contains all the instructions but leaves a lot of questions for a first time builder. Second or third time builders should have little trouble with the E Z Fli if they follow this builder's recommendation and **study** the RCM "Flight Training Manual." This is the type of builder the kit was designed for.

The balsa parts were very nicely saw cut and the one die-cut bulkhead was very well-done. Somewhere along the production line there was a slip-up. The wing spars varied in width and the thin edges were unfinished. Some minor items: The leading and trailing edges were about 1/16" short, the servo rails were 1/32" short and the hatch cover was almost 1/16" too narrow. Minor, but still worthy of comment. These are the kind of deficiencies that give modelers fits.

(Editor's Note: In checking with Flite Line Products, they check all kits in stock and it seems we had the only one that had this problem. It was easily taken care of; however, it proved a point that we don't receive hand picked kits for review.)

Let us get the negatives out of the way and go on to the fun things. The nose gear strut is listed as 5/32" but the supplied unit is .010" oversize and created quite a problem. Rather than try to explain to the local police why we were trying to "buy" a new nose gear from the local hobby shop at 11 p.m. Saturday evening, we decided to drill out the Bridi engine and nose gear mount. After drilling the mount to fit the (5/32" plus .010") nose gear, we had another problem: the steering arm and wheel collars would certainly be short on set screw threads if we drilled them to fit the nose gear wire. About this time we decided to wait until Monday and buy a new mount and bend a new nose gear using 5/32" piano wire and do it right.

to page 144

SILENT POWER

Jim Zarembski

On September 20, 1981, the Second Annual Keystone RC Club's Electric Fly was held in Lansdale, Pennsylvania. Bob Kopski was kind enough to send a report with a nice selection of photographs to give you all an idea of the events of this growing East Coast electric only event.

Bob reports that there were 36 electric on the flight line on this windy Sunday in early fall. Many of the models had to be tied down. Two that weren't were blown over and folded the wings.

The big attraction of the day was the Electric Clinic followed by a raffle. Heinz Koerner of KRC ran the Clinic all day long. He and other participants seemingly answered hundreds of questions from the non-flying spectators who traveled from all over the east to get a glimpse of electric powered R/C flight. It was estimated that there were between 200 and 300 attendees. It appears that the curiosity in electric power is increasing. Almost all of those at the Electric Fly were modelers since the event was not advertised to the general public. Most had never seen electric power first hand. Celebrities in attendance included Dwight Holly of Bethal, Connecticut, who is the current world glider champ; Bill Winter, and Irwin Polk.

The best performances of the day were turned in by Jack Rabbits. John Hickey's Twin 020 and Bob Kopski's Astro XL 05 Jack Rabbit handled the wind better than anything else. Bill Winter told Heinz Koerner he'd never seen anything like it and would not have believed it was possible for an electric to fly that well.

Also impressive was a Kolibri Hummingbird with a Mabuchi 550 SP system flown by Charles Hampton of Englewood, New Jersey.

The whole affair was low key, very friendly, and lots of fun. Bob hopes that next year the weather will be more cooperative.

05 Sport Aircraft

Jack Rabbit plans. John Szary's Jackrabbit has been seen in most of the Electric Columns several times in the last year. There have been a number of you interested in obtaining prints of this plan, and I'm happy to report that John will make them available for $4.00. Write to John Szary, 3034 East Meadow Grove Rd, Orange, California 92667.

KRC's Electric Fly billboard had all the good words for the day. Much interest and support from hobby industry. Much appreciated by everyone. Photo by Bruce Fenstermacher.

Charles Hampton of Englewood, New Jersey, with imported Hummingbird by Model Flight of England. Foam wing, sheet fuse, tail. Over two years old. Power is MRC/Mabuchi system. 44" span, 39 oz. 8/4 prop. Charlie was a busy flier --- popular with crowd. Won "Most Congenial" surprise prize. Photo by Herb Dirks of KRC.

State of the Art Technology in Electric Sport Models

The emphasis in electric appears to be with the powered sailplane as evidence by the interest generated at the Astro Flight Electric Championships and the Leisure Electric Grand Championship held in January. However, with the advent of the Leisure 05 and the Astro XL 05 using six 1.2 AH cells, the most

Mr. Irwin Polk (Right) and Mr. Bill Winter (Left) enjoying the day. Everyone on the field very friendly --- pace was low key. Much fun for everyone. Photo by Herb Dirks.

Heinz Koerner of KRC and Ellis Grumer of Phillipsburg, New Jersey with Ellis' Porterfield. Astro 15 belt drive. Flew very well despite strong wind conditions. Ellis won first place in "Best Looking" competition plus surprise prizes for "Largest Airplane" and "Best Ground Handling." Photo by Herb Dirks of KRC.

Twelve year old Kris Kopski with dad's Euphoria II. Aerobatic with Astro 10, twelve 1.2 AH cells, elevator, flaperons. On/off motor and prop stop. 9½" x 50" wing, 60 oz. Photo by John Hickey.

Flight line at KRC's Second Annual Electric Fly. Thirty-six electric's on field --- many more in cars out of wind. Most planes on field tied down. Photo by Bruce Fenstermacher.

promising electric category is the 05 powered sport aerobatic aircraft. These models, all in the 200 to 300 square inch category, have the capability of 7-9 minutes of truly aerobatic flying. And, best of all, this can be accomplished in the neighborhood park, a schoolyard, or even your own backyard. Up until now, almost all of these models have been scratch-built out of traditional materials such as balsa, spruce, and plywood.

About a year ago, Keith Shaw of Ann Arbor, Michigan, decided to apply the latest 1/2A technology to build an electric sport model. Keith is a well-known modeler in the Ohio, Michigan, pylon circuit area, and is certainly one of the most innovative builders around.

Keith took a stock 1/2A fiberglass fuselage for the Barbarian as kitted by J M Glascraft of Roseville, Michigan, and converted it to an exciting electric model. Keith found that he could actually build a foam wing covered with 1/16" balsa sheeting that would weigh in at 4-1/2 to 5 oz, which is equal or less than the RTF weight of most conventional wings. This is achieved by avoiding epoxy and using a super lightweight contact cement to fasten the sheeting to the wing cores. This product, which Keith introduced to me, is Southern's Sorghum distributed by Dave Brown Products. This contact cement adds very little weight to the wing and is highly recommended by Keith.

The airfoil on Keith's Barbarian is the NACA 2412 which is a 12% thick semi-symmetrical section. He feels that a streamlined fuselage combined with a smooth surfaced wing, as found in foam wings, will result in less drag and thus superior performance in the air.

The prototype Electric Barbarian weighed in at 35 oz. with 300 sq. inches of wing area. It can do inside and outside maneuvers and since Keith installed a complete 4 channel

Keith Shaw with Electric Barbarian.

system, four point rolls are possible. Keith feels that all novice patterns and most advanced maneuvers can be attained with this ship, including vertical rolls.

The original kit manufacturer was so impressed by the electric version that a special set of plans and cores have been prepared and are now commercially available. The new semi kit of the Electric Barbarian includes a special fiberglass fuselage layed up for electric, wing cores for the 49" electric powered version wing, and fully detailed plans. This version, which includes several improvements over the prototype, weighs in a 34 oz. with a 3 channel radio using mini servos and a 225 Ma pack and has 290 square inches of wing area. It is available direct from: JM Glascraft, 30820 Mayflower, Roseville, Michigan 48060. The price is $39.95 and be sure to specify the electric version.

Astro Flight has introduced a new Astro 035 motor system. The motor can best be described as an elongated 020 and comes complete with a 6 cell .55 AH flight pack. I installed this system in an Airtronics Q Tee for some test flying. The results were gratifying as the model flew quite nicely with this system. I checked the rpm and flight duration with several props. The data is listed below:

Astro 035 With 6 Cells .55 AH and Flight Duration

5¼/3, Topflite Nylon, 14500 rpm, 8 AMPS, 6 Minutes.

5½/4 Topflite Nylon, 14000 rpm, 9 AMPS, 5 Minutes

6/3 Cox Gray, 12500 rpm, 11 AMPS, 4 Minutes.

The 035 is designed for electrifiying all of those 1/2A kits on the market with 190 to 250 sq. inches of wing area. They are too small for the 05 and too much for the 020 but just right for the 035. These include the Goldberg Junior Skylark, the Junior Falcon, almost all of the Flyline kits, the Airtronics Q Tee, S Tee, as well as numerous 1/2A plans available from RCM and other magazines.

New Astro Flight Auto Charger charges 4 to 8 cells with a 12 volt car battery or 110 AC wall current.

New Astro Flight Charger

Production is well under way on Bob Boucher's new AC/DC Auto Charger. This unit features a continuously adjustable charge current from zero to six amps. You can reliably charge any nicad battery from 100 MAHR to 1800 MAHR capacity containing 4, 5, 6, 7, or 8 cells. The AC/DC charger can be operated from a 12-volt automobile battery or from a 110-volt AC current. If you race a car, run a boat, or fly your electric aircraft near a 110 AC outlet, you can simply eliminate the need for a charging battery. Another nice feature is the continuous current adjustment which allows you to break in motors on low voltage for several hours before actual flying. Since I personally have a public park in my backyard, I can do a lot of flying right here at home. For this the AC/DC charger will be superb since I can plug it in the garage or on the patio for recharging my aircraft. The units retails for $59.95 and should be available at your dealer.

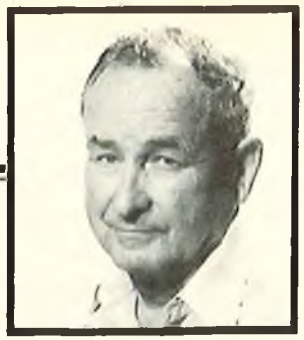
Interesting Electric Aircraft

In this issue we have a nice array of electric models from across the country. Roland Boucher was nice enough to send in another nice shot of

to page 142

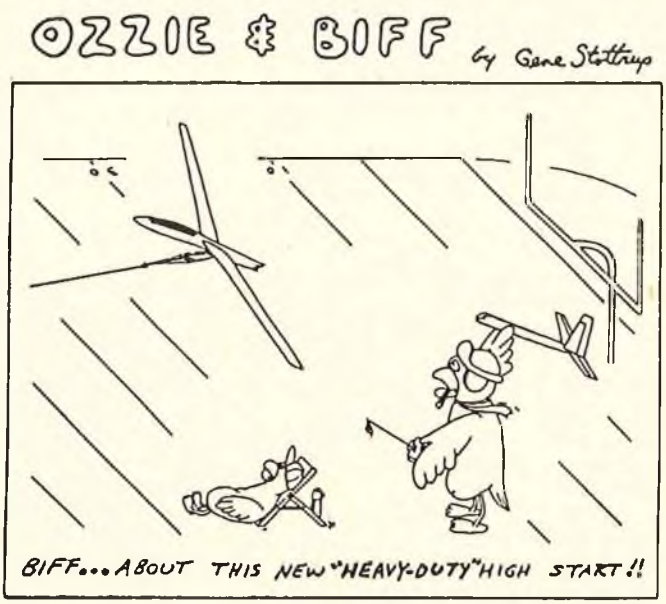
SOARING

Al Doig



One of the biggest in the country — Fall Soaring Festival by the Central Valley R/C Soaring Club, Visalia, California — 111 entries in October, 1981.

1981 National Champ John Brown, Placentia, California, lands his Icarus through the gates — Visalia Fall Festival.



For some time now, I've been reading about the prowess of a sailplane design from Florida called the "Prophet." For the past couple of years I've noticed it popping up in the winner's circle. I just received a flyer from Joe Ruth announcing that he is kitting a 2-Meter Prophet, his first venture into model sailplane production. The price — $49.95, available from hobby shops, or direct from Joe Ruth, 6018 Black Dairy Road #4, Seffner, Florida 33584. The price includes postage.

The thing that intrigues me about a new venture such as this is why? It has to be a labor of love. I've visited many small, mid-size kit manufacturers and haven't seen too many millionaires amongst them. Many start out as part time cottage-industry, with the whole family involved in fabrication, packing, and shipping. The hours are long, and the income small. In the beginning when inventories are small, financing, while pinching, is possible. The problems are related to procurement, and the fact that there are not enough hours in the day. If you get lucky and production goes up, you are faced with the need for more equipment and inventory, and financing can kill you. So, the next time you are faced with laying out 50 or 80 or 150 bucks for a kit, remind yourself that you probably couldn't buy the raw material any cheaper than the prefabricated kit. And pity the poor wretch who busted his buns for $3.00 an hour to bring it to you — and loused up the hobby for himself to boot.

★

I would like to relate a problem I had with a new sailplane. I'll tell you how I solved the problem, but I can't exactly identify what the problem really was. How's that for a confusing beginning?

From the first winch launch, my new aileron sailplane would start up okay. At about 10' it would yaw violently to the right. Opposite control would bring the ship back on line, and the remainder of the launch trajectory was straight, with no yawing tendencies. In flight, stalls were straight ahead and smooth. This initial yaw occurred on 75% of the launches.

My first thought was towhook position. I moved the towhook forward, and thought I cured the problem — but only for a few launches — and back it came. I suspected some quirk in launching technique and started launching striaght out, wings perfectly level. Again, I thought I had cured the problem, then back it came. I then carefully examined the wings for warps, etc., — nope. I did, however, find that the trim striping on the right hand wing had curled up about 1/16". I replaced the striping and the next few launches were okay. I then taped a piece of string over the outboard right hand wing striping to simulate the raised striping. The yaw came back! Hot dawg, that's it. I removed the string, launched, and the ship yawed itself right into the ground, with no control --- back to the drawing board.

The next week was a club contest. The first two launches contained the wild, right hand yaw. On the third launch, the ship again yawed itself into the ground which, this time, was covered with asphalt. The ship again proved its resiliency by not re-kitting itself. A new forward deck, servo rails, etc., and it was ready to yaw again.

I now began to suspect a radio problem. The only unusual feature of the radio installation was a cable extender in the aileron/rudder servo lead. The servo was mounted at the wing root and the receiver was too far forward to reach without an extender. Another lead extender was in the flap servo, more for convenience than necessity. The antenna lead was outside the fuselage, but ran along the fuselage to the trailing edge of the

wing, then up to the fin.

I have another very similar ship with exactly the same radio components, mounted exactly the same. Both operate from the same transmitter. This ship has had no yaw problem whatsoever. However, when this receiver was first turned on, with the transmitter off, all servos chattered like mad. The condition was aggravated when the antenna was close to the extended aileron servo lead. I consulted a friend who is a radio frequency design expert. He advised installation of Ferrite Shield Beads at each end of the extended lead. These beads are small cylinders of a molded oxide of iron. The connector is removed and the lead is looped once through the bead. These beads are designed to prevent high frequency currents from traveling down wires into unwanted areas. Installation of the Ferrite Shield Beads completely quieted this radio installation.

The shield beads had not been installed in the problem sailplane because there was no servo chatter in this installation. So, in order to fix the problem before destroying the airplane, I flew in the face of good engineering investigative practice and made three changes to the radio installation. First, I installed beads on the aileron servo lead and the receiver end of the extender. I removed the extender from the flap servo. And, I dressed the antenna farther away from the aileron servo lead.

I went to the flying field and made 21 perfectly straight launches. Subsequently, I have had about 20 more launches with no sign of a yaw. I hope the problem is gone for good. In talking with the factory people about the radio, I find that if the pusle controlling the aileron/rudder were to collapse, the servo would rotate clockwise, which would give me hard right. It seems like I was getting some sort of a phasing problem at the same close-in spot, or some antenna/servo lead interaction was causing the aileron pulse to narrow. Or, perhaps, it was a poltergeist (here is a word for George Privateer) problem, in which case, wearing the beads around my neck may have been just as effective.

I had a similar problem a couple of years ago with a totally different radio and installation in a Paragon. I had a releasable towhook on a separate channel, which happened to be the last one in the pulse train. After flying for many moons, I installed a Thermal Sensor in the ship with the antenna running out in each wing. On every subsequent launch attempt, the towhook would release about 10' up the tow. The towhook release servo was moved to a different channel and the problem disappeared. This was clearly a case of some weird radio phasing problem that occurred close-in.

Anyway — the point of all this rambling is that not all the "funnies" on launch are aerodynamic, or poor technique. It may be radio glitches. I have heard of similar problems when aileron servos are located out in the wing, at the aileron. Any time servo leads are lengthened, there is a potential problem. One problem with the "magic beads" solution is getting them on the servo lead. It's easy with Airtonics' connectors. Depressing a small gold tab allows the individual connectors to slide out of the plug, and the bead can be slipped over the wire. I don't know what problem I'm curing by this procedure. Whether there is noice generation in the servo that is radiating, or whether the extended lead is acting as an antenna, or whatever. Anyway — the radio operation does not appear impaired, and the problem goes away. Incidentally, these Ferrite Beads are manufactured by Amidon Associates, 12033 Otsego St., North Hollywood, California 91607. I bought them in an electronics supply house. A package of 12 costs $3.50. The part number is FB43-2401.

I would caution that this does not solve all radio problems. There is no substitute for factory authorized repair of defective equipment. But, if all else fails, it's worth a try.

★

At the pinnacle of the LSF (League of Silent Flight) achievement program is Level V. At this writing, only 22 fliers have achieved this award, world-wide.

Of all the tasks required to achieve LSF Level V, the most physical punishment is handed out by the eight hour Slope Duration. In May of 1981, Keith Kindrick (son of former Soaring columnist Al Kindrick) was awarded the 17th LSF Level V. Keith has a number of suggestions for anyone preparing to make a run at this task. Aside from the airplane and radio equipment, bring the following:

(1) A comfortable lawn chair with a high back. The high back allows a pillow to be used to support the head.

(2) A pillow to relieve your neck while sitting in the chair or lying on the ground.

(3) At least one gallon of cold water. Keith consumed 3/4 gallon and still lost 2 pounds of weight.

(4) A good pair of ski sunglasses that are polarized.

(5) A radio (listening type) to relieve the boredom.

(6) Sunscreen lotion — even if it is a dull day.

(7) Warm, or cool clothing to suit. Don't forget that toward evening it may be windy or cold.

(8) A good hat.

(9) Two good watches that will run eight hours, for sure.

(10) Lunch.

As far as the sailplane is concerned, Keith says, "I used a Craft-Air Viking, and it used the Mark II wing (symmetrical). I do recommend it as an "on the market" and "off the shelf" design. One reason is the size — 118" wing — and its wide chord — 11". This size is easy to see at a distance. The semi-symmetrical wing allows

to page 139

Bob Dodgson (Dodgson Designs, Camano Island, Washington), launches his Camano 100 — Visalia Fall Festival.

Northwest Soaring Society sent team to the Fall Festival from the Seattle/Portland area. All flew aileron ships.

ENGINE CLINIC

Clarence Lee

This month several of our letters regard topics that we have covered in the past. However, new readers are not aware of topics previously covered. Old time readers will have to bear with us when we do repeat different subjects from time to time. This column is going into its 14th year so, naturally, some subjects will be repeated from time to time --- particularly those for which I keep receiving a considerable number of letters.

Dear Mr. Lee,

I am a beginner in R/C flying and I have a question about electric starters. Do they prematurely wear out an engine through their use? The primary reason given to me is that it forces the crankpin into contact with the back plate. It seems that a sleeve bearing is worse for this than an engine with ball races. However, some people have told me that there is nothing to worry about when using an electric starter. I would much appreciate it if you would put this question to rest for me.

Yours truly,
Stephen McWade
Vanier, Ontario, Canada

If an engine is properly designed and manufactured, the crankpin should never be forced into the back plate by applying pressure to the crankshaft (with a propeller or flywheel installed). Unfortunately, some manufacturers have used pretty broad tolerances and occasionally you will have an engine that the crankpin will dig into the back plate. This is mostly with sleeve bearing engines that have more end play in the crankshaft, than ball bearing engines. However, I have also seen some ball bearing engines that were fit so close that the crankpin would rub on the back plate when an electric starter was used. If you are going to use an electric starter, the crankshaft end play should be checked to be sure there is no rubbing on the back plate. This is also true with rear rotor engines. Many times rapid rotor wear is due to the crankshaft applying pressure to the rotor when started with an electric starter. If the crankpin hits the back plate or pushes the rotor into the back plate, an extra back plate gasket should be installed. If this does not correct the problem, the engine should be sent back to the manufacturer for correction as this is an obvious production goof.

Ball bearing equipped engines can be started with an electric starter. Sleeve bearing engines that use an aluminum prop drive washer that rubs on the aluminum crankcase should not unless a steel ship is placed between the two rubbing aluminum parts. Aluminum rubbing against aluminum results in galling and rapid wear. If the engine has a steel drive washer then everything should be okay.

Our second letter is another subject that we have covered several times in the past — that of sintered bronze clunk filters plugging up and causing problems. I do not like filters in the tank — sintered bronze or otherwise — for the second reason in the following letter. Fellows forget and fuel the aircraft through the fuel feed line to the carburetor. This deposits any crud in the fuel can on the wrong side of the filter. It then goes directly into the carburetor. Fuel filtering should be done as the tank is filled with a filter in the fuel can. A filter can also be used between the aircraft fuel tank and carburetor but always be sure and disconnect the fuel line between the filter and tank for filling — not through the filter.

Dear Mr. Lee,

I saw an interesting engine problem yesterday at our club field. An engine in a new airplane quit right after take-off. There was no sagging lean — it quit abruptly and seemed to be a fuel supply interruption.

Inspection of the fuel system looks mostly good — no fuel line kinks, tank nicely packed in foam. Just one thing was wrong — the builder had used a sintered metal filter clunk in the tank.

I'm sure that you've written that filter clunks are bad news — they plug up and restrict the fuel flow and are hard to inspect and clean. However, this time there was an additional problem — the flier had used old cruddy fuel, and he had filled the tank through the engine line, nicely depositing the crud on the engine side of the filter. When the engine was started the crud then washed back off the filter right into the carburetor.

This is a new variation of an old problem. Many times I've seen beginners use a filter between the tank and the engine, and then proceed to fill the tank through the engine side of the filter, depositing all the crud on the wrong side of the filter.

This sort of thing seems to happen so frequently that it might be worth a mention for the readers of your RCM column.

Sincerely,
Bill
Vestal, New York

Our next letter, like the previous letter, is the type I like to receive, in that the writer has found the solution to a problem and is sharing it with the readers. This kind of letter sure makes my writing load a lot easier. Quite a few fellows have experienced the following problem including a good friend of mine using a Webra .91 marine which we straightened out a few weeks back with the same procedure.

Dear Mr. Lee:

For many years I have enjoyed reading your column and using the helpful tips which you offer for engine operation. I have run across something recently which will be of benefit to many of your readers.

I recently bought a Webra .91 and was told when I bought it that the motor would not draw enough fuel to run rich in high speed and that I would need to get a pump for it, replace the carburetor with a Perry carburetor or replace the carburetor with one from an O.S. .90. Before spending all of that money, I put the engine on a test block and ran it, adjusting the idle first and then adjusting high speed. Sure enough, I could not get enough fuel to it in high speed to get it to run rich. I then made four changes to the engine/tank arrangement which immediately solved the problem.

1. Replace the 1/8" brass tubing in the tank with 5/32" brass tubing.

2. Switch to large silicone tubing both inside and outside the tank.

3. Drill out the restriction in the tank clunk to make the hole the same size all the way through it.

4. I took the spray bar out of the carburetor and, using a number drill which just fit into the fuel T, I found there was a restriction in the bottom of the T where it goes into the spray bar. I used the number drill and drilled out this restriction.

With these modifications, suddenly there was plenty of fuel to run the motor rich and the idle needle had to be closed

down considerably to get it to run satisfactorily in idle. This sure beats spending all of that money for carburetors and fuel pumps.

Yours truly,
Charles Reeves
Paducah, Kentucky

In the September Engine Clinic we reviewed the Magic Muffler that had just been released. We asked readers to write in and let us know their own personal findings. We weren't exactly swamped with correspondence on this topic — the following being the only letter received. Everybody seems to be leaving it up to the other guy.

Dear Mr. Lee,

I read most of your articles which I always enjoy. The article about the "Magic Muffler" came back to me after our new club was visited by a "Sig Cougar" with a Tiger .60 and tuned pipe. The owner handled the Cougar very well and the performance was impressive especially compared to our ships. The next day I re-read your article, called Hobby Barn and talked to Len who gave me more info (about props and size), and placed my order.

This is what I came up with after installing the "Magic" on my FB-100 which has about 2 gallons of fuel through it since new (O.S. .61FSR SE W/muffler).

Before:

Engine — O.S. .61FSR SE w/muffler.

Prop — Top Flite 11/7.

Fuel — BK synthetic 10%.

Field elev — 4000 ft.

Rpm's — 11,500.

After:

Everything the same except:

Prop — Rev-Up 11/7¼.

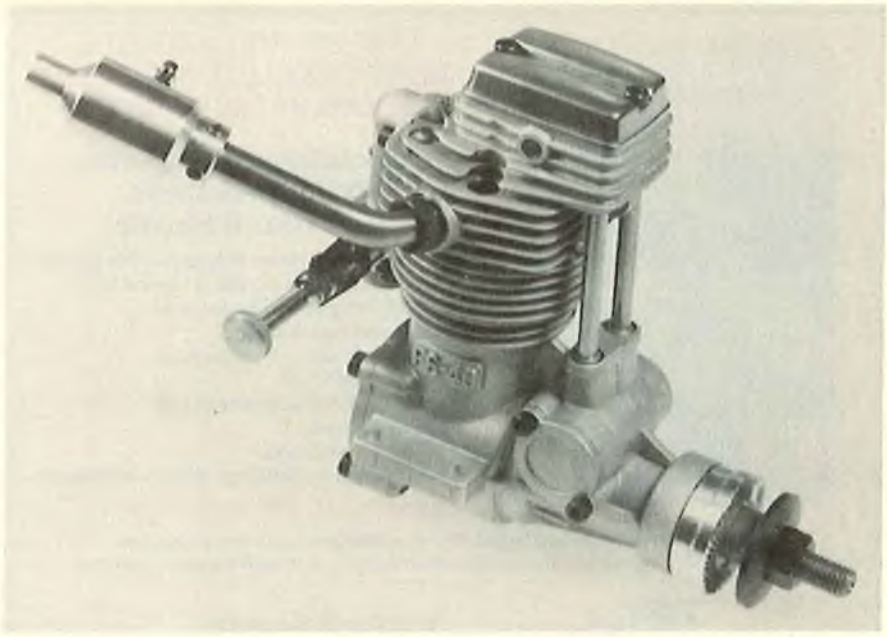
Rpm's — 12,750, fuel consumption up 15% to 20%.

Maybe the rpm increase isn't as much as some I've heard of but I was amazed at the increase in speed and climb performance.

Sincerely,
Richard Wollert
Wiley, Colorado

I would say a rpm gain of 1,250 was considerable. However, I am puzzled as to why you did your checking with two different makes of props and sizes. The figures would have been more meaningful if the same prop were used but it does give fellows a comparison. Thanks for having the interest and taking the time to write.

Some time back we asked for reader input on running the O.S. 4 stroke inverted. Several readers replied and their letters were run previously. Another has come in that I feel any fellows contemplating using the O.S. 4 stroke inverted will find interesting.



The O.S. FS-40 4 cycle engine is now available. A description will be presented in a future Engine Clinic.

Dear Mr. Lee,

I noticed that some people have been wondering whether an O.S. .60 4 stroke will run inverted, so I'll tell you my experiences. My O.S. .60 4 stroke is about 4 years old, and has done well in excess of 150 hours flying, upright until 12 months ago when I built a Tiger Moth, in fact, the same design Tiger that Dennis Bryant (who I'm sure you know of) flies. He also uses a 4 stroke. He had no trouble at all with it, and I asked Dennis why: He uses a commercial fuel mix of synthetic oil, at about 10% nitro. This is the key factor — I discovered that if you use castor oil base fuel with more than 10% oil, it makes the pickup erratic, and you often get cuts. Using nitro helps a bit, but it doesn't stop it. If the oil is cut to 10% — the problems vanish and no nitro at all is necessary; the engine runs faultlessly. Tank position is the same as any other engine. No choking, or even needle adjusting is usually necessary. When starting up, the plug should be cleaned out, as in the inverted position, between flying days it acts as a sump, and fills with oil — just like a full size engine does in radial configuration. So, use 10% castor (it doesn't get hot at all), no nitro (it'll rust out the bottom end bearings), clean the plug of oil, usual tank position, and a 13/6, 14/6 prop, and it'll run sweetly all day, no problem at all.

Yours,
Peter Fry
Adelaide, South Australia

Dear Mr. Lee,

As an old free flighter turned to R/C, I feel I am pretty good with engines. But I must turn to your expertise for this one.

I have a Webra Speed .61 on an Ugly Stick. The engine has a Mac's expansion type muffler on it, and I burn B/K Blue Flame fuel — 10% nitro. I screwed up initially (before I bought your R/C Engine Book II), and set the idle first, letting it go lean and die until I got it right. However, this did not seem to harm anything, and once I started flying, the engine ran beautifully, throwing a nice clean exhaust, and putting out great power. I then put it in a new Stick, same set-up and, shortly thereafter, it started throwing sooty exhaust. It has about 5 gallons through it, so should not be gooing up so soon.

I pulled the muffler, and the piston top was black, so I tore down the mill and cleaned it in R & S Cleaner. Flew last Sunday, and after 7-8 flights, it's black again. I had the feeling the ring was not seating, since the cylinder wall was very slick when I tore it down and, upon running last Sunday, the black was not only on top of the piston, but also down the sides, below the rings. So I consulted Book II, and tore it down again, this time cleaning the inside with a **wet** *SOS pad, both on the cylinder and the piston and ring. Flew it again and, after a few flights, it's sooty again.*

I don't think I have had any lean runs. I am using the original glow plug, the head looks new, when I cleaned all the parts, none showed signs of heat, the ring looks fine, etc. I don't know what next. I'd appreciate any help you can give me.

Another question: Running cool here in Arizona is our number one priority. Would a castor based fuel be best for me here?

That's about all for now. Thanks

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Bob Slater
Phoenix, Arizona

Carbon and varnish build up is something you have to contend with when running glow fuels. There is no way of getting around it. After running five gallons of fuel through an engine there is going to be considerable carbon and varnish build up. Some fuels contribute to the build up more than others. I am not familiar with the oil used in Blue Flame fuel but if you have black soot type build up would guess the fuel contains castor oil. Castor will cause a black carbon build up on the top of the piston. The synthetics usually have more of a brown build up. The synthetics will also have less carbon and varnish build up than castor oil.

As for the sooty exhaust— be sure it is soot and not metal particles. Wipe some of the residue off with your finger and hold up to the sunlight. If you see metal particles it is something wearing in the engine. Aluminum parts that wear will cause black in the oil on the wing. Generally, aluminum particles going through an engine will also cause the glow plug to burn out as the glow plug will not tolerate any metal particles on the element. Since your plug stays good I would guess the black you see is just residue that has built up inside the muffler. Try flushing it out and also be sure it is tight. A loose muffler or other aluminum parts rubbing together will cause black in the oil that does not necessarily come from the internal parts of the engine.

If running in hot weather, the additon of a small percentage of castor oil to synthetic oil fuel or straight castor will result in a cooler running engine, however, at the expense of rapid carbon and varnish build up as you are experiencing.

Dear Sir:

I have the Lockheed U-2 (ducted fan from R/C Kits) and would like to know the nitro range for the K & B 7.5 engine. I would like to use 25% nitro to break in the engine and then 40% after that so I can turn the same rpm's as the real U-2 does. It would be more of a Stand-Off Scale when it comes to flying it. The plane has no tuned pipe due to lack of space.

It is hard to get any information on the U-2 from Lockheed since they are not allowed to release any information on the aircraft. At the same time there is more information on the SR-71 than there is on the U-2. Try to explain that if you can! I wanted the information so that I can display it when I display the U-2.

to page 50

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Cox 8120	99.95	60.00	2	no
Futaba FP 2L	109.95	71.50	2	no
Futaba FP-2E/S7	139.95	86.00	2	no
Futaba FP-2E/S22	124.95	77.50	2	no
2 Channel Wheel				
Futaba FP 2F/S26	124.95	77.50	2	no
Futaba FP 2F/S27	129.95	80.60	2	no
3 Channel Wheel				
Futaba FP-3FG/S26	199.95	124.00	2	no
3 Channel Single Stick				
Futaba FP-3S/S20	169.95	105.00	2	no
Cox 8130	125.95	88.00	2	no
3 Channel Dual Stick				
Futaba FP-3FN/S22	199.95	124.00	2	yes
FP3EG/S27	209.95	130.00	2	no
4 Channel Dual Stick				
Futaba FP-4FN/S20	309.95	192.00	4	yes
Futaba FP-4FN/S26	269.95	167.00	4	yes
FP-4L/S26	199.95	130.00	3	yes
5 Channel Dual Stick				
Futaba FP-5FN/S26	299.95	186.00	4	yes
FP-5LK/S26	279.95	182.00	4	yes
Futaba 5FG-K/S26	349.95	217.00	4	yes
6 Channel Dual Stick				
Futaba FP-6FN/S26	309.95	192.00	4	yes
Futaba 6 F6-K/S26	359.95	229.00	4	yes
Airtronics 9160-6XL394	299.95	195.00	4	yes
Airtronics 9160-6XL431	329.95	214.00	4	yes
7 Channel Dual Stick				
Futaba 7FG-K/S26	399.95	248.00	4	yes
Airtronics 9170-7XLH31	399.95	260.00	4	yes
Airtronics 9170-7XL551	449.95	292.00	4	yes

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ENGINE CLINIC

from page 48/46

With $777.77 invested into the U-2, I cannot afford for anything to go wrong so I will have an experienced pilot to take the first flight up. It might be the last flight if you know what I mean.

I will add the Yaw Stability System (see June '80 issue of RCM). With this added safety there is no reason in the world the pilot should crash the plane. Later I will add pitch control. After this, the plane will be worth over $1,000.00. By keeping it up to date with all the latest things, maybe I can sell it to Lockheed for an old (25 yr.) U-2? Or just be happy for a ride in the U-2 or SR-71.

Sincerely yours,
Bill Fitzurka
St. Louis, Missouri

The first production run of K & B 7.5 fan engines were set up to be run on 50% nitro fuel with both a .020" and .010" shim under the head. However, fellows were getting ample power with lower nitro fuel so the next production run was set up for 25% nitro fuel with only the .020" shim under the head. So check the number of shims under the head and remove or install extras for the amount of nitro you intend using. Extra shims are included with the engine.

One word of caution, however — you **do not** want to break the engine in with 25% nitro and then use 40% after that. Use the same fuel for break-in that you intend using after break-in. Operating clearances will be different with 25% than with 40%. ABC piston/sleeve engines are fit tight at the top to allow for differential expansion rates. The sleeve grows larger than the piston, the hotter the engine gets. At operating temperature, the correct running fit is achieved. This running fit will be different with 40% than with 25%. The higher the nitro content, the tighter the piston/sleeve fit. If you break the engine in with 25%, the fit will be too loose for 40%.

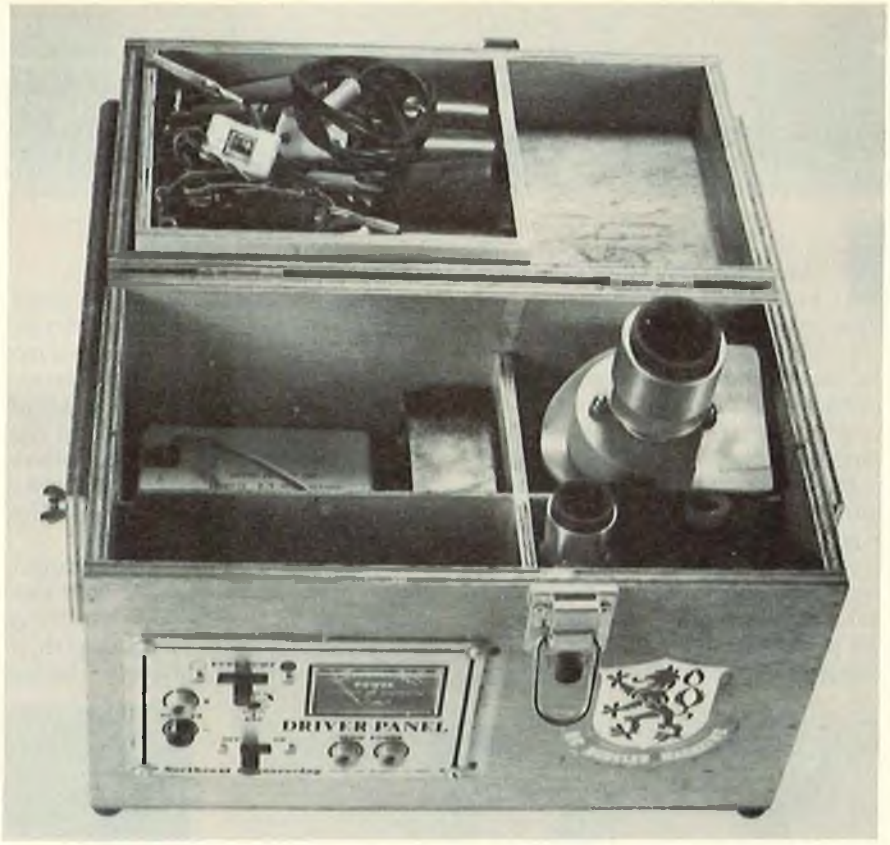
Also — the K & B 7.5 fan engine was designed to be run with a full length tuned pipe. It will not perform properly without. The rpm will be down in excess of 1,500, needle valve setting will be very critical, etc. I hate to have to throw cold water on a hot idea but these are some of the things you have to look into when picking an aircraft design. Possibly you could use a mini-pipe which would help but not equal a full length tuned pipe or use a Magic Muffler which is considerably shorter. I am not familiar with the

to page 138

RCM PRODUCT TEST

Northeast Engineering's

DRIVER PANEL



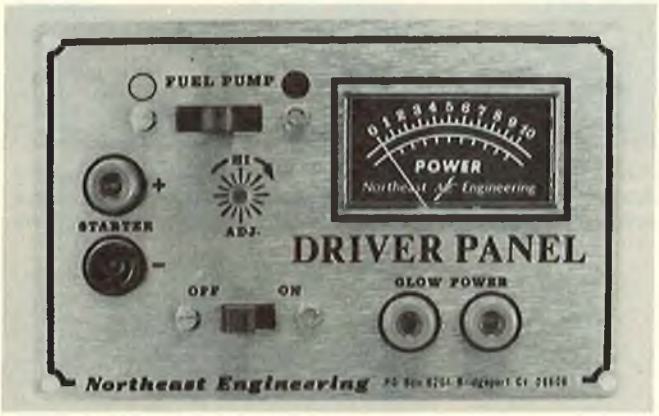
The Northeast Engineering Driver Panel mounted in our electrical box. Box contains starters, glow plug connectors, and 12V lead acid battery.

