JULY 1980 $2.00 ICD08540

MODEL AIRPLANE NEWS

with R/C Boats & Cars

RC Trainer: Bridi GLA

CL Scale: Messerschmitt Bf110

F&B Review: UTOPIA

0 07
74820 08540

A few words about me.

I am Electronic Engineer and this is my day job.

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

The first was electricity and the second the bluesky.

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

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

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

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

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

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

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

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

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

Λίγα λόγια για μένα.

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

Model Airplane News Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) The building plans of airplanes in full size can be found on websites listed in the table.

3) Articles building planes exist within and on the websites listed in the table.

4) Pages reordered.

5) Topics list added.

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

All Plans can be found here:

Hlsat Blog Free Plans and Articles.

http://www.rcgroups.com/forums/member.php?u=107085

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

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

Contributors:

Scanning by Hlsat.

Editing by Hlsat.

Thanks Elijah from Greece.

got a minute?

by DON TYPOND

• By the time you read this, our Reader Survey will have been kicking around for a couple of months. But as I write these words, it's been less than a month since the May issue hit the stands, and I haven't gotten a definite handle on the results yet.

A few comments are in order, however. First off, I must apologize to those who looked high and low for a survey card and couldn't find one. Fact of the matter is, the poor underpaid soul who operates the stapler down at the printing plant missed a few issues here and there and the cards got left out. We could have avoided that problem by printing the questionnaire on one of the pages of the magazine, but we figured a lot of you wouldn't want to tear the page out, put it in an envelope, address the envelope and put a stamp on it. We expect a greater response with the post-paid card, and we were willing to accept the risk of missing cards due to bindery errors. One thing has been very gratifying . . . many of you took the time to write in to ask for a card, or to give us your opinions in letter form. I thank you for your interest in *our* magazine!

And now, before the lynch party gets too much closer, I must extend hasty apologies to all the combat fliers who noticed their favorite event was missing from the control line preference section. Believe me, guys, it was not intentional! Some of the comments accompanying the write-in votes were pointed; one guy wrote, "What? No combat?" and another said, "How *could* you?!" I'm sorry . . . honest.

While on the subject of write-ins, let me express my profound gratitude to the enlightened gentleman who brightened what would otherwise have been a rotten day by adding "Got a Minute?" to the monthly-column list, and making it his number-one preference. I am forever in your debt, sir.

"Why was 'Got a Minute?' left off the list in the first place?" you ask. Simple. Regardless of your vote, I intend to continue to inflict this monthly meandering on you. Also, I didn't *want* to know just where, on your list of preferences, you would put it. My pride is a fragile thing, and must be treated with great care.

As I said earlier, the results of the survey are, as yet, inconclusive. Certain trends have emerged, however, and they aren't really very startling.

Of the major categories of reader preference, RC Aircraft leads with just less than 68 percent of the vote. The most popular subdivision is Sport, followed by Scale, Sailplanes, Pattern, Monster Scale, Old Timer, Helicopter and Pylon. Sport accounts for almost half of the RC activity, and Scale for almost a quarter of it. Obviously, these are the most popular areas of RC flying amongst our readers.

Next in popularity is Free Flight, which has pulled in 11.5 percent of the vote so far. The spread between subdivisions is not nearly as wide as in RC, with Power, Scale, Old Timer and Sport in almost a dead heat for first place, and Rubber, Indoor, Towline, FAI and HLG following in that order.

Control Line is close behind Free Flight with 10.8 percent. Stunt is the preferred activity, followed closely by Sport and Scale. After them it's Combat, Racing, Carrier and Speed.

RC Boats has so far pulled in 9 percent of the vote, with Sail and Hydro sharing top billing, followed closely by Deep Vee, Outboard, Scale, Sport and Mono.

The relatively new sport of RC Cars came in with a respectable 2 percent of the vote. The overwhelming choice seems to be 1/12 Scale Electric, followed by 1/8 Scale Gas and Dune Buggies.

What does it all mean? I really won't know until all returns are in. I also have yet to analyze the preference in monthly columns and other information you've provided. One of the things I've found amusing, though, is the reluctance—accompanied in some cases by downright hostility—of some respondents to divulge their annual incomes . . . even though the response is totally anonymous! Ah well, some things are best left to God and the IRS.

SUBSCRIPTION PRICES
U.S. & Possessions: 1 year $20.00; 2 years $37.00
Canada: 1 year $21.00; 2 years $38.00
All Other Countries: 1 year $22.75
Payment from all countries must be in U.S. funds drawn on a U.S. bank.

Change of Address—To make sure you don't miss any issues, send your new address to Model Airplane News, Subscription Department, 837 Post Road, Darien, CT 06820, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage. Duplicate issues cannot be sent.

Published monthly by Air Age, Inc., 837 Post Road, Darien, CT 06820. **Connecticut Editorial and Business Offices: 837 Post Road, Darien, CT 06820, phone 203-655-7737.** Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary/Treasurer. Controlled Circulation Postage paid at Gordonsville, VA 22942.

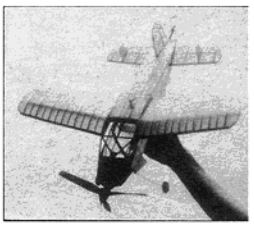
MODEL AIRPLANE NEWS

with R/C Boats & Cars

Volume 101, Number 1, July 1980 51st YEAR OF PUBLICATION

cover story:

The airplane in flight is Joe Bridi's GLA, a .40-powered four-channel trainer. Step-by-step building instructions begin on page 28. The plane on the grass is Earl Haury's Utopia, and you can read his review on page 34.



FF construction:

Gumband fans will like the Hyperwind, a pseudo-scale rubber job that's a composite of two popular homebuilt designs. Build it for sport, or for Embryo Endurance contests.

CONTENTS

For Engine Lovers Only

by GEORGE ALDRICH

• Old memories really filled my mind these past two weeks (this is being written in late March), as I moved forty-odd years of modeling accumulation (junk, the wife and daughter call it). Most of it had been in storage above the machine shop, and since we were moving the shop, machines and all, the rest had to come along. In order to make room for the lathe, mill, hone, etc., we had to clear out a storeroom for all the various things too valuable to throw away that were in the garage.

Sailplane, Zipper, Playboy kits; the original Nobler and Flite Streak kit, the latter pretty well decimated by termites a few years ago; all in a spare bedroom now. I can just stand in the door and remember more good times than anyone has a right to.

But right in the middle of moving, last Saturday, along comes a super nice guy with, among other things, a like-new K&B .29 ignition engine. Needless to say, he left without the old engines he'd brought. We took a break the next day and spent an enjoyable few hours cleaning and restoring them. We can't help but wonder if there aren't some of you out there who share our interest in caring for and restoring these old mills. There are so many new products on the market that we could do a whole column on their use and various other tricks in restoring the old mills as well as new ones. Let me know, and if there is enough interest shown, we'll do it.

All the boxes aren't unpacked yet, and the lathe isn't mounted and leveled (to .004" in 20 ft), but when we get it all done, a series of photos is planned on various setups and operations we've worked out over the years. If you have some pet "trick" you'd like us to cover—let me know.

We have a number of letters this month to share with you. The first is from Larry Miles, of Mission, Kansas. Larry writes:

"Even though your column in the April 1980 issue of *M.A.N.* was beyond me as far as it being useful to me personally. I nonetheless enjoyed it primarily because it's nice to see a guy who is really knowledgeable sharing his expertise with the rest of the modeling world. I'm sure there are some guys who are way up in the modeling world who will find it useful and very enjoyable to them personally. However, the vast majority of your readers would probably appreciate more articles that they themselves can use and share with their fellow modelers.

"I'm not an engine expert by any means, so I can't give any specific directions as to what I believe would be more appropriate, but here goes anyway. It seems as though more basic information might be useful to more people, things such as:

" 1) Precautions to observe when removing a plug from a hot head and replacing a plug in the hot head, because the expansion rate of the head is greater than that of the plug, lessening thread contact and increasing the danger of stripping a head or getting a plug in too tight so that it can't be removed when the engine cools.

" 2) Dangers of cranking a flooded engine with battery attached to glowplug.

" 3) Tilting an engine to help remove a flood.

" 4) Engine wear and destructive vibration effects from an imbalanced prop or spinner.

" 5) Suggestions on how needle valves can be shortened so that they aren't as apt to break when that inevitable crash occurs.

" 6) Filing a jeweler's screwdriver to a point to use as a scribe to better center holes for drilling in motor mount.

" 7) Suggestions on fuel to use for various types of flying.

" 8) Suggestions on how to extend plug life.

" 9) Suggestions on prop type for the Sunday flier as well as the competition-oriented modeler, depending on weight of craft, weather conditions, etc., as well as engine type.

"10) Care of a new engine—things such as tightening all screws and perhaps removing the backplate to check for filings from machining.

"I think you should definitely continue to write articles aimed primarily at the expert or near-expert. But since beginner and intermediate fliers also need help, perhaps your column could be divided into sections for beginner, intermediate, and advanced modelers. I believe that even the advanced fliers would appreciate the other two sections because these would refresh their memories and make them better equipped to help the less advanced. And, after all, that's half the fun of modeling—sharing with others."

Now that's a letter! One or two like yours each month, Larry, and my job is a lot easier. Not that my answers will carry all that much wisdom, but we'll take a whack at it.

1) The best solution for avoiding stripped head threads is to buy a 1/4-32 die, chase the threads on all your plugs, and then put a drop of light oil on them. It also wouldn't hurt to get a 1/4-32 tap while you're at it, to clean up the threads in the head. You must remove the head to do this, to avoid getting chips in the cylinder. We prefer to use a hand chuck to hold the tap for such light tapping operations, as the jaws will allow the tap to slip, avoiding breakage in the event that the teeth clog and lock up. We bought ours at Sears for 99 cents some 15 years ago, but it has saved us at least $100 in unbroken taps. A hand chuck probably costs $5 or more today.

2) & 3) The best way to crank a flooded engine is to grab the prop in your fist (battery connected) and pull it through compression until you feel it bump. Then flip it hard—but just *once*! The rule is never flip until you feel it bump. By pulling the "wet" engine through compression slowly, you get it to fire over TDC (top dead center), and the next flip will be with a fuel/air ratio not quite so "wet" and more ready to fire.

What Larry is referring to when he speaks of "tilting the engine" is really turning the engine over so that the head is down, while keeping the piston at BDC (bottom dead center); or, in other words, the exhaust open. This allows the overaccumulation of fuel in the crankcase to run through the by-pass port(s) and into the cylinder. Rocking the shaft a few degrees in each direction will aid in breaking surface tension so that most of all that juice gets into the cylinder. Now close the exhaust port so that the piston fully covers it, and roll the engine over until the exhaust is pointing straight down. The exhaust is then opened again and the shaft rocking bit repeated. If the engine was flooded very badly, you'll see the fuel really run out. Now is the time to go into the bump-and-flip routine. Just remember that if you continue to flip a flooded engine without bumping it, you're going to get whacked sooner or later.

4) Vibration, whatever the cause, causes wear more noticeably in engines with plain bushing-type bearings for the crankshaft. The model will really take a beating, though, as well as RC gear. The time it takes to balance a prop is well worth it.

5) Unfortunately, I've never seen any needle valve, however modified, that can withstand a real "planting job." With profile models, it's a very good idea to install the needle-valve system so that the needle sticks up rather than down. (Then

(Continued on page 7)

FOR ENGINE LOVERS

(Continued from page 6)

I'd always manage to land inverted and knock it off anyway.)

6) Rather than file down a jeweler's screwdriver, small scribes can be bought at most good hardware counters and these will do a real fine job of laying out hole patterns. We use a good ink marking pen on small metal parts for layout.

7) Far be it from us to tell you guys what fuel to use. However, the cost of fuel is going to tell you what to use. All the fuel ingredients are going up, have gone up, and will go up more before the year is out.

8) We ran the same plug in our original Nobler for over three years and it was still good when we changed it. All things being equal, if your particular engine is blowing a plug every flight, or even every five runs, you are doing one or more of the following: a) using too much nitro; b) the head/piston clearance is too close; c) the engine is run too lean; d) the engine is not broken in, i.e., it's still too tight and overheating; e) you are willing to sacrifice a plug or more to go faster, no matter what the cost.

If your engine is a plug-eater even on low-nitro fuel, the quick cure is to add one head gasket at a time until it stops. The other combinations are obvious.

9) I'll probably get some flak on this one, but I've never cared for nylon props on any engine over the sport .15 size. They cut badly if you get hit, and at high rpm they have a bad habit of shucking blades.

When it comes to props, my advice is to use the best one you can afford; and no matter what it costs, check it for balance. We had a good friend who splattered a very nice model, a fine radio, etc., all because of a cheapie wood prop that threw a blade. When the blade went, the resulting vibration gliched the RX and model and all really "planted."

10) You have covered part of the care of a new engine and we did a bit on break-in in last month's column. There is one good point about tightening head screws. Do it while the engine is *hot*, and with the plug removed. Tighten the screws in a triangular or opposite pattern, feeling the piston through TDC all the time. As a new engine is run-in, all the parts move around getting seated. It is at this stage that a compression leak around a gasket can occur. One of the first signs of an engine leaking compression is its tendency to go lean, run erratically, or, in the extreme case, just quit for no reason. We've cured this problem many times by merely tightening all the screws on the engine.

We really appreciate your thoughts, Larry, and you can consider yourself in that elite, top ten percent who bother to write at all. As stated before, this will always be an open column for all ages and stages.

Next we have this letter from George Fuchs, of Bogota, New Jersey:

"As I read *M.A.N.,* your column for engine lovers takes me back some years when you talk about Bill Winter. If it's the same Bill Winter, I made and flew models behind his home in Bergenfield, New Jersey, back in the 1930s. Last time I saw him was in New York City, about 1950, when he was the editor of a flying magazine. I would like to hear from him again. As I said, your column sure brings back memories."

George, I'm sure you know the same Bill Winter, and he is presently the Editor of *Model Aviation* magazine. He can be reached c/o Academy of Model Aeronautics, 815 Fifteenth St. NW, Washington, DC 20005. You listening, Bill?

R. Livingston, of Flushing, New York, sent us this SOS:

"Maybe you can help me? I am trying to locate a complete crankcase for my ignition type, Forster 29, rear rotary intake, model engine. Can 'For Engine Lovers' help me?

Well, we can't supply you with a part for your Forster 29 ignition, but we can suggest that you join the Model Engine Collectors Association. Write to Hank Hilscher, P.O. Box 725, Indianapolis, IN 46206, for membership information.

And from Tommy Biggs, of Hemet, California, came this request:

"In the February 1980 issue of *M.A.N.,* on page 54, there is a speed jet aircraft pictured. Can you tell me the name of that type of jet engine, and also where I might purchase one?"

Tommy, I've gone through all kinds of lists and I can't find a current address for the Dynajet engine. You might contact Franco Marcenaro, 8917 Random Rd., Ft. Worth, TX 76179. Franco is one of *the* brains on pulse jets and may be making a small production run of his new design. Hope this helps you.

Finally, we have this letter from Father Robert Stemper, of Appleton, Wisconsin:

"My interest is somewhat in 'collecting,' but I would like to get a season or two of flying out of some second-hand engines. The trouble with many used engines is a worn conrod. Would you like to write an article on conrods and maybe cover some of the following:

"1) What makes them last?

"2) What makes them wear fast?

"3) How snug a fit is desirable for either end?

"4) Have you ever bushed a rod that was originally unbushed?

"5) What do you suggest about building a rod from scratch for an out-of-production engine?

"6) If a person bores out the piston and rod for an oversize pin, how critical is the weight of the oversize pin?

"7) What material would you use?

"After conrods, would you consider writing an article on how to lap an engine? That is, how a 'green' mechanic should go at it so as not to damage the engine. What tools should he acquire? What lapping compounds? One old modeler was in favor of Pepsodent toothpaste to lap in .049 racing engines."

You didn't say what kind of engines you wanted to get a "season or two" out of, Father Bob, but if they were originally ignition engines and you plan to run them on glow, please don't! There were a few like the O&R front valves that will take it, but most will just eventually self-destruct.

To take your questions in order:

1) The best conrods seem to be machined from 2024-T6 aluminum (excluding some custom rods from titanium or steel), or those like Fox makes for his new twin, which are steel. There are stronger aluminum alloys, such as 7076-T6, but after 400-450°F is reached, the 2024-T6 hangs in there longer than the rest.

2) Fast wear at either end of the rod is usually due to poor alignment or the wrong material. The best bushing material we've found is known as "oilite bronze." I believe it is a sintered material, i.e., a bronze powder, highly compressed into a solid, machinable form.

3) In general, a rod should fit the crankpin or wristpin so that it will just spin freely. These fits vary as to the diameter of the parts to be mated. Some are reamed to a running clearance fit and some are honed. Since reamers are darned expensive, let me give you a home workshop method of fitting and rebushing a rod to the crankpin. This is, of course, assuming that you have a lathe to turn the bushing stock. Let's say that the crankpin diameter is exactly .250", and the hole in the bottom end of your conrod is .294" after you have pressed the old bushing out. You first want to drill an undersize hole in the bushing stock with a No. D (.246") drill only about 1" deep. Now turn the o.d. to .295" o.d. x 1" long and cut it off. You now should have a cylinder .295" o.d. x .246" i.d. Using a knife or file, put a slight chamfer on one end of the bushing stock and put it in your freezer (ice tray section) for about five minutes. Heat the proper end of the conrod with a match for a few seconds, grab the housing cylinder out of the 'fridge, and push the chamferred end into the big end hole. If it doesn't go all the way in, just hold the rod up against the closed lathe chuck jaws, push the tail stock up close, and lock it into the bed. With the drill chuck jaws closed, just turn the tail stock in very slowly until the bushing is seated flush with the back side of the rod. Now that you've read this, it will be easy to pop that bushing home while it's still cold because you can have everything ready. After the rod and bushing are back to room temperature, cut the bushing off flush with the rod face with a fine-tooth Zona or X-acto saw, and dress both surfaces smooth with a fine mill file.

Your next step is to run a .250" or No. E drill through the bushing. This can be done on a drill press or vertical mill, but you must use extreme care in feeding the cut.

(Continued on page 42)

flight line NEWS

by PAPPY deBOLT

• The continuing saga of the "Magic Muffler" . . . It was expected that the muffler story in the April 1980 issue of *M.A.N.* would create interest, but the *amount* was never anticipated! I hope that I have managed to answer all the inquiries, but there are some areas in which I do not have positive answers since I am only the "go between," working with information supplied by Ian McCaughey, the developer from Australia.

The number one question relates to the type of engines and models that can benefit from the muffler. The info on hand indicates that a muffler can be tailored to fit any engine for use with any type of model. Basically, the muffler was developed for use with .40 racing engines and RC Pylon models using FAI (no-nitro) fuel. However, enough information has been accumulated so that design parameters could be computerized in order to project muffler design for any purpose. As an example, a prototype muffler is currently being tested on a .60-powered pattern craft, with excellent results. A comparison has been made with a normal tuned pipe, and the muffler version shows an initial marked improvement. When the development is complete, the final results should be interesting.

The number two question is "where and when can I get one?" I don't have an answer to this one. It is possible that some version of it may be available in Australia . . . I have asked for a clarification of this and will report when the answer comes. I do know that negotiations are under way to make a commercial version available in the U.S.; however, seeing one in a hobby shop could be in the distant future.

The number three question comes from people interested in building their own or in developing the design themselves. What is asked for is the "formula" or "design parameters" developed by Ian McCaughey. I simply do not have any of this information, and, frankly, considering the possible magnitude of the commercial applications, I would never ask Mr. McCaughey to furnish this data to me. However, it is natural to be interested, and for some to have the ambition to try developing such a muffler themselves. It can be seen from the April story that Ian McCaughey has already given us some basic information. With a bit of research and the dimensions given, a start could be made. I can say this: the sample mufflers appear to be assembled from relatively heavy-walled tubing. The drawing that appears in that article represents the outside shape of the muffler. All dimensions indicated are *internal* dimensions. It is the *inside* of the muffler that does the work and it is the internal dimensions that must relate to each other.

What has been interesting is where the questions have come from: a number of Formula I people have made expected inquiries. Does this mean that these people are seeing the handwriting on the wall and realize that we will have to use mufflers for racing in the future? My own efforts indicate that there is no real problem encountered when installing a muffler in a Form I airplane; however, using it may be another story and only the coming good weather will answer that question. Boating people have also been asking about the muffler. Apparently they see a noise problem, too, and are looking for the best solution. But by far the greatest interest has come from pattern fliers. These people appreciate the advantages of a tuned pipe, but are also suffering from the pipe's disadvantages. It seems obvious that the "Magic Muffler" could offer them more than the pipe does, without many of the disadvantages. With all this pattern interest, I was happy to hear that some development is going on in Australia for that purpose.

I realize that all this information, or lack of it, can be exasperating. However, it must be understood that Ian McCaughey and Rayjet Phelan are simply two ordinary modelers, just like you and your flying buddy. This thing was a "cellar effort," done merely to improve their own flying. Thus a lengthy process is involved if it is to be turned into something commercial.

I was happy to learn from Tom Prosser, the Australian FAI Pylon representative, that Cliff Telford had been supplied with a sample muffler of this type some time ago. This gave me someone else in the U.S. who might have some info, and a letter to old friend Cliff brought a quick answer. Cliff has had a muffler for a long time; apparently he obtained a very early sample through a friend in Tasmania. As we all know, Bob Violett and Cliff were the FAI "kings" of the U.S., and even the world, a few years ago, but they have since turned their attention to other facets of modeling. Since the muffler came after he had given up FAI, it was of only passing interest to Cliff—meaning that very little testing or experimentation was done. The initial testing that was done showed an increase of about 600 rpm, which is far below what I have seen. However, it is a quiet muffler and did show a power *increase*, not a loss. Cliff's other comments are that the muffler he has is heavy and gets very hot, which leads to some more info on it. The weight seems to have changed with development—the sample I have weighs 2½ ounces, which is less than a Super Tigre muffler used for comparison.

The heat aspect brings us to another interesting story from "down under." Apparently, as the muffler gets hot, the internal gases expand even further, which has the effect of raising the frequency of the flow. It seems that the engine "likes" this condition and simply follows the higher frequency by increasing its rpm. McCaughey explains that the muffler "pulls" the engine to higher speeds, with rpm of up to 36,000 having been recorded. Interesting? With this in mind, experiments are being made using glass wool to insulate the muffler, in hopes of retaining all possible heat.

The April story mentioned that I was to receive a K&B 6.5 engine custom-fitted with the latest fully developed version of the Magic Muffler. Although that was months ago, and I had about given up hope, the setup arrived in the mail a few days ago. McCaughey supplied the muffler and Rayjet Phelan set up the K&B as he would for one of his record-setting models; he is *tops* in FAI racing at this time. In other words, what I have is the equal of the world-record-setting combination. The muffler is a good example of excellent home workmanship, and the K&B was furnished to Rayjet through the courtesy of John Brodbeck. I had asked Rayjet to do whatever was necessary, no holds barred, so I expected to see almost anything. I was quite surprised to find a very normal-looking K&B, with about the only visible change being a different carburetor with a much smaller venturi size (more about this later). The instructions with it *were* different, and quite interesting. First of all, I was *not* to remove the cylinder head, the reason being that the head is fitted to the sleeve, then centered and the bolts torqued down at a high temperature. Sure makes sense and is an unusually precise procedure. My only question is what do I do if I *have* to take the head off for some stupid reason?