This is not a product review. I don't know what to call it because a Jim Oddino, I ain't. I don't know a diode from a resistor, whatever those things may be.

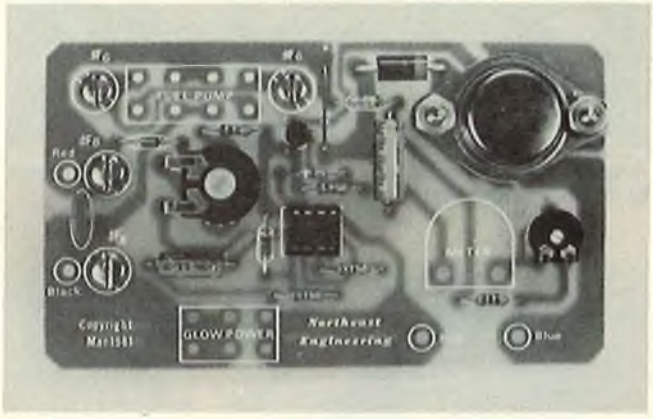
So why are we printing this article? One day the UPS truck dropped off a small box from Northeast Engineering (let's call them NE). It was the Driver Panel kit. Our first question was who would we get to assemble it and write up a report on it. It just happens that my electric field box had a power panel that used dropping resistors to provide 1½ volts to the glow plug from the 12 volt battery. Several times I have run out of electricity from using that arrangement and here was the opportunity to replace the panel with one having a current saving solid state electronic driver circuit for lighting glow plugs.

to page 137

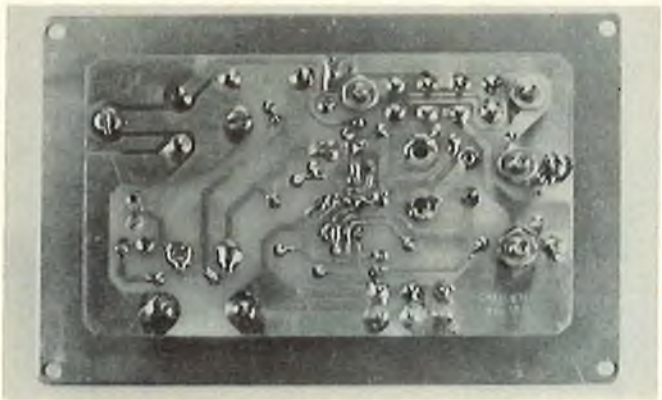
By Dick Tichenor



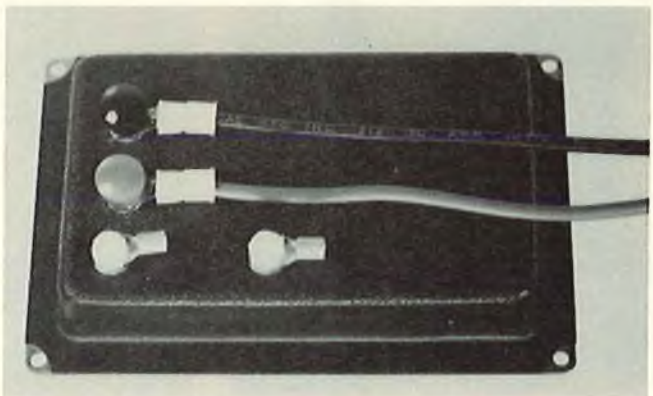
Driver Panel assembled from kit.



Components installed on printed circuit board.



Solder side of printed circuit board.



Completed panel is protected with a molded cover. Battery cables are shown, unused connections are provisions for fuel pump.

SCHNEIDER TROPHY 50TH ANNIVERSARY

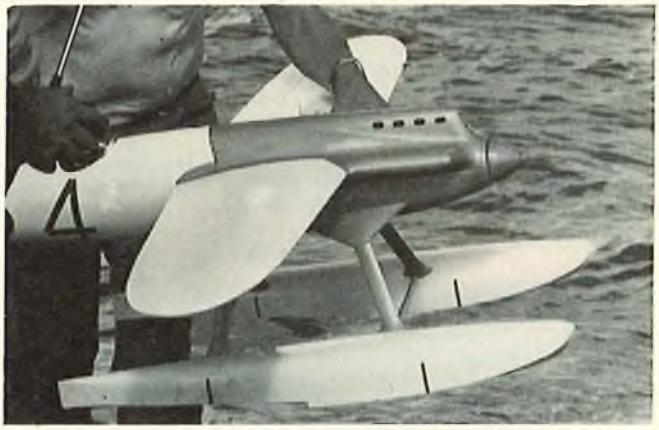
By David Boddington

In 1931 Britain won the Schneider Trophy for seaplanes outright by virtue of consecutive wins in the 1927, 1929 and 1931 contests; thus ended one of the most influential competitions for aircraft of all time. Not only was national prestige at stake, particularly between the U.S.A., Italy and Great Britain, but the competitive spirit pushed the development of engines and airframes to the limits. Speed was the main purpose of the event, although navigability and water tightness were also included in the preliminary tests, and the final Schneider Trophy winning average speed was 340 mph. The world speed record was also increased to 407:5 mph by the same aircraft (Supermarine S6B) with a Rolls Royce 'Sprint' version of the 'R' engine fitted. All of this at a time when the standard Air Force fighters were pushed to achieve 200 mph — no wonder that the Schneider Trophy attracted the attention of millions of people.

Why was such a speed event organized for seaplanes? The two main reasons were the limitless take-off run provided by a stretch of water — important for heavily loaded aircraft when short grass runways were the norm — and the types of engines used. Cooling the 2,000 h.p. plus motors was a considerable problem in the early thirties and the standard method for inline engines was to use water cooling and surface radiators. The extra areas provided by the floats solved the problems of lack of radiator surface area that would have been a factor with landplanes.

To have allowed the 50th Anniversary of the termination of the Schneider Trophy to have passed without some celebration would have been unthinkable — the 'Spitfire' was a direct descendant of the

Rojair's Roger Alton shows off the Semi-Scale S6 — fore runner to the Millinship contest S6 — to an interested spectator.



Excellent workmanship on Brian Peckham's Supermarine S-4 was all to no avail when it behaved uncontrollably and hit the water with a resounding smack. Not unlike the fate of the prototype in 1927.

Author starting up the Quadra — needed fins filed down to enclose it in cowling but did not lead to any overheating problems.

Rob Millinship's superbly finished Supermarine S6. Rob overcame a feeling of nerves and sickness to put in a creditable flight — 3rd place.

English entry (you didn't have to keep to your nationality for the model) of Macchi M72 by Roy Randall. Three pylon course was flown.

The S-51 coped with rough conditions on both days — pusher engine and through the cowl cooling gave an unusual engine note.

The winner, Bergamaschi's Macchi M39, about to lift off for a high scoring flight. Model was beautifully finished, stable and well-flown.

Dudley Pattison's Crusader.

Flown with the utmost of gallic exhuberance, the Bernard of Jean-Claude Requet gave the spectators more than their money's worth.

Not positioned in the static points, this semi Semi-Scale S5 was an excellent performer on the water and in the air.

Author's (Dave Boddington) 1/4 Scale, Quadra powered Gloster VI looks and sounds good in the air. Schneider Trophy models would be a natural for seaplane pylon events.

Second place model (highest flight score) was a nicely made Sopwith Tabloid — the 1914 Schneider Trophy winner. Model seen here shortly after completing a 180° taxi turn and smooth take-off.

Supermarine S6B. Calshot near Southampton, was the venue for the final contests in '29 and '31; this is now used as an Activities Centre with the original hangars and Castle still in use. The Royal Aeronautical Society decided to organize a special event over the weekend of September 12, 13, 1981, to commemorate the 50th Anniversary and to include a contest for R/C models of Schneider Trophy aircraft, successful types or failures.

Competition rules were kept fairly simple and the static judging was to Class 2, or 'eyeball' standard. A flotation test of two minutes was included (if the model did not pass this simple test it would have been inadvisable to fly the model!) and a navigational test was also included. It was this latter test, a turn of a full 180° before take-off, that caused a lot of problems for pilots. With winds of 12-15 knots blowing, replicas without water rudders tended to weathercock into the wind or 'turn turtle' when broadside onto the prevailing wind. Once safely airborne the pilot had to complete five laps of a triangular course — similar to a F1 pylon course — in a realistic manner, i.e., in keeping with the prototype. Take-off and landing were important parts of the flight with regard to the marking, but speed of completing the course was not of importance. Although the original contests were all about speed it would have been difficult to arrange a handicap suitable for all types — the first Schneider event was won at an average speed of 45.75 mph in 1913, less than one seventh of the 1931 speed. To have encouraged pilots to fly models of early aircraft at unreal scale speeds would have devalued the flying demonstrations. Schneider Trophy aircraft were not normally raced against each other, the contest was always 'against the clock' and the R/C model event followed the same procedure.

In three Schneider R/C events held in Italy, the entry had been rather disappointing and it was, therefore, gratifying for the organizers to receive close to thirty entries. Some entries failed to materialize — meeting competition deadlines with complex scale seaplanes is not easy — but a full twenty models were presented for static judging and flotation tests. The latter test, in keeping with the full size practice, was presumably for competitors without previous opportunities to test fly their model (or with a domestic bath large enough on

Ayling's Savoia Marchetti S51 was a very successful competition model — full of character.

S-4 away for a short flight. Note right rudder held on to counteract torque and 'P' forces, pushing the port float into the water.

which to fly the model). Fortunately, none of the seaplanes sank; either in the flotation test or during normal flying, although there were members of the local sub-aqua club ready for emergencies. Standards of models varied from two semi-scale models (entered more for the excitement of participating in the flying), to a number of scale beauties that would have been well-placed in any Class One contest. Some of the entries obviously represented hundreds of hours of construction and yet the modelers were more than willing to risk all in flying them from the unfriendly element of salt water. The contest was primarily to FAI specifications, i.e., weight limit 6 kilos, maximum engine capacity 10cc; the organizers were kind enough to issue a waiver for my 'Quadra' powered 1/4 Scale Gloster VI 'Golden Arrow' — certainly the largest model on show.

Italian entrant C. Berganaschi had his 'Coppa Schneider' competition winning Macchi MC39 and the finish and detailing on this model was superb. Finished in a matte deep red, with just the right amount of detailing to give 'atmosphere,' it was obvious that his model was going to be well in contention from the start. His compatriot, C. Martegani, chose the British designed Sopwith 'Tabloid' and this also scored high static points. He was probably fortunate that judging was carried out from a distance of about 10', as judges failed to notice that ailerons were fitted to the lower wings (the original had a wing warping system). French interests were shouldered by the irrepressible Jean-Claude Requet with his '40' powered Bernard HV 120-02 'Fakal.' Our own Brian Peckham also used '40' power in his 1913 Nieuport and this model scored third highest static model — the rigging and strut detail was magnificent. George Webb selected the same prototype for modeling but used a .60 in a heavier loaded design. The Supermarine S6B was represented in fine fashion by Rob Millinship whose airbrush work must be as good as any seen on model aircraft — it is his profession as well. His second position in static, was fully justified for this delightful racer.

Dudley Pattison and his 'Flair' team turned up with a team of three Short 'Crusaders'; a lesser known entry for the 1927 contest and unusual in its use of an air cooled radial engine. Another British entry, Roy Randall and Brian Pockwell, reciprocated the Italian's gesture by building Macchi M72 monoplanes, and John Ayling chose the difficult subject of the Savoia Marchetti S51 biplane — a model with a lot of character. Two other Supermarine designs entered were Brian Peckham's S4, beautifully built and finished as usual, and an ambitious replica of the Sea Lion III from professional modeler Roy Tassel.

Lined up in the orignal hangar used by the R.A.F. High Speed Flight, the models fairly represented the full 18 years span of the Schneider Trophy contests — it only needed a few American entries to make the representation complete! To hold the contest on the site of the 1931 venue, with most of the buildings and landmarks intact, made it a very nostalgic occasion, as it must have been for some of the original pilots who attended the display. In addition to the model competition, there were original aircraft and memorabilia displayed, and a full size flying display including a flying replica of the S.5., Concorde, Battle of Britain Flight and the 'Red Arrows.' Two days was nowhere enough time to absorb all of the atmosphere and discuss modeling and full size flying matters!

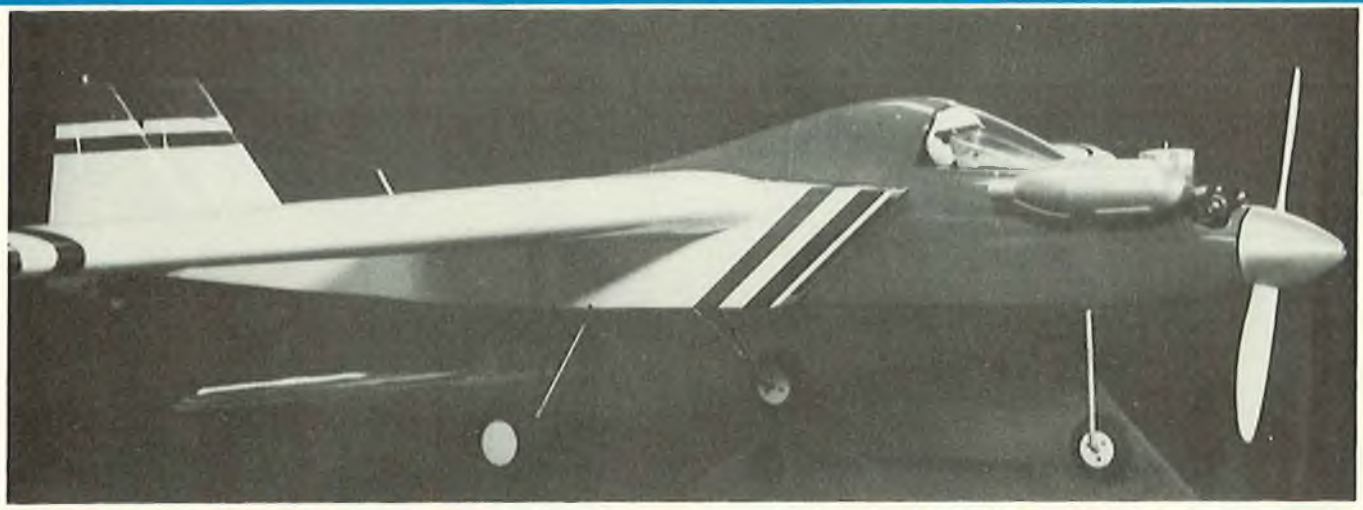
Late Saturday was 'crunch' time for the R/C Schneider models. Not all models had been test flown, including my own, and those of you who know anything about flying from water will know that results are not automatic — and that water can be very hard and unforgiving. Salt water is also far from kind on electronic equipment. From past experiences with Schneider models anything might be expected, the success rate had not been particularly high. The draw for the flying order was nervously awaited, and one of the local fliers volunteered to fly first with his very semi-scale Supermarine S4.

Ian Burridge rapidly proved that the 180° taxi maneuver was feasible with an average size model and **not** fitted with water rudders — even in wind conditions of 12-15 knots. This well-proven model coped with the take-off, course flying and landing in great style and must have instilled confidence in some of the other contestants.

The first of the Macchi 72 entries failed to negotiate the 180° taxi turn and flipped over in the wind; most of the pilots decided to omit this maneuver from this point onwards. Dudley Pattison, leading the 'Flair' team of 'Crusaders,' prepared his model, slipped it into the waves and accelerated away surrounded by a cloud of spray. As might be expected from an experienced pylon racer, Dudley flew a smooth tight course with the 'Crusader,' and the small, relatively heavily loaded model, coped well with the conditions. My allotted position of No. 4 had arrived and the 'Quadra' was swung into life, making a pleasant throaty sound compared to the higher revving two stroke glow motors. I had sneaked in a maiden test flight before the contest, and was delighted to find that the only change needed with the Gloster 'Golden Arrow' was some 'up' trim.

The second contest flight was equally smooth with the model rising onto the step automatically and leaving the water with just a touch of

to page 131



DOUBLE EAGLE 40

Following up with the success of the 'Double Eagle," the designer has designed a smaller version 'Double Eagle 40!' Its performance is as exciting as the large one.

By George R. Smith

Introduction

After several years of development, the basic Double Eagle came into being and proved itself to be one of the hottest design concepts to date (RCM, May 1979). Intended for the Novice/Advanced levels of AMA pattern competition, the Double Eagle design offered, for the first time, an aircraft dedicated to the entry-level competition pattern flier by providing unique aerodynamic characteristics tailored to his needs. These included:

The "symmetrical lift" wing, a non-symmetrical wing that provides the same lift whether upright or inverted without adjusting the aircraft's "angle of attack."

The "lateral lift" fuselage — adequate fuselage area forward of the wing providing lift to sustain knife-edge flight with minimum application of top rudder.

A high speed, low drag wing section, washed out to provide good low speed characteristics with solid control for landing.

A roll stability factor that is slightly positive, giving the aircraft a tendency to be self-correcting to maintain wings level.

The world-wide acceptance of the

ABOUT THE AUTHOR

George R. Smith is an Aeronautical Engineer who graduated from Alabama's Auburn University in the 1950's. After a highly successful decade of employment by the U.S. Army in Huntsville, Alabama, as a Technical Manager of advanced research projects, Mr. Smith has returned to the aircraft industry as a special projects manager. He is an active member and twice past president of the Rocket City Radio Controllers, Inc., of Huntsville. He spends much of his time at the club's flying site which is provided by the City of Huntsville at the, now inactive, old city airport. An avid modeler for over 30 years, Mr. Smith expresses an interest in modeling of many types but admits to a true love and fascination for powered R/C aircraft. He feels that the natural progression for him was toward the development of custom designed aircraft to provide customized performance. Mr. Smith looks at the Double Eagle concept as a jump in technology of high performance aircraft and has developed another in that series of advanced designs for individualized performance.

Double Eagle design has been most enthusiastic and has prompted the development of a high performance sport aircraft employing the same technologies. The Double Eagle "40" is that aircraft.

The Double Eagle "40" is not simply a scaled down version. In the tradition of the basic Double Eagle, the Double Eagle "40" was designed to meet specific flight characteristics. These characteristics include all of the basic Double Eagle's special aerodynamics and special performance but they are tempered with a sport aircraft's more forgiving nature.

The readers who missed the original Double Eagle article, or don't remember it, will appreciate a recap of how the design applies standard aerodynamic principles to achieve some truly spectacular performance. Much of this discussion is reminiscent of the basic Double Eagle but this intent is to describe and explain the

Double Eagle "40".

Add to the unique performance a definitely "jauntier" appearance, the convenience of smaller size and reduced power requirement, and the result is a fun aircraft that is equally at home at a Sunday fly-in or taking first place in a pre-novice pattern competition.

What is it? It's a .40 sized sport aircraft but . . . The Double Eagle "40" is different. Its looks are certainly different; its aerodynamics are different; its weight distribution is different; and most significantly, its flight performance is different from any other sport aircraft flown today. The differences that are evident in the design are the means by which the Double Eagle "40" obtains its superior performance. The differences are readily apparent and are substantial departures from the recognized convention in sport R/C aircraft, but they are **not** departures from good solid aerodynamic design.

But, getting back to the question "what is it?" — in short, it is a .40 sized, high performance sport aircraft, capable of performing with ease all of the maneuvers in the AMA Novice Class of pattern competition while maintaining the ease of handling and forgiving nature of a sport aircraft.

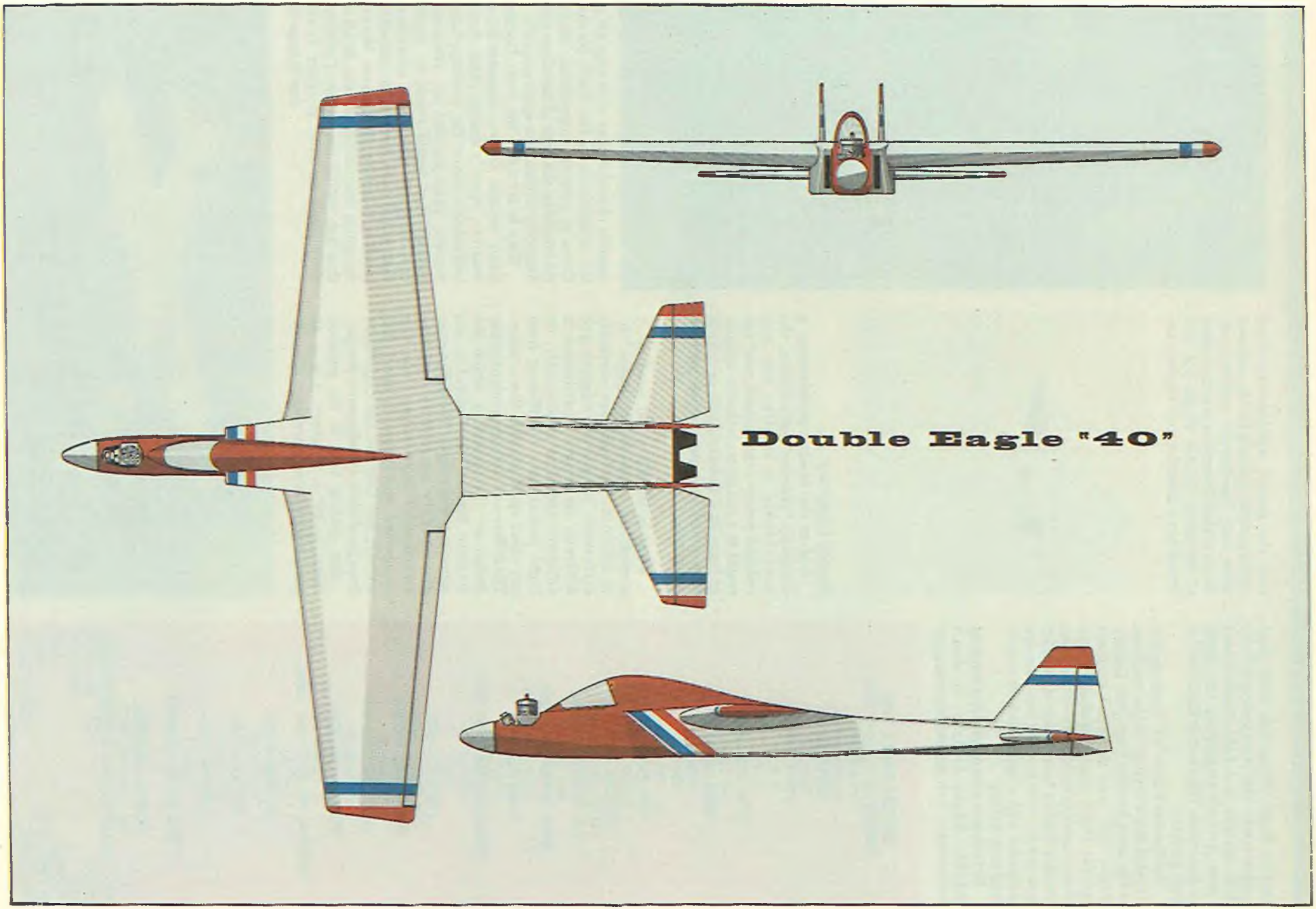
Why is it? After the basic Double Eagle became known, requests for a smaller, sport version came from individuals across the country. Like myself, they wanted an ultimate aircraft that would think for itself, that wouldn't make any mistakes, that would even correct the mistakes given to it during a maneuver. We all recognize that no aircraft can do all of that but, within the realm of reality, they need an aircraft that could

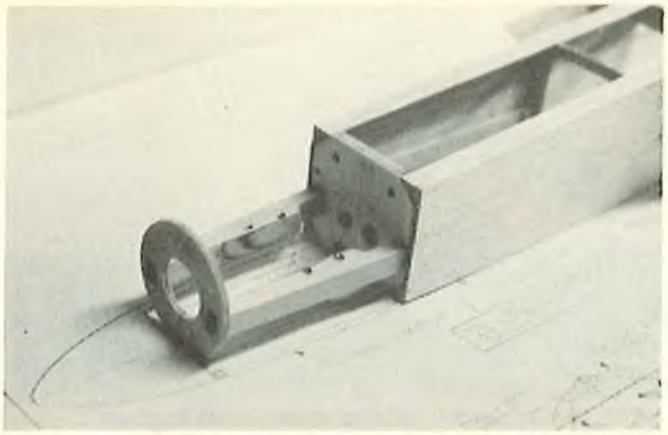
text to page 61

BILL OF MATERIALS

Balsa Sheet	
1/8" x 3" x 36"	6 pcs.
3/16" x 3" x 36"	2 pcs.
1/4" x 3" x 36"	5 pcs.
3/8" x 3" x 13"	1 pc.
1/2" x 3" x 10"	1 pc.
Balsa Shapes	
1/4" x 1/2" x 36"	4 pcs.
1/2" triangle x 36"	1 pc.
3/8" triangle x 36"	2 pcs.
1/4" triangle x 36"	1 pc.
Balsa Blocks	
2¼" x 2¼" x 5"	1 pc.
5/8" x 3" x 4¼"	1 pc.
2" x 2" x 8"	1 pc
1¼" x 1" x 6½"	2pcs.
Aircraft Plywood	
1/4" x 6" x 12"	1 pc.
1/8" x 6" x 12"	1 pc.
1/16" x 6" x 6"	1 pc.
1/32" x 6" x 18"	1 pc.
1/64" x 50" x 50"	1 pc.
Polystyrene Foam	
4" x 18" x 26"	1 pc.
Hardwood	
3/8" x 1/2" x 10	2 pcs.
Piano Wire	
5/32" (nose gear)	1 ea.
1/8" x 36"	2 pcs.
5/32" x 36"	1 pc.
Fiberglass	
6 oz. 6" x 36"	1pc.
Canopy	
Wings Mfg. Co., Sport Style	1 ea.
Spinner	
2¼" C.B. Assoc.	1 ea.

DOUBLE EAGLE "40"
Designed By: George R. Smith
TYPE AIRCRAFT
Sport/Pattern
WINGSPAN
52 Inches
WING CHORD
Root 12"
Tip 6¼"
TOTAL WING AREA
448 Sq. In.
WING LOCATION
Shoulder
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL EACH TIP
11/32" At Chord Line
O.A. FUSELAGE LENGTH
46⅜ Inches
RADIO COMPARTMENT SIZE
(L) 7" x (W) 5½" x (H) 2¼"
STABILIZER SPAN
21½ Inches
STABILIZER CHORD (Incl. elev.)
Root 7¼"
Tip 3"
STABILIZER AREA
106 Square Inches
STAB AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Mid Fuselage
VERTICAL FIN HEIGHT
6" (Twin)
VERTICAL FIN WIDTH (Incl. rudder)
6½" Avg.
REC. ENGINE SIZE
.40 W/Pump
FUEL TANK SIZE
(2-4's) 8 oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., All. Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Foam & Ply
Empennage ..... Balsa
Wt. Ready To Fly ..... 96 Oz.
Wing Loading ..... 30.86 Oz./Sq. Ft.


Double Eagle "40"

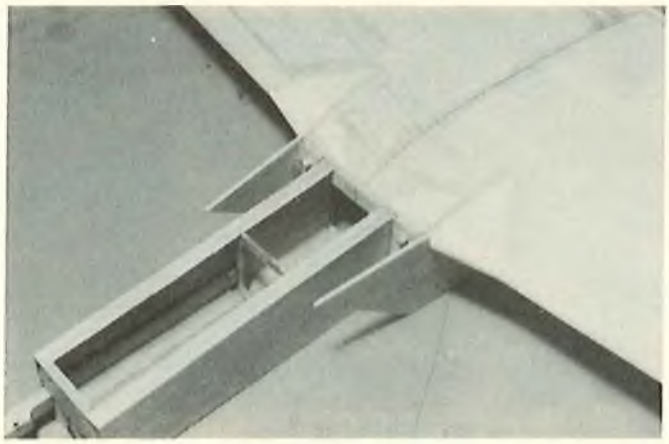


Fuselage nose with engine bearers and nose ring installed.

Fuselage built flat on board over plans, makes for a square fuselage.

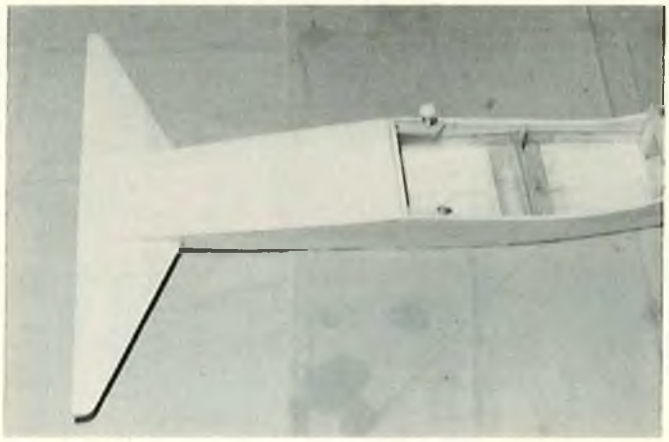
Close-up showing simulated air scoops at wing leading edge.

Aft end of fuselage. No problem with bending fuselage sides.

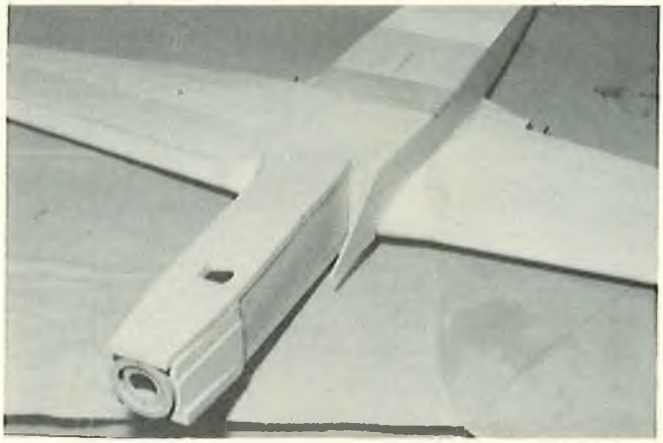


Completed foam wing being fitted to fuselage.

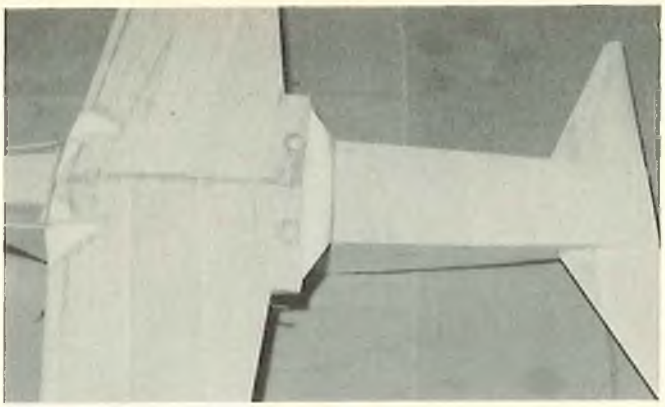
Nose section is fitted with blocks ready to shape.



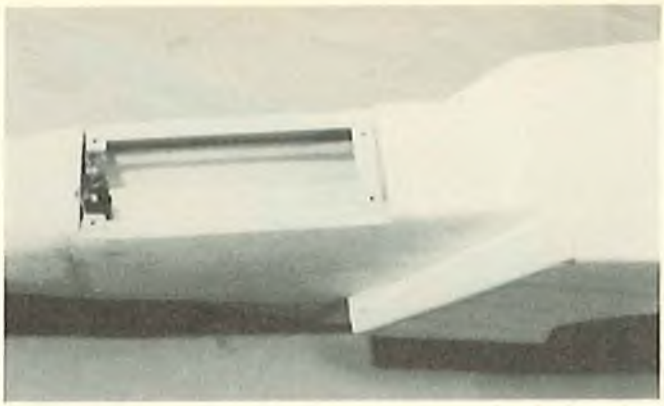
Top view looking at ample radio compartment.



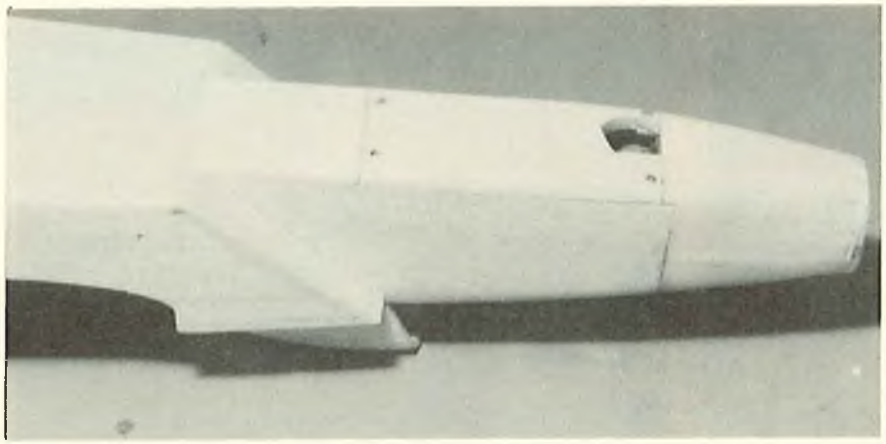
Bottom of fuselage with hole for nose wheel.



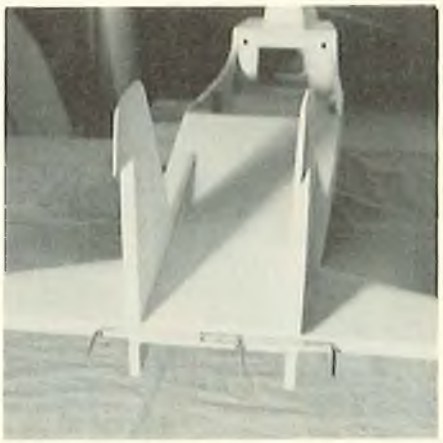
Wing installed and fitted to satisfaction.



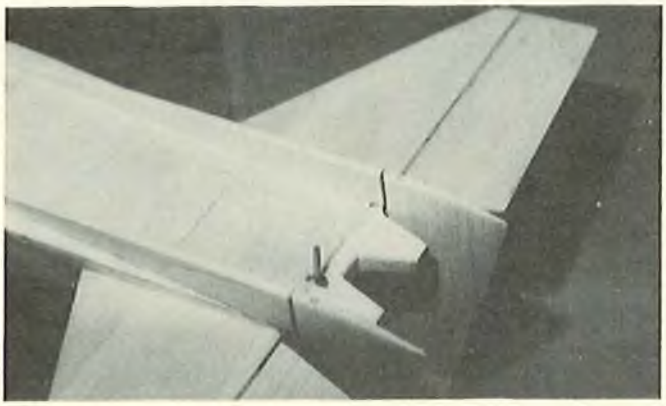
Bottom of nose section showing access hatch removed.



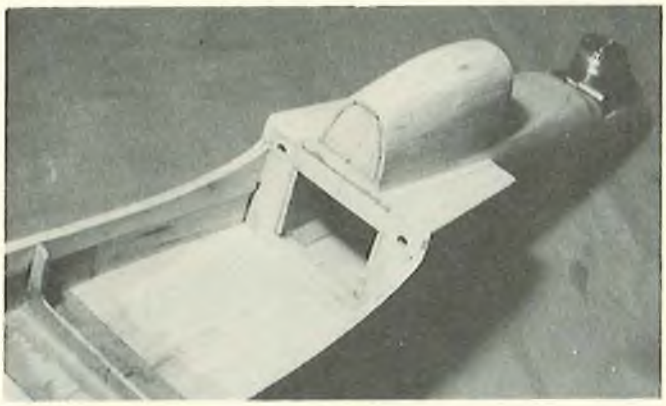
Fuselage carved and sanded. Takes on nice shape.



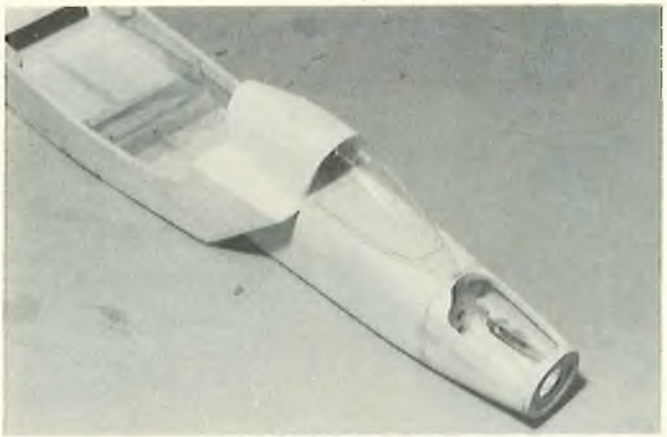
Looking at aft end with elevator linkage installed.



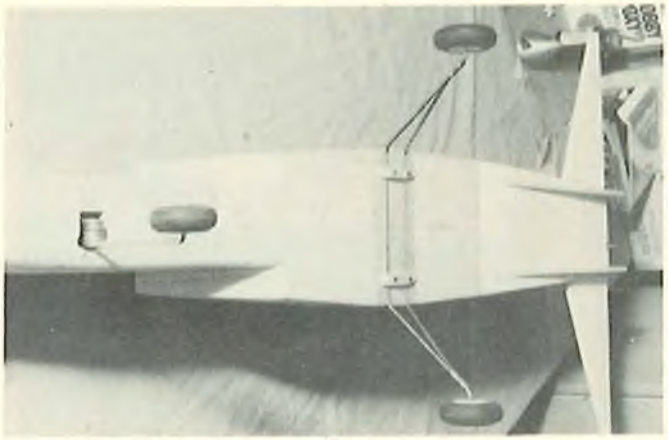
Elevators and simulated tail pipes installed. Encloses elevator linkage.



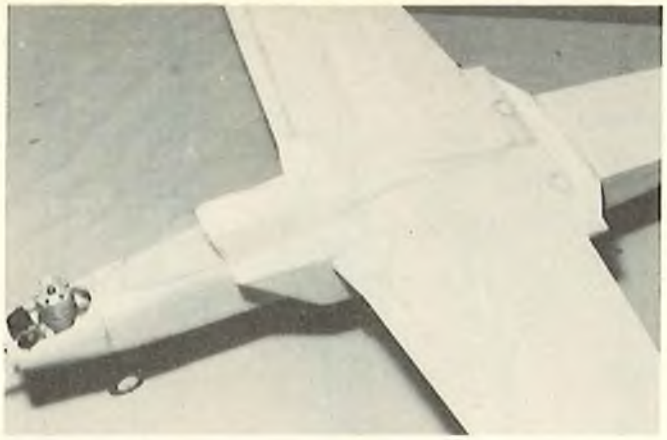
Rear portion of canopy installed on fuse.



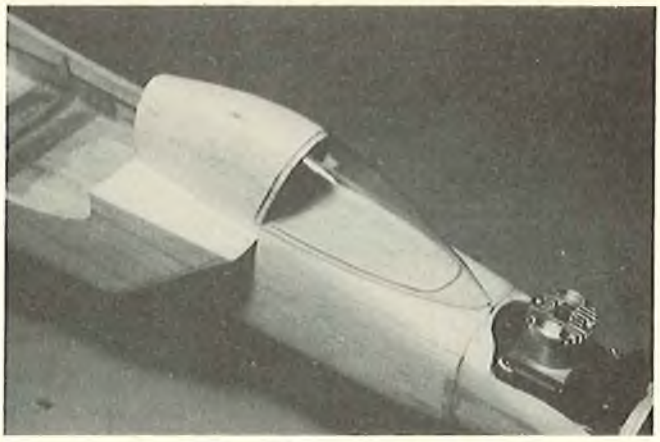
Things are approaching the covering stage. Looks good.



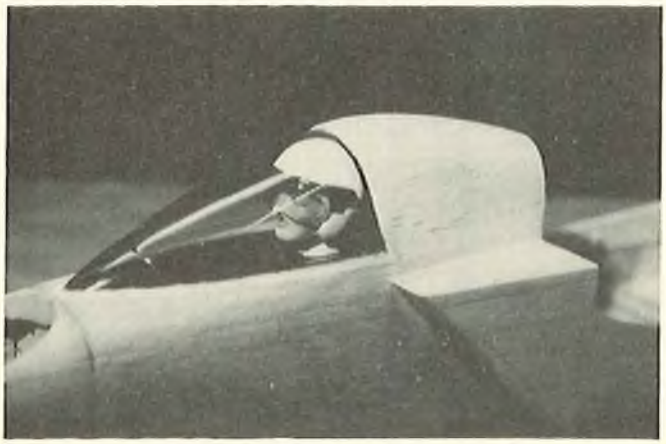
Landing gear installed for trial fit before covering.



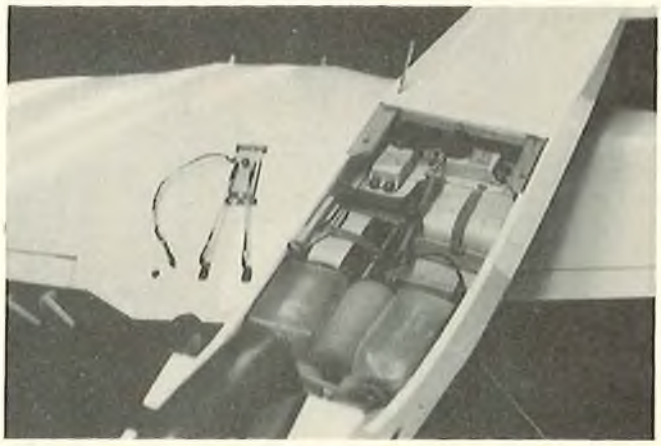
Builds into a beautiful looking model and flies as well.



Forward section of Wing Mfg., Co., "Sport Canopy."



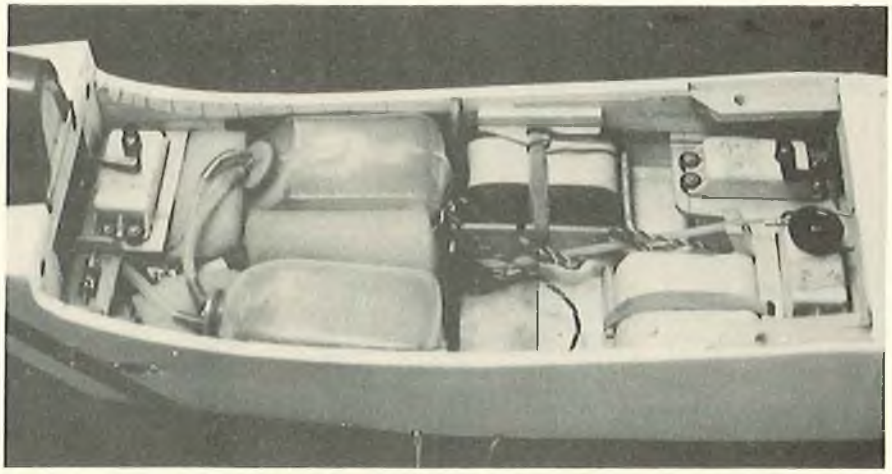
Williams Bros. pilot installed in completed cockpit.



All R/C gear installed with ample room. Note dual fuel tank installation.

approach it. The Double Eagle concept possesses the ultimate in directional stability, exhibits a proportional response to all controls in all flight attitudes, and has an ability to maintain altitude and direction in all flight attitudes, with a minimum of controls adjustment and with no perceptable changes in angle of attack. Its low drag design allows for superb high speed performance while it demonstrates rock steady, slow flight with totally predictable and controllable stall characteristics. Absolute lateral control with the wing partially stalled during the landing flare is characteristic.

Like the basic Double Eagle, the Double Eagle "40" has aerodynamic "fine points" that are responsible for those special "almost think for itself" flight characteristics. The "fine points" would be easily masked or totally obliterated by a warp or a misalignment. So, it follows that the airframe design and assembly methods would be kept as simple as possible and would conform to a rigid concept of built-in accuracy. One example of built-in accuracy is, **all alignment measurements must be made from the same reference throughout construction with no transfer of datum.** Other examples of built-in accuracy will be discussed during the "construction" portion of this article. The built-in accuracy concept contributed much to the "why is it" of the airframe and structural design and dominated the construction and assembly procedures.



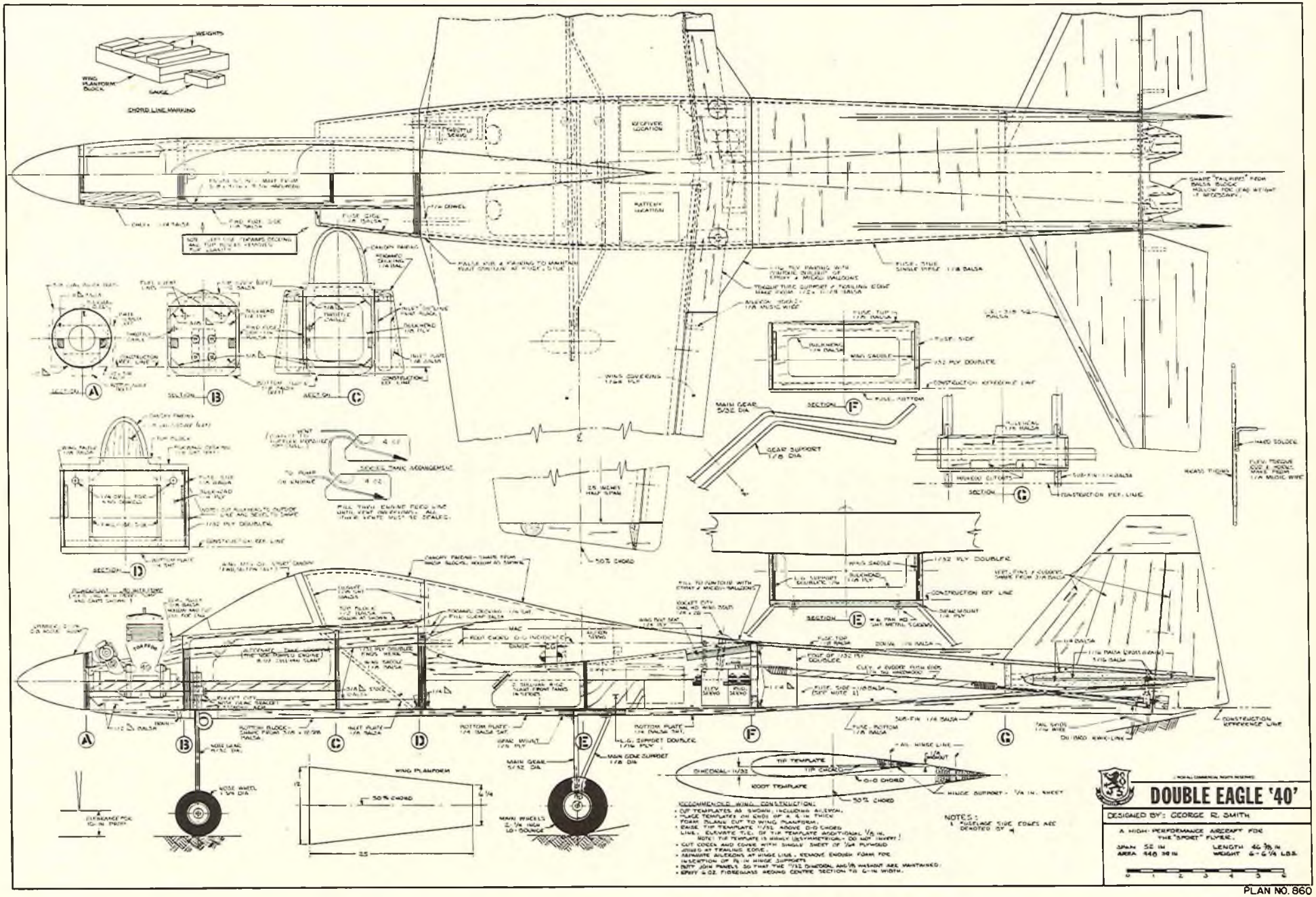
Close-up of a very neat installation package. It does help when you have this kind of room to work with.

How is it? A discussion is in order concerning the design philosophy of the Double Eagle "40" and what is behind its ability to accomplish some of its almost startling flight performance. I won't go into any great detail or clutter up the discussion with mathematical justifications but I will attempt to explain why the various aspects of the design do what they do.

Powerplant — The Double Eagle "40" was sized to be a hot performer with stock K & B .40 engine. Its performance would be truly breathtaking with the addition of a Schnuerle, Speed .40. The design was developed around a K & B .40 with Perry Pump and Carb. With its sleek lines, low drag aerodynamics and 6

text to page 65

FULL SIZE PLANS AVAILABLE — SEE PAGE 203



PLAN NO. 860

lbs. flight weight, its speed and vertical performance are truly spectacular for a sport aircraft.

Low Drag Design — Of all the factors that produce aerodynamic drag on an aircraft, the greatest, and most difficult to reduce is the drag that is "induced" by the production of lift. Of lesser severity, but still with great affect, are the frontal area (flat plate) drag, the "profile" on skin friction drag, and the various "parasite" drag producers such as landing gear, exposed wing-bolt heads, etc. The Double Eagle "40" was specifically designed to reduce the major drag producers to a minimum. The basic wing section was chosen for its low induced drag characteristics. Also, its relatively thin airfoil section provides a minimum of frontal area drag. Mounting the wing with its upper surface coincident with the top surface of the fuselage provides a smooth airflow transition and eliminates the traditional wing to fuselage buffet area which usually can be only partly helped with transitional fillets. The washout in the wing, though primarily designed to enhance low speed stability, provides a considerable contribution to a reduction in the induced drag during high speed flight; with this airfoil, the reduced angle of attack at the tips slightly reduces total lift but greatly reduces the overall induced drag of the wing. The configuration of the wing tips with the extended span at the trailing edge help to minimize vortex losses and the accompanying tip drag.

The simulated intake ducts at the fuselage transition forward of the wing are obvious "flat plate" drag producers but the structural and aerodynamic advantages of these ducts far outweigh the small amount of drag produced. The structural advantage is obvious from the plan; they provide support for the extremely long nose. They substantially break up the helical flow of air around the fuselage from the propeller wash thereby helping to provide a straight air flow over the wing center section, over the upper fuselage, to the vertical fins, and also, the sharp leading edge of the simulated ducts greatly assist the stall characteristics of the wing. At stall speeds, it forces the wing to stall first at the root section and, in conjunction with the washout, assists in assuring a progressive stall from the root to tip. This allows the full availability of lateral control with aileron, even when the wing is almost completely stalled and the aircraft is in its landing flare.

Slow Landing Speed — With a high speed/low drag airfoil and a high performance low drag airframe, the attainment of impressive flight speeds would not be any surprise; neither would it be surprising if the landings had to be made "hot" to keep from stalling. But, the Double Eagle "40" is not the usual aircraft, so its high speed performance is not indicative of the need for high speed landings. The surprises are for the spectators who, after watching the flashing flight performance, see a power-on, nose high landing approach that you can almost walk beside.

Symmetrical Lift — For an aircraft to roll inverted and maintain altitude and direction, the forces on it must be the same in the inverted condition as they were in the upright condition. The Double Eagle "40" capitalizes on the unsymmetrical aspect of the wing due to washout to produce a wing with symmetrical lift rather than a wing with symmetrical airfoil. The root section is a symmetrical airfoil. The tip section is an airfoil that is similar in contour to the root section on the upper surface but distinctly different on the bottom surface. Notice that "washout" in the upright condition changes to "washin" in the inverted condition and the resultant angle of attack at the tips is decidely positive. The bottom surface is designed to use that positive angle of attack when inverted to provide a significant amount of lift. When the aircraft is upright, straight and level flight is maintained primarily by the lift generated by the inboard portion of the wing. The outboard portion, being appropriately "washed out" to produce less lift and substantially less drag, is really going along for the ride. In the inverted condition, with no change to the straight and level attitude of the aircraft, the generation of the primary lift shifts to the outboard portion of the wing which is not blanked by the fuselage and which has a significantly high angle of attack.

Critical C.G. — The symmetrical lift of the Double Eagle "40" is dependent upon a critical location of aircraft Center of Gravity (C.G.). That is to say, the C.G., once established and trimmed for, must remain fixed within precise (± .5% MAC) limits for the symmetrical lift feature to be effective. A general C.G. range of 29% to 33% (approximate) of the Mean Aerodynamic Chord (MAC) will provide adequate pitch stability and still allow excellent maneuverability both in the inverted and upright conditions. The critical C.G. location for "symmetrical lift" will be located within this range. The dual tank arrangement devised for the Double Eagle "40" allows for a full 8 ounces of fuel but still provides a localization of fuel mass which is adequate to maintain the C.G. well-within limits to satisfy the symmetrical lift requirement. The slight lateral fuel mass shift from tank to tank during fuel utilization is totally insignificant in flight. The Double Eagle "40" may certainly be flown most successfully with a conventional 8 oz. tank located adjacent to an unpumped engine. The symmetrical lift feature would then depend on the adjustment of flight trims to compensate for fuel utilization during the flight.

Lateral Lift — Lateral lift is the lift provided by the fuselage in lateral (knife-edge) flight. The forward fuselage provides approximately 65 square inches of lifting surface that is forward of, and unencumbered by, the wing. If the reader has been wondering why the Double Eagle "40" has such an extremely long nose, this is the reason. The lateral area of the forward fuselage was sized and the contour developed to produce adequate lateral lift to maintain straight and level flight at the higher speed ranges. As with the symmetrical lift, don't expect adequate lift for slow speed knife-edge flight. Keep the speed up to keep out of the ground.

Twin Fins — The twin vertical fins were **not** added just for looks; they satisfy a need for yaw stability. The 65 square inches of lateral area of the nose is considerably larger than the nose area of any conventional sport aircraft. The negative yaw moment created by the nose is in proportion to its size — large! The vertical fin area that would be required to establish an adequate positive yaw stability, if relegated to a single surface, would make it look like the dorsal from "Jaws." Therefore, the required total area was split in half and put into two surfaces. The area was then proportionately assigned above and below the C.G. level to provide true yaw response and to minimize roll coupling.

Other Aspects Standard — All other aspects that deal with flight dynamics are pretty standard.

The horizontal stabilizer was sized for positive longitudinal stability and was designed to be fully aerodynamic for efficiency using a symmetrical airfoil.

All surfaces and the engine thrust line are set at 0-0 degrees.

The wing is designed to have a very slight dihedral, actually, the amount of dihedral is only to assure that there are no anhedral characteristics.

All control surfaces are closed hinged, with **no** hinge gap, for control efficiency and reduced drag.

Structure — a brief discussion of the structure of the Double Eagle "40" is in order to complete the "how is it" portion of this description and to show

to page 119

GIVE IT A WHIRL

John Gorham

This "Give It A Whirl" series commenced nearly two years ago with the prime intention of helping the modeler who had finally decided to learn to fly R/C model helicopters. Two years ago the best that we could do was to give advice based upon the questions asked by these prospective learners. This resulted in a kind-of open "loop" advice since most of the people who were actually flying R/C helicopters at that time were those who had been doing it for quite a while and had nearly forgotten what their problems had been.

During the last two years, although the number of attendees at competitions (that is to say "expert" flyers) has not seemed to grow very much, there has been a remarkable increase in a "new" group of people obviously determined to learn to fly the helicopter. These people come in "all shapes and sizes and degrees of neurosis" and observing them has given me and, I'm sure, many other old time heli-fliers a great deal of satisfaction and pleasure. Now at last we can go out to local helicopter meeting places and see many people hovering and several flying around, even if some of the others do have to duck now and then. At least the would-be heli-flier could find help and encouragement at last from others like him. R/C helicopters seem to have finally arrived as a challenge 'to try,' not just something to laugh at.

On the other hand, I have received many letters from individuals in remote areas who have also learned simply by reading columns such as now appear in many major magazines. In addition to all this there have been some new helicopters on the market with better control characteristics than hitherto available to the beginner. Being able to buy a machine which is easier to learn on also has contributed to the increase in helicopter fliers. Now that the numbers are increasing significantly, and, more important, the success rate is greater, we are able to put together some more realistic statistics of the problems that people are **encountering,** rather than those that they just **feared.** Phone calls, letters and attending the various helicopter meetings has enabled me recently to reach at least preliminary conclusions on the most common problems and I have tried to cover some of them in the last few columns.

This time I'd like to go back to one aspect of the learning problem which seems to be a predominant one. There will always be the guy (or girl) who can pick up an R/C transmitter and fly a glider, power plane or helicopter very quickly and apparently almost instinctively. Don't you hate them? Some psychological quirk in their make-up enables them to do this, it seems. This isn't true, however, for the majority of us. It certainly wasn't true of myself. Even though helicopters were much harder to learn to fly ten years ago, it took me nearly three years to be able to hover confidently. I hasten to add that if I could have learned with one of the more modern helicopter designs I'm sure I would have learned much quicker. The point is, however, that I was one of those people with a slow learning curve and I'm sure there are many like myself trying to learn today. If it's any consolation to you, fellows, once you do get the knack, you will climb the learning curve very quickly. Then the pleasure of hovering and properly flying an R/C helicopter will seem very well-worth all the preliminary problems and heartaches (and $!).

There are many learning problems which we have tried to cover in these columns, setting-up the helicopter, understanding the functions of all the controls, building and maintenance. But even if we have a perfectly set-up helicopter with the engine running correctly, the main and tail blade pitch set at the right angles and everything else right, there is still a major problem of what to do during those awful moments when the helicopter is floating in the air in front of you and entirely dependent upon which way you move your control sticks for its safe descent down to Mother Earth again. From my own observation recently it does appear that a better understanding of the factors involved between the movement of your stick and the movement in space of the helicopter would help some learners tremendously in many cases. So I'm going to try again this month to explain these phenomena to you.

You may remember in an earlier column that we presented the analogy of a helicopter in the hover being similar to a floating balloon and your control motions analogous to patting the ballon in one direction or another to maintain control of its position. Many of our recent letters have informed me that visualizing this phenomenon when hovering does help. So we repeat that sketch again in this column.

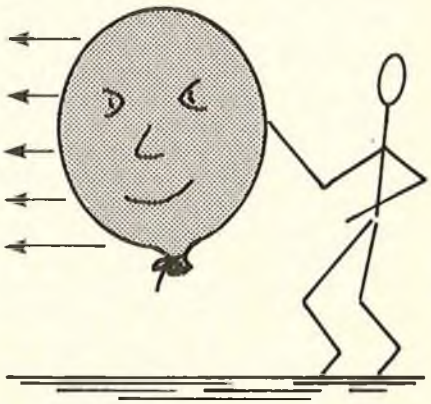


FIGURE 1
THE BALLOON ANALOGY

Well, to proceed further. Since my basic expertise is in aircraft stability and controls, I could attempt to explain how a helicopter reacts to control inputs in rather technical terms. But this would only be helpful to those people already trained in this field and they shouldn't need this sort of help anyway. So the problem is how to put in terms understandable to the majority of us exactly what's happening without resorting to highly technical and complex expositions. So let me try again to do this now that I've learned more from you of your problems.

First we must understand one of Newton's basic laws of motion: A **force** applied to a **mass** will result in an **acceleration** of that mass, or F=MA. Now, when we change the **position** of our control stick of the transmitter this results in a swashplate or tail rotor or throttle movement of the helicopter. For a given change in **position** of your transmitter stick there will be a change of **force** applied to the helicopter by the means of the particular control arrangements of your helicopter. This **force** then, at least for small movements, will result **not** infinite change of the helicopters position as you might think, but in an

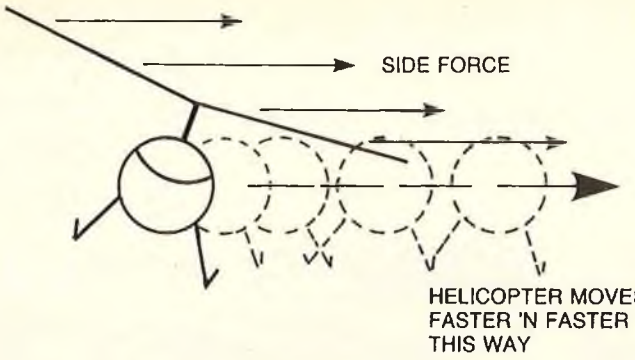


FIGURE 2
ACCELERATION DUE TO FORCE CHANGE

acceleration of the helicopter in one direction or the other. Now an **acceleration** is a **rate of change** of speed; that is to say the helicopter will start to move in the appropriate direction but at an ever **increasing** speed while the control stick is held in that position.

There are other influences, such as the increases in aerodynamic drag of the helicopter as it increases speed, and also other inertial and aerodynamic effects. We can ignore these, however, for the small motions that we experience (or **should** experience) during hovering maneuvers.

Well, then, moving your transmitter stick a certain amount will result in an increasing **rate of movement** of the helicopter. It will **accelerate** in the direction of the motion. So, as soon as the helicopter reaches the new position we want it to be in, we must be prepared to very quickly apply a stopping, or retarding, force to reduce the acceleration. The retarding force is applied by moving the control stick quickly in the **opposite** direction and holding it there until the acceleration stops. Your stick movement must then be reduced to zero, or even further, until the helicopter is in the position you desire.

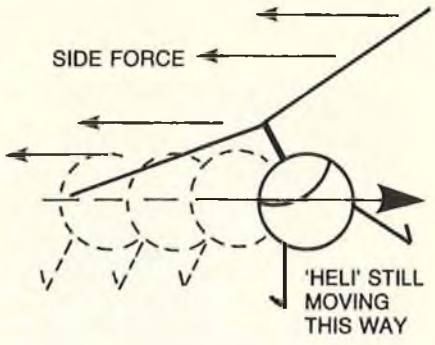


FIGURE 3
OPPOSITE SIDE FORCE NEEDED TO SLOW UP AND/OR STOP MOTION

Perhaps another analogy for this which might be helpful and which was given many years ago in one of John Tucker's "Chopper Chatter" articles is to imagine the helicopter like a large ball sitting at the top of a dome. A commencement of motion in any direction will result in an acceleration of the ball down the curve of the dome.

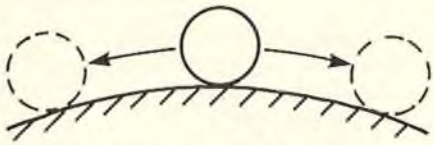


FIGURE 4
DON'T LET IT GET AWAY TOO FAR!

This example gives an idea of the stability criteria of a helicopter ("it ain't got much"). You can also see that you shouldn't let the ball get too far down the slope or it will take a heck of a lot of "push" to get it back again. Fortunately, with modern R/C helicopters, the reaction of the helicopter to control motion is firm and quite fast (if it is set-up properly!). So let's run through this once again. Figure 4 shows that a **movement** of roll or pitch command (that is to say a change in position of the right hand stick, in the case of Mode II) will result in a **force** being applied to the **mass** of the helicopter. This **force** will result in an **acceleration** of the helicopter. Because the result is an **acceleration,** rather than a speed or a positional change, we must then counteract that acceleration by **reducing** or applying **opposite** stick movement until the helicopter slows up and stops in the place where **we** want it to be. If you wish you can visualize this effect as a need to **anticipate** the final result of your control commands. Perhaps you could now go back to the balloon analogy and see that, while this helped in an initial understanding of the phenomena of control command and effect, it didn't clearly illustrate the **acceleration** factor.

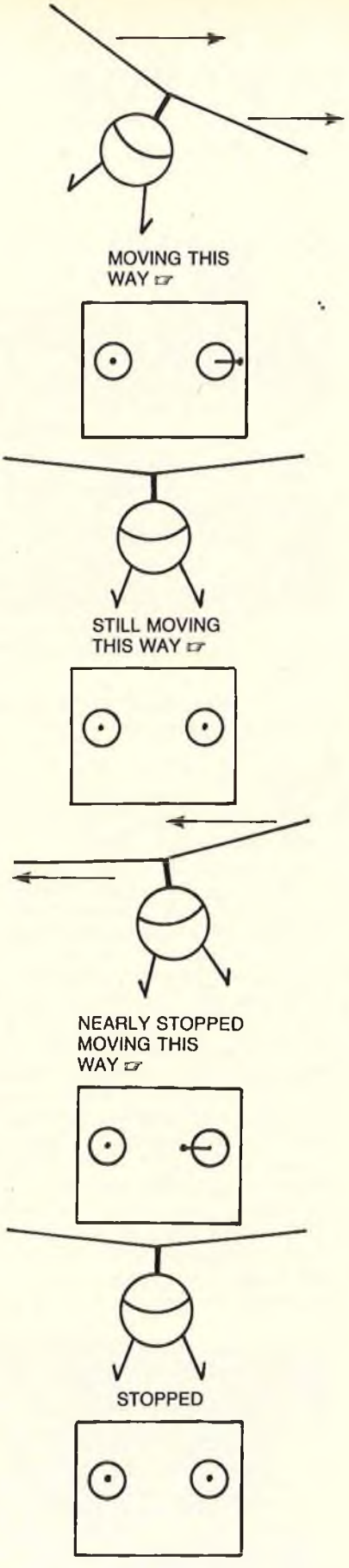
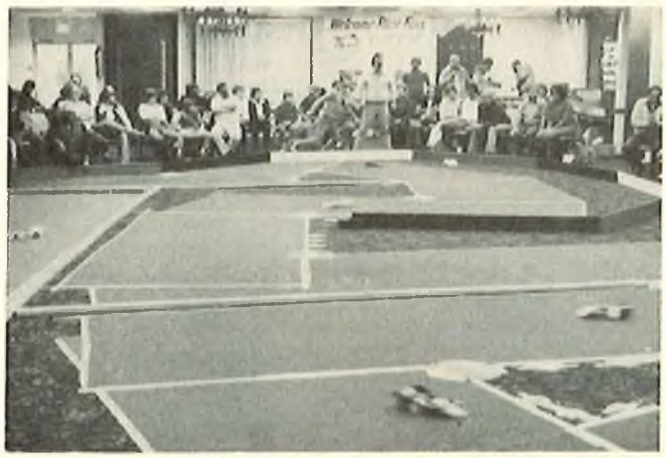


FIGURE 5
OPPOSITE CONTROL TO STOP MOVEMENTS

to page 119

PIT STOP

Gene Husting



The 2nd Annual U.S. Indoor Championships was held in Cleveland, Ohio, in this large banquet room at the Holiday Inn hotel.

The drivers said the traction was unbelievable on the indoor/outdoor carpet track surface, with some cars even rolling over without hitting anything.

2nd ANNUAL U.S. INDOOR CHAMPIONSHIPS

The 2nd Annual U.S. Indoor Championships had an added importance this year, because it was the 3rd qualifying race for the upcoming 1/12 Scale World's Championships to be held in Southern California, USA in August 1982.

There will be 120 drivers coming from all around the world to compete at the World's Championships. The Americas, including the USA, Canada, Mexico and all the South American countries, are allowed a total of 40 drivers. To determine which 40 drivers are eligible, ROAR will be selecting the 40 drivers from the drivers that qualify for the "A" Main events at four different areas in the country. These four events are the USA ROAR Nationals which was in July, 1981 in Boston, Massacheusetts, the Southern California Regionals in October 1981, the U.S. Indoor Championships in Cleveland, Ohio, in November 1981 and the last one, The Winternationals in Orlando, Florida, in February 1982.

As you can see, the races are spread from one end of the country to the other, and from the Northern states to the Southern states. I don't believe a more fair way could have been found to qualify than this. The races are also open competition, meaning that anyone can enter and compete, as long as they're a ROAR member. If you don't qualify at one race, you can still do it at another race.

Although the 1982 World's Championship race will be an outdoor race, this race in Cleveland was the U.S. Indoor Championships. Some people might say it's not fair to have an indoor race qualifying for an outdoor race, but it's been proven time and again that the great racers can race anywhere on anything and still win. Need proof? Mike Lavacot has won three ROAR Outdoor National Champs, plus the Winternats, and the Regionals. These are the biggest races in the country and they're all outdoors. Yet at the 1981 Nationals in Boston, the winner of the USA ROAR Indoor Modified Nationals was — Mike Lavacot. And one of the greatest indoor racers in the country, Ralphie Burch, Jr. from Texas, won the USA ROAR Outdoor Modified Nationals in Boston.

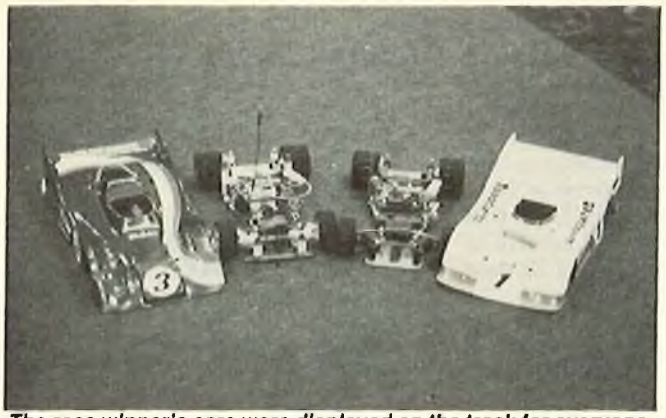
The U.S. Indoor Championships was held in a large banquet room in the Holiday Inn hotel in Akron — Cleveland. Race Director Bill Jeric and the sponsoring NORCAR club of Cleveland layed out a track of indoor/outdoor type carpet, with plow discs marking the corners. The track had many tight turns and the traction got to the **incredible** point, with reports of more than one car that actually rolled over without touching anything! Something we all dream about getting to race on, but seldom get to realize those dreams.

The race was held over Thanksgiving weekend with the largest ever entry in the Midwest, 99 in Stock class and 105 in Modified for a 204 total entry. An adjacent room to the track was used as a pit area and because the race was at the Holiday Inn, many drivers could even pit in their own hotel rooms. Sounds pretty great to me.

The list of entries read like a Who's Who in 1/12 racing. Mike Lavacot and Kent Clausen from Associated, who between them had five ROAR National Championships. Joel Johnson from MRP — twice National Champion. Ralph Burch, Jr. from JOMAC — National Champion.

204 entries made the pit areas a little crowded, but then there was always someone to talk to.

The pit area room was quite crowded, so some racers just pitted in their hotel room as Kent Clausen did. I think I could get to like this idea.



The race winner's cars were displayed on the track for everyone to see. The number 3 car was Mike Lavacot's Stock class winner. The number 1 was Mike Reedy's car driven by Kent Clausen to Top Qualifier in both classes and winner of the Modified class.

Mike Lavacot, on the right, won the Stock class and finished 2nd in Modified. Kent Clausen, in the middle, won Modified and finished 2nd in Stock class. Ralphie Burch, Jr., was 3rd in Modified and 4th in Stock class.

Re-Pete Fusco — Associated National Champion. Tyree Philips and Kevin Orton, the two top drivers from Delta. The top driver from Parma — Buddy Bartos. Bolink's fastest driver — Terje Haugen. Plus another 100 drivers doing their best to join this group. It wouldn't be easy.

Stock class ran first, with everyone getting one practice round and then three qualifying rounds. There were a lot of fast drivers in qualifying, but the fastest was Kent Clausen. Mike Reedy had built two new Associated prototype "Wonder" cars for testing. One had a graphite chassis and one had a fiberglass chassis. Reedy had elected to try his graphite car first because it was half an ounce lighter. It must have really impressed Clausen, because Clausen volunteered to test Reedy's fiberglass "Wonder" car. The first time out, the car had so much steering on this high bite track, Clausen wasn't sure he wanted to run it anymore. Reedy told him what to do to get the car tuned in to the track and the next time out Clausen went out and won top Qualifier honors! Reedy knew right then and there that he just lost his car. Mike Lavacot was also impressed with Clausen's performance. Lavacot also had a new prototype "Wonder" car, but he had elected to try the graphite chassis and he said he felt Clausen's car was just a little better. The "Wonder" car has a different type suspension system and the fiberglass springs more than the graphite, which is important in this type car. These were some of the things we were trying to find out.

Stock "A" Main

Being "Top Qualifier" doesn't automatically mean you're going to win the "A" Main. Many things can happen over eight minutes with 50 laps to go on a 6' wide track. Although Clausen was impressive, it was Mike Lavacot who was in the lead at the checkered flag in a close race, giving Mike another well-deserved big win. Kent Clausen was right behind in 2nd with Re-Pete Fusco, from New York, in 3rd and Ralphie Birch, Jr. 4th. It would certainly be hard to find four faster indoor drivers than these four.

Now it's time to put in the Modified motors, which everyone knows makes you automatically go faster, so you're bound to get more laps — correct? Well, that's normally the way it works, but not this time. The Top Qualifier in the Modified class got exactly the same amount of laps as the Top Qualifier in the Stock class. As a matter of fact, the Top Qualifier in the Modified class was exactly the same driver as the Stock class — Kent Clausen. Even though all the drivers got more horsepower with their Modified motors, Kent was able to put the power to its best use. For a lot of the other drivers the added power only made the cars harder to drive on this 6' wide track. And the Modified motors also made some of the cars roll over in the turns!

Was the Top Qualifier going to have a chance to win the Main event this time? Well, Kent Clausen was sure

to page 119

STOCK "A" MAIN

1. Mike Lavacot	Associated	
2. Kent Clausen TQ	Associated	
3. Re-Pete Fusco	Associated	
4. Ralphie Burch, Jr.	Jomac	
5. Buddy Bartos	Parma	
6. Kevin Orton	Delta	
7. Joel Johnson	MRP	
8. Mike Toland	Associated	
9. Tom Miller	Parma	
10. Ron Schuur	Jomac	

STOCK "B" MAIN

1. Ken Peckham
2. Steve Koepp
3. Tom McGarry
4. Pete Fusco
5. Tony P.
6. Dale Mooberry
7. John Huron
8. Terje Haugen

MODIFIED "A" MAIN

1. Kent Clausen TQ	Associated	Reedy
2. Mike Lavacot	Associated	Reedy
3. Ralphie Burch, Jr.	Jomac	Trinity
4. Re-Pete Fusco	Associated	Reedy
5. Pete Fusco	Associated	Reedy
6. Buddy Bartos	Parma	Parma
7. Ken Peckham	MRP	Reedy
8. Ron Schuur	Jomac	Trinity
9. Tyree Philips	Delta	Rev-Tech
10. Tom Miller	Parma	Parma

MODIFIED "B" MAIN

1. Mike Toland
2. John Huron
3. Kevin Orton
4. Bob Herman
5. Tim Morton
6. Don Marsh
7. Terje Haugen
8. Mike Reedy

Re-Pete Fusco equaled Ralphie's performance with a 3rd in Stock and a 4th in Modified.

"2 x 2" AND 2S TEE/VEE

By Gene Wallock

A primary design consideration when designing a model is to anticipate the builder's inherent desire to change the configuration because of personal preference or to have "something different." With this in mind a "Tee" and "Vee" version of the House of Balsa "2 x 2" and 2S were designed, built, and flown.

The T and V-Tail enthusiast who saw the models immediately wanted plans, instructions, etc., so that they could "do their thing." I figured an article and full-size modification plans (with pictorial instructions) published in the R/C Modeler's bible would be the fastest way to convey the information to the greatest number of glider guiders. Now let's get into the project!

General Construction:

I have observed that two serious errors are being committed by builders of the 2 x 2 and 2S:

(1). The pushrod guides **must be glued** to the boom sides along their entire length. The pushrod guides are a very important part of the boom structural integrity. Properly glued, they allow the boom to flex if you land hard, and minimize breakage. Improperly glued, the guides are dead weight that the model has to drag around.

(2). Hot Stuff and baking soda are the adhesive mixture used to bond the guides to the first (right hand) boom side. Super T is used to bond the guides to the second boom side (left hand) when the boom structure is closed. Epoxy is not recommended because of the weight that is added aft of the C.G. Very simply, extra weight aft of the C.G. equals excessive nose weight to balance the model. I use Hot Stuff to glue the tail structure to the boom. The joint is more than adequate for launch and flying loads and if I make a "Ruptured Duck" landing, the glue joint will shear cleanly. Hot Stuff, baking soda and a couple of minutes and I'm back in the air.

Now that the gluing lesson is over, the only area that needs attention is pushrod exits. I prefer to bring the pushrods out as far aft of the stab or T-Fin L.E. as possible in the smallest slot practical. The reason is to eliminate stress concentrations at stress points. I've seen too many models with big box fuselages break at pushrod exit slots because of bad location and sloppy building that displayed cavernous exit holes that were big enough to chuck a cat through.

"Tee" Construction:

The "Tee" version will require the following material in addition to either the "2 x 2" or 2S kit:

1 pc. 1/16" x 3" x 36" (fin planking)
1 pc. 3/16" x 1/4" x 36" (fin outline)
1 pc. 3/32" x 3/16" x 36" (fin ribs)
1 pc. 1/8" x 3" x 18" (rudder)

Let's start building.

1. Pre-cut the fin right side planking and the rudder.

2. Glue the planking together, mark the rib locations and glue the outline pieces on.

3. Glue the ribs in place on the marks (Photo 1).

4. Mark the NyRod guide route using the template (Photo 2).

5. Notch the outline and ribs for the NyRod guide. Insert the guide and glue in place. Add the 3/32" x 3/16" filler pieces at the rod exit (Photo 3).