Second, Rayjet requires a very particular piston-sleeve fit. He did not like the stock fit, so he proceeded to re-chrome the sleeve and fit it to his liking. Many thanks for that big effort, Rayjet! However, I was then told that the engine does require breaking in. This must be done while flying—several flights rich and then grad-

(Continued on page 9)

(Continued from page 8)

ually peak it in. I guess the reason is to keep the cylinder cool (more cooling when flying) and not allow the engine to run with minimum lubrication until the piston has seated. Unfortunately, flying weather here was two months away when I got the setup and I was *very* curious about the engine. The solution? Temperatures in Australia are high, nearly 100°F in summer—not weather for cool-running engines—and the Aussie fuel uses castor oil for lubrication. On the other hand, the temperature in Buffalo was 30°F, and I had synthetic oil (K&B X-2C) whose thinnest film offers ample lubrication. I decided that I would run the engine as little as possible on the bench, monitor the head temperature, keep it very rich, and peak it just long enough to get anticipated tach readings. With the cold temperature, better lubrication, and extreme care, I could get some safe results.

With the engine and muffler came an Australian racing prop—we got everything! The prop is interesting. With FAI fuel you expect much less power than with nitro. Yet this prop is not much different from an American Formula I prop, the major difference being that it will be turning over 30,000 rpm in the air, so I have been told. The pitch is about the same as for nitro—6½"—which would be expected. The diameter is a bit smaller: 7¾" versus something around 8¼" for nitro. However, it is *wide*-bladed, making up for much of the lost area. With its ⅝" blade width and ample thickness, it is definitely not a "toothpick" type. The test conditions were as follows: temperature, 30°F; humidity, 76%; fuel, 80% methanol (commercial grade) plus 20% K&B X-2C oil. Nitro tests were made with a stock K&B 6.5 and K&B Speed fuel (50% nitro).

The engine was first run without the muffler, and fitted with the carburetor supplied by Rayjet Phelan. The recorded rpm was 19,000. The next run was made with the muffler added, and the rpm rose to 20,500. All checks were made twice but no more, in compliance with the break-in instructions.

At this time the modified carburetor was replaced with a stock K&B unit (larger venturi), and the checks were repeated. With the larger-size venturi, the rpm without muffler was 20,000. The recorded rpm with the muffler was now 22,000.

During this running there were various indications that this was a tight engine, one which definitely needed to be broken in. At no time did it feel "normal," but it seems reasonable to expect improvement once the break-in has been completed. Also, these tests were made with alcohol fuel used in a racing engine. We do not race with alky here in the U.S.; nitro is used. Additionally, there have been many questions concerning the application of the Magic Muffler to nitro-burning engines. Curiosity, plus these reasons, leads to further tests with other engines and fuel.

One further test should be mentioned. What you see with a reworked engine may be one thing, but you have to ask, "How about a stock engine?" To answer this question, a well-used stock K&B was also tested. The results were *exactly* the same as with the "special" engine. So it would seem that any results of the special work would have to come after complete break-in, or in the air.

The nitro tests were made with what is considered to be an excellent K&B 6.5 nitro engine. It is a new engine, without any racing time, but it is one that I expect to be competitive. Normal bench tests have indicated this. The engine was run with the Australian prop, and the tach showed 23,000 rpm—1,000 rpm faster than the alky engine with muffler. This is interesting. The alky combo is expected to unload to over 30,000 rpm in the air, but is 1,000 rpm down on the bench. If a normal "pick up" can be expected from the nitro engine, the in-the-air rpm would be only about 27,000—3,000 rpm *less* than the alky engine. Could it be that the muffler supercharging is getting more power from the alky fuel than is possible with nitro?

From this nitro testing came a very confusing result: when the muffler was added to the nitro engine, there was *no change in rpm.* This was entirely unexpected! It was thought that *something* would be seen, hopefully something dramatic.

A further check of this particular engine after the testing had been completed revealed what may be a clue. A measurement of the engine indicated that the exhaust height may be about .020" lower than on a normal engine. Since everyone says that you must use a modern "high ported" design for any type of exhaust supercharging to work properly, this "low" port timing may have been the cause. So, before positive conclusions are reached, further nitro testing needs to be made with a stock engine with factory spec timing.

Hopefully, this added Magic Muffler information will make the original story more complete, and not much more can be added until we can get into the air.

OTHER NEWS. The racing season is fast approaching, and while it is not the intent of "FLN" to announce contests and such, when something unusual is offered it is *news.* From Lynn G. Engdahl of 198 Melody Dr., Akron, OH 44321, comes word of some unique racing to be held this season. The National Air Show, held at Lake Front Airport in Cleveland, Ohio, is always an interesting event. One of the few shows in this country to still offer full-scale air racing, it usually includes all classes of racing plus many of the prominent airshow exhibitions. It's a great place to be on Labor Day weekend. An addition to the show this year will be RC model racing. It is a bit difficult to pick all the details out of the announcement that was made, but it appears that the model event will be a one-design competition, using the Bridi quarter-scale Cosmic Wind design. Of course, this means *big* models. Also, there seems to be some indication that the entry list will be composed of winners of a series of elimination races held in Ohio earlier in the season. This is certainly something very new and interesting. Some big names in the industry appear to be sponsoring the event, which could help with the results. And a very impressive "Hansen Trophy" is being offered to commemorate a fine man involved in modeling and aviation. Further information is available from Lynn Engdahl, and you can write to him at the address given above.

While FAI Pylon may not be a "thing" here in the U.S., it is of interest in Canada. The only FAI International Race for 1980 is scheduled to be held in the Saskatchewan area over the last weekend in August. The contact for info is Douglas Moisuk, and his address is 6 Powell Pl., Regina, Saskatchewan, Canada. The attraction here is that this will be the only time you may have the chance of seeing people from other countries racing, and they will be using the FAI-type models, of course. Currently, there is some indication that entries will be there from Europe and other far lands. The sponsors have promised to make it a first-class event, including some enjoyable social events. The word is, "Come to Saskatchewan and you will not regret it."

Speaking of FAI Pylon, we had a news release from the FAI Committee last month that covered what is happening pretty well. We're pleased to say that the Committee has before it, at this time, some final decisions to make. Assuming that all goes well with this work, there should be some final regulations (proposed) within a short time.

It's interesting to note that there are Americans who are once more concerned about the FAI event. It could be that we will see some renewed interest in the U.S. in an event that enjoyed considerable popularity and prestige not too long ago. You can believe that the rest of the world will be pleased to have us back.

Here we are at the end of another discussion, which has been pretty narrow in character although not intended to be. We'll broaden the coverage next time, and any input from you is always of help. Do write—your letters are appreciated! Hal deBolt, 49 Colden Court, Buffalo, NY 14225. ■

scale NEWS

by STEVE SAUGER

• What you see is what you get. All the preparation, sanding, filling, detailing, etc., can go down the drain with a mediocre paint job. Conversely, the best paint job in the world is not going to cover or conceal a mediocre job of preparation.

In open-fabric types of construction, such as a stringered fuselage, how well you prepare your bulkheads or formers will determine the contour and shape of the finished stringers. On wings, by laying a straightedge across the ribs or cap strips, you can readily tell whether block-sanding may be in order. And by sighting down from the tip of the wing, it will be quite apparent whether or not each successive rib is a smooth development of the previous one. They must be proportional to each other in the case of a tapered wing, and obviously must be equal in a constant-chord wing.

I have received many inquiries concerning the pros and cons of various covering materials, especially silk, and I assume many of these come from modelers attempting silk for the first time. I won't get into a debate over silk versus Coverite or Microlon, etc., since they all have their advantages and disadvantages. They all take paint well, and the end result of a scale-like fabric finish is easily attainable. The only real difference is in the technique of application and the amount of paint required to fill. Personally, I prefer silk and dope, even though it takes quite a few coats to completely fill the silk. The synthetic fabrics, of course, do not require as much filling as silk.

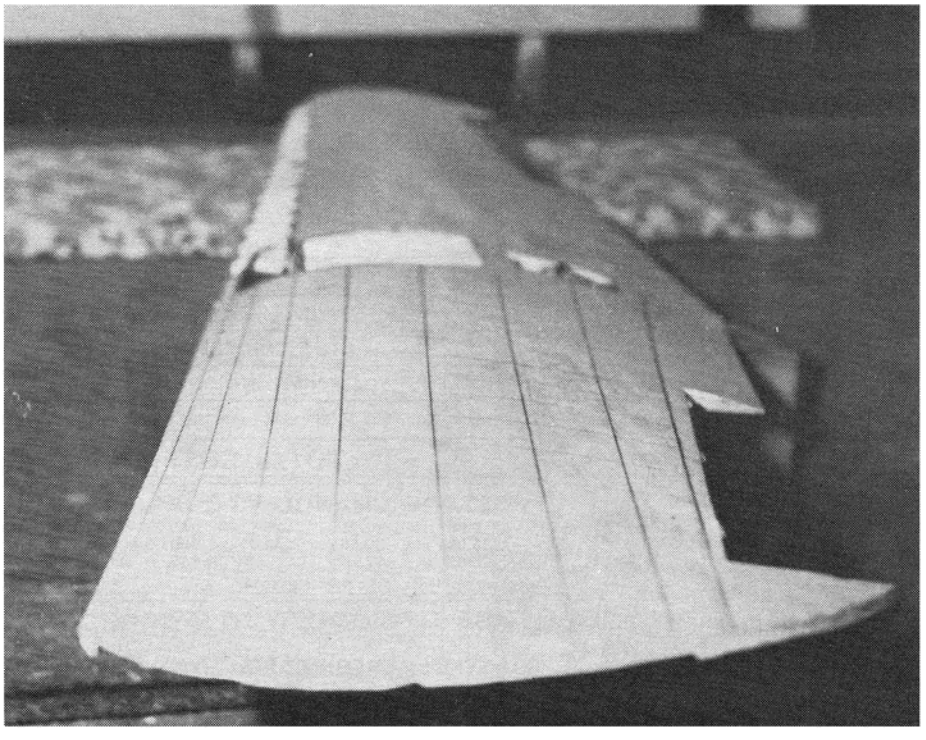
Before we tackle the actual application of the silk to the structure, let's prepare the balsa wood framework. Brush on two or three coats of clear dope, right out of the can, over all the ribs, stringers, and leading and trailing edges—every place that you want the silk to adhere to. After we give it all a light sanding, we are ready to apply the silk—wet, of course. The application of clear dope through the wet silk softens the cured dope on the framework and bonds the silk. This is an important factor to remember, because every new application of dope will soften the dope underneath, and can cause the silk to loosen when you don't want it to.

There are a couple of ways to wet the silk. You may elect to put the pre-cut panel under the tap, squeeze out the excess water, and carefully lay the silk over the framework, removing the wrinkles as you go. Or, with the material laid flat on some newspaper, a good sponge or sprayer may be used to dampen the silk. In any case, you will notice that the wet silk will want to cling to the ribs or stringers, so be careful not to snag the silk as you stretch it out. There is no need to attempt to try to pull everything tight—the drying and shrinking process will take care of that. But by all means get the wrinkles out, because all the clear dope in the land is not going to remove them.

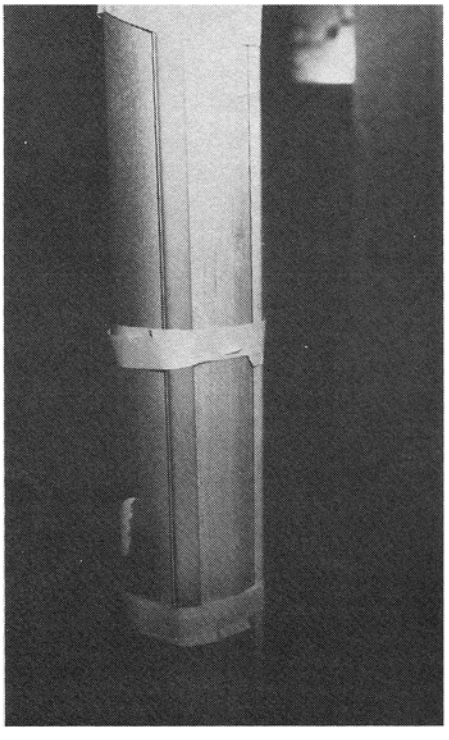
One item of caution: If you want to use Silron rather than silk, there is one important factor to be aware of. Being partly synthetic (80% silk and 20% dacron), Silron shrinks unevenly in two directions. (Pure silk shrinks almost evenly, giving equal sag between ribs and stringers, a desirable effect on fabric-type models.) Even close inspection of Silron cannot determine the direction of the grain or weave. Therefore, if you apply two separate panels of Silron on the top of your wings, one rotated at ninety degrees to the other, you will notice that there is a different amount of sag between the ribs. One panel bridges with the proper sag between, while the other really shows a predominant dip. By marking a few arrows with a felt-tip pen along one edge of the fabric, you can experiment a bit to determine the proper position. This problem is equally evident around stringered fuselages, so the same care must be taken.

Getting back to the application of the silk, using clear dope thinned about 25%, brush through the wet silk around the periphery of the wing framework about 1/4"

(Continued on page **11** *)*



Lines drawn on the surface of wing or fuselage are a great aid in detecting waviness.



Balsa wrapped around post. See text.

(Continued from page 10)

or so—no wider—and at this time *do not* dope down the ribs. This thin band is sufficient to adhere the silk panel, and allows you to pull out any wrinkles by softening the clear dope with a little thinner. To do this, brush on a little thinner to soften the edge closest to the wrinkle, then gently pull the silk smooth. (You couldn't do this if you had sealed all the ribs with clear.) Overpulling will induce another wrinkle, so be gentle. After you are satisfied that the entire panel is free of wrinkles and completely shrunk dry, you can begin filling the weave with two or three coats of clear before beginning the color. The area outside of the thin band can now be sealed with a damp sponge and more clear dope.

There is a tendency for the fabric to sag and retighten after each coat. If you have softened a thin band—a trailing edge for example, or some area where you were not able to wrap the silk around the side—a wrinkle may develop after it has dried taut. Dip a small brush in thinner, apply thinner along the edge adjacent to the wrinkle, and as the dope softens gently pull the material until it smooths out. I generally apply two or three coats *before* sealing the excess fabric around the outside; that way I have some material to grab in order to smooth out wrinkles.

In the case of the fuselage, you will probably want to use four panels: top, bottom, and two sides. Use the same technique, just adhere the wet material to the periphery, and not to the inside stringers. The first coat will take care of this.

On sheeted balsa surfaces, dips and valleys are hard to detect prior to glassing and/or silking, but show up in the priming stage when it's too late to reshape the wood. You then find yourself adding tons of primer or spot putty or spackling paste or whatever to smooth out the bumps. One trick I've used to check the wood surface before priming is the method employed in automotive clay modeling shops. Parallel lines are scribed on the clay surface at convenient vertical stations, and these lines become an aid in viewing the development of the compound surface, each adjoining section line being a progression of the previous one. Low and high surfaces become readily discernible.

The same technique can be applied to your model surfaces. Let's start with a wing. On the bare balsa surface, prior to resin or sanding sealer, draw lines with a felt-tip pen completely around the wing at convenient 2" stations, representing airfoil sections. In plan view, from the root to the tip, draw lines at various percentages of chord: 10%, 20%, 30%, and so on. These lines will converge on tapered wings and will, of course, be parallel on constant-chord wings. By sighting down the wing surface from the tip, you can "read" one rib section against the next; they should be proportional or constant, whatever the case may be. When you sight from the rear and the front, the spanwise lines should be parallel, with no apparent dips. These lines are a valuable visual aid in "reading" the development of the surface.

They are equally valuable in checking fuselages, especially the oval types and compound-curved nose cowls. Draw heavy lines completely around the fuselage at 1" or 1½" stations. You can do this by applying masking tape around the fuselage and using the edge as a guide for marking the lines. By sighting from the rear and the front, you can really see whether or not you've done a good job of preparatory sanding. The heavy ink lines are readily discernible as opposed to bare balsa, which has no reflection whatsoever. Highs and lows and flats are easily sanded, assuming there is sufficient balsa to sand. Which brings up an interesting point. In sheeted-balsa construction, whether it is built up or over foam, use 3/32" or even 1/8" sheet. The additional weight is negligible compared with 1/16" sheet, and most of it is sanded off anyway. The problem with 1/16", and sometimes even 3/32", sheet is that there just isn't enough meat to really true up the surface with heavy block-sanding. It gets paper thin in some spots, and when you wipe your sandpaper across these areas, it is actually bouncing or deflecting and you sand only the wood around them. This will certainly be noticeable after paint—behold, you have a glossy bump!

Once you're satisfied with the balsa surface, and after you've prepared it with resin or silk and applied a few coats of primer, repeat the ink-line process over the primer. A dab of rubbing alcohol will remove what is not sanded off and the final coat of prime should cover the rest.

If I may backtrack for a minute, some of you may be asking, "How do I sheet the leading edges with 3/32" or 1/8" balsa without cracking the planking?" Try this method, which I find works quite well: Dampen one side of the sheet and secure it around a basement pole, or equivalent curved surface, with two long sticks and masking tape. The sticks are used to support the edges of the balsa and keep them straight as the moisture evaporates overnight. The next day you have a perfect curved plank that you can now custom-fit to your leading edge. Repeated wetting down can tighten the radius if required.

Now, what about those inevitable dents on the leading edge from a bout with the workbench? A common mistake is to use a filler that is harder than the surrounding balsa. When you try to sand it down, you literally end up gouging a valley around the filled spot. You want something that's as easy to sand as balsa and easily fillable. Try using spackling paste—the fastest drying, easiest to sand, cheapest filler on the market. And when you reach the priming stage, instead of using spot putty, just scoop a spoonful of primer out of the can onto a scrap of cardboard. The primer's consistency is heavy enough that it can be used as a spot putty, and will blend perfectly with the primer coats. The best primer I've ever used is Ditzler DZL-32 light grey lacquer, although it is also available in dark grey and black. A lot of simulated trim panels, doors, fairings, etc., are usually made from grey ABS; therefore the two colors are compatible. Ditzler DZL-32 sands easily, cures in a few hours with heavy coats and more quickly with lighter coats, and adheres well to polyester resin, metal, etc. It has the capacity to soften enough to accept butyrate dope for good adhesion. Dope adheres poorly by nature anyway, so you need all the help you can get. I like to thin DZL-32 with butyrate thinner. This primer is quite heavily pigmented, more so than butyrate , and must be thinned almost 2 to 1 (75-100% thinner to 50% primer).

One final item on priming: After sanding, the primer coat is usually very thin on the high spots and thicker on the low spots, which results in an uneven coloration of the primer. Butyrate dopes are quite transparent, and if you spray your color over an uneven base coat, you'll end up with different tones in your finish. Always apply one final opaque coat of primer before the finish coats of color!

As I said, what you see is what you get. Steve Sauger, 145 Nottingham, Troy, MI 48098. ■

radio control NEWS

by ART SCHROEDER

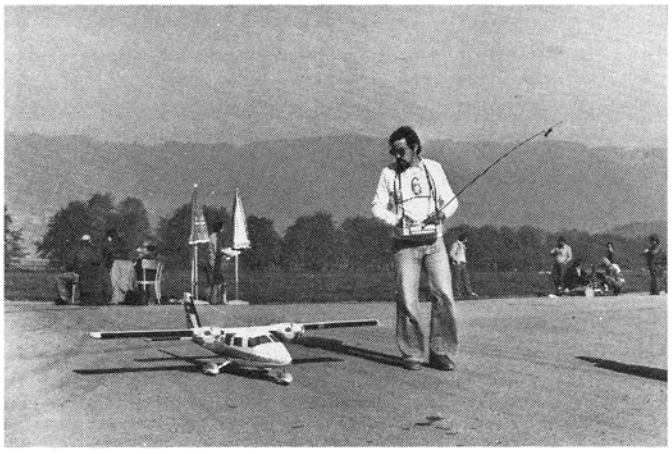
• OHIO HOSTS AGAIN. It should be a great AMA Nationals this year, since its geographical location has proven to be the ideal spot for large contestant and spectator turnout. Set for a combination of sites in Wilmington, Dayton, and Cincinnati, Ohio, the upcoming edition of AMA's huge traveling road show should duplicate the 1976 Nats—the largest national competition ever held.

A full schedule of RC events is planned on the now-familiar time-sharing procedures proven over many years. Time for each event is predicated on the event's needs, level of participation, and spectator popularity. Scale, now challenging pattern in contestant numbers, has 15 or so hours of operation, but its placement on Friday evening, Saturday and Sunday permits maximum exposure for spectators. Pattern still draws the biggest time allocation (36 hours, tied with soaring), but its qualifying format and large entry list requires that; finals come on Friday and Saturday mornings. Pylon's thirty hours are split between Quarter Midget and Formula I. All the aforementioned events are to be held in Wilmington.

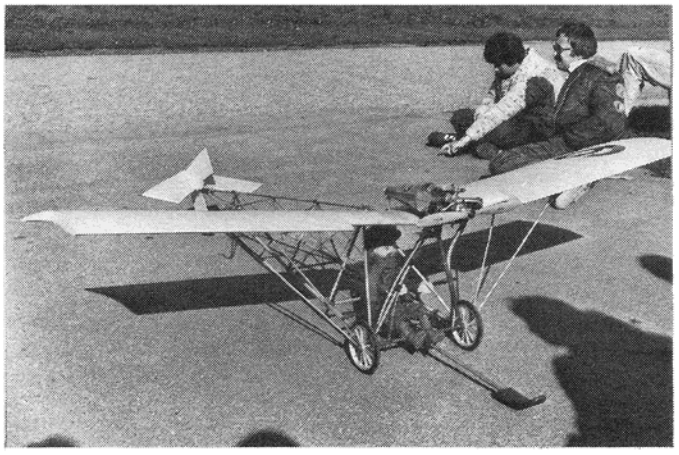
At Wright Field in Dayton, soaring and helicopter action will take place. Rotary-wing birds hold the sky for 18 hours, while the silent scene prevails for 36 hours near the Air Force Museum.

New this year, and incorporated into regular scale events, will be Giant Scale competition. Giant Scale will be open to any airplane that meets at least one of the following requirements: engine of 1.25 cid or larger, $2\frac{7}{8}'' = 1'$ scale or larger, 15 pounds—less fuel—or heavier. The maxima of 40 pounds and 3.66 cu in. engine displacement must be observed. I have a hunch that an explosion of Giant Scale may take place at Wilmington, with far more entrants than anyone expects at this point.