6. Mark the boom sides from the kit and cut off both sides uniformly.

7. Build the boom right side per the kit instructions and the modification plan. Notch the 3/16" x 3/16" boom top over the modification plan (Photo 4). **Do not glue the fin on yet.**

8. Mark the left boom side for the rudder pushrod exit and cut the exit in (Photo 5). The rudder pushrod guide tube is glued to the 3/16" x 3/16" boom bottom. Trial fit the left boom side so that you can insert the pushrod from the aft end without binding.

9. Prop the fin up 1/16" and route the elevator pushrod guide as shown in the modification drawing. When it's lined up, Hot Stuff the fin to the boom and Hot Stuff the pushrod guides along the entire length of the boom. Glue on the left boom side and fin planking. Trim the fin planking to the outline.

10. Build the horizontal tail per the kit instructions. Sand as usual and cover with MonoKote. Glue the stab on the top of the fin. Remember to carefully cut away the covering material on the stabilizer bottom at the glue joint. Finish the rest of the model per the kit instructions. Photo 6 shows the "Tee" with all hardware installed.

"Vee" Construction:

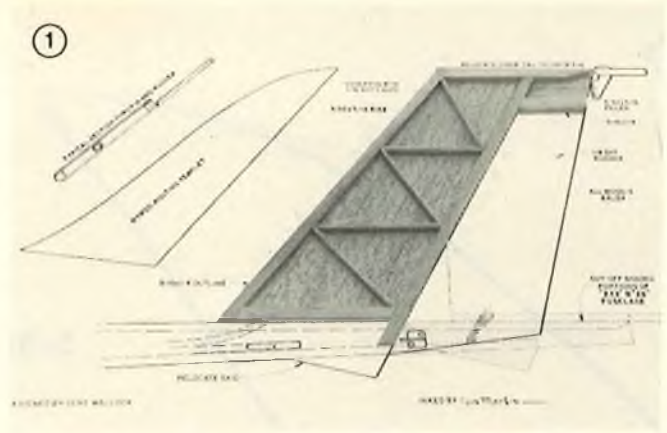
The "Vee" version will require the following material in addition to the "2 x 2" or 2S kit:

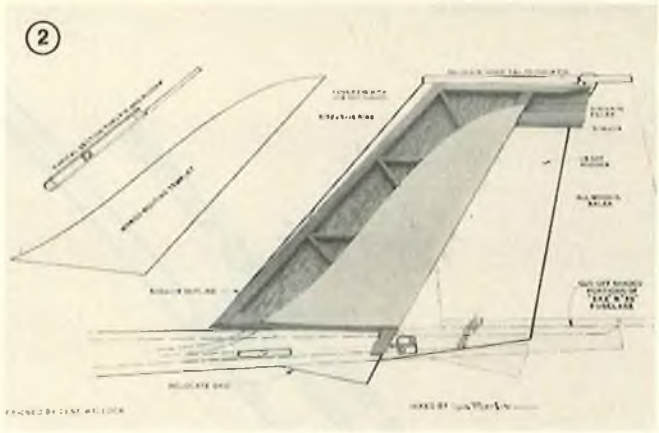
1 pc. 3/16" x 1/4" x 36" (additional outline material)
1 pc. 3/32" x 3/16" x 36" (additional rib material)
1 pc. 3/16" x 3/16" x 36" (tail mount)
1 pc. 3/16" x 2" x 36" (ruddevators)
1 1/2A perfect bellcrank (mixer mount)
1 Du-Bro mixer (p/n 215)
1 Scrap of 1/4" x 1" T.E. (fillet)

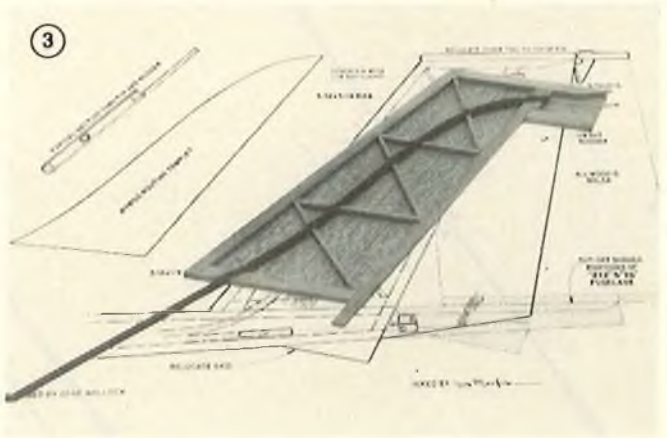
Let's continue building!

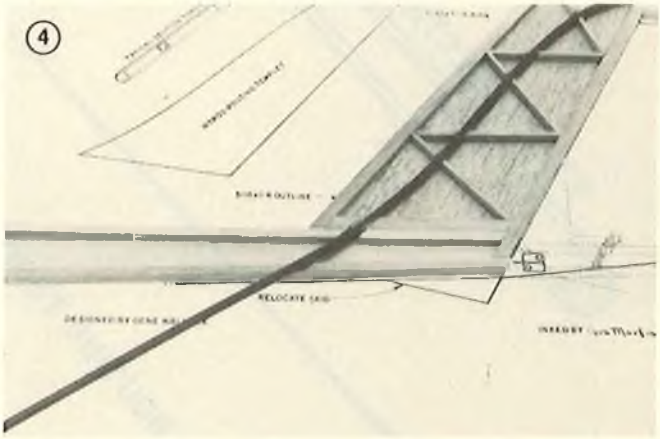
1. Take the 3/16" x 2" from the kit,

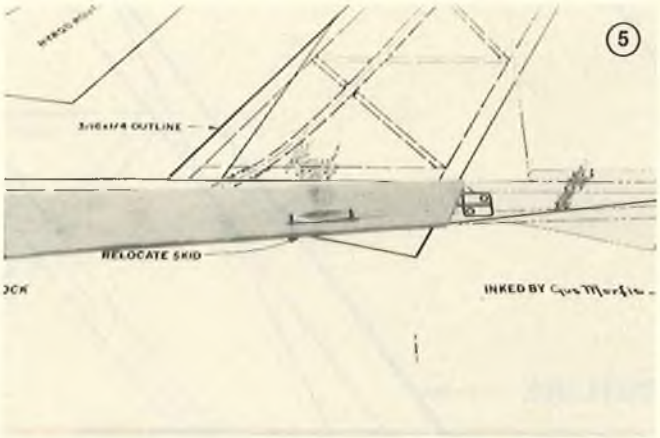
text to page 116











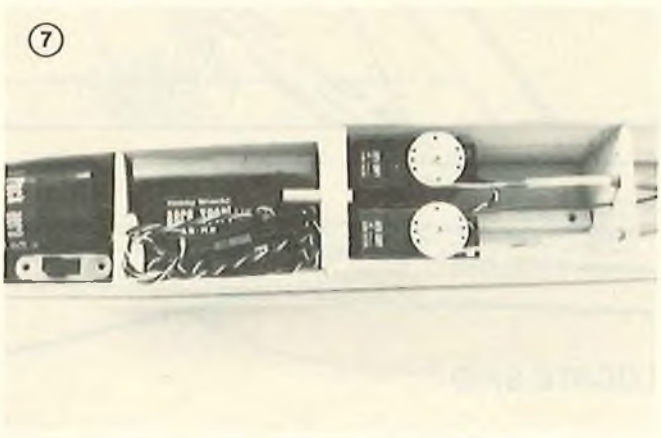


Photo 7 shows radio installation on the "Tee" tail version.

Photo 8 is an overall view of the completed "Tee" tail modification.

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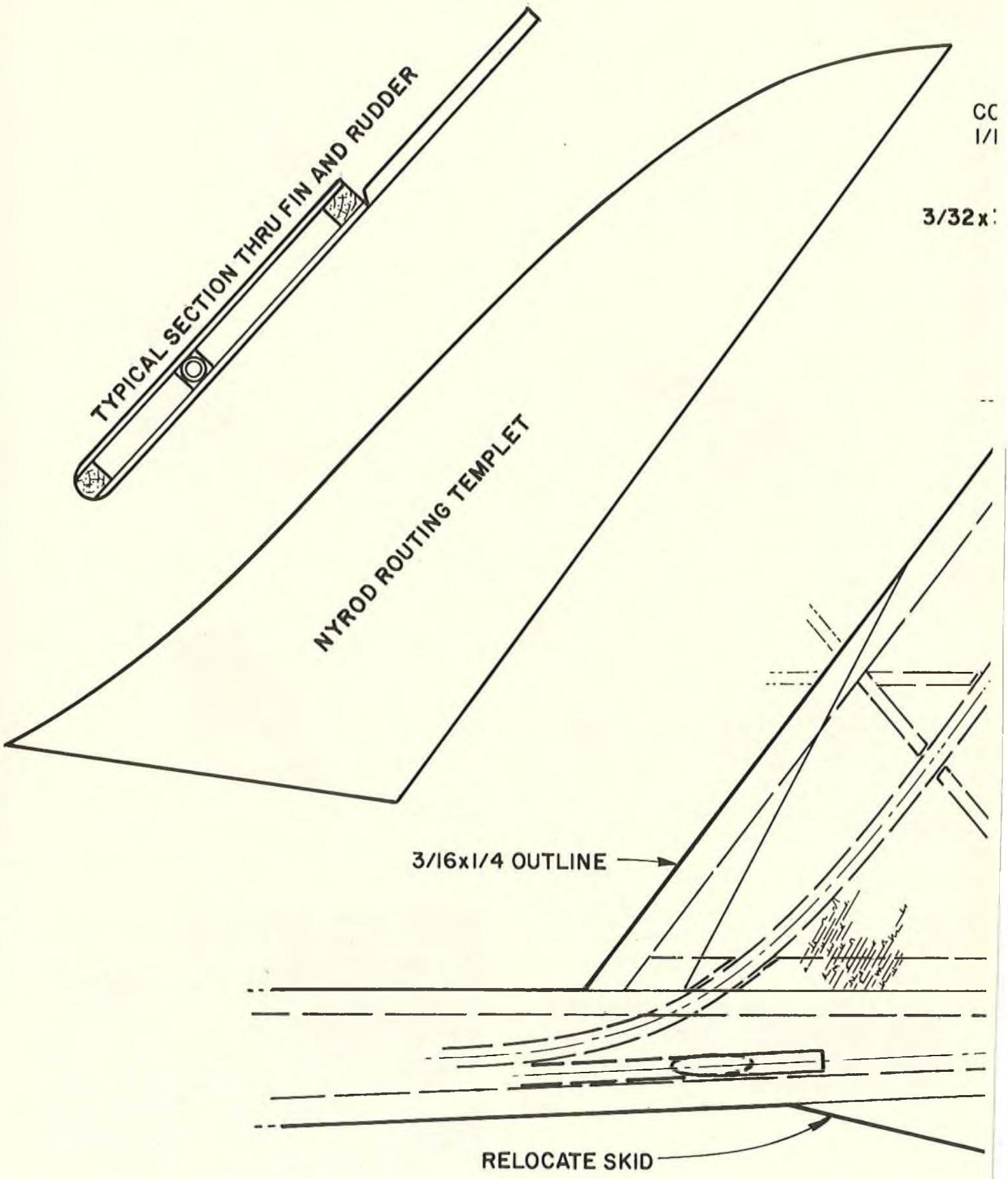

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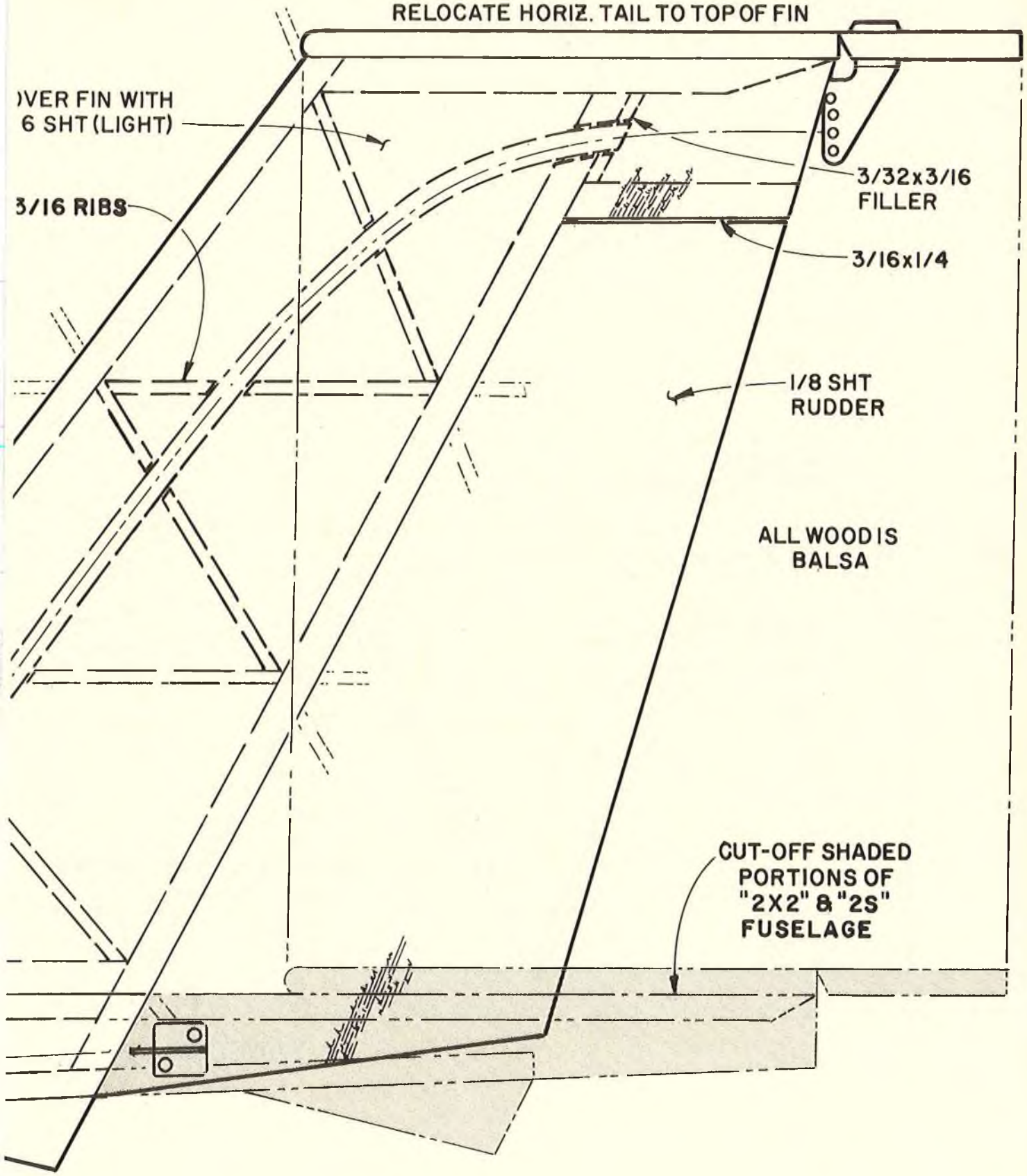

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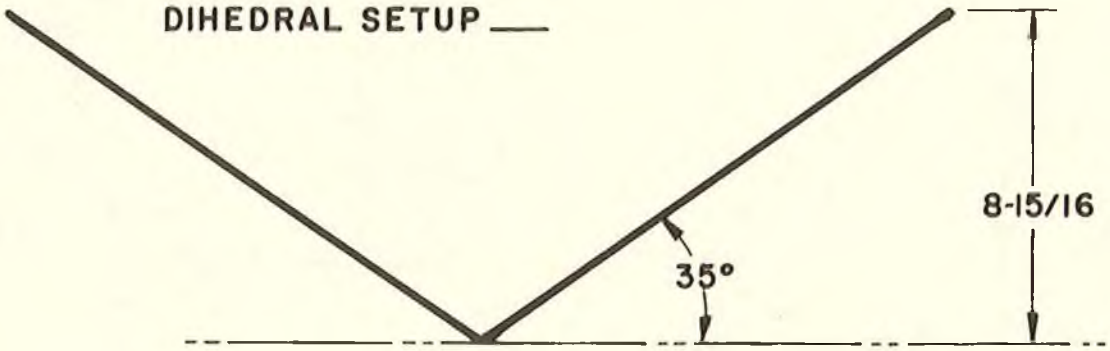

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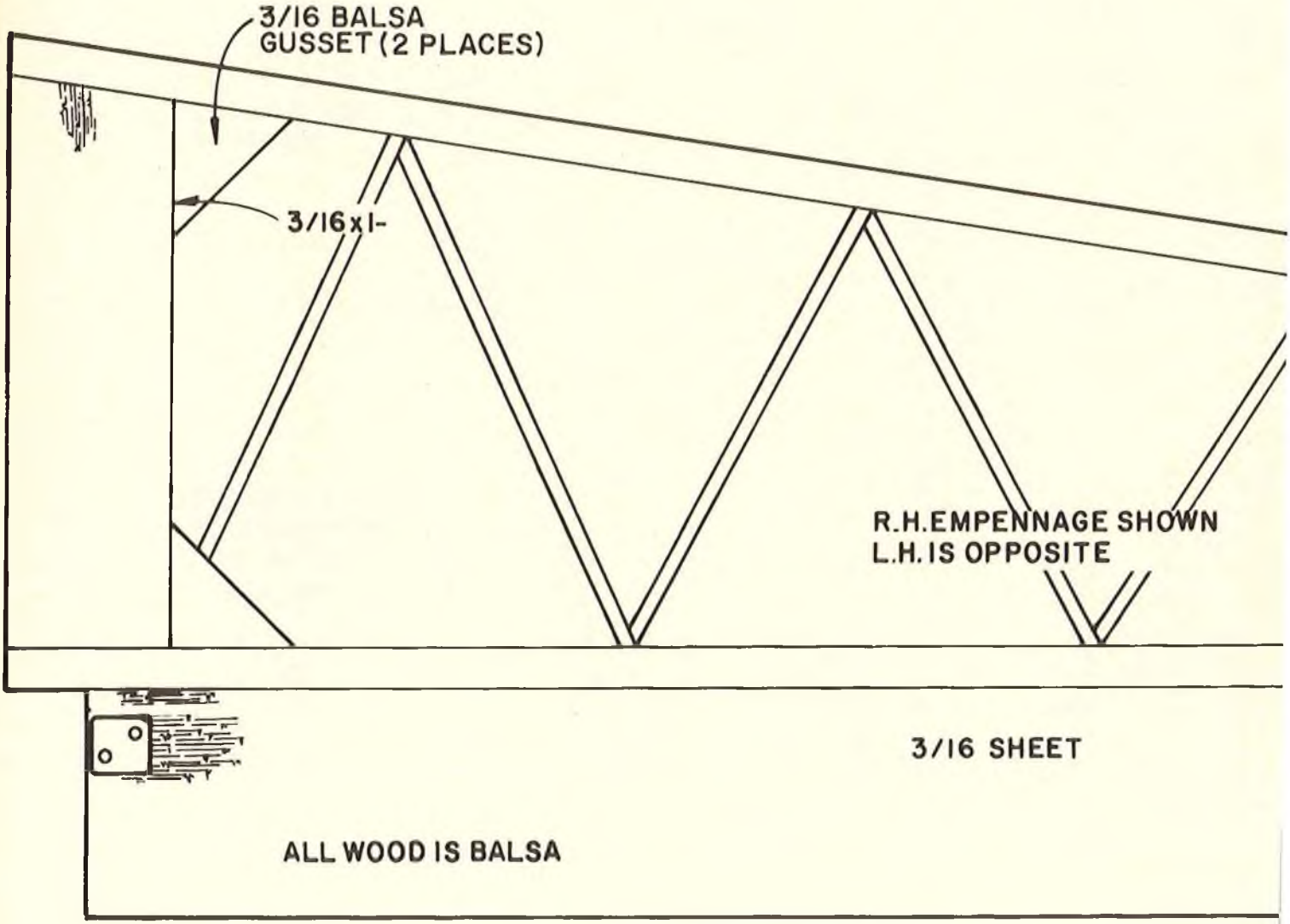

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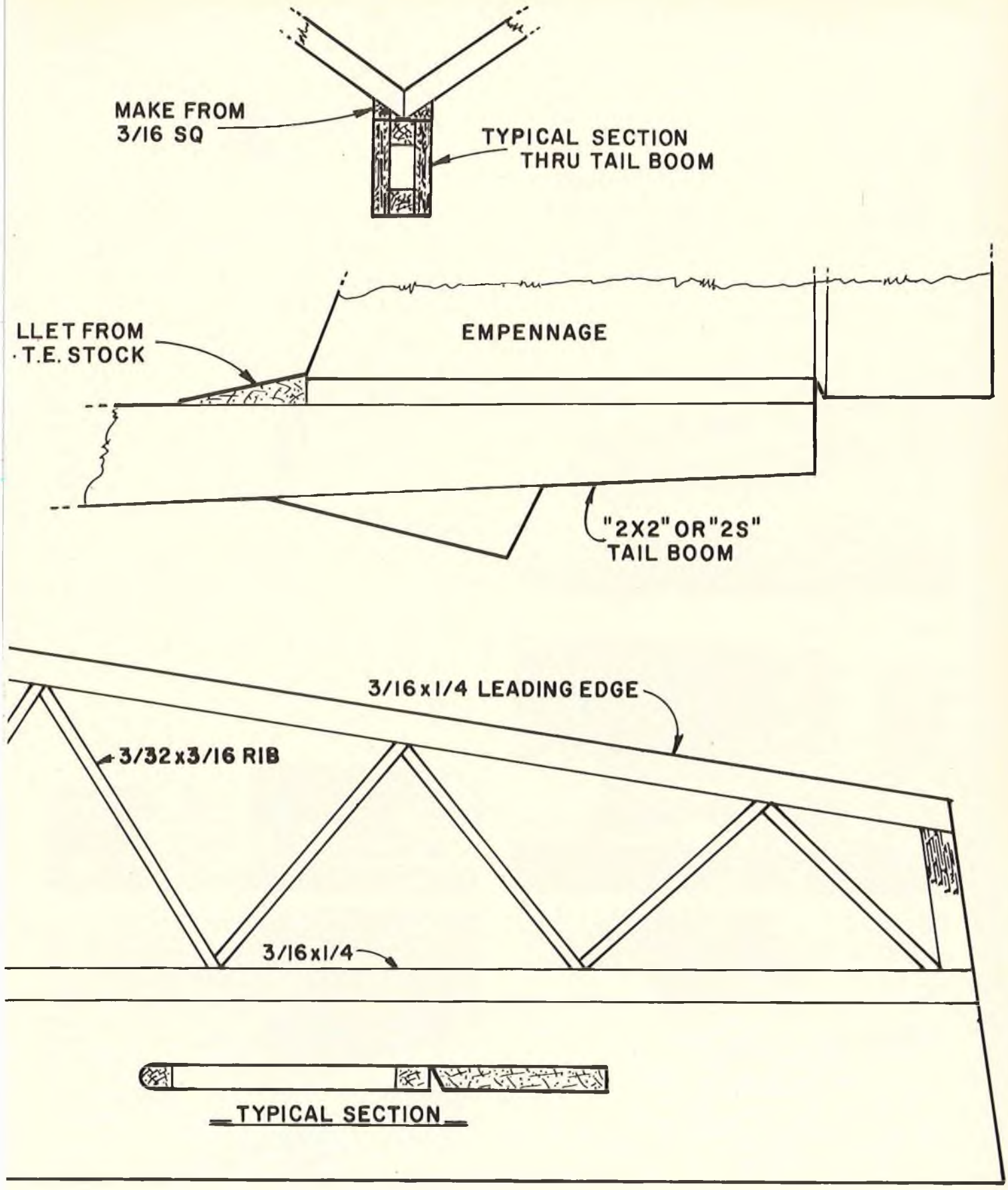

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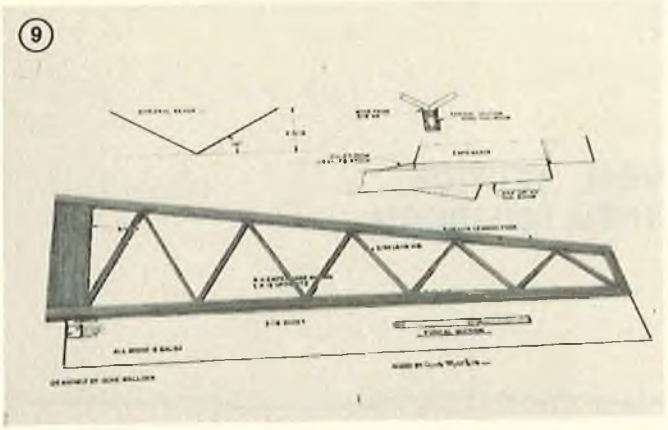
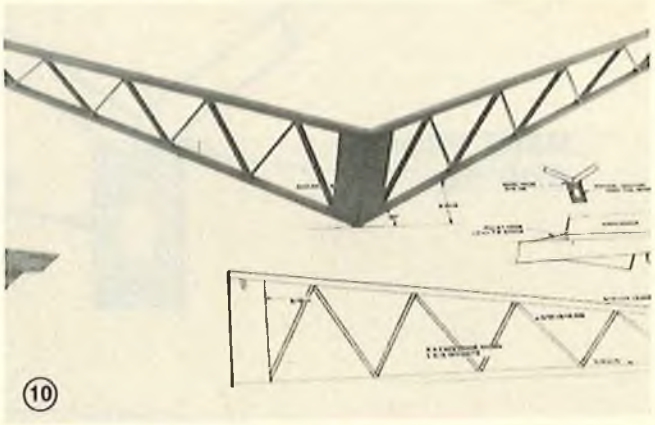
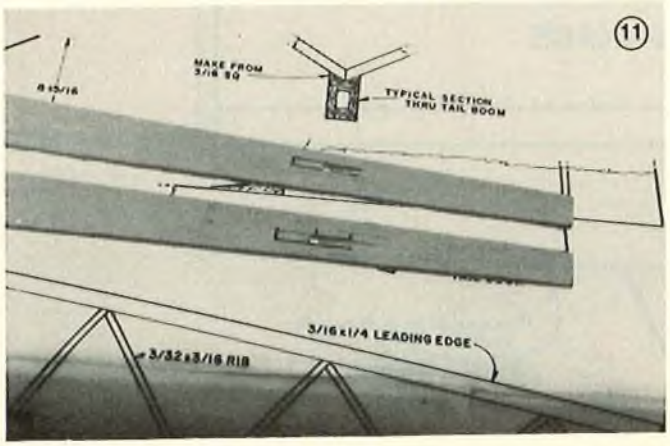
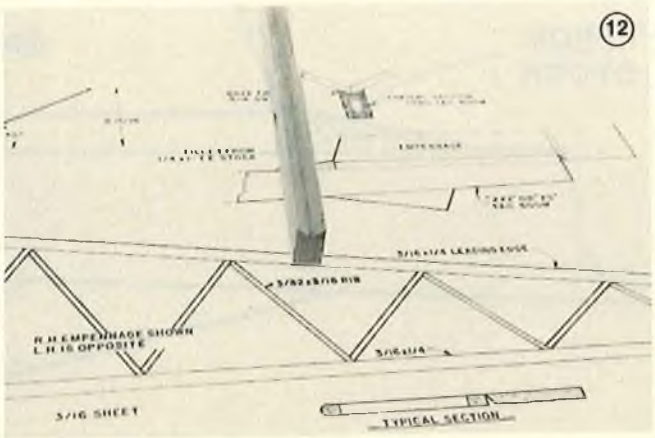
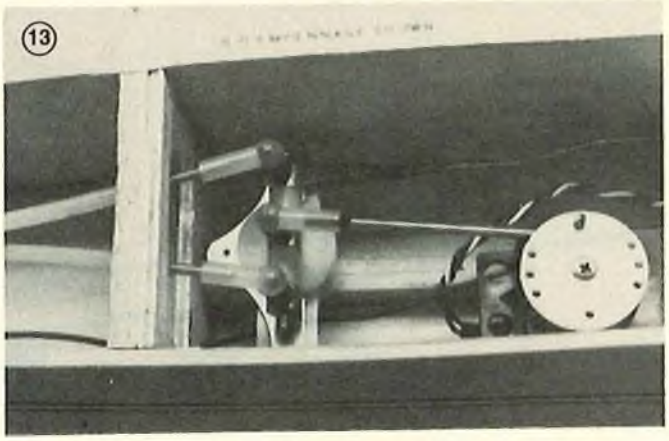
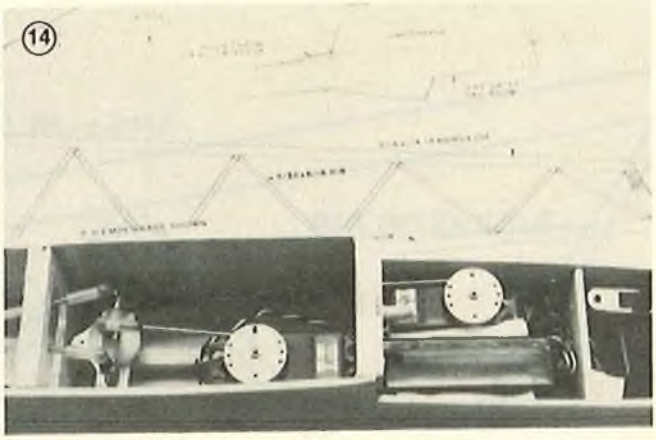












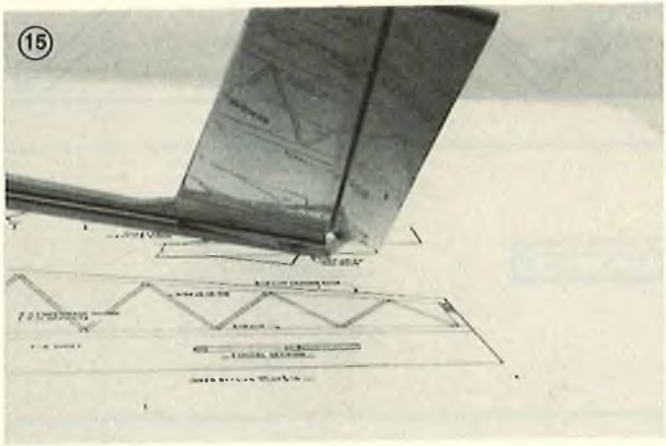


Photo 16 shows the completed "Vee" tail version.

RCM PRODUCT REVIEW

Circus Hobbies F-15 EAGLE

SPECIFICATIONS

Name	F-15 EAGLE
Aircraft Type	Stand-Off Scale Sport
Manufactured By	Circus Hobbies 3132 S. Highland Drive Las Vegas, Nevada 89109
Mfg. Suggested Retail Price	$89.95
Available From	Both Mfg. & Retail
Wingspan	43¾ Inches
Wing Chord	10" Avg.
Total Wing Area	418 Square Inches
Fuselage Length	43¼ Inches
Stabilizer Span	27 Inches
Total Stab Area	148½ Square Inches
Mfg. Rec. Engine Range	.20-.30
Recommended Fuel Tank Size	5-6 Oz.
Recommended No. of Channels	4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Foam & Ply
Wing	Foam
Tail Surfaces	Foam
Building Instructions on Plan Sheets	No Plans
Instruction Manual	Yes (6 pages)
Construction Photos	Yes (1)

RCM PROTOTYPE

Radio Used	Kraft
Engine Make & Displacement	O.S. .30
Tank Size Used	5 Oz. (incl. in kit)
Weight, Ready to Fly	67 Oz.
Wing Loading	23 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:
Exterior foam finish, hard, not easily dented.

WE DIDN'T LIKE THE:
Metal engine mounts. Performance with a .30 engine.

The F-15 Eagle from Circus Hobbies, 3132 S. Highland Dr., Las Vegas, Nevada 89109, is an ETA kit (Easy To Assemble) all foam and complete except for radio and engine. The F-15 is a Stand-Off Scale sport plane and just the thing for you fliers who just do not like to assemble completely built-up planes. The RCM prototype was finished in two days of rather dedicated work. A Monday through Friday of evenings should see you at the field Saturday morning with an excellent new model to fly.

The ETA indicates fully painted airframe, complete accessories down to the last little metric nut and bolt, full color decals and external tanks and rockets. If you have an adequate supply of 5-minute epoxy and a few Q-Tips and some modeling tools, hurried trips to the hobby shop are not necessary.

The larger than usual box seems full of packing material. As you dig your way down, you will run into a set of wings individually wrapped, two pieces of fuselage wrapped in foam; in fact, **everything** is wrapped, rudders, elevators and fins. All this wrapping was to insure nothing was scratched or dented. As you follow the instructions and you look for a part, it will be in a small plastic envelope with all related pieces, the whole neatly folded and stapled. In fact, there is nothing loose in the whole box, even the pushrods with clevises are in a long plastic envelope.

Construction:

Two of the fuselage 3rds are preassembled, you add the cockpit and center bottom section then epoxy it in place. Be sure the pieces that make the leading edge of the wing saddle are in line, you are cautioned as such by the instructions. Note where it is and have a care.

We were impressed with the many hard plastic blocks scattered all over the plane, these numbered blocks are epoxied into specific molded depressions in the foam and act as screw anchors where something will be attached later.

The elevator is assembled around a torque rod so the flying surface moves as a whole. The two one-piece fins just drop into a slot with no worries about alignment or being vertical.

Do not use a hinge slotting tool to install the included hinges. The foam will ball up and make the slot way too large. Slot with a #11 X-Acto knife blade and enlarge slightly at the surface to take the thicker center part of the hinge. This will allow the mating surfaces to come closer together avoiding that air spilling gap.

The instructions for assembling the two wing halves are more than adequate. The ailerons are no different than usual. Add the landing gear, decals, and engine, and you are ready to install your radio.

We do not know which engine the metal engine mounts were designed for but it isn't O.S. We tried an O.S. .20, .25, and .30 and not one of the three engines matched the included mounts. We installed the O.S. .30 using mounts

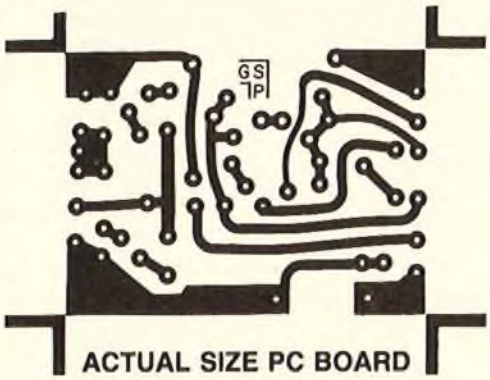
to page 102

A Redundant Power Source

By George Steiner

The 2 x 5 Project for RCM

Parts count for the 2 x 5.



For years I have observed the many failures of radio control systems. A rough guess would be that a large portion of them are due to some sort of battery failure. We have seen tons of publications and other information on the care and feeding of our nicads and we are still having occasional destruction of our model aircraft due to failure of the battery pack in the airplane.

Many modelers today take the road of very large capacity battery packs — all well and good for reserve flying — but remember, it is still a single battery source and a broken wire or open tab on a cell that would cause loss of battery power.

How would it be possible to have some sort of battery source that could cut down the percentage of this type of failure? The human element, we know, can never be eliminated. That leaves us with an idea that a second power source, if installed in the model, could give us a second chance and that is what this article is all about. Let's look into a two battery power source device and see what improvements could be made and thus prevent a crash due to battery failure.

The first thought would be to run two battery packs in parallel feeding a common point to the receiver. Great idea! Not really. Nicads don't like working together in parallel because as one battery pack starts to get low in capacity, the good pack will try to recharge it. This results in discharge of the entire system to a low value and a crash could result (see Figure 1).

The next approach would be two batteries in parallel but we will need some sort of isolation between them. This can be done, as seen in Figure 2, by the use of diodes but this has some drawbacks. These diodes are keeping one battery pack from shorting the other out but we now have a .6 volt drop across the diode reducing our power to the receiver and servos. This can be seen by the noted voltage to the receiver also indicated in Figure 2. This would work but we are starving our already overloaded airborne system (long leads) in the 1/4 Scale area. Not too good an idea just yet.

A switching device using a relay could be employed rather than switching diodes and we could end up with a fairly uncomplicated scheme that could give us back the full battery power needed, but I'm not too keen on the use of relays nowadays. Solid state is the way to go. Relays are known to let go under vibration.

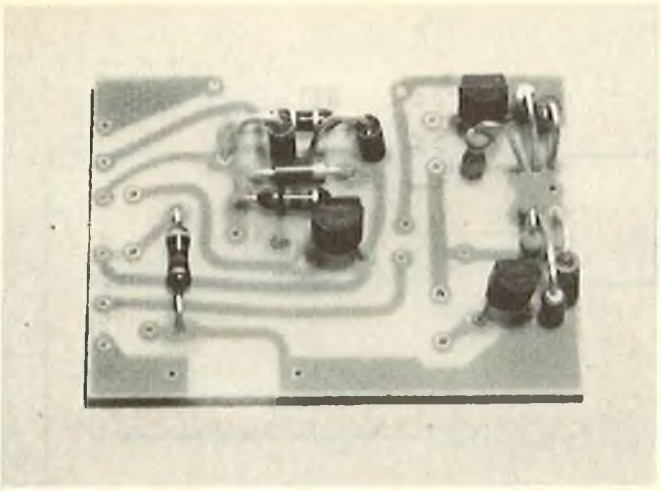
Compensating for the .6 voltage loss by increasing the voltage would seem a more positive idea (See Figure 3). Anything wrong with this? Not really. The initial thought is that we have just exceeded the power requirement to that little old receiver with an increase of 1.2 volts to it. No, we haven't because if we use a dry pack, as we sometimes do, the increase in voltage would be just about the same (see Figure 6). In fact, a dry pack would be about .2 volts higher than if we use the 2 x 5 five cell nicad battery system in the first place. It looks like most of our two battery pack system is solved by going to a system as shown in Figure 3.