The Western Ohio Radio Kontrol Society (WORKS) is the 1980 Nationals host club and deserves our thanks for taking on such a monumental task. Indeed, all officials, judges and workers at any Nats



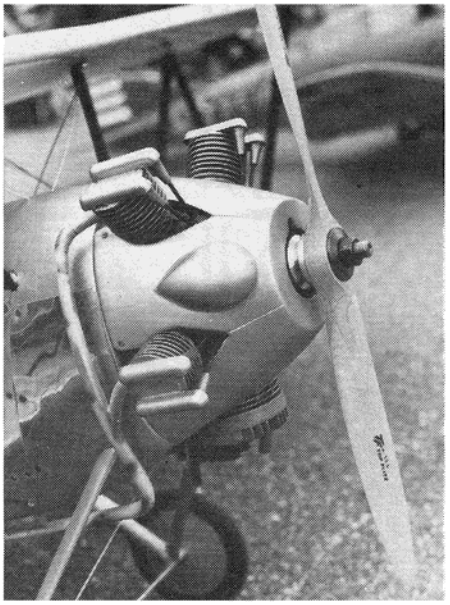
W. Luscher taxis twin OS 40 powered Partenavia Victor at Swiss Scale Championships. The model will be kitted in Switzerland.



Quarter scale Santos Dumont Demoiselle built by A. Hulliger is powered by a Damo four-stroke twin.

ALL SWISS SCALE CHAMPS PHOTOS BY PETER N. SCOTT

Mean-looking McDonnell-Douglas F-18 by Fred Meier is powered by a piped OS 60 pumper and uses Swiss-made Colibri retractable landing gear.



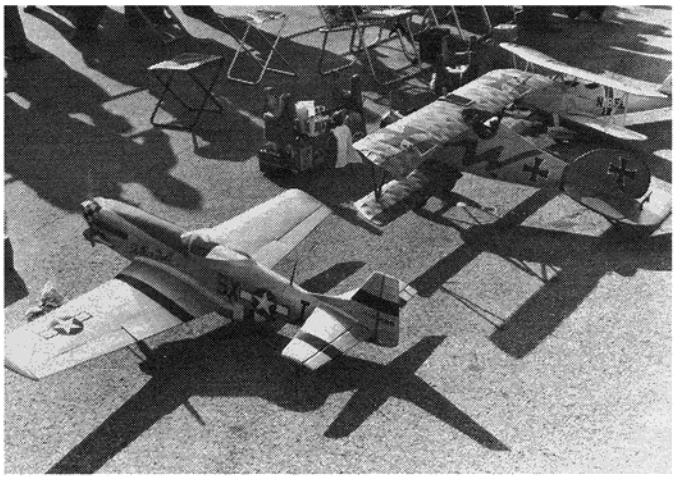
M. Gacond uses inverted (!) OS 60 four-stroke in Veron-kit Hawker Tomtit.

deserve the plaudits of all modelers whether or not they compete. The unsung heroes of so many past Nationals have done a great deal toward showcasing a positive image for model aviation in general. Take a Nats official to lunch while you're there; they ought to hear something besides complaints!

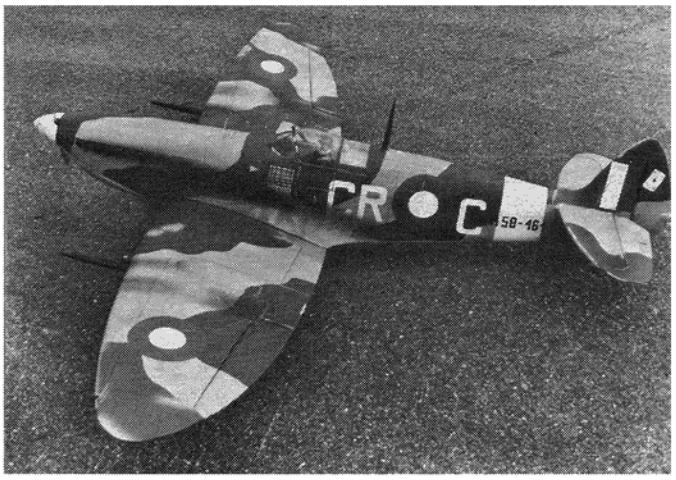
Not only will this area host the biggest model airplane meet in the world from August 10 through 17, it also has a great series of family attractions that will serve to provide a real vacation setting for all. Kings Island Park is a theme park with a national reputation and should not be missed. Just as surely, the Air Force Museum and various Wright Brothers memorials should be visited. If you like camping, you can't miss in the Cincinnati area. All in all, 1980 should be a memorable Nats and I hope to see you there. You still have time to sign up, a wise move since late entry costs a whopping $50. Full info and forms are available from AMA headquarters, 815 Fifteenth St. NW, Washington, DC 20005.

PIK-ey, PIK-ey, PIK-ey. There isn't any

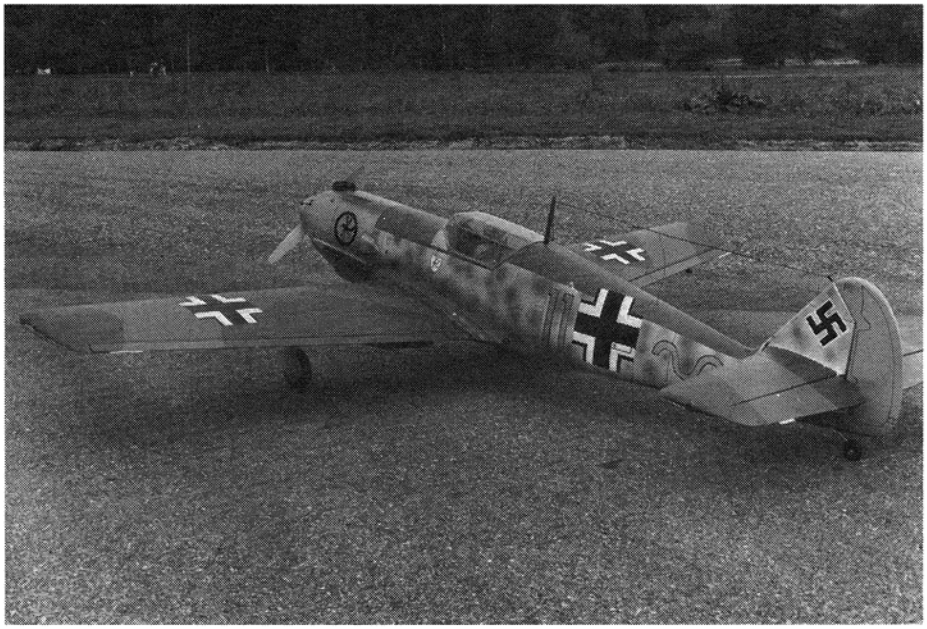
Sven Wiesendanger's Navy Crusader with piped engine driving a propeller. Ducted-fan technology now allows greater realism when modeling jet aircraft.



P-51, Albatross, and Sig Liberty Sport were German entries.



Super detailed Spitfire Mk IX by H. Polster has Webra 60 power.



Webra 60 also powers the Spitfire's adversary Me109, by J. Notter.

Closeup of Albatross shown in other photo.

commercial product that I have reported on in recent years that has brought so much mail and personal telephone calls as the brief report on the PIK 20E, the model of the Finnish retracting motor glider. Much of this has come about from a lack of response to some who wrote to Finland for further information relative to price and availability. I don't know if the problem stemmed from inefficient mail service (call that lost letters) or a change in the manufacturing and marketing company. In any event, I can report on where the project stands right now and can assure you that any request for information will be promptly honored by the new producers.

Eiriavion, manufacturers of the full-size PIK 20E and originally producers of the kit, has turned production over to Harraste Ja Tekniikka, Kustannusliike M/H Meder OY, PL 18 02631, Espoo 36, Finland. If anything, the new producers have increased the aircraft's already attractive qualities. Wing weight has been reduced considerably by using carbon fiber techniques, the wing control mechanism has been strengthened and improved, the motor pylon has been redesigned, and the fussy spoilers have been eliminated. Originally the glider employed a flying stab, but this has been changed to a conventional stab/elevator arrangement.

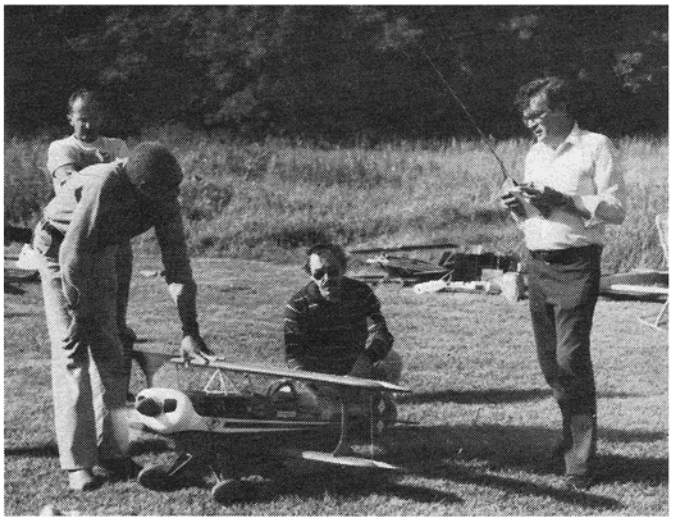
You still get a gorgeous, primed, epoxy glass fuselage; formed canopy and canopy inner shell; finished and primed fiberglass wing; foam sheeted stab; and most necessary hardware and plywood fuselage parts. The motor glider is a super performer and should make an outstanding sport scale project. The sailplane spans 3500 mm with an area of 63 sq dm; the aspect ratio is 22:1 and the length is 1540 mm. The PIK 20E is intended for .15-.20 engines. Juhani Salminen, who did much of the theoretical design work on the 20E, let us in on some of the background for the graceful machine:

"The design of an RC scale sailplane is generally very different from that of normal RC endurance sailplanes. The scale designer has constraints of form and dimension imposed by attempting to duplicate a full-size glider. To a limited extent, dimensions and proportions can be modified toward an aerodynamic optimum, but there are compromises to be made if the full-scale appearance is to be retained.

"The purpose of this project was the professional development of the PIK 20D and E sailplanes to use the most up-to-date glass/carbon fiber techniques, and in so doing, to fulfill the high demands of advanced RC fliers for a high-performance scale sailplane; particularly those interested in the PIK 20 configuration.

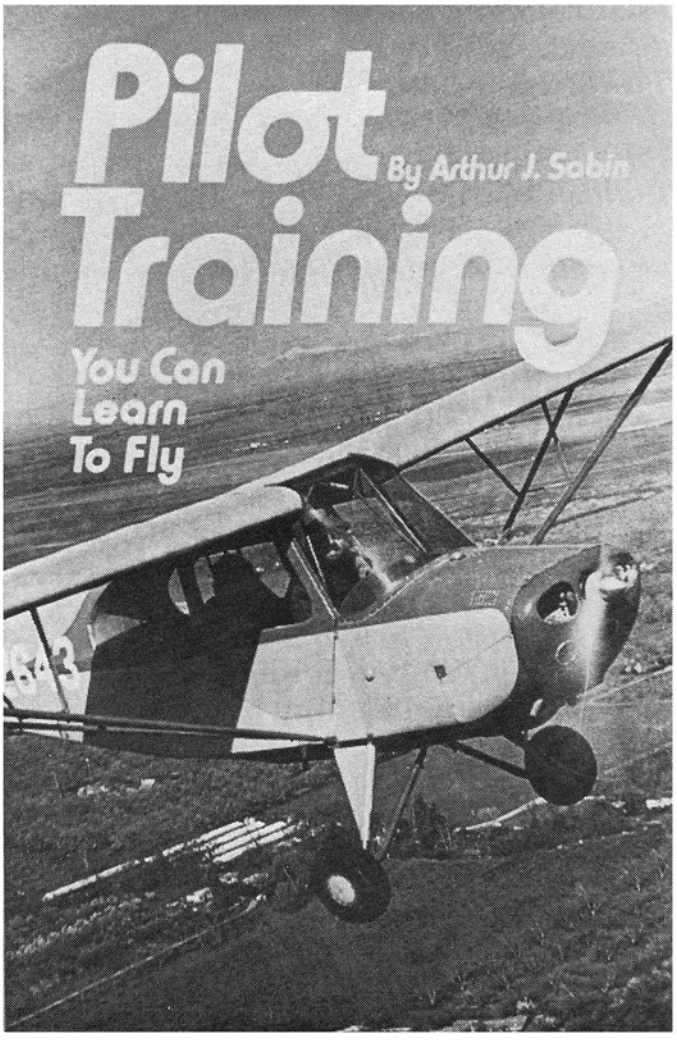
"Aerodynamic design of sailplanes is principally the optimizing of lift/drag ratios of a wing within certain speed ranges while minimizing total drag of the entire aircraft. This logical approach works well, but there are tricky details to be kept in mind when defining the final version. Though the logic of wing design in this case was conventional, the wing finally accepted was very different when compared with most seen to date. Airfoils are not laminar—an NACA 2412 root and Eppler 1210 tip, both modified to get lift distribution close to that of an elliptical wing and to achieve a higher L/D maximum, are employed. Only a slight amount of aerodynamic twist (wash-out) was necessary to achieve in model form the excellent stall characteristics of the full-size PIK 20. For low-speed performance, particularly on takeoff and landing, it was necessary to keep the wing as clean as possible. This, along with demands for superior lateral control, led to the solution of twisting the

(Continued on page **15** *)*



Art Schroeder runs up the engine on Byron Pitts. See text.

Nick Ziroli and his monster 2½" = 1' P-40D.



Modeler Art Sabin compares RC and "real" piloting in this book.

(Continued from page 14)

entire wing instead of utilizing conventional ailerons. The solution seems to be beneficial in every respect. Low-speed engine response is sufficient to level the wings on PIK 20's single wheel landing gear; adverse yaw is held to a minimum; and lateral control is effective up to the smooth, controllable stall. Stall characteristics are, of course, to some degree dependent on balance and rudder trim.

"The prototypes flew using Schempp-Hirth type airbrakes, but due to complicated mechanics, the entire brake system was dropped in the production versions. Consistently good spot landings now require a bit more practice. However, if really wanted, the wing structure can accept commercial brakes, but prepare for some linkage design problems due to the rotating wing.

"The PIK 20's stabilizer is the only distinct exception from true scale. Both stab and elevator were slightly increased in area on both the D and E models. The change was needed to cure instability in pitch and to improve elevator response. This increase came to light as a result of early test flights.

"Most materials and construction procedures are the same as those used at Eiriavion where the full-size D and E are made.

"I have often asked myself, 'Can the PIK 20 model be improved?' The answer is unquestionably, 'yes'; but only slightly. From the point the project is at now, it's very difficult to gain anything without hard work, complicated structures and high fabrication costs. Obviously, we have faith in the sailplane at its present level of development. It is light, in keeping with flight requirements. The model E can handle high wind while keeping the thermal ability of the big PIK 20. It penetrates well and is as aerobatic as the full-scale version. A real plus for both the powered (E) and non-powered (D) is a tolerance for different piloting styles and level of skill. As a final comment, I would like to say that of all the model airplanes I have designed, the PIK 20 has been the most fascinating."

Juhani is a fascinating man to talk to, a veritable "goldmine" of design thinking in the area of low-speed aerodynamics. He develops his designs in a theoretical line, mathematically, and then proves them in the only place proof can be found—the sky. Generally, as with the PIK 20, only minor modifications are needed to the initial workup of Juhani's theories.

The PIK 20E is an airplane that will grab its share of interest—it already has—and you may want to look into it a bit further. Drop a line to the address in Finland given earlier. I also understand that Tom Smith (USA PIK 20 distributor), Smitty's Soaring, Deansboro Rd., Rt. 12B, Clinton, NJ 13323, will be handling American sales, so you might try there. The last price I heard was in the $300+ class. One thing truly unusual, the kit parts come in a fiberglass case that also houses the finished model and is scaled exactly as the trailer that the full-size PIK rides in. In fact, the case could have a set of wheels attached and be towed with an RC car—now that's class!

MINI-TOLEDO, PORVOO STYLE. All the latest PIK information was generated through my attendance at a trade show in Porvoo, Finland, this past March. By American standards, this show was tiny, but all the elements were there: static show, commercial booths, the new Finnish modeling magazine *Lennokki* covering things, flight demonstrations, and a constant crowd flow. Finland may be small, but it surely doesn't lack for interest in modeling activities. One thing I can say with certainty, the show was sized just right for a relaxing Sunday afternoon—no crunch, no trampled feet!

I had an opportunity at Porvoo to watch Jorma Ponkala, designer of the indoor control system mentioned in the May issue, fly his fantastic three-gram outfit in his tiny ROG. It works well, giving positive control to a rubber-powered aircraft for about two minutes per flight. The rig would be ideal for Peanut Scale, or even rubber- or CO_2-powered indoor pylon racing. I think the system may be picked up commercially in the States; more when I hear more.

THINGS I'VE USED AND LIKED. A good deal has been said and written about Byron Originals' Pitts S1-A, including my own feeling that the 1/3 scale model is a ball to fly. My feeling resulted from many flights of the bipe put together by flying buddy Ed Welsh. Well, I can now attest to Byron's achievement from a point of view that's right in front of my workbench; I've built two of them!

That's right, two of them—simultaneously. I've found that all those laudatory comments in the various modeling publications are not exaggerations; indeed, they may understate the case. Simply stated, the Byron Pitts is worth every penny of its purchase price. It is as complete as any kit I've seen, lacking only powerplant, finishing material, and radio. While different, its construction format (some might call it assembling) is enjoyable and not all that difficult—but hardly ARF. When you gaze at the finished product, making airplane noises, you'll be happy you joined the Pitts fraternity.

A couple of observations are in order. Conflicting information in other publications with regard to incidence angles of the wings and tail planes can cause some confusion. Our discussion with Dean Copeland indicates that the molded saddles, cabane, and stabilizer slots are correct and should not be altered. This proved out on Ed Welsh's bird, which flew beautifully with no trim changes.

If you use a gasoline engine—not such an horrendous move as you might have been led to believe since the bipe can carry the weight and the structure can handle the vibration; the Quadra does a fine job—epoxy the entire interior forward of the lower wing saddle with a slow-curing epoxy resin to seal against possible fuel intrusion. Gasoline will net you a nonexistent biplane if it gets at the foam. Five-minute epoxy is a bit fast-curing for some of the operations if you are at all slow in completing the joint. I did most of the joints with 10-minute material, and the involved work where more than 10 minutes was called for with Hobbypoxy 2—the longer pot life was helpful to me. DAP is an ideal ding filler for the foam; for those who don't know this product, it is an acrylic spackling paste available at all hardware stores.

Don't kid yourself that the Byron Pitts is an eight-hour assembly job. If you want a completed bird of a quality commensurate with its pricetag and kit quality, plan on a month of spare time.

If I had to fault anything in the kit, it would be the die-cut plywood pieces. These little devils held to the security of their surrounding with the tenacity of an IRS auditor entertaining a nervous taxpayer. I finally loosened my pieces by liberal applications of bandsaw!

Stay with the Econocote finishing; you save at least two pounds and that makes a difference in performance levels. The bird may dent easily with the plastic covering, but it can be made like new with a quick pass of a heat gun.

One of my Pitts is powered by a Quadra, and on this one I doubled up on the ply firewall for my own peace of mind. The other is hauled by a twin OS 60FSR, with Cass drive; the firewall is stock for this smooth-running power unit.

Be super careful when epoxying the aileron torque tube in place—any mistake that gets glue in the bearings gives you a very large, rudder-only biplane. The toughest job is the drilling of the holes in the wings for the interplane struts. The problem is keeping the angle of the drill in an accurate plane. Make a jig for this operation and save yourself a lot of grief. I found it neater to finish the stabilizer and cover it, install the part, and then install the fin/fairing molding and cover the rear in one piece.

A Webra 90 can be mounted in the Webra/Byro-Drive by splitting the mount in the center between the two beams and then installing a steel plate with machine screws to obtain the necessary width for the big glow engine. The engine output pulley must be redrilled for the somewhat larger crankshaft. The key slot must also be reestablished. With the 90 you'll have all the thrust you can use without resorting to tuned pipes. Some prop experimentation is needed to match the 90 power combination. (The use of the Webra 90 was first tried by Maxey Hester of Sig.)

The fiberglass parts are beautifully made and require virtually no surfacing; a light sanding, a fast coat of primer, and shoot

the color. The aileron balance system shown eliminates any flutter if you follow directions and truly balance the entire movable mass. The speeds achievable with a Rossi/tuned-pipe combo caused no flutter at all. Early flights on this configuration—before Ed read the instructions—showed flutter that should have disintegrated the wings; it didn't! When he did the job per the instructions, all flutter disappeared.

You must fly a Byron Pitts to realize how strong the foam really is. On one of our patented, controlled crashes, we practically bent the hefty aluminum gear around the nose of the Pitts. The foam did not break or crack and only sustained a couple of dents. My gear looks very finished as a result of a facing of 1/32" ply applied with epoxy (the inside surface of the gear requires 3/32" shimming), and 1/4" balsa leading and trailing edges. This was sanded smooth, and the edges rounded, covered with Super Coverite and painted. It looks much better than the suggested finishing method. Be sure you cover any exposed foam with Econocote or epoxy; that's a very important operation.

One thing is certain, the Byron Pitts won't disappoint you. It is quality all the way, lives up to its advertisement, and may be the easiest way into the wonderful worlds of IMAC biplane flying and giant scale.

A fine powerplant is found in the box marked "OS Max 90FSR." I'm presently breaking in the one I purchased for my scale PIK 11, and the bench running has impressed me a great deal. The big engine is quite smooth (at least equivalent to the 60FSR) and very easy to start both hot and cold. Of particular note is the very effective throttle. Reliable idle is easy to achieve; mid-range is positive. But it's at high speed that the engine comes into its own. On 10% fuel, the 90 turns a 15x6 in excess of 12,000 rpm. There is little doubt that it can handle props up to 18x4, which makes it ideal for moderately-loaded quarter scale aircraft. The engine weighs a cut under 24 ounces, with a bore/stroke of 1.063 x 1.023 for a displacement of .908 cu in.

If you're looking for a way to achieve a good-looking, not too difficult to construct instrument panel in quarter scale, check out the instrument faces available from Hobby Lobby. Marketed under the *Modellbau Wanitschek* name (Best-NR-5080), these little beauties include multi-colored faces, clear dial covers, and molded housings. All commonly found instruments are included, as well as a radio facing. Attached to a plywood backing and sprayed flat black (or other appropriate color), they'll look almost as if the needle could move.

I've used the Robart Model Incidence meter on a number of projects recently and I don't know how I've gotten along without this device for so many years. Frankly, I didn't trust it at first and conducted my usually involved measurements to verify the readings obtained with the meter. In every case, the meter readings were exactly as my measurements said they should be, so I now simply clamp it to the wing profile and trust the information. The incidence meter makes initial aircraft setup simple and direct; no fuss, no muss. Give it a try.

I recently received a book by Arthur J. Sabin, entitled *Pilot Training, You Can Learn to Fly.* You may recognize Art as a regular contributor to *RC Modeler* with his column, "RC Flying and the Law." In his book, he takes the reader from his experiences as an RC flier, to his choice of flying school, through his training of 11 months and 95 flying hours, to that ultimate goal—a pilot's license. In a breezy, easy to read style, Art relates the difficulties and joys of learning to fly both kinds of aircraft—RC and full-size. And there is a relationship between the two; both require dedication, acquisition of skills, and a transitional stage. That transitional stage is defined as attempting something new, at the bottom step as a rank beginner, and it can be frightening to many. Art Sabin brings insight to RC flying (and full-scale) as a life experience, not unlike dozens of other life experiences we all have.