2 X 5 PARTS LIST

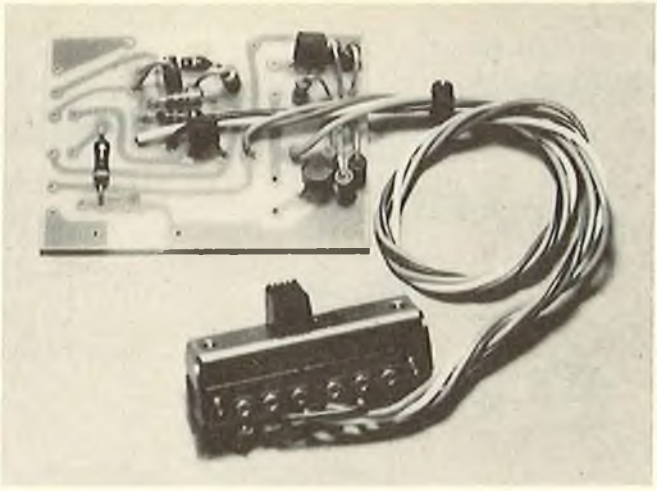
Quantity	Description	Part Source	Price Ea.
7	Diode 1N4002	ACE R/C	.75
2	Transistor Q1 Q2 2N3906 PNP S0019, 2N4402	ACE R/C	.30
1	Transistor Q3 2N3904 NPN S0015, 2N4400	ACE R/C	.50
3	LED's Large red #32K11	ACE R/C	.49
2	Resistors 2.2K OHM 1/4W #29K20A	ACE R/C	.25
1	Resistor 39 OHM 1/4W #29K20A	ACE R/C	.25
1	Resistor 150 OHM 1/4 W #29K20A	ACE R/C	.25
1	Resistor 850 OHM 1/4W #29K20A	ACE R/C	.25
1	Battery case 500MA Flat #38L10	ACE R/C	1.95
1	Noble Switch #50L506	ACE R/C	1.98
1	Noble Switch Plate #50L507	ACE R/C	.59
1	Noble Switch rear cover #50L508	ACE R/C	.59
1	R/C Hookup Wire #50L520	ACE R/C	1.79
1 Pk.	#0 3/16 x 1/8 Grommet (4) #36K5	ACE R/C	.20
2	AA 500MA Battery 38K45	ACE R/C	2.95

From G.S.P. Products
2238 Rogue River Drive
Sacramento, California 95826

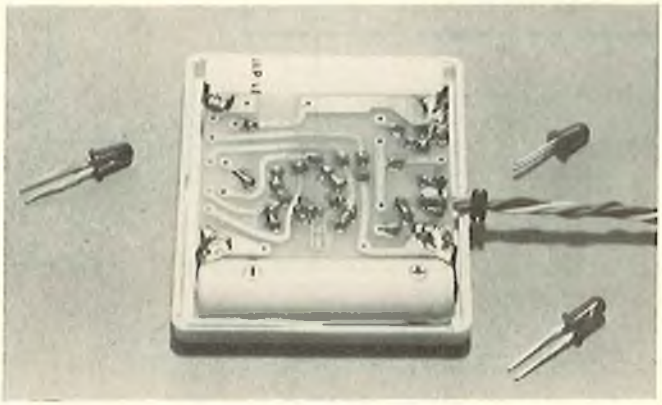
1	PC Board #PC 2 X 5	Postpaid 5.00



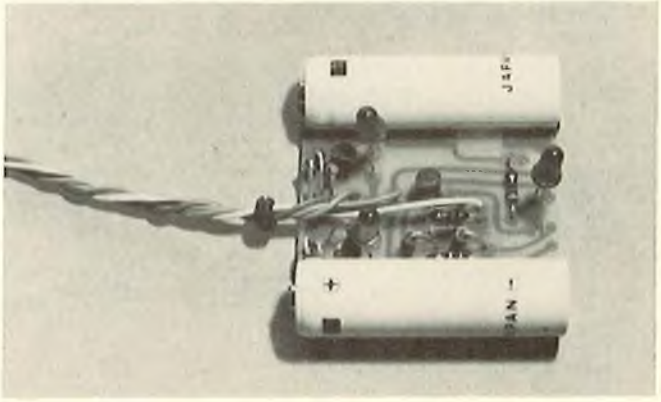
PC board and basic components in place, Step 1.



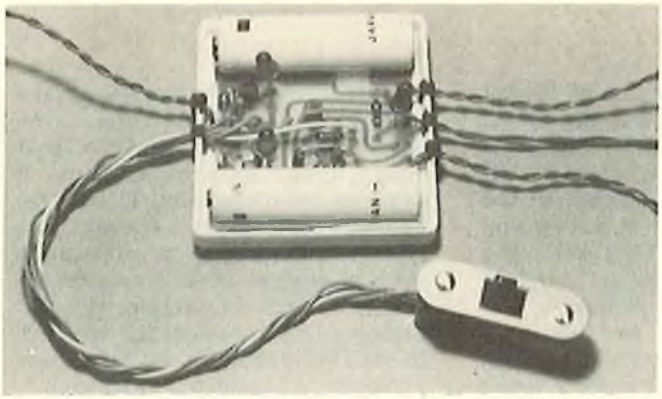
Switch wiring, Step 2.



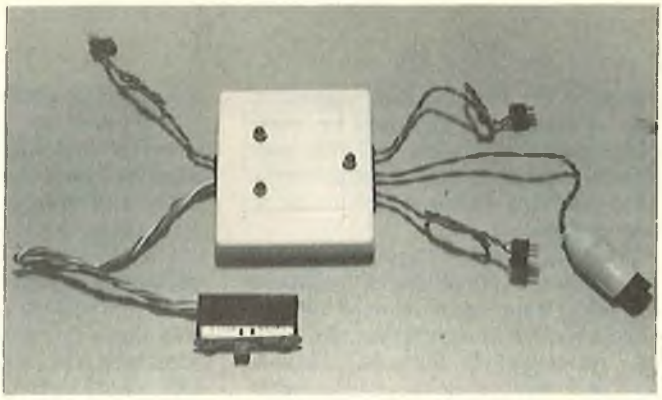
Placement of boost voltage batteries, Step 3.



Soldered LED's in place, Step 4.



Final wiring and packaging, Step 5.



Finished product ready for use, Step 6.

What other problems have we created? Even though we haven't exceeded the basic power requirement over a dry pack system (see Figure 6 again), some receivers, older ones in particular, could become glitchy with the increased voltage.

It looks like the 2 x 5 basic idea could be used, but an investigation into increased voltage versus a different manufactured radio controlled system would have to take place before the 2 x 5 idea could be implemented. One way would be to start using dry pack batteries in different R/C systems and see what problems would result. The increased voltage from the dry pack (four alkalines) would sure show up any glitching or malfunctions from the increased voltage.

I tested just about every type of R/C system I could get my hands on (Kraft, Futaba, Ace, and others) both old and new. The results were very positive, so a redundant power source using the 2 x 5 idea would work.

In looking at the 2 x 5 as pictured in Figures 3 and 6, again what great advantage do we really have by the use of a five cell battery? A twenty percent power boost will be achieved! Battery capacity has been doubled. This means two 500 mah five cell batteries will now be equal to 1,000 mah capacity.

The design of the 2 x 5 has gone even further. The addition of indicators for each battery gives an indication when juice is drawn out of the batteries. Using low drain LED's, both LED's will be dimly lit when in operation and as the load increases they will become more brilliant. If one battery pack gets tired the LED just will not turn on — a good indication that you have a cell failure or a complete battery pack drop out.

The other thing was to incorporate a charging scheme to place both five cell batteries in series within the 2 x 5

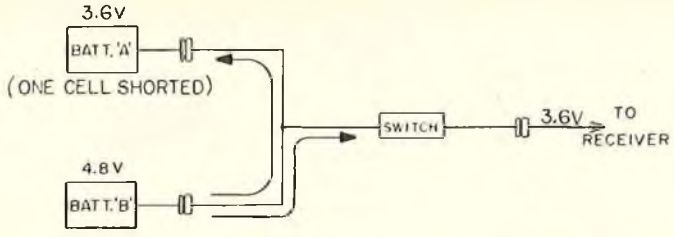


FIGURE 1

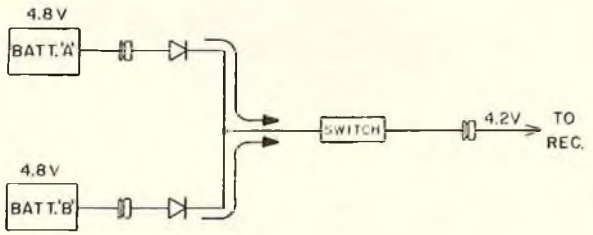


FIGURE 2

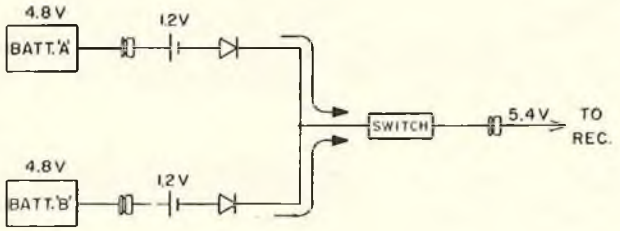
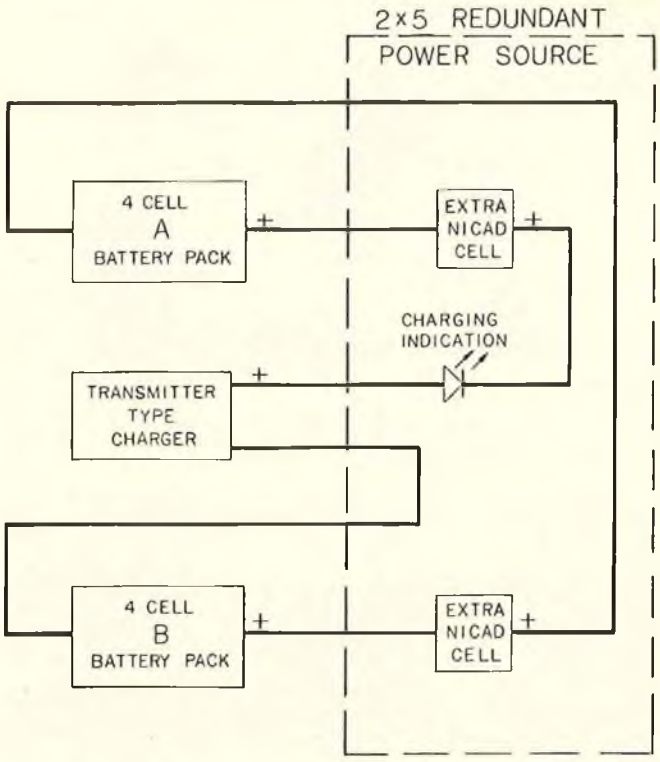


FIGURE 3



BASIC CHARGING CONCEPT OF THE 2×5 DEVICE FOR CONNECTING THE 10 CELLS IN SERIES

FIGURE 4

connection so a standard transmitter type charging set-up could be used (more about this later). All this was done by replacing the switch harness with the 2 x 5 device which made it very convenient.

Presently after over a year of testing with between 100 to 200 2 x 5 units in the field, I know of no reported battery caused R/C problems. Meyer Brothers (the builders of the Spruce Goose this last year) are using two of the units and from what I hear have nothing but praise for the 2 x 5. Many others have also reported to me that the units they are using are doing an excellent job. Even the creators of the Muppets have somehow found a use for some of the units.

Building The 2 x 5:

Construction is shown in the six step photos from the layout of the parts to the finished product.

The PC board is shown in Figure 10 as positive and makes up into a 1⅜" x 1⅞" size.

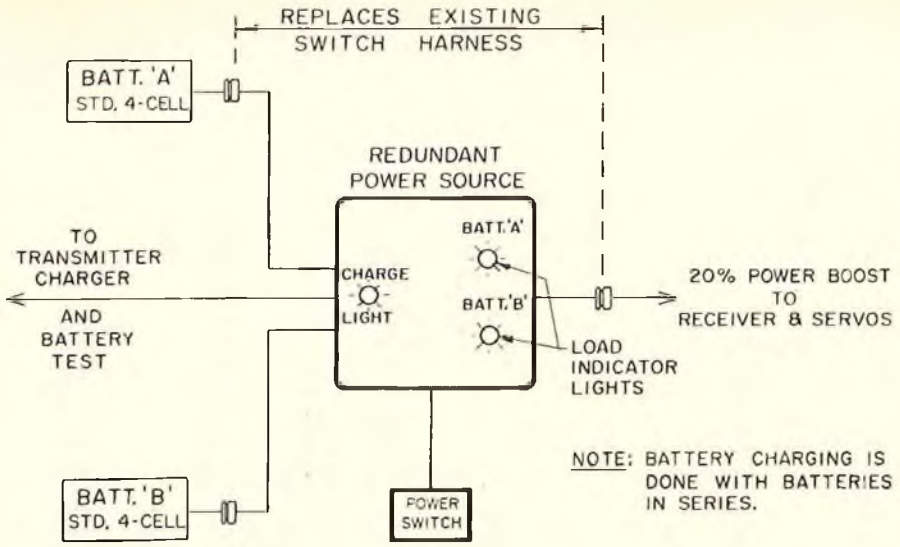
Using Figure 7 for parts layout, board stuffing and wiring can go in any sequence. It is a very easy project to build and you should not have any problems. Just follow each step as numbered by each photograph. You will note the switch option on Figure 7. This will let you use the Noble switch or a standard DPDT slide type. In some cases the Noble switch will not be available. Also you will note the strapping option for using the external five cell battery packs. For packaging I have used the standard 500 mah battery case as shown. This was done to contain the two extra boost batteries. If you decide to go with two external five cell battery packs you can use a smaller package like a Royal receiver case to contain the 2 x 5 unit. Royal has it listed as a six channel case.

Parts for the project can be purchased from Ace R/C. I will have a few etched and drilled PC boards to get you started at $5.00 each, postpaid; see parts list. Ace R/C has been contracted to produce a kit, so contact them if you are interested in a kit or just parts, at Box 511, Higginsville, Missouri 64037, Phone (816) 584-7121.

Testing and Operating:

Start out by plugging everything in as pictured in Figure 5: the two battery packs, charger cable and connection to the receiver for a load. Be sure to have the power switch in the **off** position. Apply AC to the charger you intend to use and the charge LED should light up. If it didn't, make sure both A and B batteries are plugged in. The charge LED will not light up unless you have at least 25 ma charge current (more on kinds of charges later). Now that the charge LED is lit, unplug the "A" battery and note the charge light will go out. Do the same for the "B" battery while the "A" battery is plugged in — LED should go out. If it didn't then check for a wiring error to the switch first and if that is okay you might have a defective transistor in the load circuit. If one of the load LED's become dimly lit while uplugging "B" battery you have a Q1 or Q2 that is leaking or Zenering. This comes about when the charge voltage is looking for a path as a high voltage no load condition. The cure is to replace the transistor on the side the LED should not be lit. Now unplug the charger and observe the charge light goes out. If it stayed dimly lit Q3 is defective.

For the load check turn the power switch to the **on** position. Transmitter should be **off.** Both load LED's should become dimly lit. Next turn on your transmitter and you will note a jump



THE 2 x 5 DEVICE

FIGURE 5

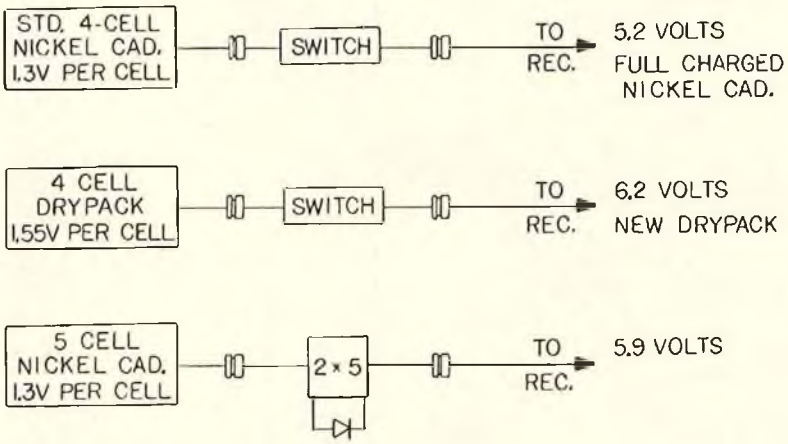


FIGURE 6

in brilliance as the servos start to pick up load and then settle down. Now start moving the controls around on the transmitters and note the load indicators are equally lit up. This shows each battery pack is sharing the receiver and servo load. If one of the LED's fails to light up, let's say the B load indicator, then unplug the "A" battery and see if B load LED will light up. If it did, then exchange "A" battery for "B" battery on the input and see if the load light follows the battery pack. If it did, you have a low voltage battery. The 2 x 5 is working and it is telling you that you have a low battery. On the other hand if the B load LED still will not come on, replacing that LED should cure the problem. Very seldom has it been Q1 or Q2 transistors or the load diodes for load indication problems.

At any time when you move one of your controls to its limit and the load LED's stay brightly lit, the 2 x 5 is telling you that you have a stalled servo. The final test would be for you to remove each "A" and "B" battery pack one at a time and see that you still have full control and note how fast the servos snap around with the twenty percent power boost.

In case of trouble like glitching servos, remove the 2 x 5 and restore your system to normal to see if the problem stll exists. Major problems of this kind stem from high resistive battery packs that have low capacity or a noisy servo. Just because you intend to have two battery packs does not mean for you to use your worst ones. Low capacity batteries cause a high noise level in your power source, so when using the Redundant Power Source use the best batteries available.

Charging the 2 x 5 System:

This seems to be the most confusing to most people and the most misunderstood. First remember what we are doing with the 2 x 5. Batteries are in parallel when operating normal power to the receiver, but when we switch the 2 x 5 to the **off** position and to the charging condition, we have switched the batteries to a series mode. See Figure 4. When this takes place it connects all ten cells together in series so that a single 12 volt charger can be used. In some cases, the existing transmitter charger will not be able to handle the increased two extra cells. I have tested a few and found that slow rate chargers dropped about twenty percent and the high rate chargers fell off about forty percent of their charging rate. This means an increased charging time.

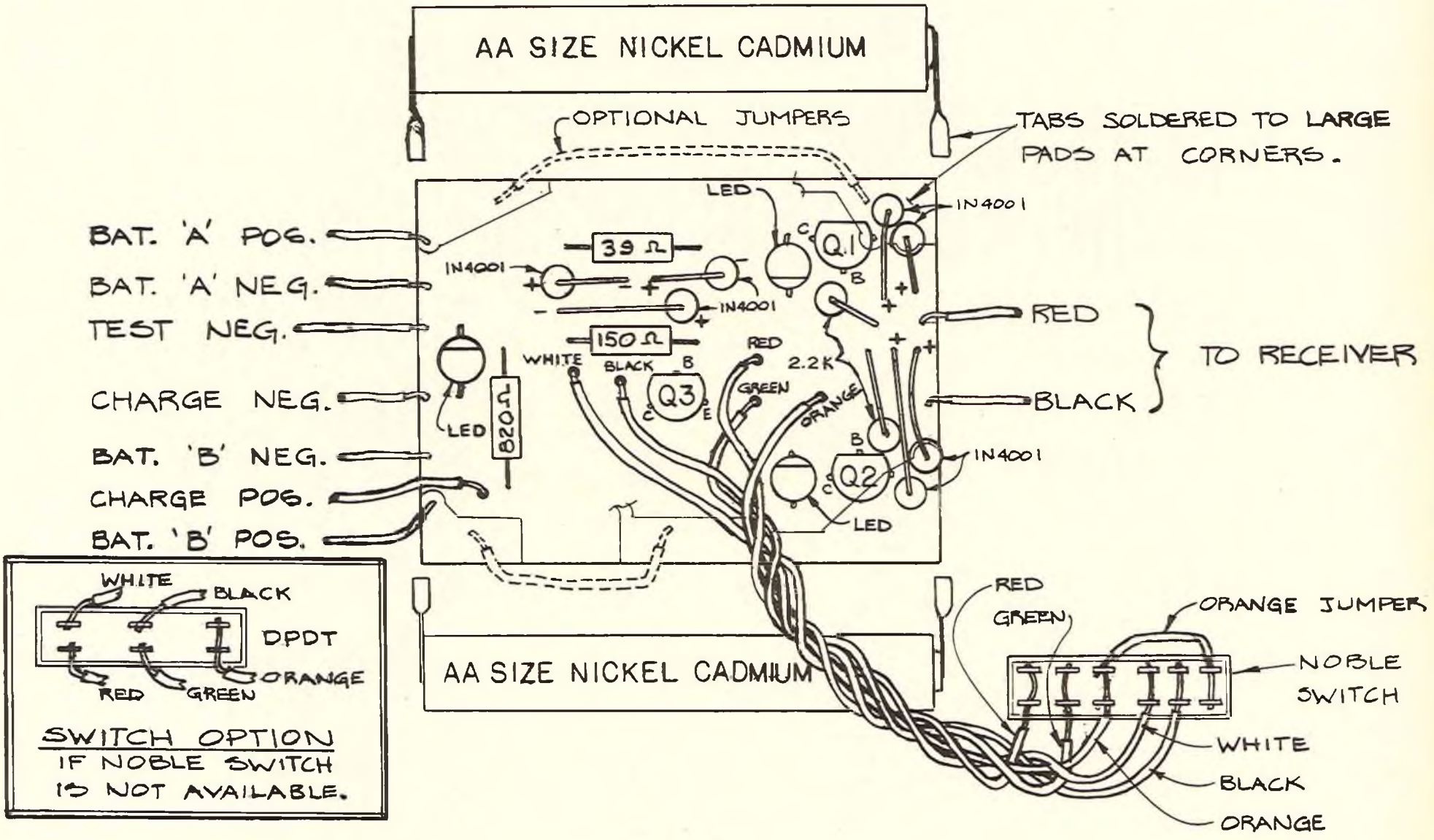
The Kraft Hi Rate transmitter charger will charge the 2 x 5 ten cell system at 100 milliamperes which turns out to be just right for a five hour charge to a 500 mah battery pack.

If you are in doubt, it might be wise to place a milliampere meter in series to see what actual charging rate you have. Don't even think of using your existing receiver charging method. The voltage is too low and no charge indication will take place. That is why the charging indicator is a good idea in the 2 x 5 unit. A good recommendation would be to use a charger like the Ace Vari Charger #34K2. This unit will charge from one cell to ten cells at a rate of from 10 to 100 ma. Also the Digipace by Ace is an excellent all around eight cell, ten cell charger. For testing the batteries you can use your normal super cycled discharger like a Digipace or L.R. Taylor Power Pacer. The 2 x 5 electronics have been compensated for the extra cells. Instead of a 1.1 volt per cell discharge point, you have a 1.0 volt per cell cycle point. An extra lead has also been brought out of the 2 x 5 so that testing of the ten cells themselves can be done. This is called "test negative" to "charge positive" point. See Figure 7. This would be the connection point if you wanted to use the M.E.N. 12 volt charger. This will also let high rate field charging occur. The only hangup here is that the car engine has to be running in order to get an increase in voltage over 12 volts. Otherwise no charging will take place. Remember also the charge indicator has been by-passed when you use the "test negative" lead.

A final 12 point fact listing just in case I lost you in the preceeding description and other points I haven't covered of the 2 x 5 might be of some help, as follows:

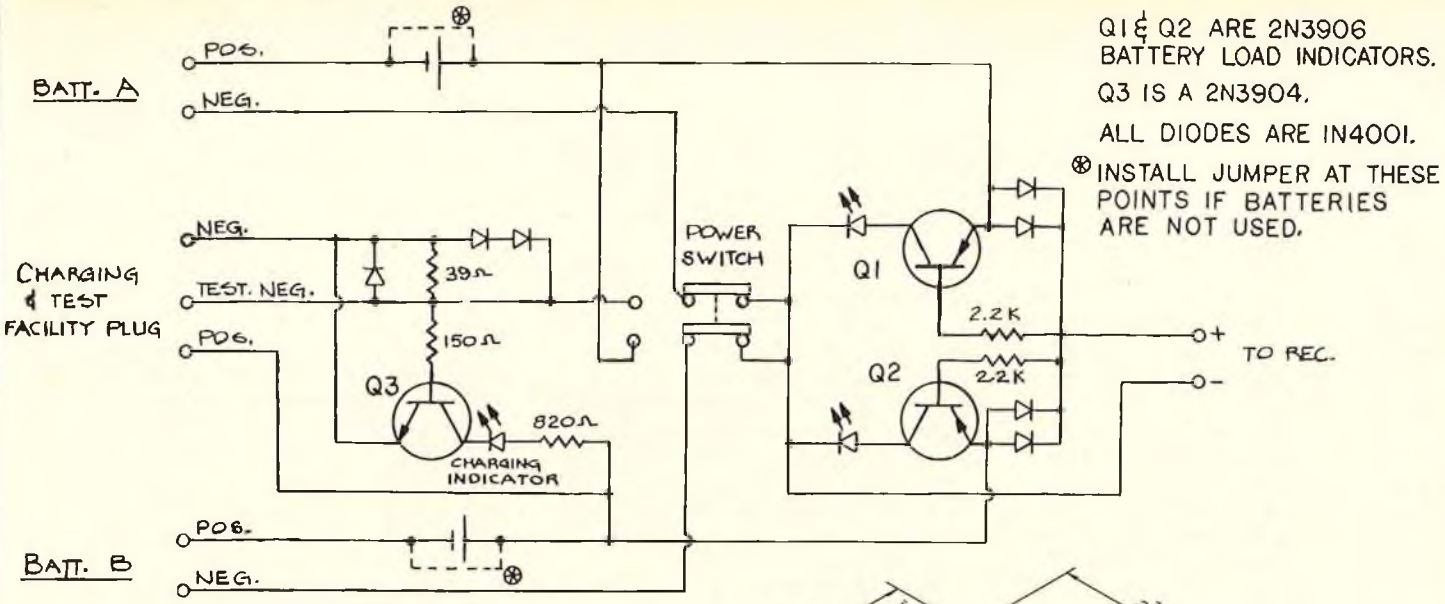
1. Operation of the 2 x 5 gives a two battery source without interreaction between batteries in a model airborne system.

Q1 & Q2 ARE 2N3906.
Q3 IS A 2N3904.



COMPONENT LAYOUT & SWITCH CONNECTIONS

FIGURE 7



SCHEMATIC

FIGURE 8

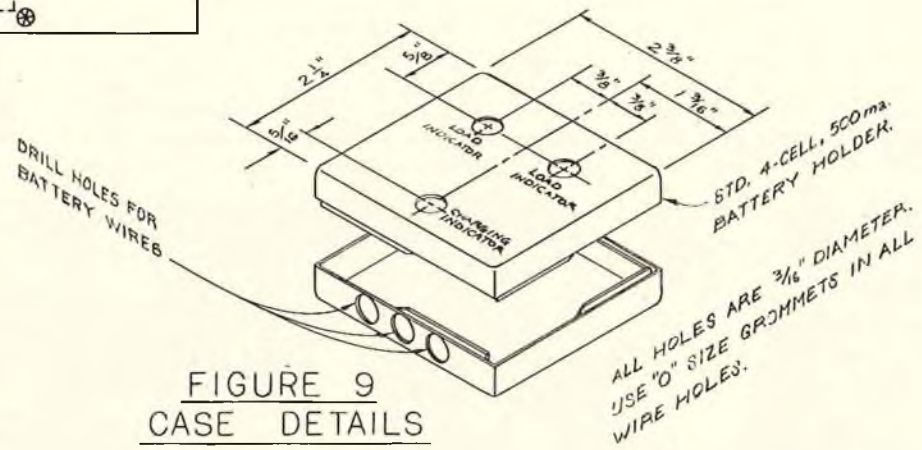


FIGURE 9
CASE DETAILS

2. The 2 x 5 replaces the existing switch harness.

3. The 2 x 5 requires two 500 mah four cell battery packs for normal operation. If 1000 mah batteries are desired (two each) special consideration has to be made and two jumpers added to the 2 x 5 unit. With two 500 mah batteries in use the unit will give a 1000 mah battery capacity.

4. The 2 x 5 will give a twenty percent power boost to the servos making up for power loss in long servo leads.

5. The 2 x 5 will not exceed the R/C manufacturers requirements for a battery power source.

6. If one battery pack fails the other battery pack will take over and will be indicated by the LED load indicators on the unit.

7. The 2 x 5 will indicate a stalled servo.

8. Charge and discharge testing can be done with your existing test set-up.

9. Charging current is indicated by a LED on the 2 x 5 unit.

10. Charging requirement is that of a normal eight cell, transmitter type charger to be used and charging takes place without removal of the batteries from the model.

11. Physical size, 2¼" x 2⅜" x 3/4".

12. The 2 x 5 unit weighs three ounces ready for use, less the extra battery packs.

Final Comment:

A trend perhaps — as I just finished writing this article I noticed in a product review of a most recent publication that Futaba is now offering a five cell 600 mah battery pack (NR-5). Does this mean in the near future that all R/C systems will be using five cells? If so, the 2 x 5 can most easily be accepted. □

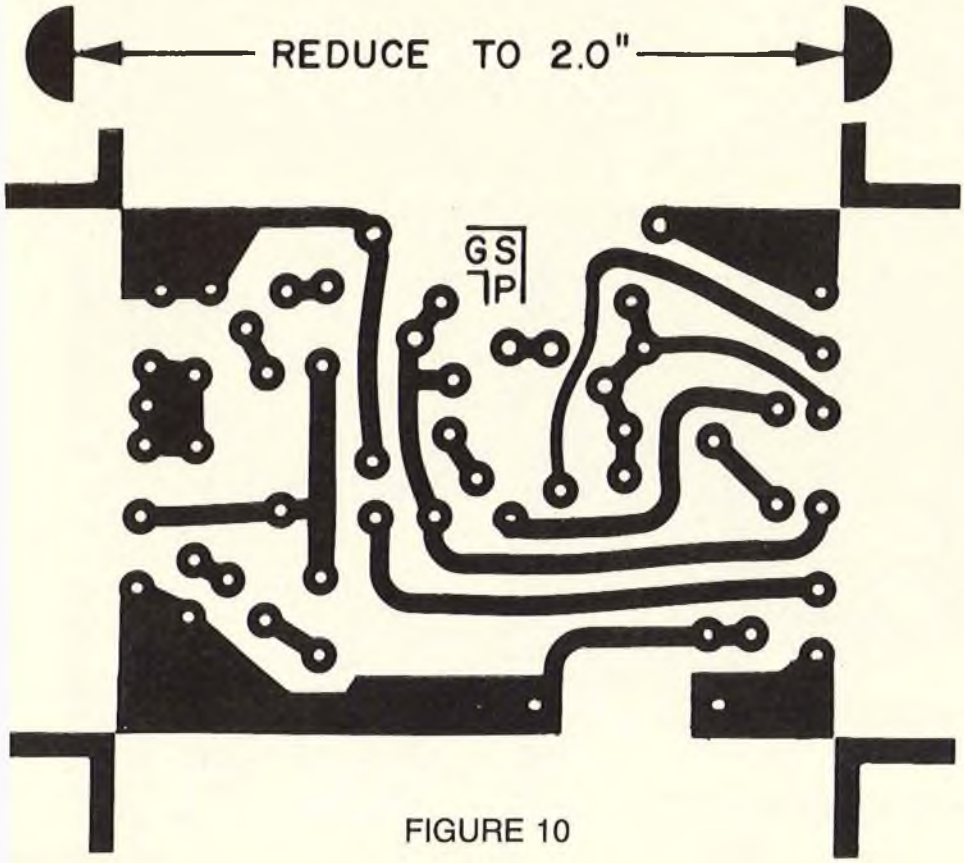


FIGURE 10

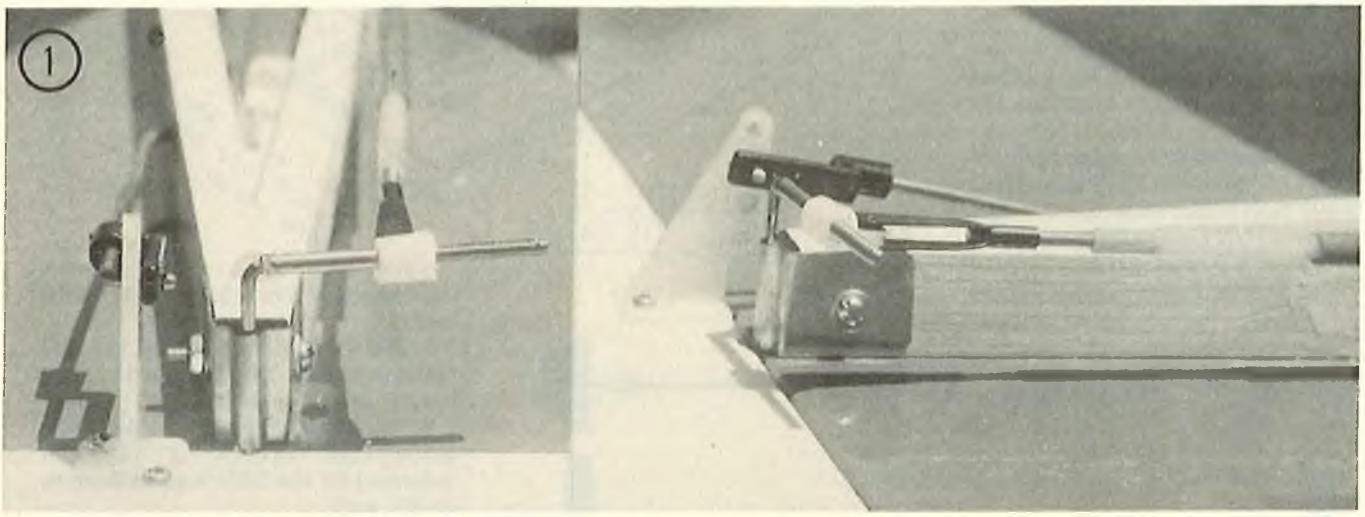
SWEEPINGS FROM THE balsa dust factory

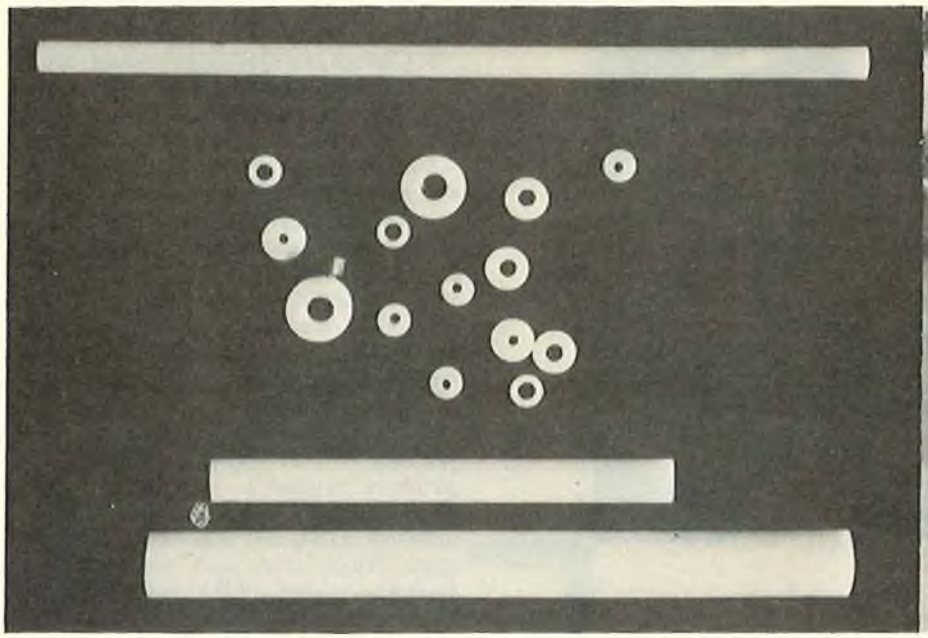
By Paul Denson

Photo 1. We have grown accustomed to strip elevators and like them much more than those that have some kind of hardwood connector that unifies the two halves. It does, however, make a problem with pushrod action to the rudder. It necessitates going up over the stab with a long wire that tends to flex on opposite rudder.

The method shown may be used on any type fuselage, it just so happens it has been used twice and both times it was on a stick type tail boom. The idea first appeared in RCM in May 1975 as our modification to RCM Quick Stick which was a tail dragger. In that instance the idea was to transmit motion from the rudder to the tail wheel. This time it transmits movement from below the stab to the rudder above the stab. It is actually a part of another innovation. The whole tail assembly may be removed by unscrewing three machine screws. The fin and stab are held to the boom with two 6-32 nylon screws. The rudder and its horn are held by a 4-40 machine screw which holds the brass pivot mechanism to the tail boom. We have lost numerous tail assemblies to door openings, station wagon door posts and even an occasional hard landing. Epoxy tends to snap when hit by a hard twisting motion. The nylon screws tend to be impervious to this motion. The bottom of the fin is hardwood which is threaded for the nylon screws.

Now back to the situation at hand. The pivot tube is soldered to the brass strip which is bent to fit the tail post of the fuselage. The torque rod is bent to fit the bottom of the rudder, passed down through a notch in the stab, through the pivot tube and bent at right angles to take the threaded pushrod link which is soldered in place. The rudder horn you have just fabricated is adjustable by moving the tab in or out. It would have been great if the tabs on strip aileron wires would fit but they are drilled for 6-32 threads which makes them too large for this purpose. This tab was made from a piece of drilled and threaded 3/8" Teflon rod. Other material such as brass, aluminum or nylon would work as well, let your ingenuity run rampant. Don't forget to epoxy the torque rod to the bottom of the rudder. The elevator horn is applied in the standard manner.





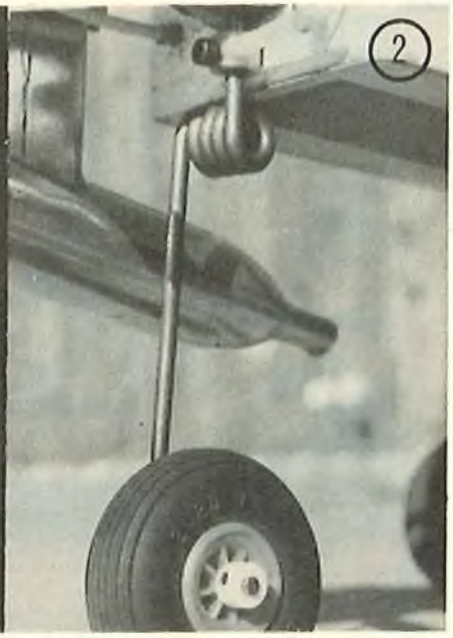


Photo 2. It has been previously mentioned here that Teflon rod is very useful in model building as a source for washers. Here are a couple of new ideas; wheel locks and bushings. It was late and we couldn't get to the hobby shop, the plane was finished and Saturday morning was dawning soon. We were one wheel lock short. A piece of 3/8" Teflon rod was drilled with a 5/32" hole. The rod was placed in the vise to hold it horizontal as we drilled. Drill in only as far as you will use, the next hole could be a different size. Slice off 1/4" for each wheel lock. Using a No. 43 or 3/32" drill, drill a hole in from the side then tap the hole for a 4-40 machine screw. You can use an Allen set screw, or a Hex head or slot head screw. When you secure the wheel lock to the axle, don't tighten down as if it were metal. Even so, we haven't lost that wheel yet.