The book should be of interest to all modelers, particularly those who yearn for a shot at the big ones. I was particularly pleased to find that the author did not subject RCing to a comparison with full-size, making it a subordinate type of activity. Indeed, Art points out that both are mature activities of equal difficulty, and both require acquisition of skills and investments in time and effort.

Pilot Training includes a wealth of information on the time required to achieve a license, school selection, FAA examinations, and the mental and physical attitudes necessary for a successful pilot. Published by World Publications, Sabin's book is worth your time whether you want to do your piloting with your feet on solid ground or on the floorboards of a Cessna 150.

Harry's Handbook for Miniature Engines is everything you ever wanted to know about that noseweight on your airplane but were afraid to ask! Loaded with photos, line drawings and charts, this 96-page effort by *M.A.N.*'s own Harry Higley covers basic theory, design, glowplugs, fuel, props, starting, breaking-in, throttles, pressure systems, cleaning/oiling, 1/2A engines, overhaul, repair, hop-up, and developments. This book is *complete,* and should be in every modeler's library. It's available from *Model Airplane News,* or direct from Harry B. Higley & Sons, 433 Arquilla Dr., Glenwood, IL 60425. The price is $9.95, postage paid.

SWISS CHAMPIONSHIPS. We have the following report from Peter N. Scott on the 1979 Swiss National Scale, Standoff Scale, and Quarter Scale Championships that were held at Hausen am Albis, October 20-21, 1979:

"Considering that scale modeling is not thought to be very popular in Switzerland (aerobatics and slope-soaring take precedence), the 1979 RC Scale Champs were well supported by both competitors and spectators alike. The weather gods were kind, bringing unbroken sunshine and clear blue skies on the first day, although the second day was hazy and the shortening evenings at that time of year restricted the amount of flying that could be accomplished. Two rounds were flown; around forty models were present, and all but one survived unscathed. Zeier's beautiful Hunter was 'shot down' by interference on 27 MHz, an increasing problem in Switzerland.

"The standard of the entries in Scale was high, even though the event attracted only three models: Hirt and Muller entered the same models that they flew at Woodvale in 1978, Muller's now a little less pristine, to Hirt's advantage. Muller is a force to be reckoned with in Scale RC modeling; his Douglas Dauntless won Standoff Scale and featured excellent craftsmanship. The remainder of the entries in Standoff were generally of high standard, although detailing had been applied overenthusiastically in some cases. Interestingly, few models included a pilot figure, which by international standards is almost a decade behind the times. Multiplex and Simprop radios were most popular, the almost universal choice of powerplant being OS 60s in one variant or another, with a sprinkling of Webras. Gathering mist during the late afternoon brought humidity problems for some entrants' motors, but in the main few had to call attempts. Only two twins were entered in Standoff Scale, both well built but sparsely furnished.

"Quarter Scale attracted only five entries, but caused a lot of interest; few European kit manufacturers have jumped on the quarter scale bandwagon, and Swiss modelers have little option to import from the States. (Airfreight charges are high, but on a large order can work out cheaper than paying Swiss retail prices!)

"All told, it was an excellent meet, and the Affoltern Club can well be proud of their organization, and congratulated for providing the bratwurst and beer!"

MORE ON SCALE JUDGING. The letter about scale judging and aircraft speed at the 1979 Nats by Ted White that appeared in the January "R/C News" has generated a great deal of incoming mail. Every letter seems to express a different concept and approach to scale speed, and I'll try to include those of the greatest general interest over the next few months. This month's point of view is expressed by someone who knows quite a bit about this area, Dave Platt. I offer this one for your consideration and request that you speak your thoughts if you wish.

(Continued on page **18***)*

TOLEDO

PREVIEW

A brief look at the highlights.

by ART SCHROEDER

• The first year of their second quarter century was celebrated by Toledo's Weak Signals as they once again held their premier trade show in April. Known worldwide simply as *Toledo,* the annual Toledo Radio Control Exposition drew crowds that seemed well in excess of the Sports Arena's capability to hold them. Indeed, particularly on Saturday, it became all but impossible to move from one point to some planned second point. I'm told that a new Toledo convention center, to be built three years from now, will ease the situation.

The crowds were not new, but much that is was unveiled at various manufacturers' booths. New items will be extensively covered in the next issue of *M.A.N.* and throughout the next several months. "Monster" scale continues as a most visible facet of the RC hobby/sport. The array of potential "big" projects is mind-boggling. As for support items for the quarter scale movement, the accessory, powerplant and servo fields are keeping pace.

A number of new radios were seen, with a brand new concern, Circus Hobbies, presenting their new imported "super" set, the JR radio. Much will be written on this well conceived rig, which has a sizable reputation for utility and reliability in many countries. Circus Hobbies is headed by Jerry Nelson, the well-known and very active modeler, formerly with Midwest Model Supply Company.

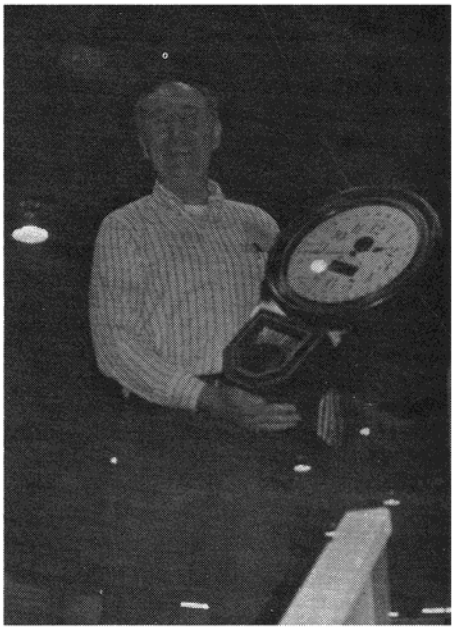
Servos head the new development list, with a wide variety of power, speed, centering accuracy, and price available to RC consumers. Whether big or small, there is a servo made somewhere to fit any need and pocketbook.

Scale was in solid evidence at Toledo and new projects abound, including a number of ducted fan airplanes. Byron Originals was in the difficult position of trying to handle a crush of interested RCers at their booth. At times it was nearly impossible to pass through the aisle fronting the Byron area; hundreds planted themselves to view the TV presentation of the company's rapidly expanding line.

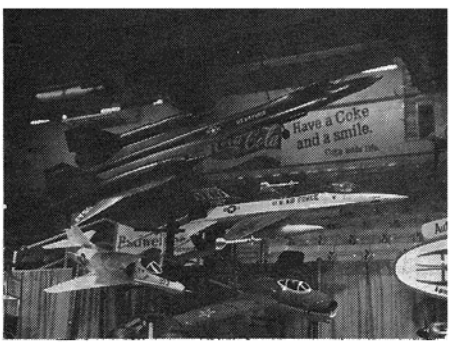
Part of the problem at Byron's booth (apart from the obvious popularity the concern's offerings have enjoyed) was a restructuring of the display areas, which narrowed the aisles a bit. Also, in past years, the area across from Byron would have been part of the static competition display area. This year, with commercial exhibitors on *both* sides of the aisle, a real bottleneck developed and some folks got pretty upset. It is hoped that the arrangement of displays for next year can take

(Continued on page 18)

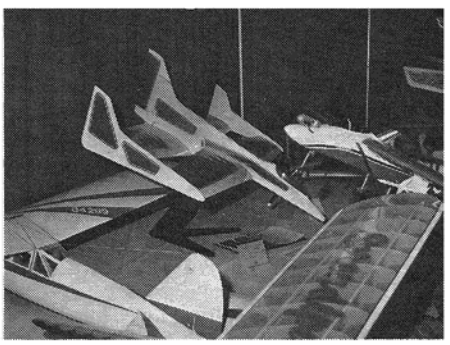
The aisles were narrower this year, and the crowd was bigger. Tower Hobbies' blimp was radio controlled, powered by two electric motors. They kept it tethered.



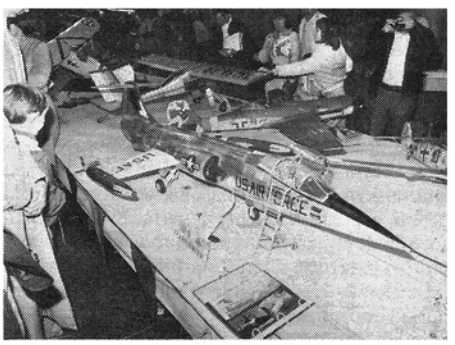
Jim Funduk won M.A.N.-sponsored award for his F-104 shown in photo below.



Byron Originals' huge SR-71 is powered by two Byro-Jet ducted fans. Impressive!



Tandem wing sailplane by Dick Sprague won Best Original Design award.



Jim Funduk's F-104 has ducted fan, is covered with aluminum sheet and foil.

RADIO CONTROL NEWS

(Continued from page **16** *)*

"Dear Art,

"Responding to your request for comments on Ted White's views on R/C Scale in your column 1/80, may I have a piece of this?

"Now it happens that Ted is a friend of mine and I'd like him to continue to be one. Since I find myself of dissimilar persuasion in some ways, I'd like to describe my comments as 'honest difference of opinion,' and that's all they are.

"I see Ted's points addressing R/C Scale on three distinct and separate levels: Technical, Political, and Philosophical. Taking them in that order then . . .

"Technical. It's a shame that Ted introduced his scale-weight argument, especially so in view of his subsequent mention of 'people with no basic knowledge of physics.' (He said a 1/6 scale version of a 10,000 lb. ship should weigh 10,000 ÷ 6 or 1,675 lbs.) Now, opinions are subjective, but math is an absolute science, and that one belonged in *MAD,* not *M.A.N.,* magazine. The pity is that this sample tended to throw doubt on the rest of his thinking, too, but other points he raised warrant serious answers. So, putting that one aside, let's get to his real bone—scale speed.

"Ted really shouldn't have dismissed scale as a direct proportion from his mind as ridiculous, because that prevented him from considering it logically. He would have found it *is* true after all.

"Sometimes our preoccupation with square and cube roots, etc., is apt to snow us into thinking of *everything* in complex terms. There's nothing difficult about scale speed. The correct visual speed for a 1/6 model of a 360 mph aeroplane will be 60 mph, no more, no less.

"The reason is this: Speed is a function of distance and *time.* To preserve a correct relationship we have to scale the time by the same factor used for the distance. Thus, when the model travels 1/6 of the distance in 1/6 of the time, it covers its own length in the *same* time the 'real' one took, and appearance is correct. (Here's another way to think of it: Imagine you're in an aircraft looking down on a town from 2,000 feet. It's like looking at a model, right? The distances appear shorter, the cars smaller and slower, but the *time* everything takes to happen is always the same.)

"There's nothing new about scale speed—it's only 'new' to us, or leastways, it's only recently we've begun considering it. The model railroad boys have known all about it for over 50 years. So have movie makers when they use models. Inasmuch as they intend the audience to believe they're seeing the real thing, if they goof it up here it blows the whole deal!

"In one respect I can agree with Ted. Since, unlike trains or cars, aircraft have to be *supported* by the air through which they move, things can become a challenge technically. But what's wrong with a challenge?

"This leads to the Political bit. Ted holds that 'scale people in power, with apparently no basic knowledge of physics, are hurting scale.' It is a fact that judges have for some years been wanting (and rewarding when answered) scale realism *in operation* equal to that achievable by the static appearance of the subject. Simply put, the judges say, 'Okay guy, it *looks* like it; now let's see if it can *fly* like it!' I believe that scale fans approved of this demand, because we could admit that things needed to get better. After all, Realism in Flight was introduced into the scale schedule six years ago.

"Since that time, the state of the art has improved and new tackle has become available that has given the modeler a fighting chance at meeting this demand. Ted put the cart before the horse. He implies that the judges have been influenced by a few sneaky modelers. Not so. The reverse is the case; the models we build are influenced by the demands made upon us by the judges. Just like in Pattern, Ted. The dissent has arisen at this time because some scale competitors are beginning to get those points (which were there all along); those who haven't yet cottoned to it are losing out, so they're calling 'Unfair.'

"In summary, I believe that scalish operation—scale speed, turning radii, etc.—is a perfectly reasonable request. Accomplishing it will improve the state of the art, it is inevitable because the time is right, and the great majority of R/C scale builders recognize these things and are in agreement with them.

"Okay, finally Philosophy. Scale R/C is not Pattern and Pattern is not Scale and never the twain shall meet. Pattern fliers who enter scale events should try to *think* like scale people if they hope to have fun. For one primary thing, *winning* is not where it's at to us. We just like to fly and see the other birds fly, and if we get a trophy that's fine. When did you ever hear of a Pattern Fly-In or a Pattern Rally? Often, pattern-minded entrants in a scale contest are frustrated by the (to them) fussy rules and idiotic concentration on matters other than precision flying skill, which they see as the only important thing. 'Lookee here,' they say, 'I'm supposed to actually *build* my model! How quaint! We can't bother with that in Pattern . . . etc, etc.' They'd like to get into scale, but on their own terms. So they want to change the rules—'Let's make the circle bigger' (translation—'that guy's plane is better than mine'); or 'Let's change the ratio of static vs. flight' (translation—'I can't be bothered spending the time to build a decent model, but I could *win* if flying was the biggie').

"Now if a scale flier wanted in on pattern, he'd have to go by the pattern rules. Scale fans are happy with the scale rules (they should be—they created them), so let the reverse hold true. It will be more enjoyable for all.

"If I may, I'd like to end on an agreeable note. I endorse Ted's remarks on the dumb Figure 8 maneuvers. He's right! (signed) Dave Platt." ■

TOLEDO PREVIEW

(Continued from page **17***)*

some of the 1980 problems into account to produce a reasonable flow of traffic.

Byron showed their now familiar Pitts, MiG and F-16, along with the long-awaited P-51 and a P-47. Big kit news was a huge SR-71, for twin Byro-Jet power. Another attention-grabber was the introduction of a Quadra Byro-Drive. This extremely interesting power unit is used in the P-47 and 51, as well as being adaptable to the 1/3 scale Pitts.

It was virtually impossible to discover a missing manufacturer at Toledo—for all intents and purposes, everyone was exhibiting. So too, it was nearly impossible to not run into an RC personality every 10 or 15 feet one traversed; truly a gathering of the clan!

Static competition entries seemed somewhat diminished over past years. The display area was shifted from the hockey arena to the main room, perhaps in an effort to gain more booth space. This display section seemed more crowded, but that appearance may have resulted from the length of the area. No matter, many fine projects were on display over the wide variety of Toledo categories.

For the first time, *Model Airplane News* was the sponsor of a Toledo trophy, the Directors' Award for Achievement. The winner of this trophy was Jim Funduk for his very nice Lockheed F-104 G Starfighter. The 11½-pound bird is powered by a 60-size fan designed by Bob Kress, but with a 7.5 K&B engine employed. Construction is all-balsa with litho plate covering in many areas and a bit of Reynold's kitchen aluminum. A full cockpit is part of the project, with functioning strobes as a finishing touch.

The Best of Show for 1980 was George Bussman for his Wilga, a repeat of his WRAMS placement in Non-Military Scale.

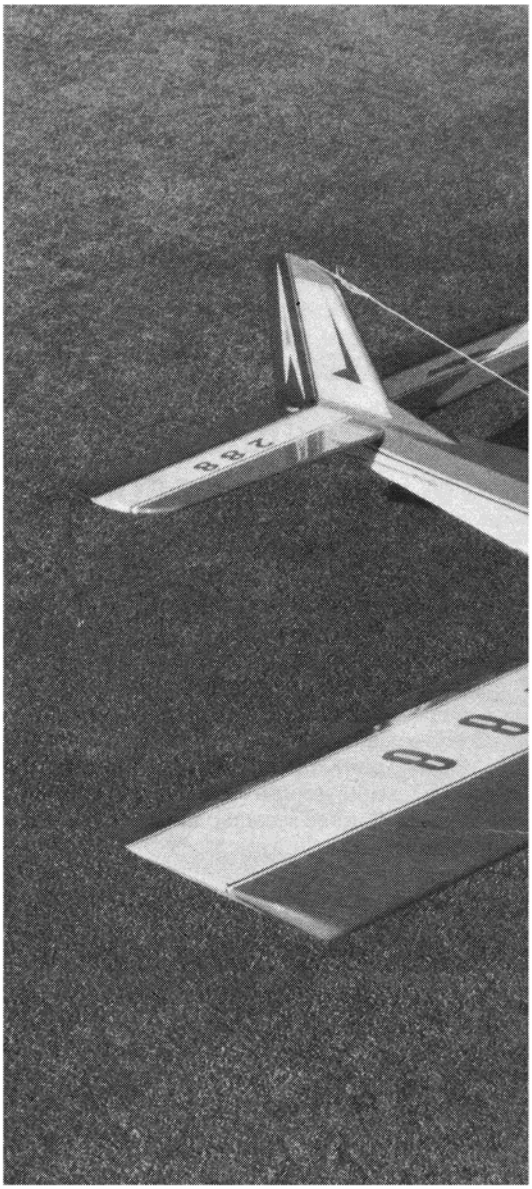
As the show wound down on Sunday, I found myself with little feeling left in the old feet. The problem wasn't too much walking—I'm told that the refrigeration for hockey floor ice goes on early on Sunday. Finally I know why I always come home from Toledo with a "spring" cold—and I don't even like hockey all that much!

'Twas a great scene, one that will be repeated in 1981 on April 10, 11, and 12. You really ought to get there. ■

BRIDI G.L.A.

This four-channel trainer is truly a "GREAT LITTLE AIRPLANE." Follow the step-by-step instructions and you can't go wrong.

Designed by Joe Bridi
Text and photos by Al Tuttle



G.L.A.
TYPE: RC Basic Trainer
WINGSPAN: 59¼ inches
WING AREA: 625 square inches
LENGTH: 47 inches
WEIGHT: 5 pounds
ENGINE: .25-.45
RADIO: 4-channel

• Construction of the "Great Little Airplane" is straightforward and requires no exotic or odd-size materials. All hardware is readily available from your hobby dealer. The canopy, dural landing gear, and motor mount are available from Bridi Hobby Enterprises, 1611 E. Sandison St., Wilmington, CA 90744.

Because this aircraft is aimed at the newcomer to radio control, the instructions may seem to be oversimplified to you old-timers—remember, we were *all* neophytes once. For example, you will notice that I keep harping about minimum or no gap at the control surfaces. Though a seemingly insignificant point, much of how well or how badly the aircraft performs is due to this little detail. How many newcomers (and "experts" too) have you seen at the field who wonder why their aircraft response in the air is so sloppy, only to find a gap of 1/16" or more at the control surfaces? If the instructions are carefully followed, you should end up with a straight, strong, and excellent flying basic trainer.

For adhesives to use, I'd recommend 5-minute and 30-minute epoxies, Hobbypoxy Formula 2 epoxy, Wilhold or Franklin aliphatic resin (Titebond), Hot Stuff, ZAP or its equivalent, and Duco cement or its equivalent for attaching the canopy, although the cyanoacrylate adhesives (Hot Stuff, etc.) can also be used.

To make sure all parts—such as leading and trailing edges, empennage, and control surfaces—get sanded evenly and straight, make up a couple of sanding blocks to be approximately 12" to 18" long and 2" to 3" wide. I use 1/2" x 3" wide aluminum channel stock with the sandpaper attached to the block with double-sided tape. This makes it easy to replace the worn-out sandpaper.

The building sequence is as follows: wing and ailerons, empennage, fuselage and hatch, final-sanding and covering, and equipment installation. *Read each step completely and carefully!*

WING CONSTRUCTION

Pre-construction:

____ 1. Cut 22 ribs from 3/32" sheet balsa stock.

____ 2. Make four trailing edge pieces 7/8" wide from 3/32" sheet balsa and cut to length.

____ 3. Cut to length: four 1/4" x 3/8" balsa spars, two 3/8" x 3/4" balsa leading edges, and two 3/16" x 1/4" trailing edges.

____ 4. Cut two ailerons 1 1/16" wide from 1/4" sheet balsa. *Do not trim to length or round edges yet.*

Note: If stick stock is not available, the spars and trailing edges can be stripped from 1/4" sheet stock. The leading edges can be cut from 3/8" sheet stock.

STEP #5

____ 5. With a soft lead pencil or fine ball-point pen, draw a guide line on the 3/4" wide side of both leading edge pieces (one side only), to match the centerline shown on the rib.

____ 6. Place the ribs over the plan side view of the rib and mark the centerline on each rib.

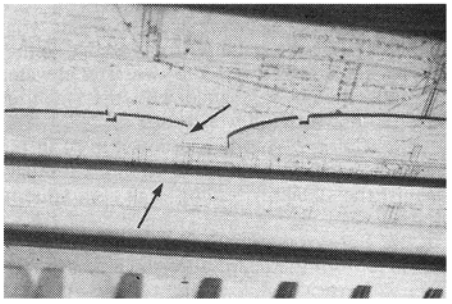
Right-hand wing panel construction:

Shoulder-wing layout and long tail moment make the GLA a stable four-channel trainer. It's easy for the beginner to fly, provided he's helped by a qualified instructor during the first flights.

Before starting, place a piece of waxed paper or plastic wrap over the plans to protect them and keep the adhesives from sticking to them.

___ 7. Pin the bottom 1/4" x 3/8" spar over the plans.

___ 8. Pin and glue ribs to the spar, making sure that ribs are perpendicular and square to the plan.



STEP #9

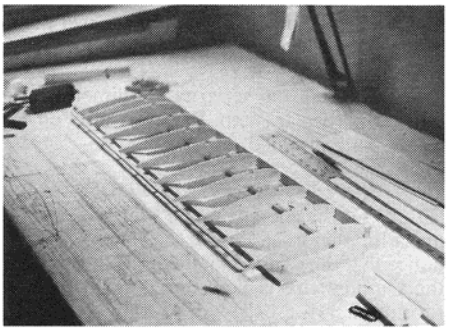
___ 9. When dry, block up the ribs inboard from their trailing edge (tapered trailing edge stock works fine). Glue the 3/16" x 1/4" trailing edge to the rib ends, making sure that the ribs are 90° to the trailing edge. In other words, be sure that everything is square.

___ 10. When the adhesive has dried, bevel the top of the trailing edge to match the contour of the ribs. Refer to the plan side view of the wing for proper shape.

___ 11. Add the top 3/32" x 7/8" trailing edge sheet.

___ 12. Glue the top 1/4" x 3/8" spar in place.

___ 13. Add the 3/8" x 3/4" leading edge, making sure that the leading edge guide line is on the side facing the ribs, and that this line aligns with the rib centerline.



STEP #13 & 14

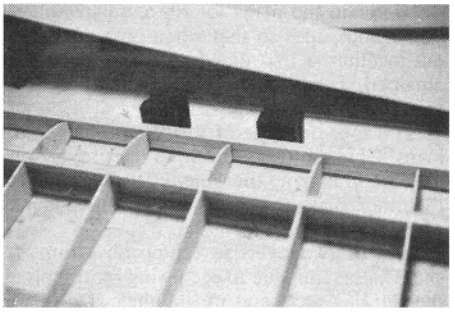
___ 14. Add the 1/16" vertical grain shear webbing. Refer to the plan view showing the shear webbing.

___ 15. Turn the wing panel over and place it upside down over the plans, and block up the trailing edge.

___ 16. Bevel the 3/16" x 1/4" trailing edge to match the rib contour and add the 3/32" x 7/8" bottom trailing edge.

Caution: Before proceeding to the next step, make sure that the wing is straight and square. Straightness can be checked by measuring the trailing edge height at each end of the wing. It should be the same; if not, adjust blocking until trailing edge is parallel to the work surface. Squareness can be checked either with a square, or by alignment over the plans.

Once you are satisfied that the wing is true, the leading edge sheeting can be installed. This step "locks" the wing, and if it is twisted now, it will stay twisted.



STEP #17

___ 17. The leading edge sheeting is installed as follows: Draw a centerline along the length of the 1/4" x 3/8" spar. Cut a piece of 3/32" x 3" x 36" balsa sheet to be approximately 1/4" longer than the wing panel. Bevel one edge so that it fits flush against the rear of the 3/8" x 3/4" leading edge, and against the ribs. Temporarily pin the sheet in place, and mark the sheeting at the spar centerline. Remove the sheeting and trim to width. When installed, the rear edge of the sheeting should stop at the spar centerline.

___ 18. Add 15- or 30-minute epoxy to the ribs and inside of the spar centerline. Do not put any on the leading edge. Apply 5-minute epoxy to the bevelled edge of the leading edge sheet and pin in place against the leading edge only. When the 5-minute epoxy has set, fasten the leading edge sheeting down on the ribs and spar.

___ 19. Add the 3/32" sheet center section and the 3/32" x 1/4" balsa cap strips.

___ 20. Turn wing panel over so that it is right side up, check to see that there are *no warps*, and repeat steps 17 through 19. When dry, remove from the plan and trim all sheeting and spar ends to be flush with the end ribs.

Left-hand wing panel construction:

This panel is built upside down over the right-hand wing panel.

G.L.A.

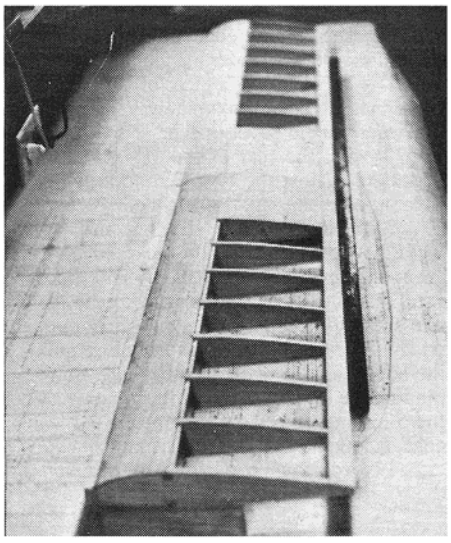
___ 21. Pin a 1/4" x 3/8" spar over the plans. (Since the panel is being built upside down, this is the top spar.)
___ 22. Glue the ribs to the spar, making sure that the ribs are perpendicular and square to the plan.
___ 23. When dry, block up the ribs inboard from their trailing edge. Glue the 3/16" x 1/4" trailing edge to the rib ends, making sure that the ribs are 90° to the trailing edge.
___ 24. When the adhesive has dried, bevel the top of the trailing edge (actually, it's the underneath or bottom side).
___ 25. Add the 3/32" x 7/8" bottom trailing edge sheet.
___ 26. Glue the bottom spar in place.
___ 27. Add the 3/8" x 3/4" leading edge.
___ 28. Add the 1/16" vertical grain shear webbing.

Note: Refer back to the "Caution" note between steps 16 and 17 before proceeding.

___ 29. Install the bottom 3/32" leading edge sheet as per steps 17 and 18.
___ 30. Add the 3/32" sheet center section and the 3/32" x 1/4" cap strips.
___ 31. Turn the panel over so that it is right side up, and repeat steps 17 through 19. When dry, remove from the plan and trim all sheeting and spar ends to be flush with the end ribs.
___ 32. Cut out the oversize 1/4" thick center rib (refer to the plans for rib template shape). Taper both sides so that when both panels are put together, a 1 1/4" dihedral at each tip will be obtained. There are several methods of doing this, two of which follow:

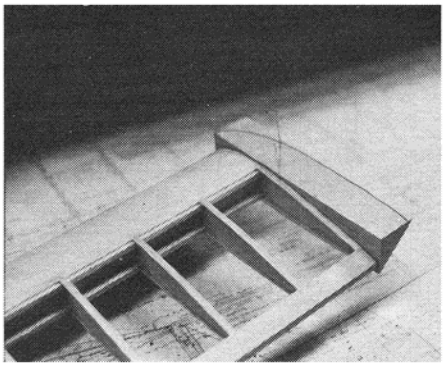
(a) Taper one side of the 1/4" rib as per the plans. Glue the tapered side to the proper wing panel root. Prop up the wing tip 2 1/2" and sand in the other angle as you would on a hand-launch glider wing.

(b) Cut two oversize center ribs from 1/8" sheet balsa, and glue to each wing root. Prop up the tip 1 1/4" and sand in the angle. Do this to both wing panels.



STEP #33

___ 33. Prop up each wing tip 1 1/4" and glue wing roots together, making sure that both panels are even and that there is no sweep forward or back.
___ 34. After the adhesive dries, shape the leading edge. Use the plan side view for proper shape.



STEP #35

___ 35. Glue on triangular or square wing tip blocks, and shape per the plans.
___ 36. Sand the wing smooth. Do not round the trailing edge.
___ 37. Apply 4-ounce glass cloth to the center section. The cloth should extend a minimum of 3" beyond each side of the center joint. Cover the bottom first, let the epoxy cure, turn it over, and do the top. When applying the epoxy, let it extend past the glass cloth edges approximately 3/8". This will make it easier to feather the edges, allowing the cloth to be blended into the wing sheeting. I used Hobbypoxy Formula 2, as it is easy to use and the 45-minute working time is ample for doing a good job.
___ 38. After the epoxy cures, feather the glass cloth edges on both the top and bottom of the wing.
___ 39. Turn the wing upside down and cut out the aileron servo hole. Refer to the plans for the hole location and dimensions. Lay out and cut the hole to the inside dimensions.

(a) Cut out the center-section sheeting and remove the center rib.

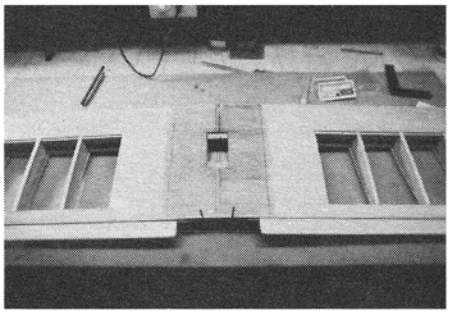
(b) Cut out and fit four 1/16" sheet balsa pieces—two for the front of the box and two for the rear. Glue these in place. The front pieces will go against the rear of the spar and against the edge of the 3/32" inner rib, and against the edge of the center rib. The bottom edge will fit under the 1/16" overhang. The two rear pieces are installed in the same manner, except that there is no spar to glue against. The grain should run parallel to the span. The bottom edge fits under the bottom center section.

(c) Using the wing rib template, place it over the plans at the servo box location, and with the bottom spar notch over the spar. Mark the template at the ends of the 3/32" servo box sides. From 3/32" sheet balsa, cut out two partial ribs and trim the rib ends to match the two marks made on the wing template. Fit and glue in place.

___ 40. Install the servo rails—dimensions to fit your particular servo. Rails can be of pine or 1/4" five-ply plywood.

AILERON INSTALLATION

___ 1. Fit the ailerons to the wing (refer to the plans for aileron and hinge locations). You will notice that the wing trailing edge is thicker than the ailerons. This is okay, and is as it should be for this aircraft.
___ 2. Trim each aileron end to be the shape as shown on the plan top view. Do not round the edges yet.
___ 3. The hinges are centered along the wing trailing edge and aileron leading edge longitudinal axis. Mark hinge locations and cut the slots. (I like the Kraft-type polypropylene hinge; it has no hinge pin for glue to get into, and the control surface does not have to be notched to obtain a gapless installation. In addition to easy installation, it provides excellent damping against control surface flutter.)
___ 4. Drill and notch the aileron leading edge to accept the aileron control horn. Slot the wing trailing edge to accept the aileron control horn nylon bearing.

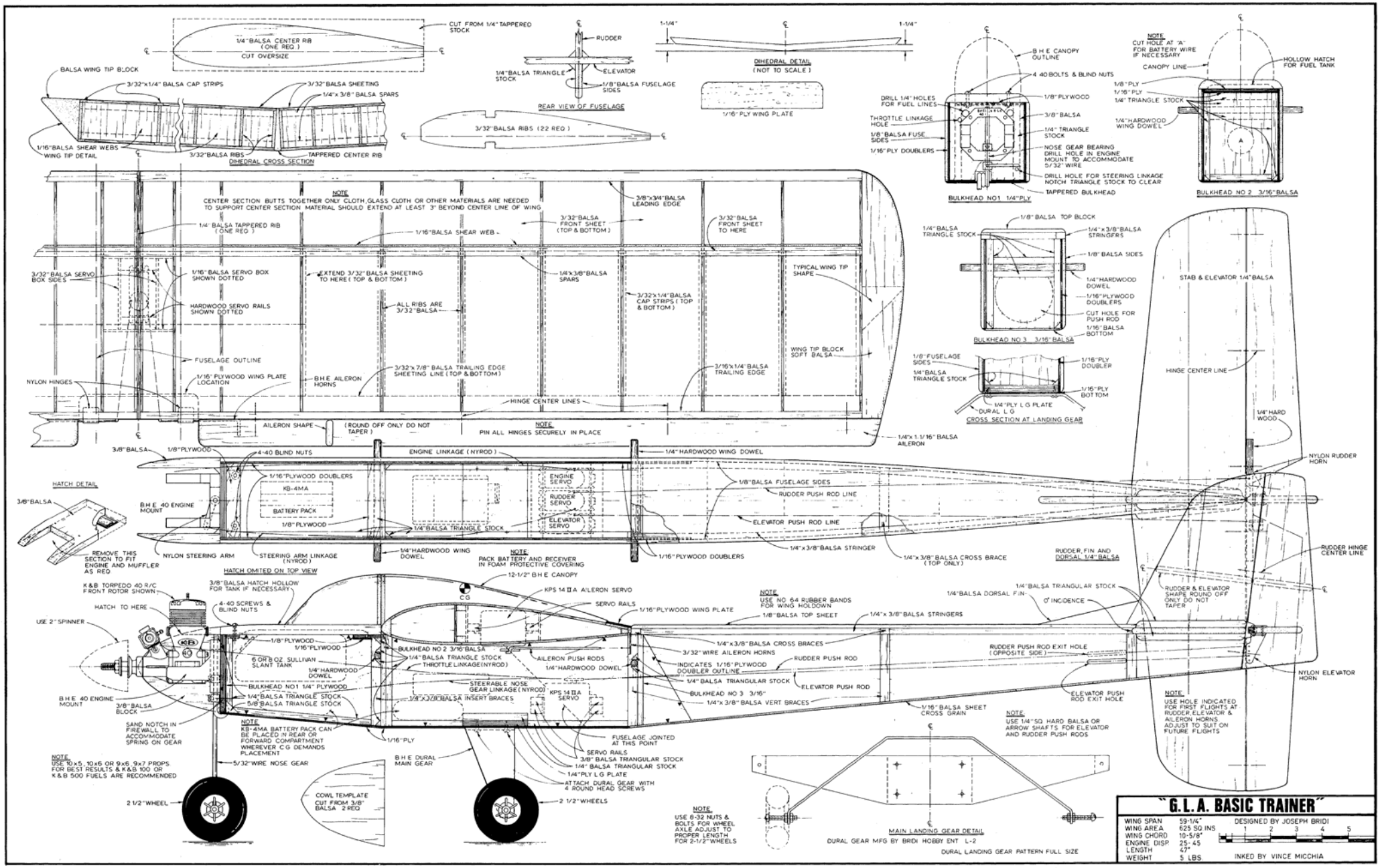


STEP #5

___ 5. Using the hinges, reassemble the ailerons to the wing and make sure that there is no gap between the two. Remove the ailerons and hinges, and round the ailerons' leading and trailing edges as shown on the plans (also inboard ends). Reassemble and check that there are no gaps, and that each aileron has an up-and-down movement of approximately plus or minus 1/2", for a total movement of 1".
___ 6. Cut out the 1/16" ply wing plate and install as shown on the plans. The plate extends past the wing center-section trailing edge 1/8". This completes the wing except for final-sanding and covering. Do not glue in the aileron hinges yet.

EMPENNAGE (TAIL FEATHERS)

All parts are made from 1/4" x 36" sheet balsa.
___ 1. Horizontal stabilizer—Cut two pieces of 1/4" sheet balsa to length and strip to width (2 1/4") as shown on the plans.
___ 2. Edge-glue these two pieces together, making sure that it is a tight fit (no gaps, etc.).
___ 3. Using a template, cut the horizontal stabilizer to the shape shown on the plans.
___ 4. Elevators—Cut out the elevators to the shape shown on the plans. Use a template. Don't forget the notch for the 1/4" diameter birch dowel.
___ 5. Pin the horizontal stabilizer down on the workbench. Cut a piece of plastic wrap about 12" long and place it midpoint over the top of the stabilizer, letting half of it hang out past the trailing edge.
___ 6. Place the elevators over the plastic wrap and up against the stabilizer trailing edge so that the plastic is in between the two. The elevator tip ends should be aligned with the stabilizer tips. Pin down to the workbench.
___ 7. Cut a 1/4" hardwood dowel to fit in the elevator notches. The dowel should fit snugly against the stabilizer trailing edge also. Glue in place.
___ 8. Locate and mark the hinge positions. Remove from the board after the glue dries.
___ 9. Vertical stabilizer and rudder—Cut the vertical stabilizer, rudder and dorsal to shape as shown on the plans. Note that the vertical fin is notched 1/8" deep for a distance of 3/8" at the base of the leading edge to allow for fuselage top planking. Assemble over the plans and glue.
___ 10. Place the rudder up against the vertical stabilizer and mark the hinge positions. When the vertical stabilizer adhesive has dried, remove the piece from the plans.



FULL-SIZE PLANS AVAILABLE . . . PAGE 130

G.L.A.

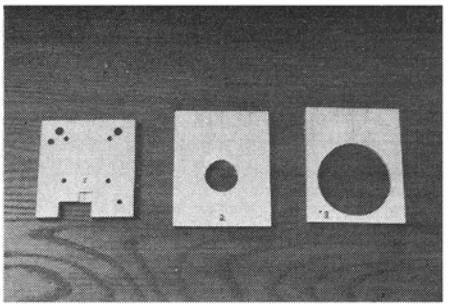
___ 11. The hinge slots for the empennage control surfaces can now be cut. After this has been done, sand the surfaces and round the edges as per the plans. Do not round the center portion of the horizontal stabilizer leading edge, as it is to fit up under the rear of the top fuselage stringer and against the top rear fuselage crossbrace. With the hinges in place but not glued, assemble the control surfaces and check that there are no gaps and at least plus or minus 3/4" control surface movement. Also check to make sure that during the sanding process you didn't remove too much material from the control surface ends. There is nothing more frustrating than discovering that one of the control surfaces is either shorter or longer than the stabilizers after you have covered and assembled the aircraft. This completes the empennage construction.

FUSELAGE CONSTRUCTION

___ 1. Cut the fuselage sides from 1/8" x 4" x 48" sheet balsa. Both sheets should be as equally stiff as possible. If 36" stock balsa is used, it will be necessary to splice on another piece to get the proper fuselage side length. Cut the two pieces at a 45° angle and place the splice toward the front so that it will be under the 1/16" ply doubler (see side view on plan).

___ 2. Cut out doublers from 1/16" x 20" ply sheet.

___ 3. Glue the 1/16" ply doublers to the 1/8" balsa fuselage sides. Make sure that you have a left and a right side! Titebond or Wilhold aliphatic resin glue works well here, but epoxy is better. Place weights on the assemblies and let them dry overnight. If you are in a real hurry, you can use contact cement, but be sure that everything is aligned before placing the two pieces together. One way of doing this is to place a piece of waxed paper over the fuselage side and lay the doubler on top of the paper. Align, and while holding the two pieces firmly to keep them from moving, draw the waxed paper out from between the two.



STEP #4 & 5

___ 4. Cut the firewall (No. 1 bulkhead) from 1/4" aircraft ply. If you are using the Bridi motor mount, drill all holes as shown on the bulkhead 1 front view (see layout showing firewall dimensions, hole locations, hole sizes, etc.).

___ 5. Cut out bulkheads 2 and 3 from 3/16" balsa sheet. If you are going to use the nyrod type of pushrod, do *not* cut out the large hole in bulkhead 3.

___ 6. On the inside of one fuselage side, mark the locations of bulkheads 2 and 3, and the two vertical braces aft of bulkhead 3. All lines are 90° to the top edge of the fuselage sides. Transfer these lines to the other fuselage side.

___ 7. Locate and mark the position of the 1/4" wing hold-down dowels, one in front of bulkhead 2 and one in front of bulkhead 3. The location of the holes is such that when a 1/4" diameter hole is drilled, one edge of the hole is just touching the bulkhead line.

Helpful hint: After the holes have been located, push a pin through the hole center mark from the doubler side, completely through the fuselage side. Turn it over (balsa side out) and mark where the pin comes through. Remove the pin and put a couple of drops of cyanoacrylate glue (Hot Stuff, Zap, etc.) at this place. This will prevent splitting of the balsa when drilling the holes. With the balsa side of the fuselage down, and against a piece of board, drill the 1/4" diameter holes.

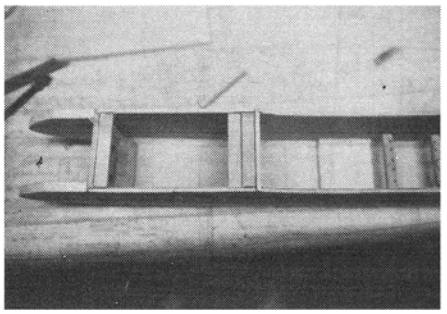
___ 8. Measure and cut the 1/4" x 3/8" balsa top stringer to length and glue it to the top of the fuselage side (both fuselage sides should be pinned down to the work surface). Repeat for the other fuselage side.

___ 9. Add the two 1/4" x 3/8" vertical pieces to each side.

___ 10. With the right-hand fuselage side pinned or weighted down (to make sure that it is perfectly flat), install bulkheads 1 (firewall), 2, and 3; be certain that they are vertical.

___ 11. After the adhesive has dried, and with the right side still pinned or weighted down on the work surface, add the left fuselage side. Be sure that it is square and perpendicular to the work surface.

___ 12. Install the 1/4" ply landing gear plate.



STEP #13

___ 13. Install the various crosspieces as follows:

(a) Install the 1/4" x 3/8" rear compartment top crosspiece. This butts up against the front of the rear top fuselage stringers.

(b) Install the two 1/8" x 1/2" ply crosspieces at the tank compartment.

(c) Install the four 1/4" x 3/8" vertical pieces, two in front of bulkhead 2 and two in front of bulkhead 3.

(d) Install the 5/8" triangular balsa crosspiece at the rear of bulkhead 1.

(e) Drill out the 1/4" wing hold-down dowel holes that were covered up by the 1/4" x 3/8" vertical pieces.

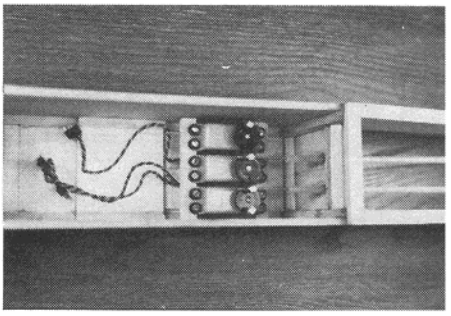
(f) Temporarily install the wing hold-down dowels, and glue in the 1/4" triangular dowel braces, making sure that the dowels are not glued in during this process. Remove the dowels after the 1/4" triangular pieces have dried.

(g) Install the rest of the triangular stock as shown on the plans.

___ 14. Place the fuselage upside down over the top view of the plans, pull the sides together at the tail, and glue. Be sure that the fuselage is straight. After this has dried, add the 1/4" x 3/8" balsa rear crosspieces.

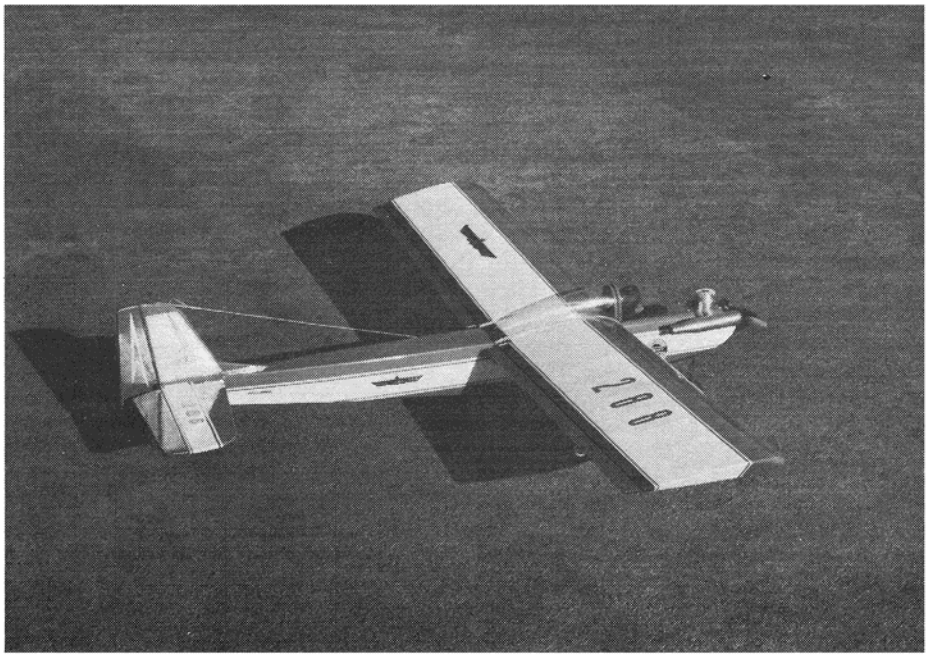
___ 15. Install the 1/16" ply bottom sheeting. Notch the front of the ply for nose-gear strut coil clearance. Now is a good time to notch out the firewall for the gear strut coil clearance if you haven't done so already.

If you are going to use nyrods or the Du-Bro Kwik-Rods, now is the time to install them before adding the rear 1/16" bottom and 1/8" balsa top sheeting.



STEP #15

(a) Install the servo rails and mount the servos. Refer to the plans for servo location.



(b) Install the rods and support them halfway down the rear fuselage. Note that bulkhead 3 is solid in order to give the outer rod a good gluing surface. Glue the outer rod at bulkhead 3 and the rear of the fuselage where the rods exit. Refer to the plans for the location of the pushrod exit holes. After the adhesive has dried, trim the rods flush with the fuselage sides.