We slice off a 1/8" bushing to use inside the wheel so the wheel won't lock up on the slope of the bend in the wheel wire. In the picture even though it is out of focus you can see a bushing on one of the main wheels.

Note the variety of sizes of washers and bushings you may cut from 3/8", 1/4", and 3/16" Teflon rods. Sometimes the holes get a little off center, but this would annoy only a perfectionist.

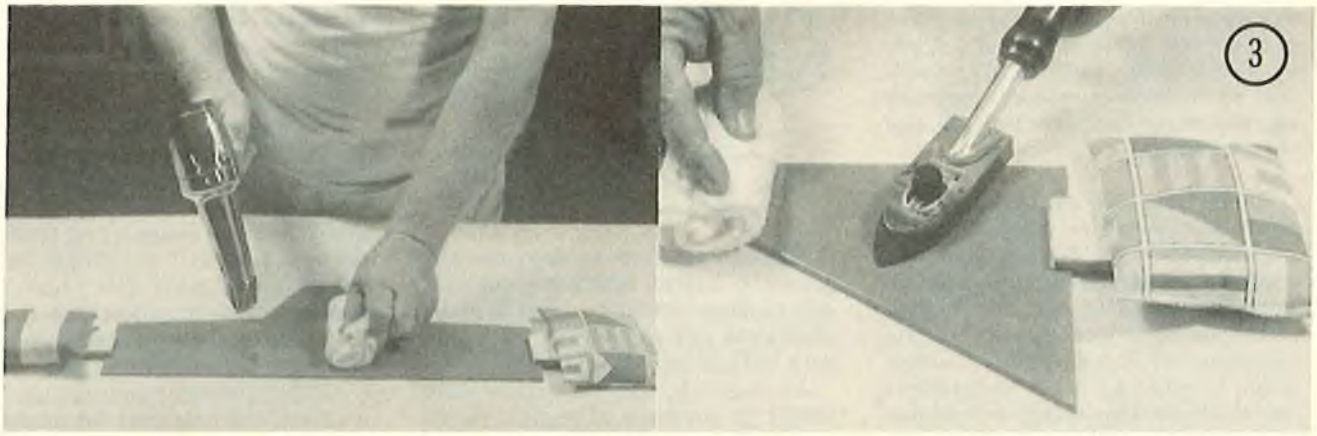


Photo 3. When using the heat gun to shrink MonoKote, etc., it drives us nuts when, as we rub, the piece slides back and forth on the workbench. We finally licked that "bug a boo." After the piece is covered and pin holes punched in one end to let out the air, we overlap the ends of the piece with one or more sanding blocks then add a shot-bag or so to keep everything in place. Apply heat until the covering starts to shrink then rub the air out toward the pin holes. It is important, if you use this method, that the balsa is sanded as smoothly as possible because the plastic covering assumes the surface of the balsa texture. This technique really holds the piece being covered squarely in place. If you are careful and really don't get carried away by your rubbing, the sandpaper blocks will not leave scratches on the parts.

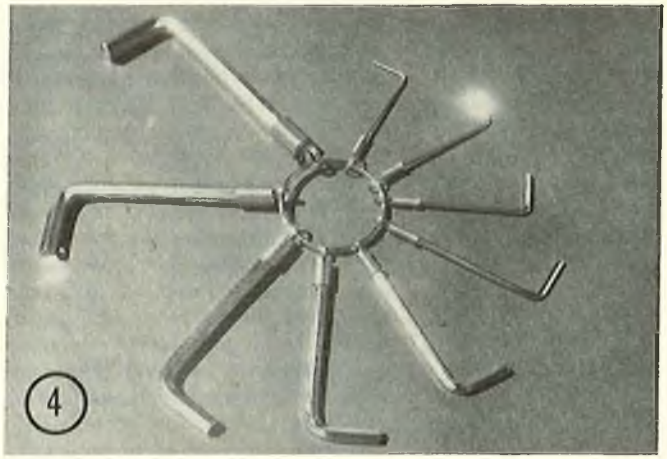


Photo 4. Here is one we have waited years for a solution, how to keep track of Allen wrenches. We found it at the Save On Drug store for less than $2.00. Each wrench is held securely to the ring so there is no loss and a slight tug separates the wrench of your choice for immediate use. Push and it is back in storage. The ninth wrench, for wheel locks was not included. The wrench socket was fabricated by wrapping a piece of .020 piano wire (the smallest usually available) around a length of .045 wire then forming the end into two loops which fit around the key ring. Cut ends of the .020 piano wire with a carbide disc to avoid snags. This is the most ingenious use of old tools we have seen in years.

Photo 5. If you have ever square danced at school or socially, you know what a U-Turn Back is. This is our U-Turn Back for front wheel control. Because of a number of things, usually called lack of planning, we were unable to get the pushrod to exit at the same level as the wheel tiller. If you look closely at the picture, it is hard to find, you will see our U-Turn Back.

The nice thing is, the farther the mis-match, the larger the radius of the U-Turn Back. What could be simpler? And not only that, but note there is also a horizontal misalignment as well as the vertical one. In this case, the U is bent slightly and the two axes become parallel. If you can't see it too clearly, all it is, is a piece of pushrod wire bent in a U back upon itself.

□

MEDICAL HAZARDS

By Ronald L. Cahn, M.D.

(Editor's Note: Very few of us are aware of the many hidden health hazards associated with the exotic materials being used in modeling. Dr. Ronald L. Cahn, a prominent physician and active R/C modeler, researched the subject and wrote this article for the edification of his fellow club members in the Pioneer R/C Club, Inc., Santa Clara, California. We strongly urge all modelers to read this important information reprinted here with the kind permission of Dr. Cahn.)

Aside from the obvious physical dangers involved in operating high performance model aircraft, there are a number of significant hidden health hazards encountered in our hobby. These can be divided into two general categories of skin reactions (allergic and irritant) and systemic intoxications. This article will discuss the potential problems that can be anticipated and also deal with treatment and prevention.

It is first important to differentiate between irritant contact dermatitis and allergic contact dermatitis. Allergic reactions require a prolonged period of preliminary exposure to render the individual sensitive. Once sensitized by repeated contact, the distinctive eczematous rash develops after each exposure and lasts fourteen to twenty-one days if untreated. The allergic type relies upon the immune system as the mediator to produce the adverse reaction and this requires a minimum of forty-eight to seventy-two hours after the offending exposure before symptoms arise. Irritant reactions are more common than the allergic type and require no biologic mediators. They result from direct chemical action of the offending agent on the skin. The difference can be conceptualized by comparing exposure to poison oak (an allergy) with the effect of skin contact with nitric acid, a direct injury. The allergic mechanism of poison oak requires many hours to develop whereas nitric acid injury is virtually immediate. It must be remembered that the skin absorbs the antigenic chemical, the immune system must "process it," and a cascade of cellular events then occurs before the reaction can be initiated, whereas potential irritants are capable of injuring the skin on contact by immediate protein denaturation. Two additional concepts must be considered: (1) relatively weak irritants require repeated exposure to degrade the protective barrier function of the skin and produce reactions, and (2) many chemicals are capable of producing both irritant and allergic reactions.

As a group, the chemicals most likely to produce allergic contact reactions are the adhesives and finishing products in model construction. Additionally, polyester resin, fiberglass, and solvents are frequently incriminated in irritant and allergic reactions. Additives, solvents, and certain paint systems are potentially hazardous in terms of systemic intoxication.

Allergic Reactions

Epoxy systems are undoubtedly the most likely to cause sensitization and resultant allergic contact dermatitis. Epoxy resin systems contain a number of ingredients, these include uncured epoxy resin itself, the catalyst, plasticizers, solvents, filler, pigments and other resins. Most uncured resins are condensation products of epichlorhydrin and p, p' — isopropylidene, diphenol (Biphenol A). This material serves no useful purpose until it is further polymerized or cured by the catalyst, which is usually an amide (polymerized) anhydride amine, or inorganic fluoride compound. Once cured, they are hard, insoluble, stable, and non-irritating and non-sensitizing. The amine hardeners (alliphatic poly amines, and amino polyamides) are also potent allergic contact sensitizers and irritants. The latter catalysts are more commonly used in epoxy resin systems that cure at room temperature and are capable of producing severe chemical burns in addition to allergic contact dermatitis. The other resins, solvents, plasticizers, etc., carried in the epoxy mix are also capable of sensitization and irritation but at a much lower level of probability than the epoxy/catalyst constituents.

Polyester resin is a viscous liquid that is widely used in various constuction and finishing techniques. When catalyzed, it cures to a hard, insoluble, inert plastic that is neither allergenic nor an irritant. In the liquid state it may be an irritant of weak proportions.

Fiberglass cloth may also produce an annoying type of irritant dermatitis under appropriate conditons. The glass cloth itself is inert but the tiny spicules of the glass fibers become fragmented from the surface and will be lodged in the openings of hair follicles. This produces an uncomfortable itching situation which lasts until the fiber spicules are finally dislodged.

All the solvents in common use have a significant potential for producing irritant reactions. They all act by the same mechanism in producing damage to the skin. Such chemicals are alaphatic (straight chain) or aromatic (ring structure) hydrocarbon molecules, many with halogenated (mainly chlorinated) side chains. They dissolve the natural oils from the skin and produce secondary dehydration as water is eluted during exposure and alter as additional water evaporates from the skin because of the previous loss of oils that acted as a moisture evaporation barrier. Solvents can also penetrate directly into the skin through tiny fissures and cuts to produce a chemical inflammation of the lymphatic vessels in the skin (lymphangitis). Sharing the potential for both allergic and irritant reactions and systemic intoxications is the polyurethane group of chemical agents. Two part polyurethanes are encountered in widely different areas of model construction and finishing: (1) foam filler for stiffening of fuselages, etc., and (2) paint finishers.

Generally these chemicals are isocyanates. The most commonly used are toluene disocyanate and methylene biphenyl isocyanate and, less commonly, hexamethylene disocyanate and naphthalene disocyanate. These agents are mixed with polyhydroxy compounds, and the reaction proceeds rapidly to completion at room temperature and renders an inert end product. Toluene disocyanate is the most volatile of these reagents and therefore most potentially dangerous. Irriation of the eyes, respiratory tract and skin are to

OF R/C MODELING

be expected from any underlying to any exposure. Nausea, vomiting, and abdominal pain may occur and be delayed in onset. Prolonged skin contact will cause redness, swelling, and blistering. Permanent damage can be expected from direct eye exposure. Repeated exposures to vapor can induce allergic asthmatic symptoms of wheezing, shortness of breath, coughing, bronchitis, and even pulmonary edema (accumulation of fluid in the lungs). These, too, may be delayed in onset for several hours after exposure.

Two part polyurethane paints (e.g., Dupont's "Imron") also exemplifies this group of hazardous products which are intended only for industrial application under proper circumstances and with appropriate precautions. The only safe method of mixing and/or spraying with such materials is with a self-contained closed breathing system. Particle masks are useless for protection and even gas masks intended for use in poisonous environments cannot be relied upon even outdoors with the wind used to dissipate the overspray.

Intoxications:

Chemical intoxications are relatively uncommon but potentially a much greater biological hazard. The chemicals most likely to be involved (in order of decreasing likelihood) include solvents, paints, and adhesives. Prolonged cutaneous exposure to breathing of fumes in confined areas can lead to intoxication. It is hard to imagine circumstances productive of such results, but it must be kept in mind. Symptoms would include respiratory tract irritation, tearing, and irritation of the eyes, mental confusion, and dizziness. Late consequences vary depending upon the offending agent but include shortness of breath, coughing up blood, kidney damage, and even potential liver abnormalities.

One variation on the theme of intoxication is the problem with cyanoacrylate adhesives. These glues are supplied as thin liquids that polymerize with amazing rapidity in the presence of water vapor (ever wonder why it dried instantly on your fingers and more slowly on the balsa?). In situations of low humidity (below 55% relative) the volatile fumes linger in the air for a considerable period of time and produce significantly increased skin, eye, and respiratory

irritation. The potential for breathing the unpolymerized fumes under such circumstances is definitely increased. The fact is that the polymerized cyanoacrylates are not biologic tissue irritants and have been used since the early 1970's as "surgical glue" and as a hemostatic agent in cases of massive trauma and bleeding. However, these wet applications produce almost immediate polymerization and no monomer remains. The monomer in dry circumstances has produced chronic dermatitis in industrial settings which abated promptly when air humidifiers were employed.

Another interesting and potentially disturbing result of prolonged breathing of cyanoacrylate fumes is an accentuated "hangover" from concomitant consumption of alcoholic beverages. I have heard of such reactions from reliable individuals but have had no experience with it or the treatment thereof. Apparently, if the fumes are absorbed in addition to moderate alcohol intake, the predictable effect of the alcohol is considerably intensified for some unknown reason. Lots of theory can be applied to this situation but no definitive biological mechanism has been demonstrated. Adequate ventilation preferably with a fan is the evident solution. The other alternative is more than obvious.

In the first segment of this discussion, the latent health hazards involved in handling the chemicals and materials involved in model construction and finishing were enumerated. Certainly, other risks inherent to highly specialized operations exist that were not covered and these can be approached individually in the future. I would like to cover the general principles of treatment and prevention this month.

The eczematous skin eruptions common to both allergic and irritant dermatitis may appear to be strikingly similar. In the acute phase (immediately at the onset) the skin becomes red, swollen and pruritic (itchy) and tiny pinpoint blisters appear under the surface of the skin. These subsequently rupture and weeping and crusting ensue. Continued exposure will result in dry scaling, with thickening of the skin and painful fissuring at points of flexion. In some cases where exposure to the offending agent(s) is intermittent the reaction waxes and wanes but never clears completely.

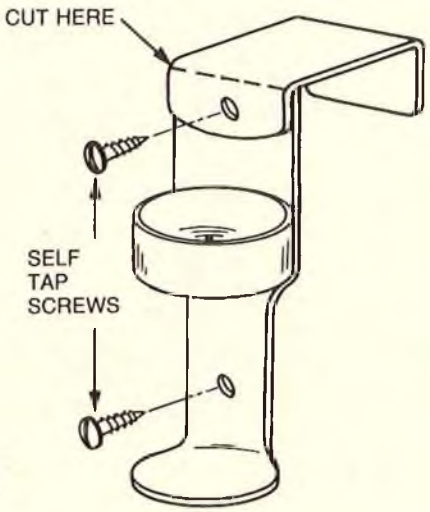
Treatment of such eczematous reactions revolves around four general principles: (1) absolute avoidance of the allergen or irritant, (2) exclusion of other contributing irritants (soaps, cleansers, solvents, etc.), (3) the use of potent, topically applied steroid (Cortisone) medications to obliterate the reaction, and (4) the use of oral antibiotics when indicated to eliminate secondarily acquired infection. All of the above are obvious, with the exception of number three. Since the most common site of such reactions is the hands, the steriod medication applied must be sufficiently potent to penetrate the involved thick skin. This invariably requires one of the "super strength" drugs that are suspended in a vehicle which enhances penetration and absorption and also contains no extraneous preservatives, perfumes, coloring agents, etc. On rare occasions, oral or injection steroids are required to obliterate a particularly severe reacion. Chemical irritant injuries must be treated as burns but this is necessary only in overwhelming reactions.

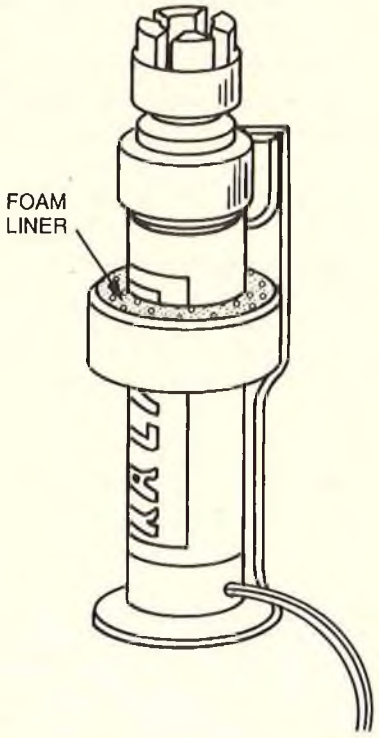
Prevention of these undersireable effects revolves around appropriate knowledge of the materials being handled and respect for their potentially adverse consequences. Most of the local allergic reactions occur in individuals who routinely use the involved substance(s) and nothing favors the development of an allergy better than repeated sloppy handling. Remember, the barrier function of the skin becomes compromised or degraded by the irritating chemical effects of solvents, adhesives, cleansers, etc. This situation is a "set-up" for eventual sensitization through skin unable to protect itself from the antigenic or irritant effects of

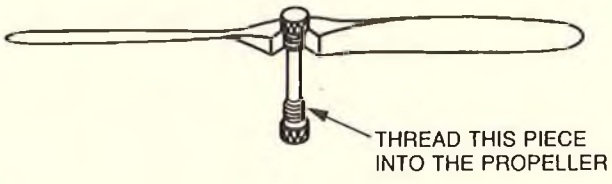
to page 100

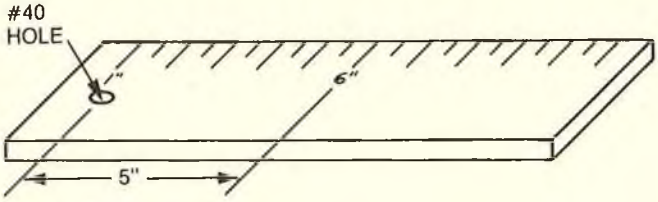
FOR WHAT IT'S WORTH

If you want a neat looking starter holder, nothing is easier to fabricate and is economical, than modifying the car cup holder, available at most general stores. Trim off the 'hook,' as pictured in sketch, and attach to your favorite starter box with self-tapping screws. To give a snug fit, Major H.O. Merican, Royal Malaysian Air Force, suggests lining the top section with foam.









FOR A 10" PROPELLER

REMEMBER 1/4" WILL EQUAL 1/2" ON THE OVERALL LENGTH OF THE PROPELLER

When SRA William Bell, APO, New York, needed to shorten an 11/6 prop to 10", he found that his Du-Bro prop balancer works perfectly. Simply screw the piece into the prop that would normally set on the table. This acts as the "axle." Then drill a #40 hole through a ruler and mark a line 5" out from the center. By putting the "axle" into the hole you have an easy and accurate way to change the diameter of a propeller. See sketch for more detail.

When using a grinding wheel or high speed steel cutters in the Dremel tool, Bruce Steingraber of Sterling Heights, Michigan, suggests that you put the part in a clear kitchen bag. This will let you see the part your working on and at the same time you'll be able to keep the chips or dust in one place.

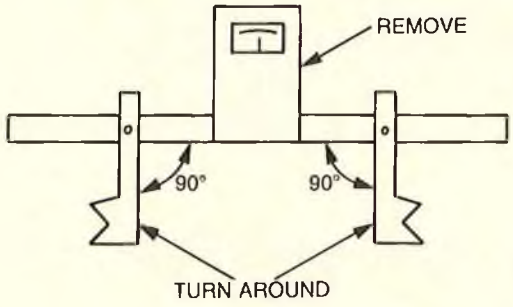
Duie Matenkosky of Murraysville, Pennsylvania, suggests how to keep spackling paste such as UGL 222 soft and usable for extended periods of non-use on the shelf. Next time you use the stuff, take a paper towel, cut and fold it to fit flat under the lid. After using the paste, wet the prepared towel, place it on top of the contents and replace the lid. Then the next time you want to fill those balsa dings, your spackling paste will still be soft and workable.

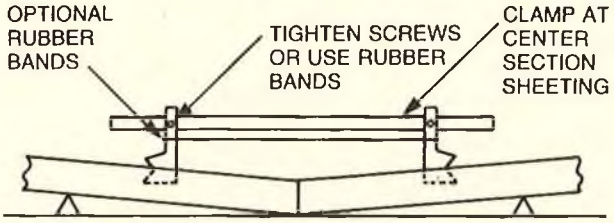
John Murphy of Boxboro, Massachusetts, tells how he solved the clean-up problem on flat paint surfaces. John says anyone who has used K & B Super Poxy with the flat catalyst will have a hard time finding a way to keep the paint scheme clean and free of stains from fuel and dirt, etc. He has found that "Macs" whitewall tire cleaner removes all stains even on flat white and black with only mild rubbing with a paper towel.

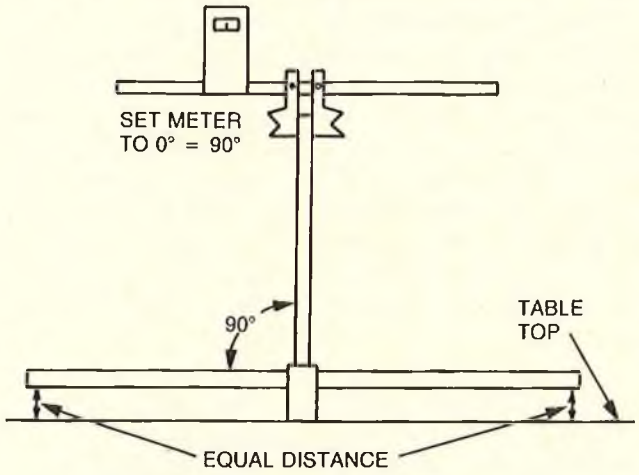
This method of getting iron-on coverings to adhere to epoxy/glass cloth was sent in by William Toppa of Bethel, Alaska. After joining wing halves and reinforcing the joint with fiberglass cloth and epoxy, plastic covering materials will not stick well. William uses 1/32 balsa and contact cement over the joint. Now he just sands to the contour desired, adds balsarite, and the plastic film stays on.

George L. Giesey of Ligonier, Pennsylvania, has come up with many useful ideas in his 25 years of modeling, here is one of them. George makes handles for small files and wood rasps by cutting off the round top part from old fashioned wooden clothes pins. He drills a hole in the wood and epoxies the shank of the file into the hole. A real finger saver!

FOR WHAT IT'S WORTH

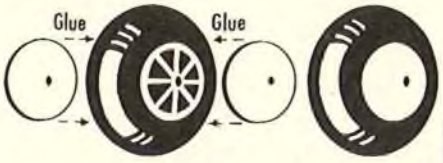




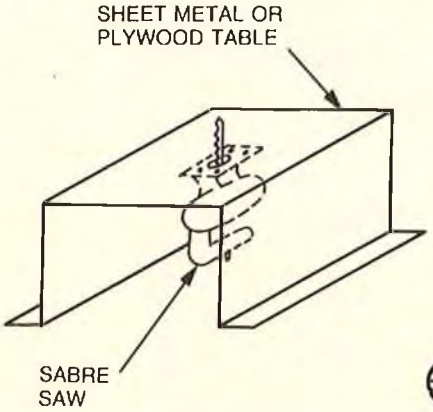


Stephen Raby of Mississauga, Ontario, Canada, has found other uses for his Robart Incidence Meter. He discovered that by removing the pin gauge from his Robart Incidence Meter and reversing the calipers, he had a very useful clamp that can hold objects up to 16" wide, such as built-up wing panels for gluing them together. The meter can also be used to set up the vertical stab when you have a tapered horizontal stab. The sketches show how both of these ideas were achieved.

An easy way to modify wheels was submitted by Robert Plogman, Cincinnati, Ohio. This modification was designed for a set of standard Du-Bro 3¼" tires to work with a semi-scale deHavilland Tiger Moth. A piece of white polystyrene about 1/32" thick should be used. With a compass, draw four circles slightly bigger than the hubs. Be sure to scrape away the chrome plating on the plastic and use cyanoacrylate glue to secure the new discs over the original hubs, per sketch.



Richard Shirey, Sewisckly, Pennsylvania, adapts an ordinary shop tool to model use. An inexpensive "jig-saw" can be made by mounting a sabre saw under a table as shown in the sketch. The table can be made from sheet metal, or it can be made of plywood. Even a wood box or an old drawer could be used. Richard has been using his for a number of years and it has been useful for cutting inside holes as well as outside shapes. A fine tooth saw blade seems to work best on plywood or balsa. Plastic has also been sawn with good success. He likes to plug the saw into his Dremel speed control and adjust it for the proper cutting speed.



Two inner, yellow sections of Gold'N-Rod pushrods can be easily and securely spliced together using a 3/4" 2-56 bolt. Screw the bolt halfway into one section. Cut off the bolt head. Using another 2-56 bolt, tap one end of the second piece of pushrod. Now screw the two sections of pushrod together and secure the joint with Hot Stuff. The joint will be solid yet still able to take almost all normal bends in the outer pushrod run. This technique is handy when you want to splice two leftover inner pushrod pieces together, or if you have an exceptionally long run. This material saving hint was submitted by Stephen Pendo of Burlington, Vermont.

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

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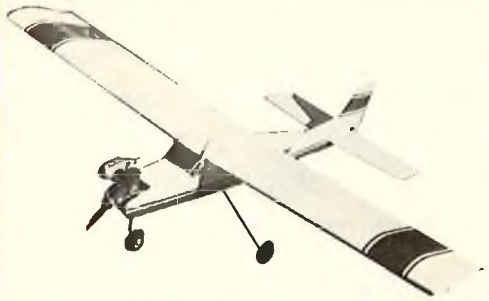

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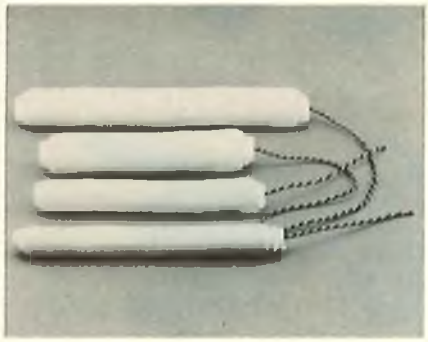
SHOWCASE '82

from page 96/88

3 view drawing. It features four scale sizes; 1/8 — 1½" = 1' (most .60 scale); 1/6 — 2" = 1' (larger .60 scale); 1/5 — 2.4" = 1' (.90 size, Ziroli/Platt); 1/4 — 3" = 1' (Nosen, etc., 1.20 and up). A precision device fabricated on a durable 2 ft. long laminate No. 406. Retails for $6.95 and is available from leading dealers throughout the world. For more information contact Robart, 310 N. 5th St., St. Charles, Illinois 60174.



IN LINE BATTERY PACK KITS

Special requirements need special equipment. The normal physical configurations of the battery packs currently available sometimes are not right for certain applications such as long and skinny sailplanes or pattern ships with critical tank/nose gear clearances. Before, the only solution was to build the pack from individual cells, some wire lying around, and electricians tape. At best, the results were not very professional. In order to solve this, Ace is packaging a kit with four cells, solder, wire, the proper diameter heat shrink tube, and instructions so you can make a pack with all the batteries stacked end to end as a long tube or separated into 2 two cell units that can be split up. Available in four sizes: 250, 450, 550, and 1200 mah. All are 4.8v packs for the receiver. No connectors. Price ranges from $14.50 to $19.50. For additional information, contact Ace R/C, Inc., Box 511, 116 W. 19th St., Higginsville, Missouri 64037. □

MEDICAL HAZARDS OF R/C MODELING

from page 87/86

the involved chemicals.

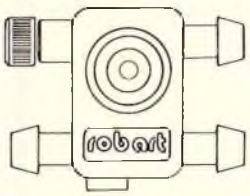
Gloves provide a useful protective barrier against many of the slovents, adhesives and paints. These can be obtained as Bard-Parker vinyl exam gloves from local pharmacies. They are non-reactive and free from surface chemicals that interfere with the majority of work (painting) being performed. They do not offer protection from cyanoacroids, however. The most useful aspect of such gloves is during spray (epoxy) painting. Such protection significantly reduces skin exposure, trauma and the time required for clean up.

There are several products marketed for hand protection during potentially hazardous work. Silicote (a silicone-based cream) is one but may interfere with paint finishes being applied if the work is carelessly handled. Another is Kerodex. The type intended for protection from dry or oily substances may be quite helpful but, again, it suffers from the potential to interfere with the surface preparation for painting.

The final recommendation is simply that no substitutes exist for intelligent handling of those substances capable of causing injury or intoxication and the responsibility rests with the users, not the manufacturers. □

FUEL SYSTEMS

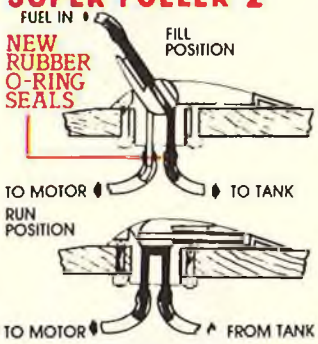
AUTO MIX 2



This device allows fuel, delivered by a pump, in excess of that required by the engine to be returned to the tank. * Now with "Return Limiter" (needle valve sensitivity adjustment) a means for controlling fuel pressure at the needle valve in proportion to fuel return volume. You can adjust needle sensitivity from critical to broad.

207 Auto Mix 2 $10.95

SUPER FUELER 2



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F-15 EAGLE

from page 77

... we fabricated from a small scrap of 1/8" aluminum sheet. It was drilled and tapped the same as the engine mounts which are included in the kit. Later a K & B .40 was installed; it was not necessary to change the mounting plate.

Plans are not necessary, the 6 pages of instructions are generally adequate and everything fits well when assembled.

Covering:

No covering is needed as all parts of the airframe are sprayed with a glossy paint. The dense foam has a relatively strong skin and takes paint well. The external tanks and rockets were not painted. The foam is said to be fuel proof. If you intend to add the tanks and rockets we would recommend they be coated; finger painted, if you will, with a thin coat of epoxy before applying paint. Most paints blister foam; we have safely used Sig Plastinamel on molded foam but you should test any foam-paint combination prior to use. The firewall must be coated with epoxy, a Q-Tip makes a neat throwaway paint brush.

Engine:

As mentioned previously, we used an O.S. .30 and a K & B .40 with mufflers included. No other mounting problems were encountered. If you are going to use the prop spinner included in the kit, be sure to have one of your favorite props available. The thickness of the prop is a factor for engine location on the mount.

to page 106

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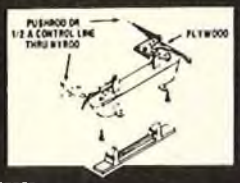

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F-15 EAGLE

from page 102/77

Radio:

Here is where we made significant modifications. The instructions show the radio mounted to the inside of the radio compartment hatch cover. This is inconvenient because all servo horns must be removed by using a screwdriver through blind holes in the fuselage in case you would want to remove the hatch cover. We installed our own ply servo tray in the plane then used the servo mounts and hardware included in the kit. This removable tray is similar to those installed through wing openings in conventional planes. Now, the compartment hatch cover becomes just that. We used a Kraft radio with four KPS-12 servos.

Flying:

The first flight was completed (using the O.S. .30) as recommended on the cover of the box and in the instruction sheet. Since we fly from a grass field, getting enough speed for a good take-off was difficult. The plane was horsed into the air and almost snap rolled. The flight, to say the least, was not acceptable. From information gathered from advertisements in RCM, we saw recommendations that indicated the engine flight range was from .30 to .40. So, nothing gained, nothing lost — we removed the O.S. .30 and installed a K & B .40. Oh! dear Gussie, did that make a difference. **Wow!** What a flying machine! It was capable of every stunt in the book; we really wrung that baby out and she took it all and asked for more. It is hard to believe there was such a difference in the same plane. If flying is your thing, you really want one of these.

to page 116

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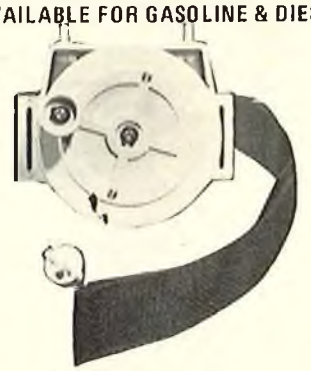

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F-15 EAGLE

from page 106/77

When using a .40, you will find the tank included in the kit gives very short engine runs and you will have to install a larger tank. If your .40 is a pumper, this will be no problem. Otherwise, we found it necessary to fabricate our own tank since the space molded in for the tank is too narrow for the larger standard tanks.

Conclusion:

We were impressed by the quality of the foam, its surface, and the glossy paint used. The red, blue and black trim was applied very neatly. The whole kit was well-engineered and when it came time to add something, the holes were there and the part added, fit. This showed foresight and thought and it was appreciated. Since there are no step-by-step instructions, one should have some building experience.

The flying instructions are definitely brief, indicating the flier should have a fair amount of aileron experience. If you are looking for something that builds quickly, one that will stand up to the bumps and knocks and keep right in there, and be ready to fly when you are — this looks like the one you will want. A bit of 5-minute epoxy will fix any damage you have — right there at the field.□

"2 x 2" AND 2S TEE/VEE

from page 70

cut in half and angle the front for the leading edge.

2. Build two stabilizer halves (Photo 9). **Note:** The plans show two gussets at the center. These were added to eliminate stress points, after photos were taken.

3. Cut the ruddevators from the 3/16" x 3" sheet.

4. Bevel the stab half centers per the modification plan. Don't make two lefts or two rights! Glue together using the modification plan. Be sure the stabilizer trailing edge is against the plan (Photo 10).

5. Mark and cut pushrod exits in the boom sides (Photo 11). Remember, one pushrod guide is above the other. The pushrod guides should end so that the pushrods exit at least 1/2" aft of the front of the stabilizer.

6. Glue pushrod guides along their full length. Finish boom per kit instructions.

to page 118

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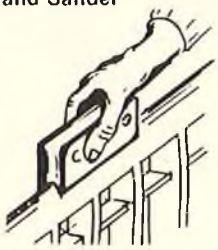

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"2 x 2" AND 2S TEE/VEE

from page 116/70

7. Glue 3/16" x 3/16" stabilizer mount to the top of the boom.

8. Notch the stabilizer mount using the stabilizer for checking fit (Photo 12).

9. Hollow out bulkhead #5. A rectangular hole 3/4" high by 1⅝" wide, down 1/4" from the top will give plenty of clearance. Mount the Du-Bro mixer on the bellcrank using mixer attach hardware (Photo 13). Build the fuselage up to radio installation per kit. Add a piece of 3/16" x 3/16" behind bulkhead #5 (Photo 19). Using scrap lite-ply from the die-cut sheets, cut a strip 1/2" wide by 2" long. Mount the bellcrank with the mixer body attached to the strip. Glue the mixer assembly in after a trial fit with the servo linkage (Photo 14).

10. Finish the model with MonoKote and install pushrods (Photo 15).

Control Throws:

"Tee" Rudder — 1½" left and right. Elevator — 1/4"-3/8" up and down.

"Vee" Ruddevator — 1/2"-5/8" up and down (left surface up for right turn).

Flying:

Balance per kit location. I hand glide models with controls and trims at 0-0. Both models should glide with a slight nose down attitude. I launch with no more than 9 pounds of pull on a high start or pulse with a 6 volt winch. If you're the type who's an ex-carrier pilot or can't coordinate your hands and feet at the same time, may I suggest using spruce spars in the center section and then practice

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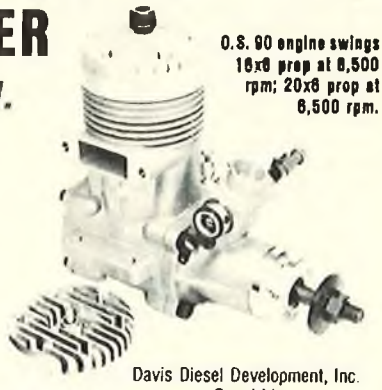

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"finesse" in your launch technique. When the model is airborne, the nose should "look" slightly down. If the fuselage is level, you're on the verge of a stall. □

PIT STOP

from page 69/68

going to be trying awfully hard, but so would nine other drivers. But the only other driver that could race with Kent, was Mike Lavacot. Kent and Mike raced literally side by side for the whole race, with Kent finally winning in a close finish, with Lavacot taking 2nd. Meanwhile, Ralphie Burch, Jr. and Re-Pete Fusco were having their own private duel for 3rd. But in a close race the order reversed itself, and this time it was Ralphie taking 3rd with Re-Pete right behind in 4th. But I think the happiest guy at the race came in 5th. At least I have to give him as much credit as possible for being able to race with these young Whiz Kids. Pete Fusco followed Re-Pete home to a well-deserved 5th place finish. Congratulations Pete and to the winners and also to all the other racers who did such an outstanding job in qualifying for the World's Championships. □

GIVE IT A WHIRL

from page 67/66

To summarize, remember that as soon as you pick the helicopter from the ground into the hover it will generally take a little time before it will wander off from its original position (assuming it is trimmed properly, and you lift off straight up and quite quickly!). If and when it does wander or move, small stick movements will apply **forces** to the helicopter which will result in an **increasing rate** of movement back to the position you want. You must then **remove** the control you have applied **before** the helicopter gets to where you want it to be, perhaps applying a little opposite control, and, finally, moving your stick to neutral when the helicopter **is** where it should be. Another simple way of learning this technique at the beginning, which appears to suit some people better, is not to use continuous changes in stick **position**, but to apply control movements in small pulses. By doing this we can better control the acceleration affect since we are applying the force control in small doses. However, should your helicopter really start moving away fast from where it should be, then you must quickly abandon the "pulse" technique and quickly hold the stick in the right direction to oppose the motion until all is back to normal. Then you can put the stick back to center again and resume the pulsing technique. Of course, eventually you will be able to control by judiciously timed stick movements of the right size without "pulsing." But pulsing seems to have helped ease the learning process in many cases.

Well, I hope this column has helped a bit for the beginner but I can help you best if you will give me more feed-back on your own learning problems so that I can scratch my head and perhaps come up with better advice. So let me hear from you and see you next month. □

DOUBLE EAGLE "40"

from page 65/56

how the structural design complements the aerodynamic design.

The fuselage forward section is a conventional beam-mount structure designed to maintain its stiffness in spite of its extremely long nose moment and slender cross section. The

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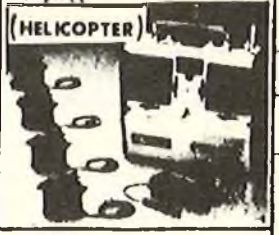

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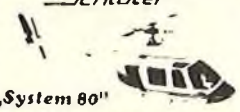

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beams carry the primary load. Balsa sides and hollowed out top and bottom blocks complete the contour. The beams are hardwood and are notched to provide accurate alignment of the bulkheads. The canopy is, of course, non-structural but its contour is an integral part of the lifting body shape.

The fuselage aft section has a simple rectangular cross section.

The forward and aft sections are coupled by a wing saddle which is stiffened by plywood-doubled side pieces. The center section floor is 1/4" balsa with an integral main gear mounting plate so located as to transmit landing loads into the rest of the structure.

The wing structure is polystyrene foam covered with 1/16" balsa or 1/64" plywood. The horizontal stabilizer is shaped to contour from a balsa laminate and becomes integral with the fuselage aft structure at assembly.

Construction and Assembly

The construction and assembly methods and techniques that are suggested for the Double Eagle "40" were devised for the express purpose of facilitating construction and imparting the built-in accuracy to the assembled aircraft that is required to take advantage of the aerodynamic fine points just discussed. The structure was designed to utilize these techniques. The ease with which extreme accuracy can be obtained by using them will be surprising.

A flat building surface that is large enough to accommodate the entire assembled aircraft is desirable but not absolutely necessary. The "flatness" of the surface is mandatory; the size is according to relative convenience. It is necessary, however, to have enough total area capability for the assembled aircraft to sit flat on the surface and for enough of the aircraft to be over the surface for vertical measurements to be taken.

The builder will need a foam cutter

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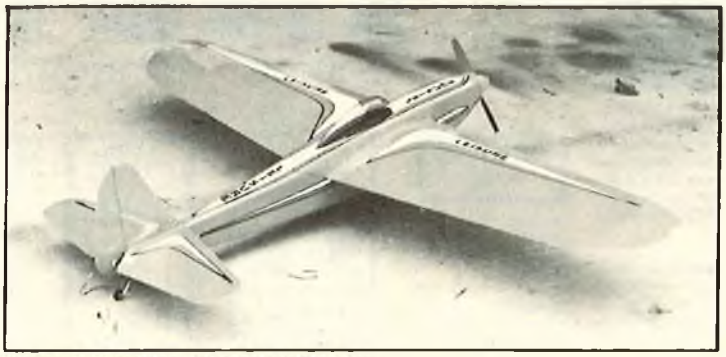

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ELECTRIC POWER

By MITCH POLING, in July '81 MODEL BUILDER magazine.

How would you like to have an 05 size motor that delivers super performance and flies for 8 to 10 minutes? I would, and when I was admiring the digital charger at the Leisure Electronics booth at the IMS show, Roland Boucher showed me a motor that he said could do just that. When Roland says something works well, I listen, because Roland and his brother Bob are the pioneers of electric flight in the U.S., and they really know electric flight from start to finish. The motor is the black label Leisure Electronics Aircraft motor, available in pattern or racing wind, with ball bearings on both ends, balanced armature, and trued commutators (retail price $45.).

Roland suggested trying the motor on an 05 plane using six sub-C NiCds and a 6x4 prop. I did, And it was a revelation! In my Astro Stunt plane (my own design) it flew like a pylon plane, and could do spins, loops, and rolls on two channels with ease. In fact, the Astro Stunt flies better with this motor than any other, and it flies well with most of them. I could hardly believe the level of performance, and on 6 cells, 2 less than usual! Roland was right about duration, too. I'm getting consistent 8-10 minute flights with stunting throughout the flight, not just from going over maximum altitude. I've had several fliers say that this was the first electric that they had been impressed with (they all flew gas), and one thought I was catching a lot of thermals to stay up that long! No thermals are necessary, just good engineering by Leisure Electronics!

I did some ground testing, and the specs are; 12,000 rpm on a 6x4 prop, at 14 amperes draw, all-up weight of the system with the batteries and prop equals 17.5 oz., two ounces more than the Astro 05. Even so, the Astro Stunt weighs only 30 oz. with a Cannon receiver, Bantam midget servos, and a 250 mah receiver pack (two channel). The Astro Stunt is a 42 inch span, 290 sq. in. plane with a 10% flat bottom airfoil. The Astro Stunt kitted by Astro Flight is very similar and would be ideal for this motor.

capable of cutting a 25" wing panel. The foam cutter should be mounted above and used in conjunction with the flat assembly surface to assure trueness.

The idea is to build everything on the flat surface and impart its accuracy to the aircraft. The fuselage is built with the bulkheads standing on the flat surface; the wing and stab are fitted to the fuselage and aligned to be parallel to the flat surface; the vertical fins are added and made to be perpendicular to the flat surface. After all alignments are completed, the bottom plate can be added to the fuselage, sanded to shape and it's finished!

Wing:

The wing cores are cut from a solid block of medium density polystyrene foam. The foam blocks should have smooth, parallel surfaces and should be at least 3" thick (4" would be even better) since we're going to use the top and bottom "waste" as construction molds. Accurately cut a planform of each wing panel, including ailerons. Be certain that the root and tip cuts are exactly square with the top and bottom surfaces. Note that the 50% chord line is perpendicular to the centerline of the aircraft so that fore and aft wing taper is symmetrical.

With the wing blocks weighted down on the flat surface and using a marking gauge, made as shown, mark the chord line on the root end of both foam blocks. All marking should be done with a fine line felt tip or ball point pen and done with extreme care and accuracy. The chord line is to be marked on the tips the same way, **except** that it is done with an 11/32" spacer under the marking gauge. This will provide the exact amount of dihedral in the assembled wing. Make your airfoil templates as accurately as possible, using 1/32" plywood or phenolic, and include the aileron. The

to page 124

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from page 121/56

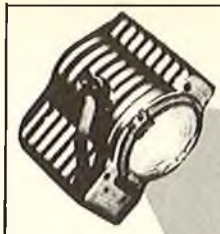
root template must be placed exactly on the chord line but with its tail end 1/8" **above** the raised chord line. This is the washout and it must be exactly the same on both wing panels. Take care to place the 50% chords of both templates on the 50% chord line.

The wing halves may be covered with either 1/16" balsa sheet or a single piece of 1/64" plywood, joined at the trailing edge. (Note: the template contours should be adjusted according to the thickness of covering to be used.) In either case the grain should be aligned with the leading edge. I prefer the 1/64" plywood because it is as light as 1/16" balsa and is stronger. To prepare the wood covering, align the leading edge over a 1/2" dowel that has been backed with a piece of 1" x 2" for strength. Wet down the leading edge, hang weights on the trailing edges (using "C" clamps) and let it dry. Slightly thin approximately 1/4 pint of Hobbypoxy II to a good brushing consistency. Lightly coat both the foam core and the inside of the wood envelope with the brushed on Hobbypoxy. Slip the core into the envelope and replace into the molds. Use plenty of weight, uniformly placed. Unlike contact cements, the Hobbypoxy will allow the core to align itself inside the wood envelope and will allow the wood to assume the true contour of the core without any warps. (For accuracy, be sure to have the same side of foam molds against the flat surface as when the wing cores were cut.) Allow the epoxy to cure thoroughly. Carefully remove the molds and **save** them — you're not through with them yet.

Trim any excess wood from the root, tips, and trailing edge. Carefully razor saw the ailerons along the hinge line, cutting completely through wood and foam. Remove enough foam on either side of the aileron hinge line to insert the 3/8" balsa hinge supports.

The two wing halves are now joined. To aid this, cut approximately 1"-2" off the root ends of the molds and replace the wing panels into them. Weight them down again on the flat surface with the root sections in contact and carefully butt glue the panels together, using Hobbypoxy II. (I wrap masking tape around the bottom of the joint to keep the Hobbypoxy in place.) If you have carefully followed the cutting and covering procedures, you now have a wing that is as close to perfect as is possible to produce.

to page 126



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from page 124/56

Notice how easily you have completed both the washout and the dihedral.

The wing can be completed in a conventional manner. A solid balsa trailing edge containing the aileron torque rods is added. The center section may be strengthened all around with 6 ounce fiberglass if desired. When you install the ailerons, note that they are **not** interchangeable because of the washout.

The forward edge of the center section is built up by adding false ribs of the same contour as the root airfoil to the leading edge at a width to match the fuselage and then filling between the false ribs with scrap balsa.

The center wing aft fairing, wing support dowels, and the locations for wing hold-down bolts will be added later.

Stabilizer and Vertical Fins:

The stabilizer and vertical fins are shaped to contour from balsa laminates as shown on the plan. The laminated construction adds considerable stiffness and resistance to warpage. An additional benefit is gained in the sanding process of shaping the contour. You can easily hear when you reach the Hobbypoxy laminating bond, making it easy to keep all edges a uniform 1/16" thick. Centering hinges is also greatly simplified.

Fuselage:

The major bulkheads, A, B, C, D, E, and F are flat on the bottom **at the same level** and provide the basis for the alignment of the fuselage. The longitudinal members key into the bulkheads and tie the structure together. Lay out the plan on the flat surface and tape it down. The major bulkheads are stood up on the plan and the total fuselage is built in place using a square to align each component precisely over its image on the plan. Bulkhead "G" simply is glued in place between the side pieces.

I used Hot Stuff to assemble much of the fuselage quickly and to hold alignments. It was great! Hobbypoxy II is my favorite for laying-up plywood doublers and for the main crutch assembly of engine mount beams, firewall bulkhead, etc. When all side panels are in place and all strengthening gussets, triangle corner braces, etc., are holding everything rigid, the stab and wing should be mated to the fuselage before the fuselage is moved from the flat surface.

Mounting the Stab — The stab is

slid into the shaped slots in the fuselage sides and must butt snugly against bulkhead "G". Align the stabilizer to be accurately parallel to the flat surface, i.e., the chord **plane** of the stab, as measured on the leading edge, on the hinge centerline and at the tips must be the same distance from the flat surface at all points.

Mating the Wing — The fuselage wing saddle must be mated to the wing, i.e., any sanding or fitting must be done to the saddle to fit the already fiberglassed wing center section. I found the carbon paper method to be most effective.

Tape a piece of carbon paper (carbon side out) to the bottom of the wing. Carefully place the wing in the saddle, as close to correct alignment as possible, and "wiggle" the wing a bit. The carbon marks on the saddle will indicate the high points that should be sanded. Work with great care and don't be in a hurry to take down too much wood at a time. It's awfully easy to go too far! The alignment measurements for the wing are as critical as for the horizontal stab. A point on the tip should be the same distance from the flat surface as the corresponding point on the opposite tip. The 0-0 degree incidence angle of the root section must be maintained exactly. Notice that the 0-0 chord still shows on the tip airfoil — it must also be level with the flat surface.

When you are satisfied with the wing saddle, the wing hold-down bolt holes are drilled through the wing and tapped into the fuselage blocks. With the wing securely weighted in place, the dowel locations are back drilled into the wing leading edge through the holes in bulkhead "D".

A 1/16" plywood fairing is added to the trailing edge of the wing center section to complete the wing planform. Filleting of epoxy and micro-balloons to fair the top surface of the wing into the top of the fuselage is added after the fuselage decking is in place.

Completing the Fuselage — The top decking can be added and the vertical fins fitted in place. The fins must be parallel and symmetrically placed relative to the aircraft centerline. The fuselage base, with integral plywood landing gear mounting plate, top and bottom blocks and forward "cheek" pieces are all added and shaped. The addition of the canopy and canopy fairing complete the contours.

Engine and Landing Gear:

The engine and fixed gear mounting should offer no trouble whatsoever to even the amateur builder. Be certain that the engine thrust line is 0-0 (a degree or so of right thrust won't hurt but no left).

to page 129

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from page 127/56

The gear position shown is correct for a lightly weighted nose wheel. The main gear may be mounted in reverse for heavier weighted nose wheel if desired.

Double Eagle "40" will easily accommodate retractable gear and this is recommended if competition is contemplated.

Some of the fitting-out of the Double Eagle "40" is a little different from the usual and needs some explanation.

Fuel Tanks Hook-Up:

As was already discussed, the location of the fuel supply is critical to the maintenance of the C.G. for symmetrical lift. Also, the use of two 4 oz. tanks instead of a single 8 oz. tank helps to localize the fuel mass. A simple series hook-up of the tanks allows the use of a full 8 ounces as reliably as from a single tank.

To fill the tanks, break the line to the engine pump and fill until the vent line overflows. Replace the line. There can be no other unsealed openings to the system or the series hook-up will not work.

Servo Hook-up:

The servo mountings for the ailerons, throttle (landing gear if used) and elevator are conventional so the builder shouldn't have any trouble. The rudder hook-up is a little different. The prime consideration is centerline action to guarantee symmetrical movement of the twin rudders. This means that the rudder servo center of rotation is on aircraft centerline and pushrod connections are symmetrical. Placement of servos and battery pack as far rearward as possible keeps pushrods short and helps put the C.G. rearward.

Finishing:

After the construction is complete, the canopy is in place, and all crevices filled and filleted, the aircraft can be painted or covered with one of the several excellent covering materials. I MonoKoted the prototype pictured here and the results were great as you can see. The Double Eagle "40" is well-suited to MonoKote because of the abundance of flat surfaces and almost total lack of compound curves.

Pre-Flight:

Carefully "zero" all control surfaces on the flat assembly surface.

Make certain that the C.G. location is in the range 29%-33% MAC (with gear up if retracts are used). (Recommend forward C.G. for safest first flight.)

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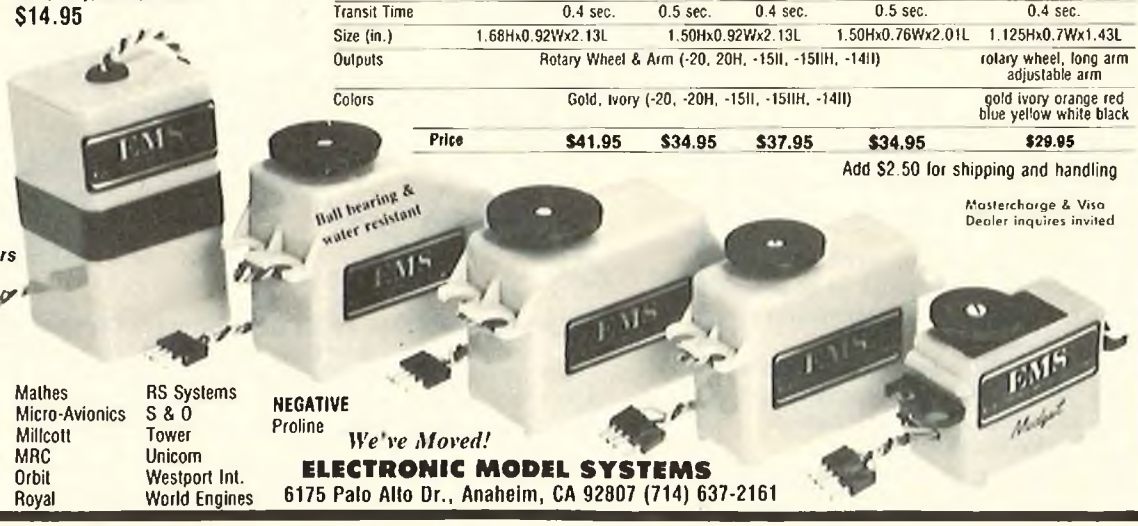

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Make certain that the completed aircraft is balanced laterally. It should be able to sit level when placed on a 1/4" x 1/4" piece of wood placed longitudinally beneath the aircraft centerline. Add weight to the light wing tip if necessary.

Flying It:

Taxiing out the Double Eagle "40" for the first time gave me every bit of the thrill that its big brother did. It is sleek and even looks ready! You will notice that the rudder control becomes effective as soon as the Double Eagle "40" starts moving. Don't over-control in yaw.

Recognize that there is a lot of mass forward of the wing to be lifted and don't try to lift it too quickly. Let it build up plenty of speed and then lift it gently. The landing gear placement and gear lengths shown on the plan gives a ground attitude that will allow the Double Eagle "40" to build up plenty of speed without trying to leap into the air prematurely.

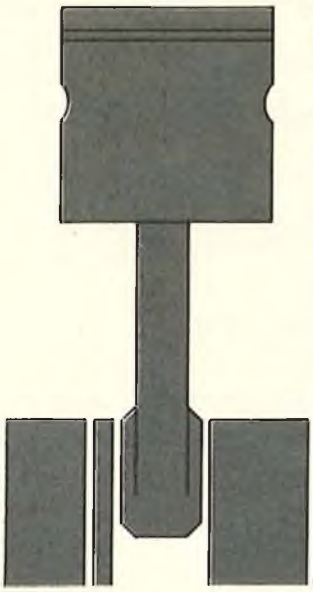
When you come in for your landing, you'll be a little "hot" if you're not careful. This is because of the low drag design. Make a couple of "check" passes to assure yourself that it's not going to "fall out" on you at slow speed and then come on in. Keep a little power on, lengthen your approach, bring the nose up, and slow it down.

As mentioned earlier, a forward C.G. location gives a safer first flight. As you become accustomed to the Double Eagle "40", you may locate that "symmetrical lift" position for your particular aircraft by making progressive C.G. changes. I locate everything to give a forward C.G. and then add lead in small amounts to the tail to bring the C.G. rearward.

To test symmetrical lift — with the power set rather high and the aircraft flying straight & level, roll inverted. If you have to apply "down trim" to hold the nose up, you must move the C.G. rearward. If, when you roll inverted, the aircraft balloons up, the C.G. is already dangerously too far rearward. The optimum location is that point where no trim adjustment is required to maintain straight and level flight.

Once this point is set, the dual tank arrangement will allow it to stay set throughout a complete flight.

With the Double Eagle "40" correctly balanced, you will be able to realize all of the aircraft's benefits. In addition to not pushing down elevator in rolls, for knife edge flight, little or no top rudder will be needed. She snap rolls beautifully at reduced power with elevator and rudder only. Similarly with spins, the entry is



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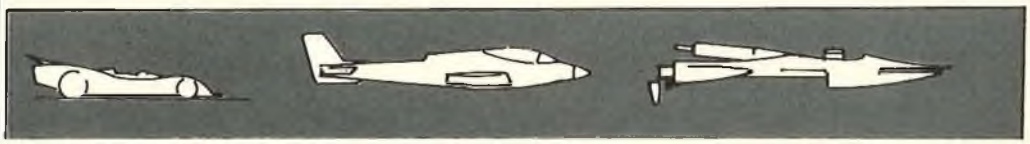

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Once you have flown the Double Eagle "40", you'll be hooked on the design concept because, I'm sure, it will fulfill your every expectation as it has fulfilled mine! □

SCHNEIDER TROPHY

from page 54/52

up elevator. There is no doubt that large models, for me at least, are impressive and easy to fly. Flying the triangular course was exciting, attempting to pylon turn in the original style, and keeping close to the pylons (sailing boats with the sails removed and union flags fixed to the masts). In common with my other racing activities, I tended to clip the number three pylon, which was a little unnecessary as it wasn't a speed race! Landing a seaplane, or flying boat, adds another dimension to flying and you get a real kick when you 'grease' the model onto the water. My mistake was in trying to turn the 180° to taxi back in front of the judges. A gust of wind caught it broadside and over she went! Waterproofing is an essential part of constructional techniques and mine were woefully inadequate, due to lack of preparation time. Water penetrates a model very rapidly and the 'Gloster' got sufficiently wet to eliminate it from the next day's racing.

All eyes were now on the Italian, C. Bergamaschi with his fabulous Macchi M39; how would he cope with the rougher British weather conditions? Preparation, starting and checking, were all carried out with an air of authority and calmness. No taxi was attempted, the model was set into wind, throttle opened up and she was safely away. The course flying was not as accurate as one might have expected and, no doubt, the wind strength and turbulence contributed to the difficulties. A safe, rather than spectacular landing, left the contest wide open at this stage. A number of entrants, mostly those with replicas of the older Schneider aircraft, opted not to fly in the hopes that the following day's weather would be more favorable — the high flight score only was to be counted. One modeler who was not deterred from having a flight was Jean-Claude Requet and he fired up his OPS and adjusted the engine until it sounded like a F1 pylon racer. On the water the 'Fakal' was less than

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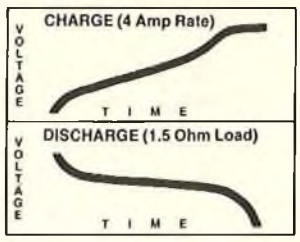

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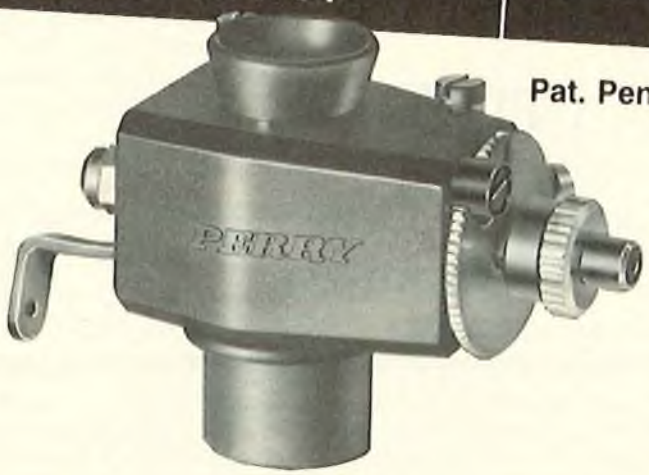

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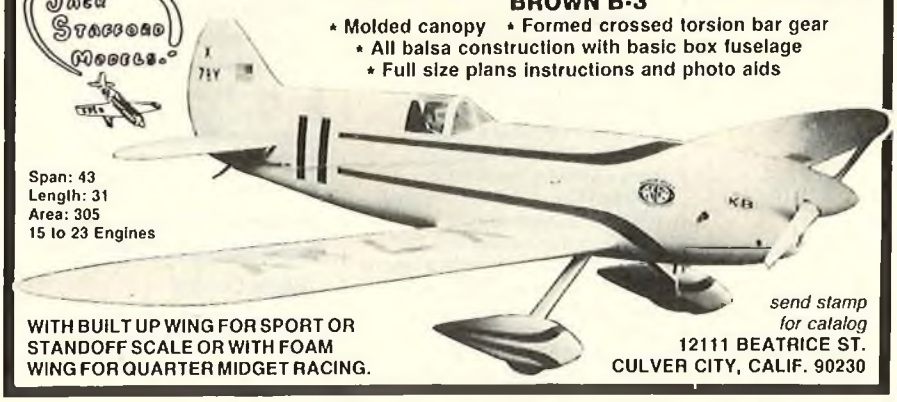

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predictable, even when prompted by Jean, and snaked across the water until one float dug in and the model turned a cartwheel. Jean turned his back on the model in disgust only to be informed that the engine miraculously, was still going and the model upright. He then proceeded to take-off, fly the course and perform a perfectly acceptable landing.

Another first flight was with Rob Millinship's 'S6B' and it looked as though the superb workmanship on this model was destined for an early and watery, grave. After three or four wave top bounces, the Supermarine was airborne, but attempts to trim out the elevator were impossible due to a rearward C.G. location. Rob was quite lucky to retrieve the model (it eventually flipped on its back and plunged from 40' into the water) with only damaged bracing wires. Wind strengths were hardly suitable for the lighter loaded biplanes, but John Ayling decided to risk his Savoia Marchetti S51 and performed in a more than creditable manner. Although there was a slight tendency for the under wing floats to 'dig in' they also helped to prevent the model from turning over when side on to wind. Two more flights with the Short 'Crusaders' (Pete Nicholson's being completely successful, but John Hodey's ending disastrously due to the dreaded rearward balance point) and a flight from the Millinship/Ward semi scale S6B brought the day's proceedings to a close in the gathering gloom.

Sunday morning looked great to those with no model problems, but was viewed with more alarm by those with still unflown models, and some individuals who had spent most of the night rectifying problems. Rob looked absolutely terrible, although he had sorted out the S6B, and went from a condition of the 'shakes' to having his muscles seize solid --- and this is a fun hobby? A reverse flight order meant that the earlier fliers were likely to get the best of the weather --- it was certainly an improvement on Saturday.

Martegani, from the Varese Aero Club, was towards the top of the list and he proved that the Sopwith 'Tabloid' biplane was capable of performing a 180° water turn in reasonable weather conditions and when fitted with a scale water rudder. His take-off and landing were very scale-like and the non-scale ailerons helped to make the pylon turns well-balanced and convincing. This flight proved to be the top rated of the whole contest; perhaps, like me, the judges have a soft spot for biplanes! John Ayling had a second flight with

to page 136

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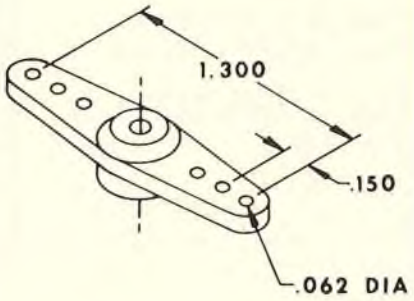

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SCHNEIDER TROPHY

from page 132/52

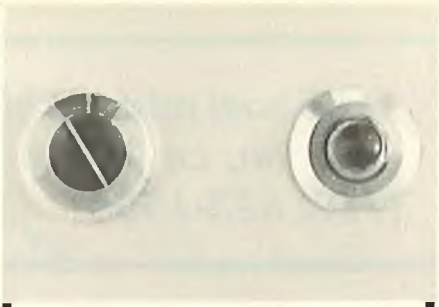
his Savoia Marchetti and I thought that this model was worthy of a higher placing than 7th. The aircraft had a lot of character, it 'sat' well in the water and in the air and was flown well by John. However, scale judging is a very subjective operation and no two sets of judges are likely to agree.

Brian Peckham was having a less satisfactory day. His first model, the 1913 Nieuport, got away at the second attempt only to have the nose rise excessively and torque turn to the left, and return inverted into the water. Untried, but looking good, the Supermarine S4 was Brian's second choice. The take-off was a little bouncy and the model rather 'skittish' in the air, but it looked as though Brian was getting this S4 settled down. Flying fast downwind, the model suddenly put its nose in the air and the following uncontrollable flicks and gyrations terminated in the dreaded loud splash. George Webb had no better luck with his 60 powered 'Nieuport.' With plenty of power to spare, the model got into the air quite rapidly, but that is where the problems started. From the moment it left the water there was little that George could do to persuade the Nieuport into a steady flight pattern. This time the splash came from the opposite side of Calshot Spit.

To relieve the proceedings, the Frenchman took the stage and we looked forward to a 'spirited' display. We were not let down, and the 'Fakal' skated across the waves in all directions. At the point when it seemed that liftoff was impossible, the model headed fast **downwind** and took off! The course flying was uneventful, but the landing approaches (three of them) were quite interesting, naturally the final touch down was smooth as silk!

Rob Millinship had now recovered sufficiently (tranquilized?) to have a second attempt with the S6B and from the moment of take-off it was clear that the lead in the nose had cured the instability problems. His flight, in the circumstances, was highly creditable, but it was doubtful whether he had amassed enough flying points to put him at the top.

Flair Products showed that the 'Crusaders' were aerobatic as well as being efficient planes and Pete and Dud put in creditable performances. Whether Bergamaschi could improve on his previous flying standard was now the big question. Conditions were certainly better for him than on Saturday, and he now had some



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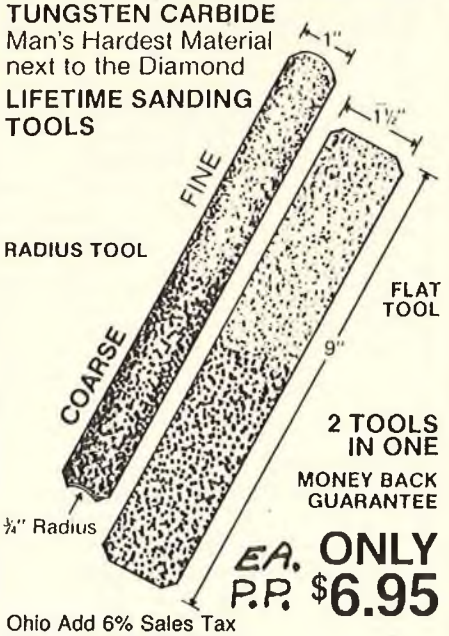

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experience flying in a wind. Competent, accurate and calm are adjectives that might be used to sum up the Italian's flight, and it was quite obvious that he had done more than enough to clinch first place.

So ended a unique occasion and an R/C competition with a larger entry and higher success rate than had been envisaged. There is the possibility of a similar event being held at Calshot next year, and it would be marvelous if we had an increased international entry. Take a look at the Curtiss CR-3 or R3C-2 and I am sure you will get enthusiastic. □

DRIVER PANEL

from page 51

There is an old saying, "I asked you for the time, not how to build a watch." Some of us feel that way about electronics, I don't want to know about zener diodes, phase shift detectors, etc. What I do want to know is, when I turn on the switch, does the black magic box do what it is supposed to do. I won't say that I took the kit into the exotic RCM electronic lab for assembly and oscilloscope testing. That is, because we don't have a lab and that's not the way it happened. I simply assembled the panel on my desk here in the office. Big deal, it was together and mounted on my field box in about an hour. That included stopping to go into our photo room several times to photograph the project. Yes, we do have a photo studio. Also included was taking time to read the instructions before starting assembly. (*And who knows how many times D.T. got up to get coffee, look at the girls going by, etc. . . . p.c.*)

Assembly of the NE Driver Panel only requires that you follow instructions that are so clear, and so simple, that it is almost embarrassing to check off (in a little square box) each step. A person would have to really try hard to do it incorrectly.

Time for the smoke test came quickly so the battery and glow plug were hooked up and the switch was flipped on. A small light bulb came with the kit for first power testing but I had followed instructions long enough and went directly for the glow plug. No smoke, only the rosy glow of the plug element.

There is a trim pot accessible through a hole near the center of the front panel. The pot is pre-set at the factory at a safe starting position and is to be adjusted to match any particular brand of plug. Naturally I had to tweek it each way to watch the plug element glow hotter and cooler. Yep, I kept turning it higher and finally burned out the plug, it sure did

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get white hot. NE says you can crank it up that way and operate the two plugs of a twin in series. When time permits I'm gonna try it on our Fox Twin. Hmmm — I can make a neat wire harness and plug into the side of the fuselage. Later, this isn't the time for that.

The NE Driver Panel has been used numerous times over the last few months and I can give it my unqualified approval. It does everything Northeast claims it will do and does it well. My 12 volt battery certainly goes farther on a charge than previously. I must admit that I haven't used an electric fuel pump with the panel but I do get a 12 volt reading when I insert the probes of a multimeter into the starter sockets. The juice is there if I elect to use it. I am hung up on hand crank fuel pumps, Du-Bro's and Dave Brown's are the pumps that I use.

We all learn something every day. For instance, you can have the starter cranking up a storm, load up the engine real good and the panel just won't do a thing if you don't turn the switch to the ON position. Kinda dumb but it happens. No sweat, turn it on, the panel figures out what you did, applies a bit more current to burn through the flooded condition and the engine fires up like it is supposed to.

That switch serves a worthwhile function. When you are tuning your engine with different props or in different weather conditions, you don't have to disconnect the glow plug clip while you are tweeking the needle, just turn the switch off. Turn it back on for restarts.

Northeast Engineering lists a big bunch of features in their brochure, fewer in their ads, and they are true and beneficial. The Driver Panel is available through hobby shops or direct from Northeast Engineering, P.O. Box 6201R, Bridgeport, Connecticut 06606. List price for the assembled and tested unit is $50.00 and $42.50 for the kit. □

ENGINE CLINIC

from page 50/46

particular kit you are building and do not know how much space you have to work with.

Sorry I cannot help with any information on the U-2, but this is a little out of my line.

As far as adding a Yaw Stability System for added safety — in my opinion this is a bunch of unnecessary gadgetry that is not needed. You are still at the mercy of the transistor gods and are adding more parts that can

fail. All you need are standard control functions and an experienced pilot to fly the model. There are enough components to go wrong in a normal R/C radio installation without adding extra functions that serve no useful purpose. I think if you had a little more experience flying R/C aircraft you would realize this.

I doubt if you would have much luck selling the model to Lockheed, let alone for a U-2 even if 25 years old. I wouldn't hold my breath waiting for a ride in a U-2 or SR-71. I think your chances are about as good as a snow ball in you know where! □

SOARING

from page 45/44

greater freedom in the penetration department. This is a great aid when the wind gets strong and you can't add ballast. Regardless of what ship you choose, I recommend one with not less than 100" wing length and a wing loading between 7.5 and 10.5 oz./ft. It should have spoilers or flaps. These devices are needed to allow quick, but safe, descent from high altitudes and also to stabilize in violent turbulence.

"Where batteries are concerned, don't get exotic. One guy in our club decided to unplug one set of nicads in his transmitter, and plug in a fresh set during the flight. During the operation, one of the male plugs bent, and he had to take his eyes off the ship to fix it. By the time he recovered, the plane was nearly out of sight downwind.

"I used seven AA pencells in my Futaba FP3S transmitter and they went the full eight hours. The voltage was 10 volts at the start, and 8.5 at the finish. For the airborne pack, I used four C cells. At the start they measured 6 volts, and at the finish, 5 volts. I used three S-20 servos for the control surfaces.

"Getting to the physical aspects, the eyes are the first to go crazy. A good pair of sunglasses is an absolute necessity. Watch out for sunburn (and windburn). If your skin is sensitive, wear long pants, and long sleeves. I also recommend that you wear a hat --- I didn't. My flight was in 90° heat, and I experienced a mild case of heat exhaustion. At about the four hour plus mark, I experienced mild forms of vertigo which, with time did get worse. This, I feel, was due to the heat and sun exposure. I had problems stalling and recognizing sailplane pitch attitude. It pays to have a good helper, one who realizes what is happening to you, physically.

to page 142

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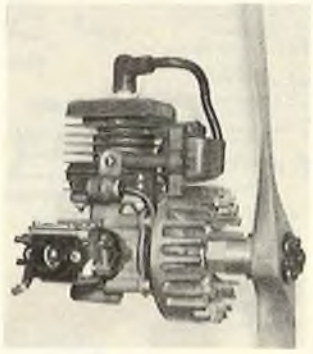
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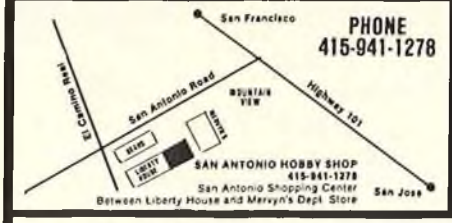

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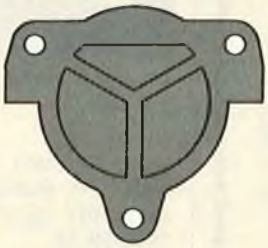

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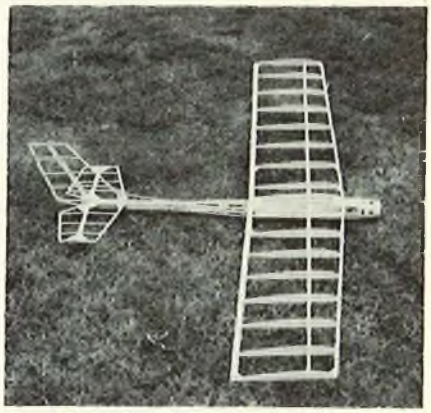
Leo Lenar with 075 geared Gentle Lady.

drive and an 11/8½ Top Flite prop. The fuselage had to be deepened and widened for the Astro battery. Of course, the model had to be built with Super Jet!

Charlie Parker of Van Nuys, California, sent in a couple of photos of his R-1 competition ship. Designed for an 05 system, the model has an increadible framed-up weight of 4½ oz. Ready to fly the ship weighs in at 25 oz. with a 2 channel radio. It is amazing at what can be done with balsa. The ship climbs well and is presently being redesigned for a slightly larger wing.



Parker's R-1 framed — only 4½ oz.

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Remember Silent Power is a quarterly feature of RCM and will magically appear again in the June 1982 RCM.

Until then, Good Flying. □

EZ FLI

from page 39

(Editor's Note: Per the manufacturer, approximately 100 kits were shipped like this, however, it has been corrected.)

The wing was our first attempt at using foam and it worked out very well following the instructions on the plan. Tail feathers are 3/16" balsa sheet cut to size and require a small amount of cement and sanding. Epoxy was used to join the wing and install the servo rails. The remainder of the E Z Fli was assembled using Jet and Super Jet.

When we saw the wing sheeting material (looked like Krome Kote, a light, very shiny card stock), we were less than impressed. "Here was a cheap way to go." Surprise!! The very smooth card stock works easily and finishes beautifully. The plans list several contact or water based cements to attach the wing covering. None of these were handy. So we tested Scotch Adhesive #6081 (which we use to attach sanding paper to sanding blocks), on a scrap of foam and it was not eaten up. All that is required is to spray the wing foam, line up the trailing edge over the dull side of the covering material, and roll the wing on to the covering. The finish is as smooth as you could ever want. A little hint — pre-curve the covering

to page 158

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EZ FLI

from page 144/39

material by rolling the leading edge portion over a 1/2" to 1" dowel or other tubing. This will help when you roll the wing core on to the covering material and prevent it lifting away from the leading edge.

Aileron control horn installation is very simple. "Coat aileron horns with wax, vaseline, etc. Glue bearing blocks in place with epoxy or Titebond. When dry, break horns loose and you will have a good bearing." We had doubts because of all the advertising showing much more elaborate methods. It took a little effort to remove the excess epoxy from around the lubed areas and the horns moved very easily. After test installing the elevator, rudder and ailerons, using the sealed nylon hinges which were supplied, a lot of resistance was felt. We pulled out these moulded hinges and installed pinned hinges. All of the control surfaces then moved freely; there was no resistance.

Covering:

The fin, rudder and fuselage are covered with Super MonoKote. The wing stabilizer and elevator are covered with Kwik Cote. Low temperature Kwik Cote was used so as to not melt the wing foam when using the heat gun. The low temperature film is very fast working and we had absolutely no problems with bubbles. The wing surface was very lightly sanded prior to covering. Another hint (we learned a lot while building the E Z Fli): When using high temperature and low temperature films adjacent to each other, apply the high temperature material first. Reversing that procedure will cause problems. If installed first, the low temperature film will shrink away as you attempt to seal the high temperature film over it at the seams.

Engine:

An old O.S. .25 R/C with muffler was installed since it was the only engine we had available near the recommended size. The O.S. had done yoeman service and was called on to do it again. A 6 ounce Sullivan (SS-6) slant tank was installed using a muffler pressure line to the tank. Our tank centerline was about 3/4" below the carburetor, so pressure was probably needed. The old .25 was on the low side of the recommended power and we felt we should give it all the help we could.

Radio:

A new Airtronics XL 6 channel was installed. Four servos were used (aileron, rudder, elevator and throttle). Since this was our first aileron model, we planned a lot of taxi time getting used to the rudder and nose gear stearing being located on the left stick.

Installing the Airtronics servos was a modeler's dream. Install them where they fit best and let those little reversing switches on the transmitter make them rotate the way they should. There is plenty of room in the fuselage of the E Z Fli for the radio gear. In the near future we plan to have some fun trying bombs, smoke, etc.