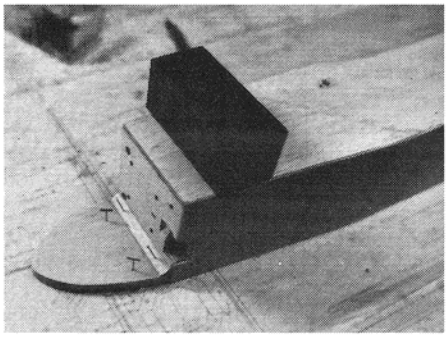
Helpful hint: For good glue adhesion to the outer rod and wood, roughen up the portion to be glued with sandpaper.

____ 16. Install the bottom rear 1/16" crossgrain balsa sheeting.

____ 17. Install the top rear 1/8" balsa sheet with the grain running lengthwise (along its longitudinal axis). Note that the top sheet or block extends out over the rear 1/4" x 3/8" top balsa stringers by 5/32". Hold down with weights. Trim to shape after the adhesive dries.

____ 18. Fit the wing to the fuselage wing saddle. There should be no gaps between the wing and the fuselage; it needs to be a good fit because no foam tape or rubber is used as a gasket or "gap cover-upper."

____ 19. With the wing resting on the fuselage and the 1/16" ply wing plate butted up against the front of the top rear balsa top sheet, fit the 1/4" triangular balsa piece on top of bulkhead 2 as shown on the plans. Shape this piece so that the wing leading edge will fit into it. When completed, the wing should fit perfectly on top of the fuselage.



STEP #20

____ 20. Add the 3/8" sheet balsa nose blocks.

____ 21. Hatch—The plans show the hatch being held on with a "tongue and groove" type of installation, as the Sig canopy is too wide to allow clearance for two rear bolts.

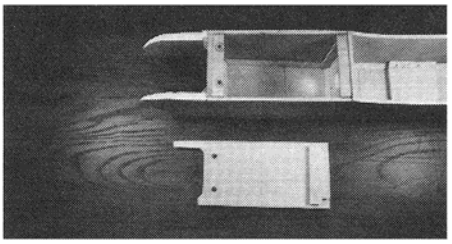
____ 22. Cut a piece of 1/16" ply 1" wide and long enough to equal the width of the tank compartment. Notch this piece to fit the 1/4" x 3/8" vertical pieces at the rear of the tank compartment.

____ 23. Push this piece under the rear 1/8" x 1/2" ply crosspiece. Make sure that it fits nice and tight, and leave it in place.

____ 24. Cut a piece of 1/8" ply 1/2" wide, with the length equal to the width of the tank compartment. Place this piece on top of the 1/16" x 1" piece that is in position under the 1/8" x 1/2" ply crosspiece. This piece should fit nice and tight. Make sure that it butts against and is even or level with the 1/8" x 1/2" ply crosspiece. Remove this piece, and using the 1/8" x 1/2" rear ply crosspiece as a reference, draw a line on the 1/16" ply piece.

____ 25. Remove the notched 1/16" x 1" ply piece and glue on the 1/8" x 1/2" ply piece so that one edge butts along the pencil line that you have just drawn.

____ 26. When the glue has dried, reinstall the assembled piece. Make sure that it is a snug fit and that the top 1/8" x 1/2" ply piece is even with the top of the fuselage sides and the rear 1/8" x 1/2" crosspiece.



STEP #21-30

____ 27. With the assembly still in place, put a *light* coating of 5-minute epoxy on top of the 1/8" x 1/2" ply piece that is glued to the 1/16" ply piece. Don't use too much epoxy, as you are going to put the hatch in place and any excess epoxy will squish out around the edges and permanently attach the whole mess to the fuselage. Put the hatch in place and hold it down with weights while the epoxy cures. When the epoxy has cured, remove the hatch by pulling straight toward the front of the fuselage.

____ 28. Install the two front 4-40 bolts and blind nuts.

____ 29. The following step is not absolutely necessary, but because balsa is quite soft, the hatch hold-down bolts do tend to compress the wood during use. To prevent this, 1/4" birch dowel inserts are installed as follows:

(a) Cut two pieces of 1/4" diameter birch dowels 3/8" long (thickness of the hatch).

(b) Using a No. 33 drill (a 4-40 clearance drill), drill a hole through the center of the two 3/8" long pieces.

(c) Put a couple of drops of cyanoacrylate adhesive on the hatch around the No. 33 holes already drilled. Do this on both sides of the hatch. Now open up these holes to 1/4" diameter. To assure a nice round hole, enlarge the holes progressively: 1/8", 3/16", then 1/4".

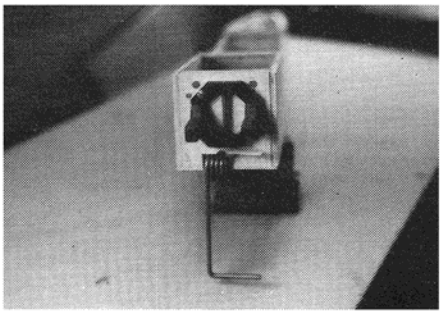
(d) With the hatch in place, take one of the drilled dowel inserts and put it on a 4-40 x 1 1/2" long bolt. Insert the bolt through one of the 1/4" diameter hatch holes, and thread it into the 4-40 blind nut. Making sure that the hatch is aligned, tighten the bolt; this will force the insert into the 1/4" diameter hole. Continue tightening until the insert is seated against the ply crosspiece. The top of the insert should be flush with or slightly below the top of the hatch. Leaving this bolt in place, take another 4-40 x 1 1/2" bolt and repeat for the other hole.

(e) Remove the bolts and hatch, and glue the inserts in with cyanoacrylate adhesive.

____ 30. Cut out the hatch for engine clearance and shape to blend with the top of the nose block.

ENGINE INSTALLATION

____ 1. Drill the motor mount to accept your particular engine.



STEP #2

____ 2. Temporarily install the motor mount onto the firewall.

____ 3. Trim the hatch and nose block to fit your engine. If the K&B .40 is used, you will have to remove the front right-hand portion of the hatch and notch the right-hand nose block in order to clear the muffler assembly.

____ 4. Locate and cut slots in the fuselage sides for the pushrod exits. Refer to the plans for location.

____ 5. Remove the engine and motor mount.

____ 6. With the hatch attached, sand the fuselage to shape, referring to the plan cross-sectional views and front top view for proper contours.

ASSEMBLY OF EMPENNAGE TO FUSELAGE

____ 1. Temporarily pin the horizontal stabilizer (less elevators) to the fuselage, making sure that the stabilizer centerline is aligned with the fuselage centerline.

____ 2. When you sight down the length of the fuselage, from front to rear, the horizontal stabilizer should be at right angles to the fuselage sides. If it isn't, remove the stabilizer and sand down the high side at the fuselage.

____ 3. With the hatch removed, make a mark at the top center of the firewall and place a pin at this location. Tie a 4-foot piece of string, or heavy carpet thread, to the pin and pull the string straight back to the left-hand tip of the horizontal stabilizer. Place your finger or a clothespin at the place where the string and stabilizer tip intersect. Move the string over to the right-hand stabilizer tip. The string marker should intersect at the same location. If it doesn't, make adjustments to the stabilizer until both tips are equidistant to the firewall center mark. (A 48-inch straightedge or 6-foot steel rule can be used in place of the string.)

____ 4. When you're satisfied that the horizontal stabilizer is square to the fuselage, mark its position by drawing a pencil line on the underside of the stabilizer where it intersects with the fuselage sides.

____ 5. Remove the stabilizer and put adhesive on the portions of the fuselage where the horizontal stabilizer makes contact.

____ 6. Install the horizontal stabilizer, using pencil lines to locate it on the fuselage. Repeat steps 2 and 3 to check alignment.

____ 7. After the adhesive has dried, place the vertical stabilizer assembly (less rudder) on top of the fuselage and horizontal stabilizer centerline. Check that no gaps exist between these two assemblies. While holding the vertical stabilizer in position, put the rudder in place, check for proper fit, and make sure that no gaps exist between the vertical stabilizer and rudder.

____ 8. Glue the vertical stabilizer in place. It must line up on the fuselage/stabilizer centerline and be at right angles to the horizontal stabilizer.

____ 9. After the adhesive has dried, install the 1/4" balsa triangular pieces (fillets) as shown on the plans. The rear of the top fuselage block ends abruptly at the top of the horizontal stabilizer. A pie-shaped piece of 1/8" balsa can be butt-glued to this, and then blended into the top of the horizontal stabilizer and triangular crosspiece. Or leave it as is, and when covering the 1/4" triangular fillets, let the covering material extend forward over the top block by about 1". This will cover up the square end.

COVERING

____ 1. Sand all parts so that there are no bumps, dings, etc. Use No. 280 grit sandpaper

(Continued on page 25)

(Continued from page 24)

for the finish-sanding. Using a coarse-grit sandpaper, roughen up the fiberglass at the wing center section. This will allow the covering to adhere to the fiberglass.

The next step is not absolutely necessary, but it is a method that I use to prevent bubbles and sagging when using iron-on materials. The reason for this procedure is that iron-on coverings tend to bubble when covering solid or sheeted surfaces. In addition, after covering and if there is moisture in the wood, when the airplane sits out in the sun for a while, the moisture will start to "cook" out and cause wrinkles or bubbles to appear over the sheeted or solid portions of the aircraft. Coverite markets a product called "Balsarite," which is applied over the entire airframe prior to covering and effectively seals the balsa. It also makes the adhesive in the covering material stick better.

____ 2. Apply the Balsarite to the airframe as per the instructions on the can, and let it dry.

____ 3. Take a common pin or T-pin, and prick holes all over the solid and sheeted portions of the airframe, making approximately six to eight holes per square inch. They don't have to go completely through the sheeting; 1/16" deep is a good average. By now you are probably thinking that all the sanding effort has gone to pot. Not to worry, as this does not affect the final finish at all. *Do not sand* the airframe after punching the little holes. Don't forget to put holes in the control surfaces also. The airplane is now ready to cover. Top Flite Super MonoKote was used to cover the two prototypes.

____ 4. The wing is covered first. If you haven't already done so, now is the time to purchase or borrow one of those small sealing irons. The Top Flite MonoKote iron is an excellent choice. If this is your first time using MonoKote, carefully follow the directions enclosed with the roll. *Before* covering the wing, temporarily install the ailerons and balance the wing. If one panel is heavier than the other, glue a weight to the inside of the tip rib of the lighter panel.

____ 5. Cut two strips of MonoKote, each one about 2" longer than each wing panel (one-half the span). Cut each strip wide enough so that when it is applied to the trailing edge, it will overlap both sides of the wing by 1/16" to 3/32".

____ 6. Apply the strips to the wing trailing edges, making sure that the MonoKote edges are well sealed.

____ 7. Using a razor blade or other sharp implement, slit the MonoKote at the trailing edge hinge slots. Seal the covering edges at the slots with the iron. Glue in the hinges. After the adhesive has dried, drill two 5/64" diameter holes 1/8" in from the trailing edge (TE), and completely through the wing and hinge. Put some glue into each hole and insert a round birch toothpick into each. Repeat for the rest of the hinges. After the glue has dried, cut off the toothpick ends flush with the wing TE planking. Sand smooth so that there are no bumps.

____ 8. Cover the rest of the wing, bottom side first. Let the covering overlap the TE by 1/8".

____ 9. Cover the rest of the aircraft.

____ 10. Slit the MonoKote at the hinge slots and seal the edges. Roughen the flat hinge surfaces with sandpaper to allow the glue to adhere to them. Mix a batch of Hobbypoxy Formula 2 or 30-minute epoxy. Take a T-pin, or long common pin, and bend a small hook at the pointed end. (A piece of small-diameter wire can be used if it's stiff enough.) Place a small amount of epoxy on the hinge slot, and with the hook end of the pin, work the epoxy down into the slot. Repeat this until the slot is filled. Insert the hinge and wipe off any excess epoxy that oozes out around the edges. Repeat this for the rest of the hinges.

Install the hinges on the vertical and horizontal stabilizers first (wing hinges are already installed). After the epoxy has cured, install the control surfaces to the hinges already mounted. Clean off all excess epoxy. Hold the surfaces tightly against each other with masking tape and be absolutely sure that there are no gaps. Once the epoxy has cured, remove the tape and check control surfaces for freedom of movement. Remove any epoxy that may have oozed out from the hinge slots. Pinning the hinges is not necessary when using this method on solid surfaces.

If steel-pin type hinges are used, epoxy can be prevented from sticking to the hinge pin and joint by bending the hinge back on itself and dipping the hinged section into melted vaseline.

____ 11. Cut out the pushrod exits in the fuselage and seal the MonoKote edges.

____ 12. Turn the fuselage over and mount the main landing gear. Use No. 4 x 1/2" sheet metal screws. If using the Bridi dural gear, drill all holes as per the plans. For those of you who prefer a 5/32" diameter piano-wire type of gear, the layout is shown on the plans. Mount with metal clips and No. 4 x 1/2" sheet metal screws. This type of gear is being used on one of the prototypes.

____ 13. Paint the engine and fuel tank compartment with fuel-proof paint or epoxy, and let dry.

____ 14. Install the motor mount using No. 6-32 bolts. The bolts should be long enough to just protrude through the blind nuts by two threads. Mount the nose gear.

EQUIPMENT INSTALLATION

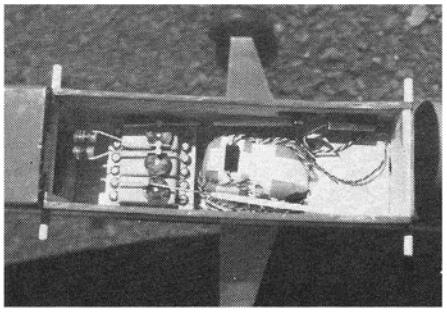
____ 1. Fuselage—Install the servo rails and mount the servos at the location shown on the plans. If you're using the Kraft KPS-14s, the mounting rail spacing can be taken directly from the plans. Be sure that there is a space between the bottom of the servos and the fuselage floor.

____ 2. Install the rudder and elevator pushrods and control horns. Goldberg pushrod connectors were used on the servo wheels and arms of both prototypes; they make pushrod installation and adjustments at the servo ends simple, and when the setscrew is tightened down, they will not slip.

____ 3. Install the nose gear and throttle pushrods. Hook up the nose gear arm to the pushrod, using the outer hole on the steering arm. A Goldberg pushrod connector was used here also.

____ 4. Install the engine and hook up the throttle pushrod.

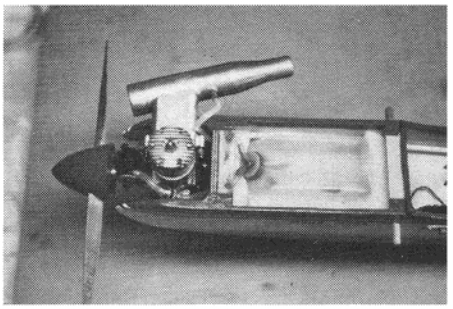
____ 5. Install the battery pack, switch harness, and receiver. The switch is to be mounted on the fuselage side opposite the engine exhaust. The receiver antenna wire should come out on the same side as the switch.



STEP #5

G.L.A.

Both prototypes turned out nose-heavy, so the battery pack was located at the rear of bulkhead 2 and on the floor of the fuselage. A piece of 1/8" ply sheet was cut out and glued over the top of the battery pack to keep it from rattling around. Enough height was allowed so that the foam-wrapped pack would fit snugly in this space. For easy removal, a piece of 1" wide masking tape was wrapped around the pack, leaving a 1/2" long pull-tab sticking out toward the rear of the fuselage compartment. The receiver is mounted between the battery pack and servos, and is held down by rubber bands.



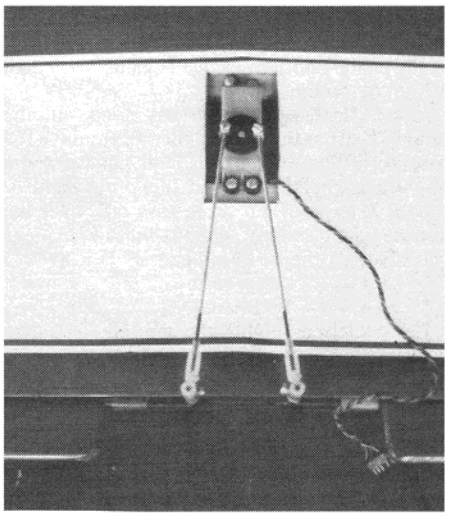
STEP #6

____ 6. Install the tank and fuel lines.

____ 7. Install the 1/4" diameter wing hold-down dowels. Do not glue; the wing rubber bands will keep the dowels from moving when the aircraft is assembled.

____ 8. Wing—If you haven't already done so, cut open the covering at the aileron servo hole. Seal the MonoKote edges.

____ 9. Shorten the 3/32" diameter aileron control horn wire to 7/8" long (measured from the inside bend radius).



STEP #10

____ 10. Install the nylon horn and metal retaining collar onto the control horns. The top of the assembly should be flush with the 3/32" diameter wire end. With the clevis holes pointing toward the wing leading edge, set the wing on the fuselage and check the ailerons for interference

by moving each aileron in both directions. You will probably find that the control horn assembly will hit the rear top wing hold-down dowel triangular crosspiece mounted to the front of bulkhead 3 when the aileron is in the "up" position. If it does, remove the interferring section. You may also have to remove some of bulkhead 3 in this area to obtain enough "up" throw in the ailerons. Aileron movement should be at least 5/16" up and 5/16" down.

____ 11. Install the aileron servo and pushrods.

____ 12. Plug the servos into the receiver. Using the transmitter, check that up is up, down is down, left is left, and right is right (don't forget the nose wheel steering), and that the throttle is on high (the hole in the carburetor barrel is fully open) when the transmitter throttle lever or stick is pushed to full forward.

CANOPY AND PILOT INSTALLATION

____ 1. With the hatch in place, attach the wing to the fuselage with a couple of No. 64 rubber bands on each side. Do not crisscross the bands, as the rear portion of the canopy fits over the center of the wing.

____ 2. Fit the canopy to the hatch and wing as shown on the plans.

____ 3. Cut out the two canopy formers from 1/8" sheet balsa and install them at the location shown. Remove a section of MonoKote at the places where these formers attach to the hatch and wing.

____ 4. Install a 1/4" sheet balsa floor, located on top of the hatch and under the forward portion of the canopy. Remove the MonoKote from the hatch area where the floor attaches.

____ 5. Install the pilot onto this floor. Do a good job of gluing this in, as it will be inaccessible once the canopy is installed. The floor can be painted if desired.

____ 6. Remove a very narrow strip of MonoKote where the rear canopy section attaches. Install and glue the canopy to the hatch cover, wing and two bulkheads. Do not let the glue get in between the two bulkheads. The front of the canopy bottom is glued against the edges of the 1/4" canopy floor.

____ 7. After the adhesive has dried, cut the canopy apart at the two bulkheads. Remove the wing by lifting straight up, and paint the exposed balsa bulkheads with fuel-proof paint or epoxy. A piece of 3/16" wide trim tape over the outside of the canopy at the bulkhead locations will cover up the bulkhead edges.

BALANCING

Completely assemble the aircraft, including wheels, prop, and spinner.

____ 1. With the fuel tank empty, balance the aircraft at the center-of-gravity (CG) location shown on the plans.

____ 2. The nose of the aircraft should point slightly down at an angle of several degrees. If it does, this means that the airplane is slightly nose-heavy and is okay for flying.

____ 3. If the tail drops or is down by several degrees, this means that the aircraft is tail-heavy. Add weights to the nose, just behind the firewall at the tank compartment floor, until the nose points down at an angle of several degrees. Glue in the weights. *Do not* attempt to fly the plane in a tail-heavy condition or you'll be in for some nasty surprises, such as snap rolls at slow speeds when putting in too much elevator during climb out or landing.

____ 4. If the nose really drops down at a sharp angle (30 degrees or so), you should move the battery pack back to the radio/servo compartment; this was done on the prototypes. Refer back to step 5 under "Equipment Installation." Just remember that a slightly nose-heavy condition is okay, but if the model is too nose-heavy it will not spin or snap roll.

CONTROL SURFACE DIRECTION CHECK

You should have already checked out the direction of the control movements, but do it again to make sure.

____ 1. Ailerons are really easy to hook up backwards, but there is a simple way to check for proper direction. Stand behind the model and move the transmitter aileron control to the right; the left aileron should go down and the right aileron should go up. Move the aileron control stick to the left; the right aileron should go down and the left aileron should go up.

____ 2. Pull back on the elevator control stick; the elevator should go up. Push forward on the elevator control stick; the elevator should go down.

____ 3. Move the rudder control stick (or knob if you're using a single-stick) to the left; the rudder should move to the left. Move the rudder control stick to the right; the rudder should move to the right. Check the nose wheel steering for proper direction at this time; it should move in the same direction as the rudder.

____ 4. Push the throttle stick forward; the hole in the carburetor should be open (full throttle or "high"). Pull the throttle stick all the way back; the hole in the carburetor barrel should be in the closed position.

CONTROL SURFACE THROWS

With the transmitter and receiver on, and all transmitter trims at their neutral or center positions, all control surfaces should be at neutral, i.e., no up or down. If they're not, adjust the control surface via the pushrods until they are.

____ 1. Ailerons—5/16" up and 1/4" down.

____ 2. Elevators—3/8" up and 3/8" down.

____ 3. Rudder—5/8" left and 5/8" right.

____ 4. Throttle—Set up the throttle per the engine manufacturer's instructions. Total throw, however, should be such that the engine throttle servo will not be in a stalled condition when the throttle stick *and* trim lever are at their extreme high or low throttle positions at the same time; otherwise excessive battery drain will occur, and it doesn't help the servo any, either.

PRE-FLIGHT PROCEDURE

Try to pick a calm day for the first flights, as it makes it easier to trim out the craft. If this is your first ship, or if you're fairly new at this game, enlist the help of an experienced modeler. It takes two people to perform several of the following steps.

Make sure that the transmitter and receiver batteries are fully charged according to the radio manufacturer's instructions. Assemble the airplane using at least five No. 64 rubber bands on each side of the wing. Don't forget to plug in the aileron servo before putting on the bands.

____ 1. Check the ground tracking of the plane by giving it a shove and letting it coast along the runway or pit area. If it goes to the left or right, adjust the nose wheel steering via the nose wheel steering arm pushrod connector until it tracks straight. Check that the transmitter rudder trim is at its neutral or center position before making these adjustments.

____ 2. Fill the tank and start the engine. Adjust the needle valve for a slightly rich high-throttle setting. Have your helper pick up the plane, and with the engine at high throttle, have him point the nose straight up. The engine should not sag or quit. If it does, the setting is too lean. Adjust the idle so that it is reliable yet slow enough to allow the aircraft to land.

Note: These adjustments are to be made with the transmitter and receiver on. Make it a practice to always start your engine at low or half throttle and with the radio turned on.

____ 3. Range-check the radio for distance as per the manufacturer's instructions. Do this with and without the engine running. There should be no significant difference in range between these two conditions.

____ 4. Top off the fuel tank, and turn on the transmitter and receiver. With the transmitter trims at their neutral positions, check the control surfaces for proper direction. Start the engine. While your helper holds the airplane, run the engine at full throttle and check the controls again for proper movement. If you have vibration problems, the controls will not react the way that they should. Do not attempt to fly if you notice any abnormalities. The majority of vibration problems are caused by an unbalanced prop and/or an off-balance or out-of-round spinner.