The E Z Fli is a good intermediate trainer and we plan to have a lot of fun (?) learning to steer with the wrong thumb. Which reminds us of when we almost learned to drive on the wrong side of the street in Australia. We plan to be more successful with the rudder because the curbs on the street we use as a flying field won't move out of the way as our Aussie friends did when we drove on the U.S.A. side of the road in their country.

Flying:

As mentioned previously, this is our first aileron model, so we asked two of our experienced friends to do the initial flight tests. After much

to page 160

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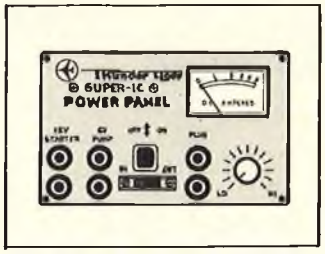

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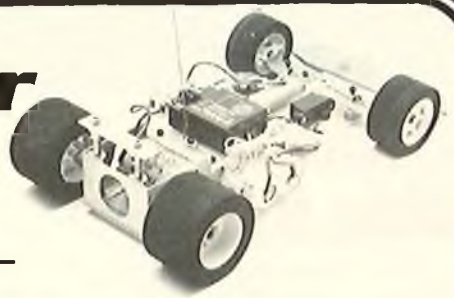

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EZ FLI

from page 158/39

procrastination and questions such as, "Is it ready to fly," valor overcame chicken and we said it was ready to go. No more excuses, kick the tire, light the fire, check yellow and white and launch. Our friend was cautioned about the tired old O.S. .25. The take-off roll was about 150' and a smooth lift-off was made. The E Z Fli was in the air and staying there. It was beautiful. A couple of clicks of rudder and aileron and she flew straight and level. All the basic maneuvers were handled with precision and smoothness. After she was trimmed we took over for awhile and thoroughly enjoyed the greater response given by the ailerons. Our friend took over for the landing and made it look like a piece of cake. She is a rugged bird and a lot of fun to fly.

Conclusions:

The E Z Fli is an easy kit for a builder with some previous model building experience. It is a very solid plane and will be a lot of pleasure for this Sunday Flier. We expect to improve our flying skills as well as have a lot of fun with her. It has been well worth the time, effort and money putting it all together. □

BIG IS BEAUTIFUL

from page 29/26

been impressed with some of the engines they have seen in the past.

In addition to its reliable idle and improving top end, the engine starts very reliably with one or two flips of the prop, once it has been primed. A carefully placed finger over the carb throat, a couple of turns and it will start easily on the first or second flip. Since it is a new engine, that's what I would expect, but I have seen some pretty cantankerous engines in the past which required a good deal of propping before the fire started. This one looks like a real pussy cat and I am looking forward to getting it into the air in the near future.

One of the things about engine performance that we often neglect is as plain as the nose on your face, or more accurately, the prop on your engine. As I have mentioned in the past, I prop my Quadras with the prop that gives me the closest rpm I can get to the turns where the engine produces its peak torque. That, according to TML's

to page 166

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from page 160/26

spec sheet, is at about 7000 to 7200 rpm. It has worked well for me in the past and the Quadra is the engine with which I have had the most experience.

I have thought, however, that we may be propping the engines 'under' what they will take and have been watching Bob Beckman's prop tests with interest. The small industrial engines we are using have a capacity to work very hard and they must do so in many of the applications where they are used. For example, a chain saw engine does its best work, and runs better, when it is under load, and some of the loads they get are siginficant.

Most of the props we have been using are relatively low pitch props, 6", 8" and 10" mainly. The manufacturers supply us with what they feel will sell and, as many of us have considerable glow engine experience behind us, the pitches we are used to seem about the best to us. A few years ago an 8" pitch, and especially a 10" pitch prop, would have seemed very coarse indeed and we would not have used them. Now 8" and 10" are becoming the rule with the larger engines and I am wondering if we would not be better propping our gas engines with even coarser pitches than 10".

I'll have the opportunity to talk with at least two of the producers of large props in the near future and will see if there is a chance of getting even a small sample of coarser pitch props made for testing just to see if there is anything in this idea. I know Wendell Hostetler has been making his own props for some time now and he has used both a 20/10 and a 20/12 on his Skybolt with the 2.44 c.i. Kioritz and prefers the 20/12. I do not know of anyone currently making props for our use in 20/12 size although 20/8 and 20/10 are easily obtained.

Wendell has been using one of his own 20/14 props on his P6-E equipped with the 3.7 c.i. Kioritz with, I understand, quite good results. It could well be that some more thought, and some coarser pitches, could be of significant help to us in our efforts to fly the larger models with adequate power. Especially such models as the WW II fighters, the Pitts and the Eagles, the latter two of which should have much more spectacular vertical performance than I have seen to date.

It is typical, however, of the hobby, that in any new area, there is a rush of new products to the marketplace when it is ready for them. Then there is a

period of steady development where items which may have been overlooked in the rush will receive ever increasing attention as the marketplace is, at least temporarily, satisfied with all the new goodies. I will be surprised if we do not see some such work in the area of propellers, now that we have several good engines on the market, and many fine accessories for our use. It's about time to start the refining process and this should lead to many of the newer products being improved and refined for us. □

F-16A

from page 22

The wing construction is straightforward. Balsa ribs, leading and trailing edges, and spruce spars form the basic structure. After checking to make sure the wing was true, the top and bottom of the wing was sheeted. Goldberg Super Jet made the job go fast, and kept the structure as light as possible.

Both the vertical and horizontal stabs build very fast. The vertical is built over the plan from balsa sheet and then sanded to shape. A rudder is not used on this model. The flying stabs are of conventional built-up construction. Balsa leading and trailing edges, and 1/8" x 5/16" balsa stock form the stabs. After both stabs are completed, they are sanded to an airfoil shape. The instructions show these stabs covered with fabric, but it was decided to sheet both stabs with 1/16" balsa to make painting and finishing easier. Take care in the selection of adhesives. A small increase in weight will increase the wing loading. Goldberg Super Jet was used for all construction except for joining the wing to the saddle. For this wing to fuselage joint, we used 45-minute Hobbypoxy.

Covering:

After the completed aircraft was sanded and shaped, we used Ohio Superstar Soft Glass to blend and mold the fuselage and wing. When the soft glass was dry, the whole assembly was sanded with 220 grit dry sandpaper. Automotive grade lacquer primer was sprayed on for the base coat, while the final finish was sprayed using red, white, and blue acrylic lacquer. K & B Superpoxy clear was used as the top coat.

Engine:

A new Super Tigre X25 was installed in the mount provided. The stock Super Tigre muffler provides quiet operation with a minimum power loss. A Robart pump w/auto mix was later added along with a 9/6

to page 170

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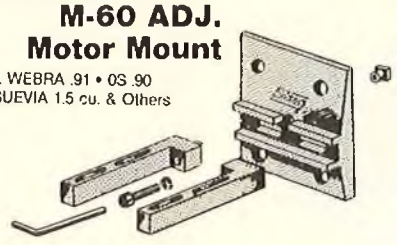

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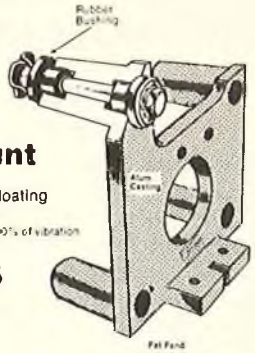

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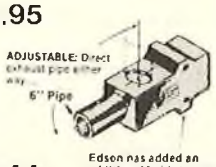

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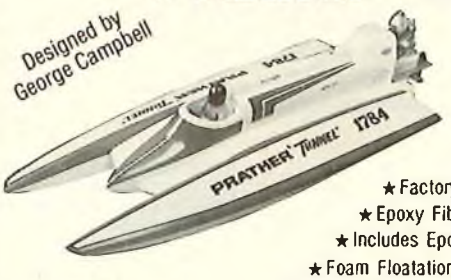

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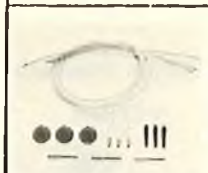

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F-16A

from page 167/22

Zinger prop. Using Sheldon's hobby shop fuel (hot mix of 20% nitro); it really performed.

Radio:

A Futaba 6 channel radio was installed using five servos. The radio is located as far aft as possible to keep the C.G. at the required location. The provided space was more than adequate. The basic flight pack should be installed before closing the fuselage. The pushrods that go forward, have to be installed and checked for free travel prior to completing the final planking.

Flying:

A final check was made for C.G. location and control travel set as indicated on the plans. The radio was range checked and everything was ready for the first flight. With a wing loading at 30 ounces per sq. foot, air speed is your best friend. With that thought in mind, the first take-off was made. The F-16A not only looks like the real one, it flys that way also. Reaction to the controls is crisp and all inflight maneuvers that do not require rudder control are completed smoothly.

Conclusion:

This model is not for the beginning builder or flier. Anyone who has some scale or pattern experience should have no problems. Overall, this is a well-engineered kit with a very complete hardware assortment. Hobby Shack has come up with another winner in their scale series.□

POWER BOATING

from page 13/12

efficiency somewhat. Hydro hull width dictates the maximum distance between your propellers. I would suggest that you try to separate the propeller tips by a distance equal to the diameter of the largest prop you intend to use on your boat.

I would strongly suggest that you use a separate cooling system for each engine. Large engines suffer overheating problems because their cooling surface area is small compared to the heat liberated in combustion. The cooling water should be about the same temperature when it enters both heads. If it is not, one motor will run hotter than the other which is undesirable. The use of separate cooling systems also keeps you from

to page 172

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POWER BOATING

from page 170/12

burning up two engines if the water pick-up should become clogged. I don't think that exhaust manifold cooling increases power output much but it does increase silicon pipe coupler life greatly. This is especially important when running .60 or larger sized engines.

Mr. Power,

I have two questions I hope you can answer for me or refer me to some further reference material for the answers.

First, I understand the application of tuned pipes (resonators) to two-cycle glow engines. My question is, are these pipes applicable for use with diesel two cycle engines and/or four-cycle glow engines?

My second question concerns the theory and application of "exhaust throttles." Of late I've seen them advertised often, but haven't heard anybody speak of using them.

Thank you for your time and attention.

Respectfully,
Kenneth Edwards
Oceanside, California

If my understanding of tuned pipes is correct all two-cycle engines will benefit from the use of a tuned pipe — regardless of the fuel used. Tuned lengths will, however, be different for various fuels. Because I have never operated a diesel two-cycle engine with a tuned pipe, I am not familiar with the potential performance gain one may expect to achieve. Four-cycle engines, however, do not repond to the use of tuned pipes. A cycle, as applied to an engine, is defined by the piston traveling from one extreme to the other. For every revolution of the crankshaft there are two cycles. Two cycle engines fire every revolution since intake and compression occur during one cycle, and combustion and exhaust occur during the second cycle. Four-cycle engines fire only once every two revolutions since intake, compression, ignition, and exhaust each comprise a single cycle.

Let's consider the possibility of tuned pipe operation using a four-cycle engine. Let's start with the beginning of the exhaust cycle where the piston is at BDC (Bottom Dead Center). The exhaust valve opens and gases are forced out as the piston moves upward to TDC (Top Dead Center). The exhaust pressure pulse would start down the pipe as the exhaust valve opens. When the piston starts downward from TDC, the exhaust valve closes and the intake valve opens to allow a fresh charge of fuel and air into the engine through an

intake manifold. Since the exhaust valve is closed the pipe cannot aid the intake of gas through the carb as it does in the two-cycle engine. After BDC, the intake valve closes and the fuel-air mixture is compressed as the piston reaches TDC. The spark plug fires when the piston is close to TDC and, as ignition occurs, the piston moves down to BDC for the power cycle. The four cycles then repeat themselves. Since the exhaust and intake tracts of the engine are isolated from each other by the action of the valves, it is not possible to develop the supercharging effect of a tuned pipe applied to the normal four-cycle engine.

An exhaust throttle is a very good method of speed control for boat engines. An exhaust throttle works on the basic principle that the mass of fuel and air ingested into the motor is equal to the mass of exhaust gasses expelled out the exhaust. If this were not so, the motor would have to store the difference between what goes in and what comes out. If you restrict the flow of exhaust gas you also will decrease the amount of fuel and air that flows into the intake tract. The rate of intake flow determines the power output. When you restrict the exhaust the motor must slow down and produce less power. Exhaust throttles are good throttling devices because restriction of the exhaust keeps the glow plug hot during slow engine speeds. As a result, as soon as you open the throttle the motor responds with no perceptible lag. The use of exhaust throttles also includes the use of a simple venturi on the intake side of the motor. A Super Tigre spraybar assembly is usually mounted on that venturi. This particular spraybar has a very fine threaded needle so that accurate adjustment of mixture is possible. This system is very simple to tune since it involves only one mixture adjustment. Once you set the mixture you shouldn't have to change the setting by more than 1/4 turn for just about any changes in pressure and temperature. This system does, however, have some disadvantages when compared to the use of a carburetor.

The disadvantage is involved with the fact that a fixed venturi size must be used. If a venturi is used, there is a maximum choke area that can be accommodated. This max venturi size is fixed by the low speed torque requirements of launching the boat. For a given prop you will find that it is only possible to leave the beach with a venturi smaller than a particular size. For example, it has been found that (with a properly designed venturi) the maximum venturi inside diameter is

to page 177

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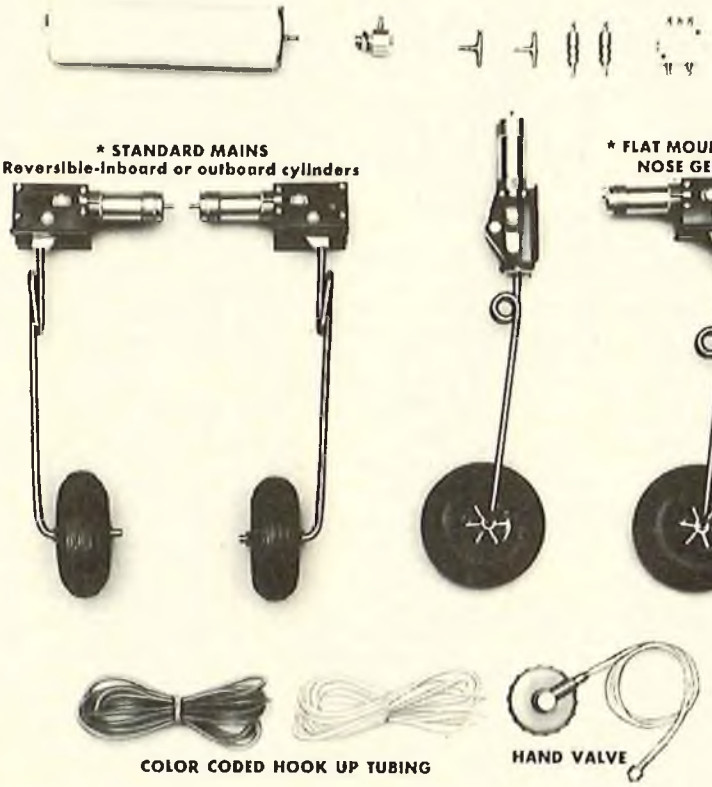

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POWER BOATING

from page 173/12

approximately .500" for a .65 size engine when installed in a monoplane. You must, however, use a smaller size (.450") for a .65 sized hydroplane (assuming that you use pipe pressure on your fuel tanks). It has also been found that, in most cases, we can increase the maximum rpm if the venturi size can be made even larger. In effect, then, the simple venturi can limit high speed performance. A rotating barrel carburetor does not suffer from this problem. When you leave the beach, its choke area is small and you can pull almost any size prop without stopping. Now we can increase the choke area and match the high speed requirement of the engine better.

There are disadvantages to the use of big bore carburetors also. The fuel requirement for low and high speed operation of a piped engine differs greatly. A simple carb with a single high speed needle adjustment just cannot cope with these requirements. Usually if you set the needle so that it is proper at high speed, the motor will run very rich at lower speeds. This low or mid-range richness can produce poor acceleration and slow throttle response. For this reason, I recommend that you use only carbs that have both a high and low speed mixture adjustment. The carbs on both the Rossi and O.S. Max engines are of this type and are highly recommended. The disadvantage of the use of these carbs is the greater complexity of mixture adjustments of two needles. These carbs also seem to be more affected by atmospheric changes and are, therefore, harder to keep properly adjusted. If you want to take the time to learn how to properly use them, big bore carbs will usually boost your power as compared to the use of an exhaust throttle.

Well, that about does it for another month. Remember to send a self addressed, stamped envelope with your questions if you want a quick reply. Send questions, comments and race result to me at the following address: Howard Power, Hobbies Unlimited, 766 Broadway, Seaside, California 93955. (408) 394-1200. □

FLYING LOWE

from page 11

affect the radio system and cause some trim change, particularly if the transmitter encoder or the servos are

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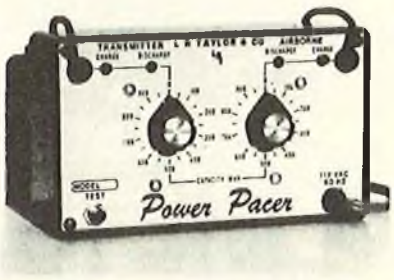

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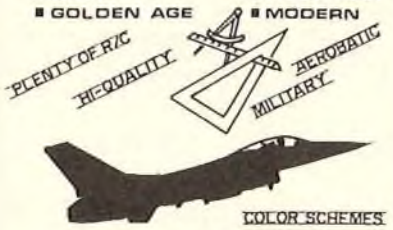

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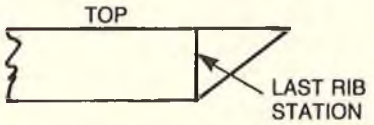
temperature sensitive. My experience indicates this would have to be a large temperature change. The inside of a dark fuselage, however, can get pretty hot in direct sunlight.

Strange Rudder Effects:

I had an inquiry from Lenny Keer of Gilcrest, Colorado, concerning a strange flight condition encountered with his "Contender" design. It seems that this flat wing airplane will roll in the opposite direction with application of rudder, and Lenny wonders if this is desirable in a pattern trainer. The answer to this question is **no!** Ideally the aircraft should not roll in either direction under any flight condition with applicaiton of rudder. The fact that is rolls opposite applied rudder at high speed indicates a lack of dihedral effect. This seems to be a common problem with this design. Some have cured this by sweeping the wing tips up like the sketch below. Adding dihedral will also solve the problem. The amount required is cut and try, but I would guess 1"-1½" total should suffice.



WING TIP

Maybe someone out there who has solved this problem for themselves on this design could help. The fact that the ship rolls in the direction of rudder application at low speeds gets complicated. Swept wings have an increasing dihedral effect with increasing angle of attack which causes increasing proverse roll. The "Contender" design principle influence may be the placement of the high vertical fin relative to the roll axis. In essence, a high rudder generates a roll couple opposite the applied rudder due to the high placement of that force relative to the roll axis. As you increase the angle of attack, at slow speed, that force moves closer to the roll axis generating less adverse roll couple. In any event, no aircraft that I know of is the same in this regard at all angles of attack. You must find the right compromise set-up. Generally we like to set up the yaw/roll couple solution so that the ship doesn't roll at high speed. This makes all rolling maneuvers easier. We also, of course, prefer not to have roll couple in looping maneuvers so that rudder corrections will not roll the ship off heading. Sometimes the best solution in a given design is slight adverse roll at high speed so that no roll is encountered at increased angle of attack in looping maneuvers.

Let's further confuse you a little bit with a discussion of rudder effects. As we stated, a high rudder produces an adverse roll or one opposite the applied rudder. The distribution of the fixed stabilizer and the rudder elements about the roll axis is important. Placing the movable rudder high promotes adverse roll couple; conversely, moving it down reduces it. Placing the fixed vertical stabilizer high promotes **proverse** roll couple, conversely, placing it low low promotes adverse roll couple. Another solution to the problem would be to add a sub-fin with the movable rudder also moved down. You could also add fixed area above the rudder to aid proverse roll couple. If you are confused, think of the whole thing as a wing with an aileron. When the ship yaws the fixed stabilizer sees and increased angle of attack creating lift opposite the applied rudder. This creates a rolling moment which makes the ship roll one direction or another depending on the distribution of the fixed and movable elements. See sketches at beginning of column.

Well, I'll sign off for this time. If you enjoy being confused, send me your inquiries and we'll try to help. □

CUNNINGHAM ON R/C

from page 8/6

story of the very early days of aviation. Dave designed and flew for the cameras an early Bleriot and 1911 Blackburn. Not only did David B. and David T. build the 8' span scale models for the filming, but also three full size, non-flying replicas for ground shots. All of this in eleven weeks! This mini-series has already been shown on PBS but will probably be shown again soon — watch for it. David has several more film making projects on the drawing board, as well as his own flying and writing books and columns.

After pushing the balsa dust aside in his factory to view the DC-3's and then looking inside his traveling van at about ten other aircraft of all sizes, we motored to the Old Warden Airfield for a look at the world's largest collection of flyable antique aircraft. A flying display is made of these aircraft the last Sunday in each month, April through October each year, but we were not fortunate enough to be there on the right day. We visited all of the aircraft on static display, including numerous Tiger and Gypsy Moths, a beautiful, much photographed Sopwith Pup, and lots of antique biplanes. Because David was with us we were allowed into the

to page 186

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12%	13.25	8.25	8.00	7.25	178.00	280.00
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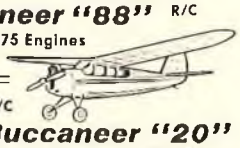

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from page 179/6

restoration room, where a mechanic was working on rebuilding a Bristol Scout. The heady aroma of Nitrate dope was mixed with fumes from a gas heater, reminding me of modeling days before plastic films. The rebuilding work looked like working on a giant model. The wings had been completed but the fuselage framework of oak stringers and longerons was propped up on two sawhorses, and the mechanic was fabricating new parts to fit into the fuselage.

Outside, on a rather cold and blustery October day, we saw a Jackaroo land; the Jackaroo is the enclosed cabin version of the Tiger Moth. This landing was closely followed by a Chipmunk resplendent in its white and red paint job. The field is all grass, as are most of the small British airfields. One day, I'm going to be there for the flying show.

We talked to the manager of the Old Warden and his biggest problem now is trying to find enough money to keep the facility open and the aircraft in flying conditon. The Shuttleworth Trust can provide enough funds to keep the aircraft in static display, but the high cost of maintenance and flying is slowly eating into the reserves. Also in the collection are several mint condition old cars and motorcycles that are also used in vintage films from time to time.

Back from Old Warden we returned to David's home to meet his lovely and charming wife Jill. The rest of the afternoon was spent talking and enjoying getting to know one another, finally topped by Jill's fantastic supper, and a couple of bottles from David's fine wine cellar. We finally caught the 8:30 train back to London after spending an unforgetable day with two very fine people. I'm hopeful that Dave will be able to spend some time with us next summer on his way back from Australia where he is going to be the Chief Judge at the 1982 Vintage Air pageant and Races to be held in Sydney next June, as reported to you last month.

All in all, it was a great trip. We drove just a bit over 1800 miles in Europe, both on super highways, and little small roads that were just not wide enough for a small car and a large bus or truck. Times like that you hang a couple of wheels in the ditch and hope you've given the big guy enough room. On the Autobahns there really isn't any posted speed limits, except when entering a city area, and most of the traffic clips along at 130

kilometers per hour, (about 80 mph). You have to keep your eye on the rearview mirror because every now and then you will see some really fast car overhauling you at speeds well over 100 mph. In all of the driving we never even saw a fender bender accident, but you get the feeling that you are always driving in a grand prix race, especially in city driving.

♦

The other evening I was working on a small fun airplane, soldering 1/16" wire to brass threaded couplers. The wire that I was using is quite liberally coated with an oily covering to keep it from rusting. It suddenly dawned on me that this solder joint is a point of potential problems for most beginners to this hobby. So, let's take a minute to mention how to make this a good solder joint, one that won't let go when your bird is airborne.

First, naturally, you must have a good quality soldering iron; second, use a good quality metal repairing solder and then soldering flux. Be sure to use resin flux as acid flux will later corrode the metal parts. Most solder comes with flux in the core, but this never seems to be enough for good wire soldering. Buy a small can of flux, it will last at least a couple of lifetimes. The secret to making a good soldered connection is to have the wire clean. Wipe off the end to be soldered with a bit of rag dipped in dope thinner. This will remove the oil coating. Then take a piece of fine sandpaper and lightly sand the portion of the wire which will receive the solder. This will remove the oxidation from the wire and expose the bright metal. Slip the sanded wire into the brass fitting (or, if joining two pieces of wire, wrap with thin copper wire), then heat the joint with the point of your soldering gun. Do not melt the solder with the soldering gun, but heat the part to be joined, then let this heated joint melt the solder. Dip the end of the solder into the flux, then rub the solder over the heated joint, applying a bit more heat with the soldering gun as you do this. The heated joint will melt the solder, letting it flow in and around the joint, making a connection that will give you lasting service. If you don't heat the joint (but simply melt the solder and drip it onto the joint) you will have a "cold connection," one that will surely come apart in the air at just the wrong time.

Another tip for those of you who are interested in scratch-building is to always square up the balsa sheets before you use them. The easiest way to do this is with an X-Acto knife and a good straightedge. A good straightedge can be had from the local hardware store. You can purchase an

to page 189

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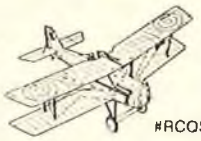

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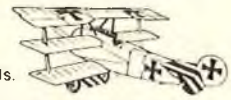

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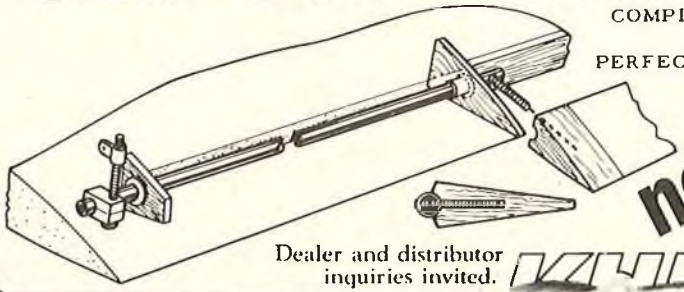

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CUNNINGHAM ON R/C

from page 187/6

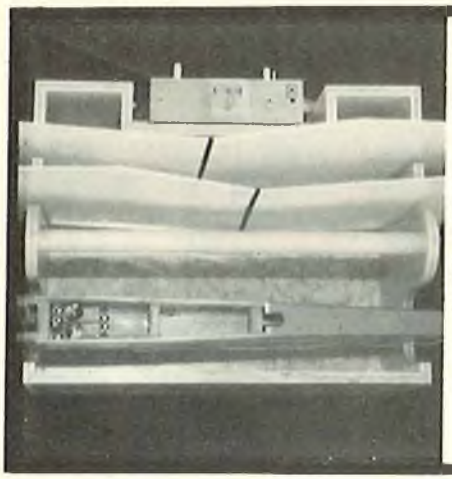
aluminum angle about 1" x 1" x 1/8". A 4' piece is super handy for squaring up long pieces of balsa sheet. You can hold onto it easily, yet keep your fingers away from the edge of the X-Acto blade. Speaking of blades, you do know that you can sharpen and reuse these blades many, many times — don't you? Just use a small knife stone and keep honing the blade as you work, you will always have a sharp blade handy this way. Cutting MonoKote seems to dull a razor blade very rapidly, but by constant resharpening of the blade you can keep on slicing through the MonoKote and the balsa wood.

If you've had trouble with the tailwheel tire slipping off of the hub after a landing, an easy cure is to remove the tire from the hub, squirt a bit of silicone rubber on the rim, then slip the tire back into place. Once I had trouble with the tailwheel tire splitting open on one of my large biplanes. I squirted a load of silicone rubber into the split joint of the tire, taped it together with masking tape, and it has since been running a year with no more problem.

Last month I reported that I was busily flying my new model the 28% size Turbulent. Since this has proven to be such an enjoyable aircraft, I have been working on the plans for a .90 size with 84" wingspan and for a .40 size with 60" wingspan. Currently I'm building the .40 size, and if I can ever get everything wrapped up, I will get it done and into the hands of RCM for a construction article on either the .60 size or the .40 size, then set about building the .90 aircraft.

Speaking of .90 brings me to the

to page 192



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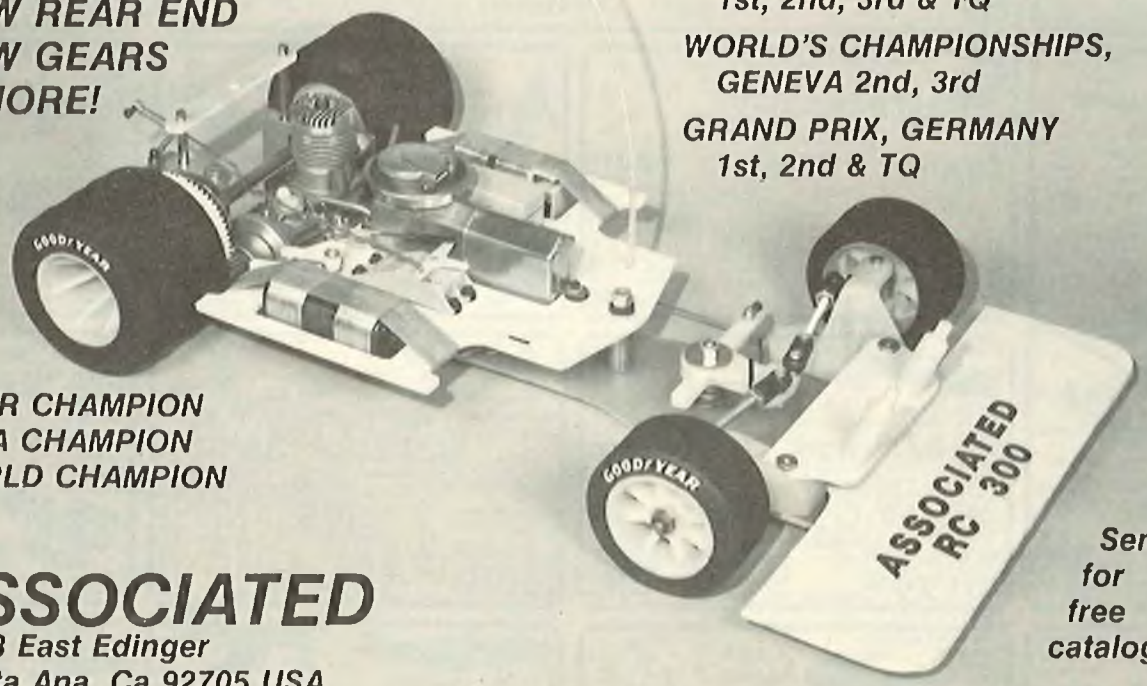

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CUNNINGHAM ON R/C

from page 189/6

subject of large aircraft. This summer, again --- the third weekend in July --- we are going to put on the Fifth Annual Southwestern Jumbo Fly-In. It is possible that the Fly-In this year will be combined with another Fly-In to bring you an even better big airplane show. Plans are not firmed up yet, but will be by the next issue. Mark your calendar now, and in the future I will give you some more info on the Fifth Annual Southwestern Jumbo Fly-In. □

FROM THE SHOP

from page 4

event will demand finesse in making turns and still will demand ballast, but the initial dive is shortened and the "Gees" in the turns are lower. Experience shows that 30 seconds for the four laps is very good time. Any takers?

Another major change is in the winch department. Twelve volts only, with a "weak link" insert in the line to give a breaking limit of 40 to 50 kilograms (88 to 110 lbs). One millimeter monofilament is the standard to be used. And, for those of you who still like to hand tow, there is a 175 meter length option for use in "pulley" systems.

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Remote launches are out: the launcher must stand parallel to, or in front of the winch. Working time in speed is raised to 5 minutes.

Man-on-man is out for distance, as is the unlimited lap scheme. (Lots of

to page 195

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from page 192/4

objections from people who had personal axes to grind, I'll bet.) Also, there are frequency problems in Europe that hinder man-on-man, as well as problems in true random selection.

Well, that should open things up for almost all fliers in the club to try FAI, since speed was the major problem. Also, large models will do well in 4-lap speed, if they turn corners crisply. With the "Midwestern" models being developed for good L/D ratios to help in penetrating our usual gales, we should be able to do well in the new speed event. Also, correspondence with fliers in California and England tells of 2-meter models flying the 4-lap speed course in 30-second range, so all you 2-meter specialists take note.

★

A most deplorable situation is described by Bob Wallace, member of the Northern Connecticut Radio Control Club Inc., East Granby, Connecticut.

An Open Letter To All R/C Clubs
Subject: Flying Field Loss due to Deliberate Frequency Interference

The intent of this letter is to inform you of the frustrating dilemma which our club has suffered through over the past 18 months. This is a problem which could easily confront almost every R/C club in this country. It is unnecessary to sequentially recount all of the events leading up to our loss of our flying field, as this would be repetitious and quite lengthy. Basically, it involves one individual who has rendered our flying site unusable. The Northern Connecticut Radio Control Club Incorporated flying field "was" one which was in continued used for over seventeen years. It featured paved runways, an equipment shed, public address system, a barn which was used for storage of our tractor and grass cutting equipment, fencing, picnic tables, toilet facilities, and a spacious spectator and parking area. During our seventeen years of residence; our club established and enjoyed an excellent relationship with the town of Suffield, in which our field was located. A few years ago an individual purchased an existing home across the road and several hundred yards from our flying site. This individual purchased the property fully aware of our existence. Shortly thereafter, our troubles began. This individual has driven his automobile onto our flying field (beyond the spectator parking area and onto the runway) on several

to page 197

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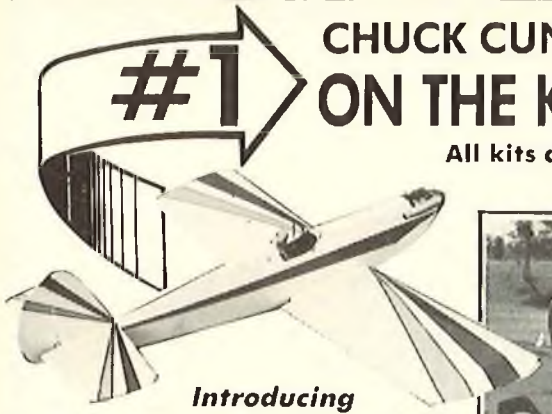

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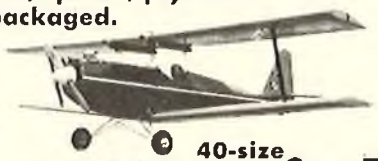

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FROM THE SHOP

from page 195/4

occasions, (once narrowly missing a club member) in order to verbally berate club members who were using our facility at the time. He has shot at in-flight R/C aircraft with a rifle, and is suspected of using the club facilities for "target practice" on other occasions. He has filed continual complaints with the police over aircraft noise and property overflights (sound familiar?) with such a frequency that the police department finally told him that he would be arrested for false complaint if he persisted. (Note: our club rules require mufflers and, flying over the road, our parking and pit areas, and adjacent property, has always been prohibited). After brief respite from this individual's harassment, unexplained R/C aircraft crashes began to occur on a regular basis. It was not long before a definite pattern emerged, whereby these crashes always occurred on week nights or on weekends when this individual was home. Weekday flying (except holidays) was uneventful. As our club did not possess a frequency scanner at that time, we could not confirm our suspicions. Our club then arranged for the setting up of elaborate monitoring and homing equipment, which was operated by qualified personnel. Test aircraft were flown on the 27 Mhz and 6 meter bands as well as "sacrificial" aircraft on several 72 Mhz frequencies. The suspected individual was observed to be home and working in his yard at the time. When ever an aircraft was flown, the suspect could be observed entering his house and seconds later, the monitoring equipment would verify an interferring transmission which sequentially covered the entire 72 Mhz band and 75 Mhz as well.

Mobile tests confirmed that the interference was from the suspected individual's home. A whip type antenna was also observed on his garage. There was absolutely no doubt that this individual was deliberately shooting down R/C aircraft via interferring radio transmissions. At this point in time the plea from club officials was for the membership to be calm and patient and above all, not to attempt any form of retaliation against our suspected tormentor; while the club solicited the help, and, assistance of both the AMA and the FCC, in dealing with the matter.

Both the AMA and the FCC were notified and provided with all background data and information. (At this juncture, it becomes all but impossible to recount the remainder of this report without doing so in an extremely bitter tone, as both our

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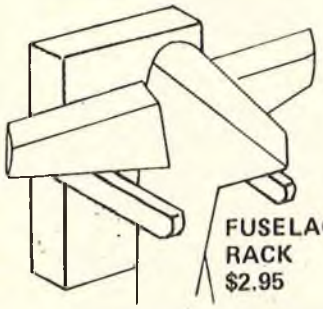

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AMA and the FCC offered little help on this matter.) The FCC refused to verify and comfirm our findings, and offered an endless variety of excuses as to why they could not make a field inspection. It would appear that the FCC is nothing more than a bureaucratic agency that exists for the singular purpose of justifying its own existence!

Our own AMA Headquarters staff offered little additonal assistance. It was suggested by our executive director, Mr. Worth, that we reason with the suspected individual. If either Mr. Worth, or whoever was delegated to write his response, had taken the time to scan the documentation that was provided to the AMA on our dilemma, he would have been aware that our club had spent well over a year doing just that! During the period of prolonged indifference by the FCC and AMA, our problem was further compounded. Our field is leased on a yearly basis. In order to meet our lease payments, our club hosts a full season of contests to obtain additional income. With our flying field being rendered unusable; we systematically cancelled our entire season of varied contests. Our club "hung on" and scraped to meet our quarterly lease payments in the vain hope that the FCC and AMA would provide the necessary assistance to rectify our problem. After all, we were in the right, and were following all the proper rules and regulations. After many months of naive optimism, it became readily apparent that no help would be forecoming from either the FCC or the AMA. The decision was reluctantly made, not to renew our lease. We are presently a club of 120 members without a flying field. The primary purpose of this letter is not to berate the FCC or the AMA, (although it is impossible not to do so) but rather to make it clear to other R/C clubs that, should they be faced with a similar problem, that they can expect to fight their "Battle of the Alamo" — **alone**! Unfortunately, in a fight such as this; being in the right doesn't mean much! As an added side note, our club also sought legal advise relative to initiating a civil court action. We were advised that this would cost several thousand dollars, take a minimum of two to three years and that our chances of winning were less than 50% due to the difficulty in proving that the suspected individual's actions were deliberate!

The last item this month is to advise the world that Dick Tichenor has been sentenced to perform the RCM post flight airplane clean-up chores for 1982. This is his punishment for misspelling **Valkyrie** in our January issue. That'll learn 'em, durn 'em. □

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