FLYING

If you have never flown RC before, do not attempt to teach yourself! Find a qualified instructor and have him teach you. If you have flown before, read on.

Point the plane into the wind and ease on the throttle. The plane should track straight as a string. Once it has reached flying speed, gentle back pressure on the elevator stick will unstick it from the runway. Climb up to a safe altitude and trim the aircraft via the transmitter trim levers until it flies straight and level, hands-off.

Now try a steep turn. If the nose drops, the plane could be too nose-heavy; if it wants to climb, it could be tail-heavy.

Try a few stalls. You will notice that the stalls are gentle, and that the ailerons and rudder are effective right up to the stall. Lowering the nose a few degrees will get the aircraft flying again.

Do a few aileron rolls to check the roll rate. The roll rate on both prototypes was ideal. If you want a faster roll rate, move the aileron clevis assemblies in toward the wing for more throw.

Try a rudder roll. If the rudder has enough throw, you'll see an excellent rudder or dutch roll.

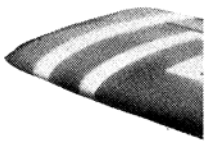
Although it is not recommended, the aircraft can be flown using rudder, elevator, and motor control only.

Once you're satisfied that the aircraft is trimmable, etc., go ahead and land it. Set up for a nice glide slope on final, and just before it touches down, flare it out ever so gently and it will grease right onto the runway with nary a bounce. If you find yourself having to feed in more elevator during the final approach to maintain the glide slope, then the plane is probably too nose-heavy.

Taxi back to the pit area and stop the engine. With the transmitter and receiver still on, check the transmitter trim positions and make the necessary control adjustments. Don't forget to return the transmitter trims to neutral before making the adjustments.

Remove the wing and inspect all mounting screws, bolts, etc., for tightness. Check the hinges also. In fact, check all parts that could loosen up and fall off.

That about does it. Have fun with your Great Little Airplane! ■



UTOPIA

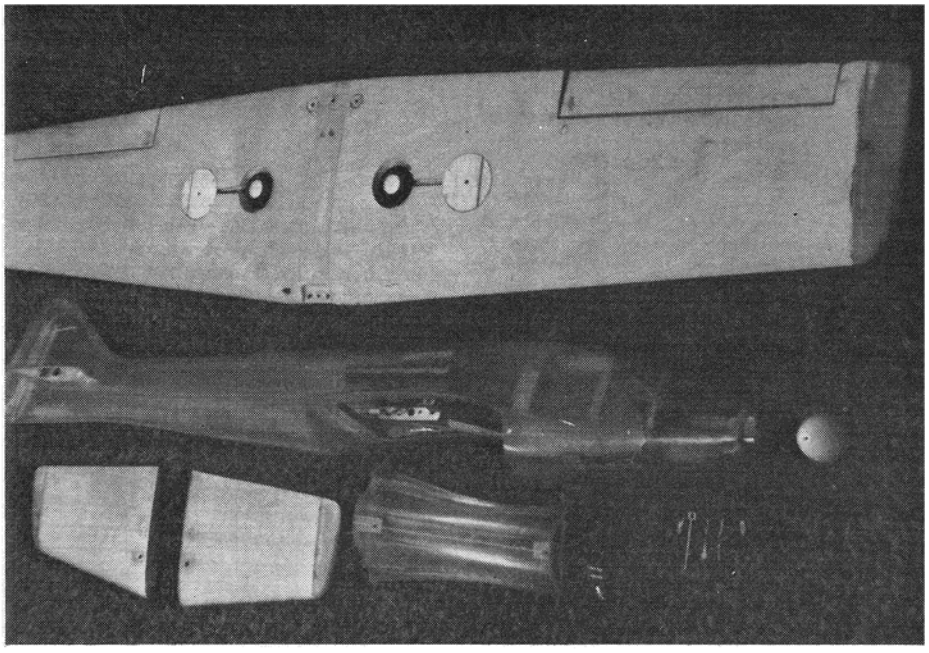
THE ULTIMATE ALMOST-READY-TO-FLY PATTERN AIRPLANE.

by Earl Haury

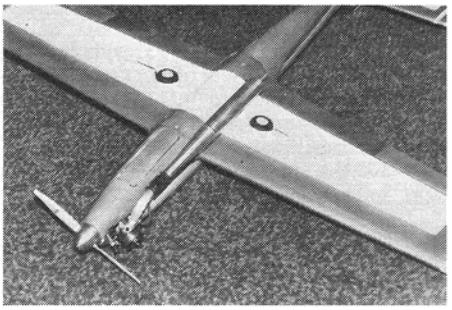
• The Utopia, as its name implies, is *the* ultimate pattern aircraft. When combined with the Rossi .60 piped engine and a good radio, it is a piece of competition equipment second to none. Strong words? You bet! They're based on the experience provided by preparation of two Utopias for competition and several hundred flights. Never before have I flown a competition system as fine as this.

Choosing a pattern design is difficult. Most are similar and yet each is different. Many long hours will be spent building, trimming, modifying, and practicing with a pattern aircraft until the pilot and the equipment are honed into a competitive team. This is where Utopia is unique. All the building, testing, and modifying is done for you. All that remains is adjusting control travels to your preference and practicing. The people at Utopia Enterprises have done their homework. Utopia is not just another RTF; it is a precision pattern aircraft in a class by itself.

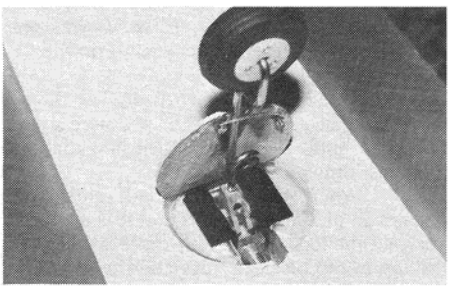
The Utopia design was originally published in the March 1972 issue of *Model Airplane News*. Refinements have been incorporated since then to keep pace with pattern demands as they have evolved. I was attracted to the Utopia by its smoothness and tracking qualities when I first saw it fly in 1973, but the lack of a kit, or even up-to-date plans, kept me from flying the aircraft until Utopia Enterprises was formed in 1977. Their plans to market a ready-to-fly Utopia opened the door. I wondered a little if they really could produce an aircraft of competition quality. They could and they did! It is not within the scope of this article to tell you how they do it, but I have visited their plant and will say it is impressive. Many innovative techniques have been developed and absolutely nothing is left to the discretion of the construction technicians. More than



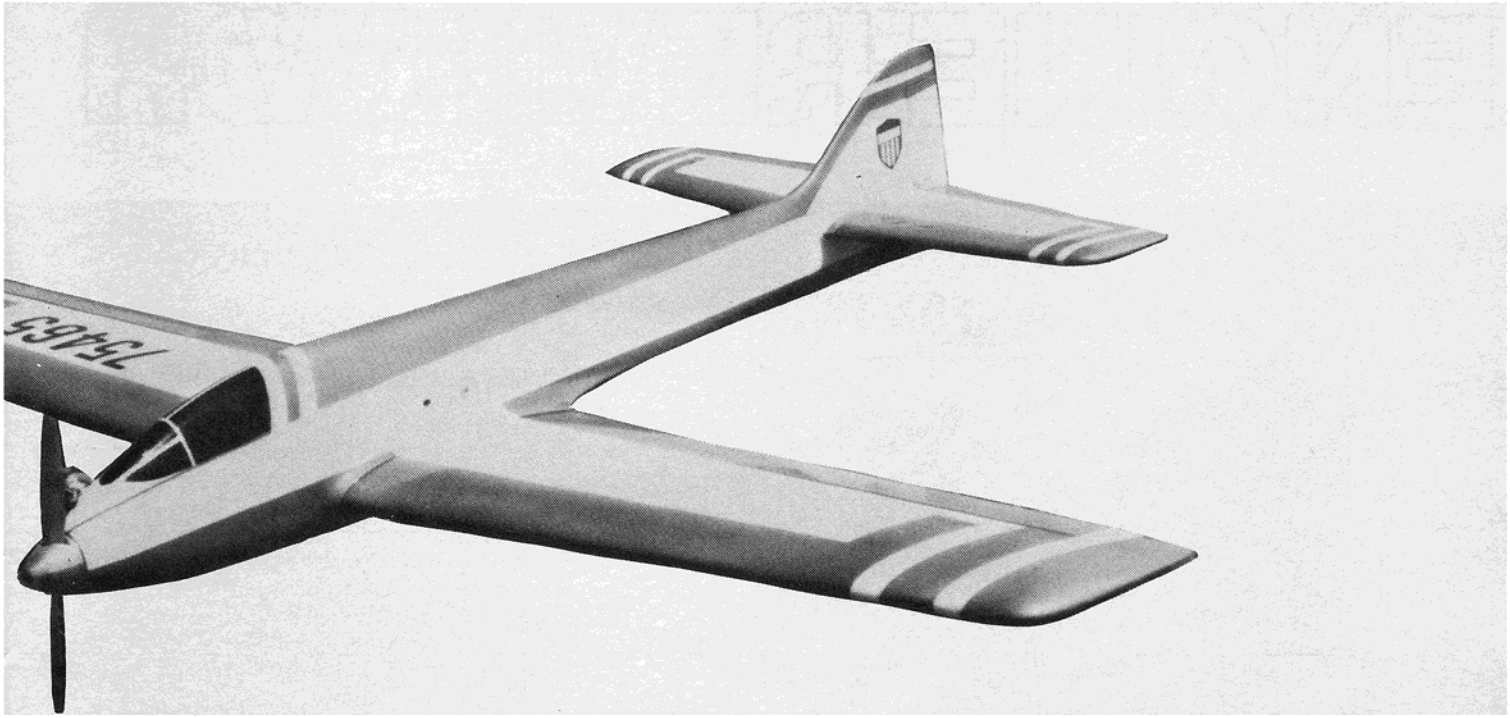
The Utopia as you receive it. Aside from paint, it's completely built.



Pipe location and gear details.



Modified gear doors. See text for more.



Author's Utopia was finished with acrylic lacquer and urethane.

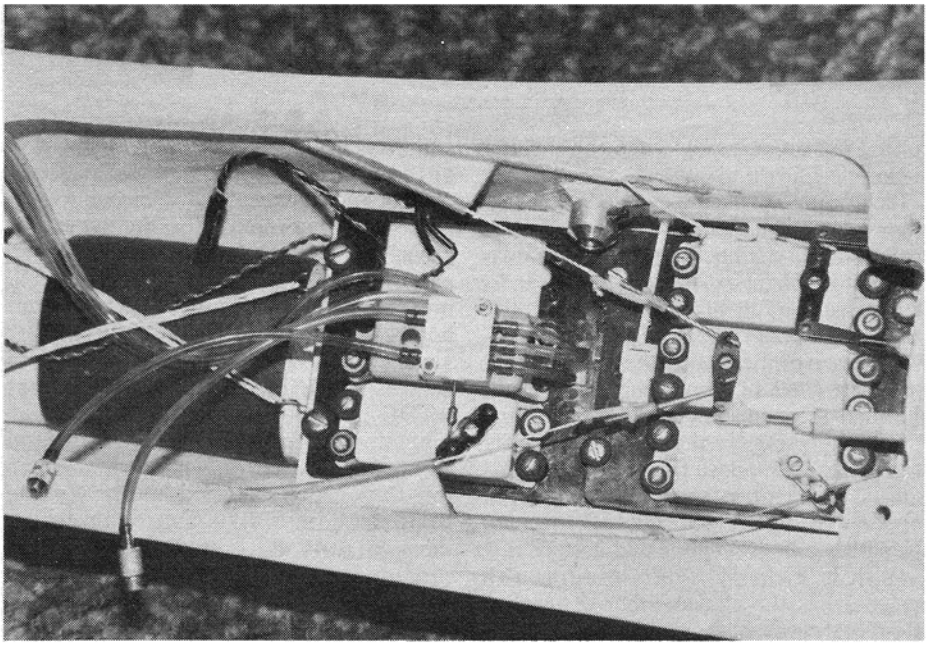
three hundred jigs and fixtures are used, including a monstrous final assembly alignment stand. It is refreshing to see quality stressed above all else.

When the people at Utopia say they provide a complete aircraft, they aren't kidding. The only option permitted is whether or not your Utopia will be painted.

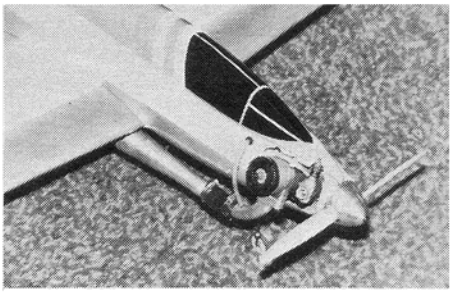
My first impression when I received my Utopia was that the box was too small for a completely built aircraft. The removable flying stab accounts for the compact shipping carton. (The carton is very sturdy and should be saved for future shipment of the Utopia from contest to contest.) After opening the box and disposing of a couple of garbage bags full of foam peanuts, I was staring at the most perfect fiberglass fuselage I've ever seen. When I dug deeper, the ply skinned wing and stab were uncovered. Again flawless. The wing fit the fuselage saddle as though the saddle had been molded onto the wing. Rhom retracts with Kraft wheels are installed. The nose gear sports a brake. Kraft servo trays (for KPS 15II servos) are installed, as are the pushrods and servo arms. A Sullivan 16-ounce fuel tank is in place with the necessary lines. Above the tank is the Rhom pressure tank, and the retract valve is mounted on a servo tray. The accessory package contains an EK switch actuator, a CB spinner with Fox adaptor nut, Rhom quick connects, engine mounting bolts and assorted other goodies. A complete instruction pamphlet detailing finishing and gear installation is included.

I assembled the fuselage, wing and stab, and carefully checked alignment . . . it was as straight as one can measure. I had elected to do my own painting, so the aircraft was disassembled and the hinges masked. (All control surfaces are removable.) Areas where foam is exposed

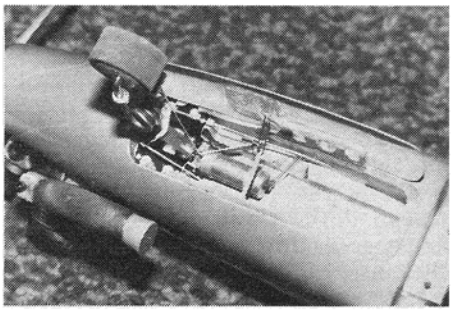
(Continued on page **29** *)*



Stabilator, rudder, and throttle servos at right, retract valve servo at left.



Angled engine puts pipe under fuselage.



Nose gear and door details.

F&B: UTOPIA

(Continued from page 28)

around aileron linkage and hinges were sealed with white glue thinned with water. The plywood wing and stab surfaces were filled with K&B resin, poured on and squeegeed off while wet with a razor blade. A light coat of K&B primer was sprayed onto the entire aircraft. The fuselage seam fit so well that a light coat of primer, brushed on, sealed it. The fiberglass parts are surprisingly free of the usual pinholes, and the very few imperfections were filled with a paste made of K&B primer and talc. Utopia was sanded, wiped with a tack rag, and sprayed with four light coats of Ditzler acrylic lacquer, well plasticized. After the trim was applied, the lacquer was sanded with 600 wet, paying special attention to the mask lines. The airplane was then sprayed with one coat of Ditzler Delthane clear polyurethane, thinned 100% with acrylic lacquer thinner. The total weight of the finish is 7.2 ounces and it's beautiful! The Delthane clear is really clear and tough as nails.

During the final assembly I made a few changes. Utopia recommends mounting the engine with No. 8 sheet metal screws. I substituted 8-32 socket-head cap screws with tapped 3/16" aluminum plates under the engine bearers. The rudder pushrod provided is wood and was replaced with a duplicate fabricated from a fiberglass arrowshaft in order to prevent trim changes from expansion and contraction of the fuselage. The flying stab linkage is very sturdy, but I am inclined to overbuild highly important linkages. I installed two Violett forks, one up and one down. They will fit side by side by removing 1/8" from the center bearing bosses of each and by shortening Utopia's fork positioning tubes to 7/8" each. Two fiberglass pushrods, one to each side of the servo output, complete the system. The wires by which the main gear semi-doors are pulled closed were modified by moving the bolts rearward to position the front bolt 1/8" forward of the strut. This prevents the strut from striking the rear bolt and breaking the door hinges on those occasional hard landings we've all been known to make. Actually, these are the only mods I could come up with to personalize the Utopia—and I've been known to use only the fuselage from some kits.

Installation of the tuned pipe required fabricating a special header because of the angled engine installation. The rear of the pipe is fastened to the belly pan with an aluminum bracket. Experience has shown it's imperative that the pipe be installed exactly parallel to the aircraft centerline, 2 1/4" to 2 3/8" to the right measuring from the pipe center to fuselage center, and as high as possible. This will prevent yaw in level flight and pitch toward down-elevator when top rudder is applied in knife-edge.

Flying the Utopia is an experience in itself. Neither Utopia has required any control offset. About the only trimming necessary is the setting of control travels to your preference. The CG was a little rearward in both my aircraft, but was corrected by placing the Rhom pressure tank in the belly of the fuselage behind the wing and moving the battery above the tank and forward. At a finished weight of 9 lb, the Utopia/Rossi combination has a superb vertical performance. With equal aileron travel in each direction (and no differential), Utopia rolls axially in either direction at the same rate. The flying stab is smooth beyond belief, but slightly less responsive down than up. The rudder is very responsive and very little travel is needed except for stall turns and spins. I use dual-rate rudder, setting the low rate so that slightly less than full stick is necessary for the reverse knife-edge maneuver. Excessive rudder travel will cause a climbing tendency in knife-edge and some pitch toward down-elevator. I use high-rate rudder only for the spin and stall turns. No rudder roll coupling is present.

Utopia excels in all maneuvers except a snap roll. I have not been able to perform good snaps, probably because of the flying stab, but I don't really care to anyway. Landings are a dream; the Utopia can be walked in on the mains with positive control. The only big difficulty I've found is that a blown maneuver is your own fault. It seems that the practice required for good flying cannot be included in any aircraft, even the Utopia.

The structural engineering applied to the Utopia is well thought out, resulting in low maintenance even though the aircraft is more complex than most. After more than three hundred flights, careful inspection has revealed no linkage or servo pot wear from vibration. Only the nose gear door and rudder hinge pins needed replacement. The landing gear must be kept clean and lubricated, as a sticky main gear—or low pressure, which will allow a door to open in flight—will create a tremendous yaw. The airplane is very fast and this necessitates using good, tight servos. Any small centering error will be translated into tracking problems. The small control deflections required, however, permit linkage gains to be reduced to effectively lessen servo centering error as seen by the control surfaces.

I selected the Rossi .60 side-exhaust engine because of its power and excellent reliability. Inspection reveals quality workmanship throughout. Initially some problems were encountered with throttle response, but changing to an idle-bar plug and an OPS pipe cut to the same length as the Rossi pipe cured the problem. I am not using a pump, but because of the ideal tank position in the Utopia, engine performance is excellent in any attitude. I do recommend removing the brass ring around the disc of the crankshaft. Its removal will not affect engine performance, but if it removes itself in flight, as some have, you usually get to buy a new engine. A worthwhile modification to an otherwise fine engine.

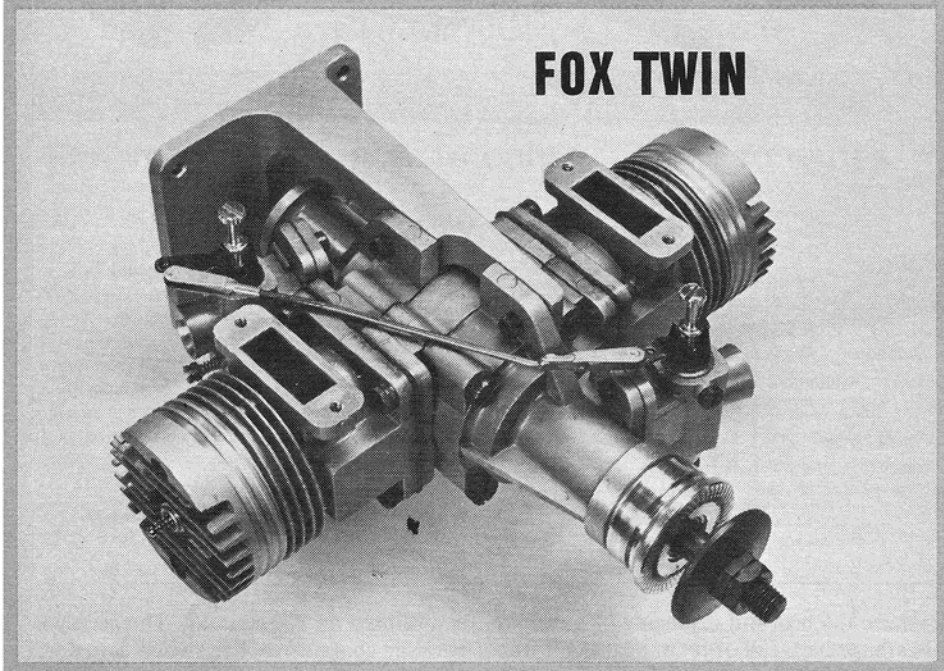
I mentioned earlier that this report deals with two Utopias. The second was built about a year after the first, and the photos included in this report are of the second. I have experimented with interchanging parts between the two aircraft and everything fits! Fantastic tolerance control! Better yet, they fly the same.

I must mention also that I received the second Utopia in an unexpected manner. My family recognized a long time ago that my mood is directly related to pattern flying. My satisfaction with the first Utopia improved my outlook on life so much that my wife and son gave me the second Utopia as a Christmas gift, thereby insuring my continued good disposition. Seems one good begets another.

For further information, write directly to Utopia Enterprises Co., 1014 Bellevue Court, Jefferson City, MO 65101. Tell them you read about it in Model Airplane News. ■

ENGINE REVIEW

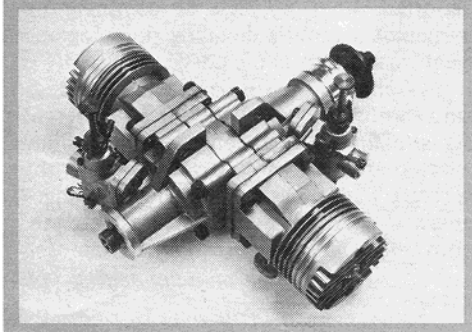
FOX TWIN



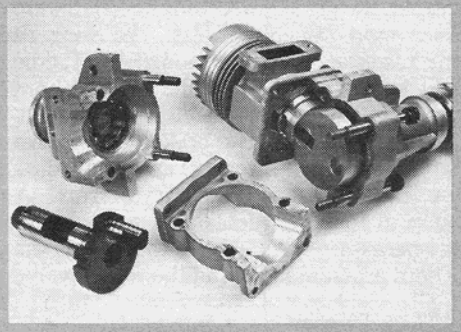
Over thirty years' experience has gone into Duke Fox's new twin design.

SPECIFICATIONS

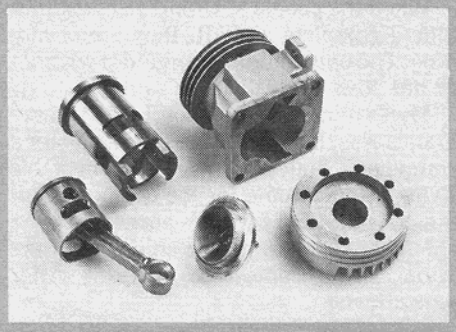
Type: Air-cooled, horizontally-opposed, simultaneous-firing, twin-cylinder, two-stroke cycle with dual shaft rotary-valve induction and Schnuerle scavenging.
Bore: 0.907 in. (23.04 mm)
Stroke: 0.937 in. (23.80 mm)
Displacement: 1.2108 cu in. (19.84cc)
Measured Compression Ratio: Approx. 9.5:1
Speed Control: Twin Fox MK.X carburetors with coupled throttles.
Checked Weight: 1,236 grams (43.6 oz) including firewall mount.
Manufacturer's claimed power output: 3.0 bhp at 14,000 rpm.
Manufacturer: Fox Manufacturing Company, 5305 Towson Avenue, Fort Smith, AR 72901.



Fox Twin with mount removed. Engine is now fitted with new Fox MK.X carbs.



Unusual crankcase and shaft design helps separate chambers for improved charging.



Schnuerle-ported cylinders are used with two-part heads having conical chambers.

• The Fox Twin, the largest and most powerful Fox model aircraft engine produced to date, is also the first two-cylinder motor from the Fox factory. Duke Fox began work on its design more than two years ago at the time when the Schnuerle-scavenged Series II Eagle 60 was under development. Not surprisingly, it shares many of the Eagle-II's features.

Basically, the Twin could, in fact, be regarded as two 60s placed back to back, each with its own carburetor and rotary-valve and *almost* with its own crank chamber. This is a good concept, since it helps to overcome the problem that has long bedeviled the designers of flat-twin, simultaneous-firing, two-cycle engines: the difficulty of delivering the optimum charge to each cylinder, at all times, so as to prevent one cylinder from starving and cutting out prematurely when the throttle is closed.

Ideally, in a crankcase charged two-cycle engine, each cylinder should have its own sealed crank chamber, fed from its own carburetor. The Fox Twin comes near to this by using a full-circle center web in the crankshaft. This runs with a clearance between its periphery and the surrounding crankcase wall of only about .020", and although there is some additional leakage through the rear crankpin drive slot, it is reasonable to suppose that charge separation is sufficient to render each cylinder responsive to fine-tuning of mixture strength via its individual carburetor.

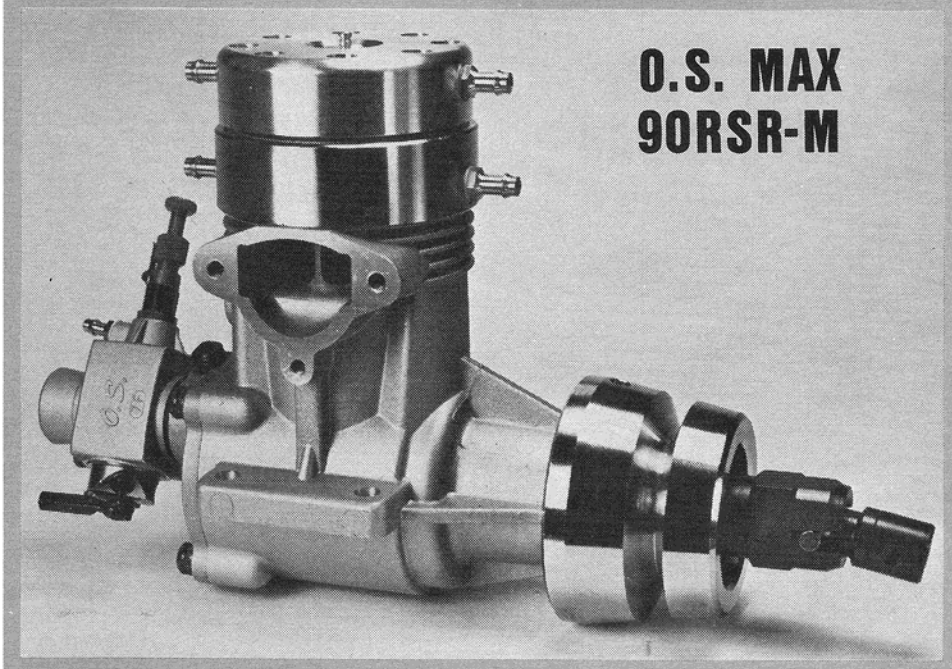
With a twin-cylinder engine, the designer has the choice either of using a one-piece crankshaft, in which case connecting rods with split lower end bearings will be necessary, or of employing a two- or three-piece shaft, permitting the use of ordinary conrods without detachable caps. Duke Fox has opted for the latter approach. The crankshaft is made in three parts. The front component has a large (17 mm) diameter main journal and a 10.3 mm bore gas passage fed from a rectangular valve port, 15.5 mm long, that opens at 45 degrees ABDC and closes at 52 degrees ATDC (our measurements). It has a 7.6 mm thick crankweb with an integral crankpin which is firmly pressed into the 8 mm thick center web. This means that the front conrod has to be in position before the two parts are pressed together and, consequently, the two shaft parts, plus the conrod, are a permanent subassembly.

The front section of the shaft runs in

(Continued on page **32** *)*

ROUND-UP

by Peter Chinn

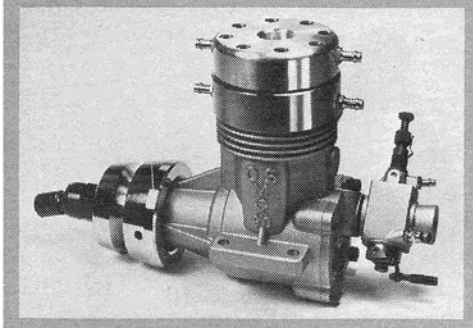


O.S. MAX 90RSR-M

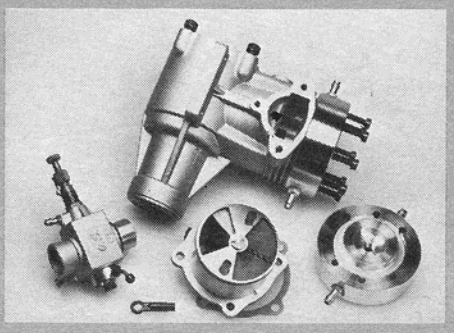
Designed for 15cc class international boat racing, Max 90RSR is most powerful OS engine.

SPECIFICATIONS

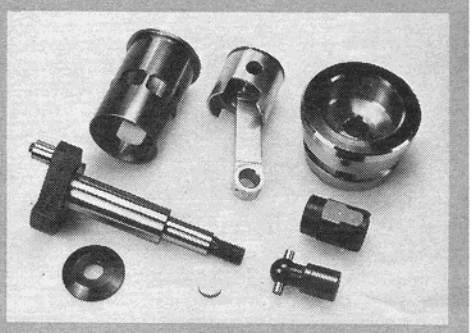
Type: Water-cooled, single-cylinder, side-exhaust, two-stroke cycle, with rear rotary disc valve induction and Schnuerle scavenging.
Bore: 27 mm (1.063 in.)
Stroke: 26 mm (1.024 in.)
Displacement: 14.886cc (0.9084 cu in.)
Measured Compression Ratio: Approx. 11.3:1
Speed Control: O.S. Type 7F carburetor.
Checked Weight: 1,082 grams (38.2 oz) including flywheel and U/J coupling.
Manufacturer's claimed power output: See text.
Manufacturer: O.S. Engines Mfg. Co., Ltd., Osaka 546, Japan
U.S. Distributor: World Engines Inc., 8960 Rossash Avenue, Cincinnati, OH 45236.



Engine has water-jacketed cylinder as well as usual water-cooled head.



90RSR features sturdy one-piece case, cast steel valve disc, machined head.



Hard-coated liner, Dykes-ringed piston, plated flywheel, marine universal joint.

• There are no less than 41 different models on the O.S. company's current engine production list, ranging from the 0.107 cu in. Max-10FSR to the 1.215 cu in. FT-120 twin-cylinder four-cycle motor, and of all these motors, the most powerful is the Max-90RSR Marine.

Designed for 15cc class powerboat racing, the Max-90RSR has a bore and stroke of 27 x 26 mm, giving a swept volume of just under 14.9cc or 0.908 cu in. These are the same dimensions as for the Max-90FSR and the two engines bear an obvious family resemblance to each other. However, whereas the 90FSR is a front-induction (crankshaft rotary-valve) engine, the 90RSR is a rear rotary disc valve design and there are very few parts that are interchangeable between the two models. In fact, the only components that are common to both engines are the connecting rod, wristpin, and front ball bearing.

One thing that the 90RSR has in common with the 90FSR—and which, incidentally, sets it apart from all seven current .61-.65 cu in. O.S. engines, both air-cooled and water-cooled—is its use of a one-piece body casting embracing the crankshaft housing as well as the crankcase and cylinder casing. It also differs from other O.S. two-cycle marine engines in that, in addition to a water-cooled cylinder head, it has a water-jacketed cylinder. This is of plated brass and has screw-in brass inlet and outlet nipples placed fore and aft. Similar nipples are located in the water-cooled head, which is of machined aluminum bar stock and is held down with eight 3.5 mm socket-head cap screws.

Reverting to the engine's main casting, this is a very substantial pressure casting with sturdy beam mounting lugs and a webbed front end. It has generously proportioned channels to feed the bypass ports and a short exhaust stack on the right side with three tapped holes to accept either an adaptor for use with an OS-744 muffler, or the O.S. header pipe unit to enable a tuned pipe to be used.

Being a rear rotary-valve engine, the 90RSR does not need such a large diameter crankshaft as the shaft-valve 90FSR, but this is still quite hefty at 15 mm o.d. The shaft has an 8 mm diameter crankpin on a 9.5 mm thick crankweb, the web flanks being cut away each side of the crankpins to leave a semicircular counterweight. The shaft is supported in NTN

(Continued on page 32)

FOX TWIN

(Continued from page 30)

two ball journal bearings; a 17 x 30 mm 10-ball steel-caged inner, and a 1/2" x 7/8" 12-ball steel-caged outer. The rear section of the shaft has a smaller (but still substantial) journal diameter of 15 mm and runs in a single 15 x 28 mm 9-ball steel-caged bearing, supplemented by a plain bearing that is bronze bushed at its outer end. The rear shaft has the same diameter gas passage (10.2 mm), and is fed by a rectangular valve port 16 mm long, but has slightly different timing—opening at 39 degrees ABDC and closing at 50 degrees ATDC (our measurements). The hefty integral crankpin has a diameter of 0.341" (nominally 11/32" or 8.7 mm) and is extended to form a 1/4" wide tongue that engages the slot in the center web.

The crankcase is made in three sections from aluminum pressure castings. The front and rear sections containing the main bearings are externally similar. Sandwiched between them is a 9/16" wide center section, the three components being aligned and held together by four special 3/16" diameter steel through-bolts with 6-32 threaded ends.

Each cylinder comprises a hardened steel liner in a pressure cast aluminum case that is tied to the crankcase with four 8-32 socket-head cap screws. Cylinder porting consists of a centrally bridged exhaust port, flanked by two deep bypass ports angled away from the exhaust and fed from sharply angled bypass passages in the surrounding casting. In place of the usual single upwardly-inclined third port there are two such ports. Port opening periods are fairly long. According to our measurements, the exhaust ports are open for 150 degrees of crank angle, the flanking bypass ports for 132 degrees, and the inclined third ports for 130 degrees.

The pistons have single, pegged compression rings and skirt windows to assist gas flow to the bypass passages. The tubular 1/4" o.d. wristpins are placed high in the piston, enabling long conrods to be used which cancel out the increased rod angularity that would otherwise result from the engine's longer than usual stroke. The conrods are bronze bushed at both ends.

Cylinder heads are uncommon and are made in two parts. The inserted inner part, or "button" as Fox calls it, is machined from bar stock and has a conical combustion chamber surrounded by a vestigial (approximately 1/16" wide) squishband. The outer component is pressure cast with deep tapered cooling fins. Eight 6-32 socket-head cap screws are used to tie the complete assembly to the cylinder. Glowplugs are Fox 1.5 volt long-reach bar type. Combustion chamber volumes of the two cylinders were well matched on the engine examined and gave a nominal geometric compression ratio of approximately 9.5:1.

One or two changes have been made to the Fox Twin since it was first announced last year and the engine is now fitted with the new Fox MK.X carburetor. This breaks with a Fox tradition in that it uses a conventional barrel throttle, rotating in a helical movement around a fixed spraybar and containing a secondary needle for adjusting the idling mixture. In other words, it works on the same principle as a number of other adjustable automatic-mixture-control carburetors. This will undoubtedly please those who are used to conventional carburetors and who may have been confused by the old type Fox carb adjustment procedures, although we would like to say, in passing, that the older Fox carb is, in principle, a very good carburetor and is not the least bit tricky to set up if one follows the correct sequence of adjustments.

The Fox Twin comes complete with an adjustable link coupling the two throttles together and a "Y" fitting for connecting the two carburetors to a common fuel line. It is also supplied ready-installed on a firewall type aluminum mount and this accounts for just over 5 oz of its total weight of nearly 2 3/4 lb. Also available for use with the engine are pairs of chromed exhaust header pipes in a choice of straight, swept-back or curve patterns. A pair of 6" straight pipes with screws weighs just over 5 oz.

The Fox Twin is of rugged construction throughout and is obviously powerful. The manufacturer rates the engine at around 3 bhp at 14,000 rpm, which does not seem to be an unreasonable claim and we hope to run full tests to confirm this in due course. Fox emphasizes that the engine should be allowed to rev and should not be loaded down with too large a prop. The instruction sheet suggests a 13" diameter prop for peak performance. However, modelers flying quarter-scale and other large-scale models who want to use a bigger size can use a 15x6 or 16x4.

Will it fit?

Fox Twin mounting dimensions, less muffler:

Overall width (less glowplugs): 185 mm (7 1/4")

Length from prop driver, including firewall mount: 157 mm (6 3/16")

Bolt-hole spacing: 54 x 54 mm (2 1/8" x 2 1/8")

O.S. MAX-90RSR-M

(Continued from page 31)

shielded ball journal bearings, a 15 x 32 mm inner and a 10 x 26 mm outer.

The piston is similar to that of the 90FSR, but has a pegged Dykes type ring. It has large rectangular skirt cutaways, fore and aft, to prevent masking the bypass entries. The 7.3 mm o.d. tubular wristpin is placed high in the piston, enabling a long (47 mm between centers) conrod to be used to keep rod angularity within desirable limits for a 26 mm stroke. The pin is full-floating and is located by wire retainers. The conrod is of machined high-duty alloy and is bronze bushed at both ends with a single oil hole at the wristpin end and two oil holes at the crankpin end.

The steel cylinder sleeve has a wall thickness of 2 mm and has O.S.'s special extra-hard all-over composite plating that is claimed to be superior to hard-chroming. The sleeve is similar to that of the 90FSR, but is very slightly longer and has much deeper exhaust ports, thereby extending the exhaust timing to give a period more appropriate to a tuned length exhaust system. The actual measured exhaust period of the engine for this report was 160 degrees of crank angle, compared with 144 degrees for the 90FSR. The main bypass ports open for 120 degrees and the upwardly inclined third port for 112 degrees.

As previously noted, the water-cooled cylinder head is of machined bar stock. It features a bowl-shaped combustion chamber surrounded by a 5 mm wide sloped squishband. With its 0.4 mm soft aluminum head gasket, our motor checked out at a compression ratio of 11.3:1. Eight 3.5 mm socket-head cap screws are used to tie the head to the main casting.

The backplate and rotary-valve assembly is basically an enlarged version of that fitted to the Max 65VRM described in the May 1980 issue of *M.A.N.* It has a 15 mm i.d. intake boss, which opens into a large sector-shaped port in the inner face of the backplate that registers with a similar port in the valve disc. The disc, which is machined, hardened and ground from a steel investment casting, is counterbalanced, has a diameter of 39.4 mm, and is 2.5 mm thick. The valve disc rotates on a bronze pin and, according to our measurements, opens at 34 degrees after BDC and closes at 60 degrees after TDC.

The carburetor, the same as that fitted to the 65VRM, is the excellent O.S. Type 7F adjustable automatic-mixture-control type with massive 11.5 mm diameter choke and an effective choke area of 75 sq mm. The carb is retained by a cotter pin and nut.

The engine is equipped with a plated brass flywheel weighing 9.4 oz. It has an o.d. of 49.6 mm, is 33 mm long, and is fitted to the 10 mm front end of the shaft with a Woodruff key. The shaft end is threaded 5/16 -24 UNF and the flywheel is held in place by a hefty steel universal-joint coupling. **Contin. on page 35**

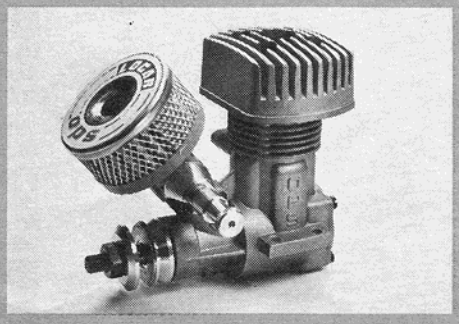
ENGINE REVIEW

OPS 3.5 SPEED-CAR

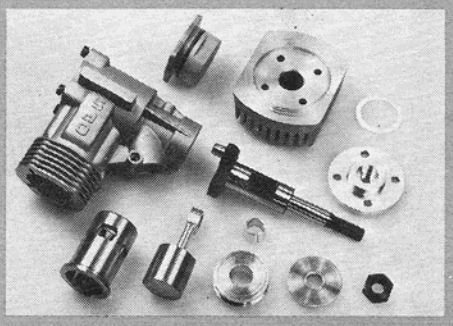
Latest version of the highly successful OPS 3.5 Speed-CAR engine from Italy.

SPECIFICATIONS

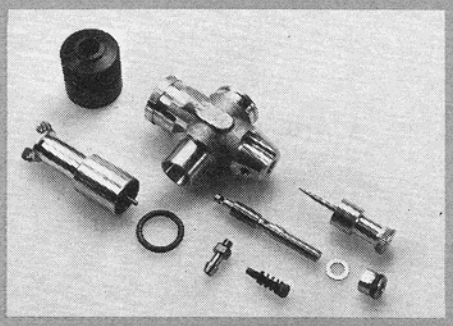
Type: Air-cooled, single-cylinder, side-exhaust, two-stroke cycle with crankshaft rotary-valve and Schnuerle scavenging.
Bore: 16.6 mm (0.6535 in.)
Stroke: 16.0 mm (0.6299 in.)
Displacement: 3.463cc (0.2113 cu in.)
Measured Compression Ratio: Approx. 13.5:1
Speed Control: OPS slide-throttle carburetor.
Checked Weights: 281 grams (9.9 oz); 297 grams (10.5 oz) including air filter.
Manufacturer's claimed power output: 0.95 bhp at 25,000 rpm.
Manufacturer: OPS s.p.a., Via Silvio Pellico 40, 20052 Monza, Italy.
U.S. Distributor: Shamrock Competition Imports, P.O. Box 26247, New Orleans LA 70186.



Optional extra snap-on air filter is made specially for OPS by Italian Locar firm.



Like all OPS engines, 3.5 Speed has ABC piston/liner assembly.



Parts of special OPS carb. Cylindrical throttle slide with needle, left.

• The OPS 3.5 Speed engines, first introduced in 1977, are available in four models. These are the 3.5 Speed-STD (with plain venturi and needle-valve assembly for control line or free flight use); the 3.5 Speed-RCA (Radio Control, Aircraft); the 3.5 Speed-RCB (Radio Control, Boat) and the 3.5 Speed-CAR (for RC cars).

The Speed-RCA was the subject of a full test report in the February 1978 *M.A.N.* Since that time the OPS 3.5 has chalked up numerous successes in the model car racing world, including many international championship wins. This supplementary article therefore deals with the latest 3.5 Speed-CAR model.

Basically, the engine is the same as our original test model insofar as it remains a twin ball bearing, shaft-intake, Schnuerle-scavenged motor with a one-piece body casting and an ABC piston/cylinder assembly. There are, however, a number of modifications, some of which are exclusive to the CAR model. Others are common to all four current versions of the OPS 3.5 Speed.

The main casting, embodying the crankcase, a full-length cylinder casing with three bypass channels and a sturdy front end with 12 mm i.d. intake boss, is unchanged except for a slightly wider intake port and the addition of a machined channel in the crankcase to provide extra clearance for the new connecting rod. The latter, instead of having plain eyes at both ends, has a bronze bushing at the crankpin end. The piston is also slightly modified. It now has wider bosses to give better support to the wristpin and the sum total of these changes is to increase the piston and rod assembly weight from 7.3 to 8.1 grams.

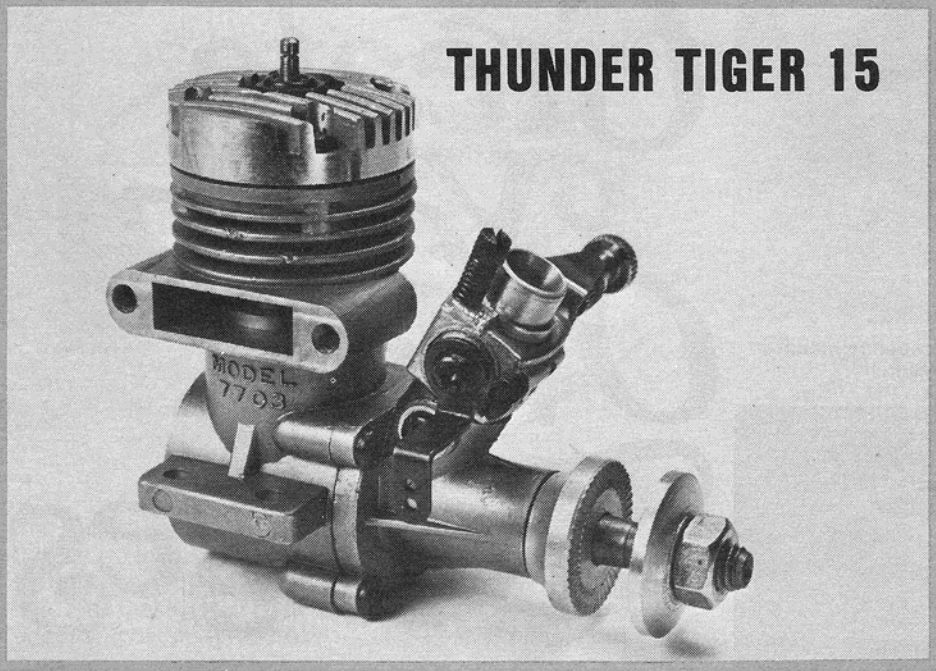
The cylinder head, made in two parts and consisting of a machined, flanged combustion chamber insert, surmounted by a large pressure-cast heatsink with deep lateral finning, is unchanged except for a slightly increased inserted depth which raises the compression ratio slightly. The actual measured compression ratio of the engine examined, with standard 0.2 mm aluminum gasket, was approximately 13.5:1. The chromed bore brass cylinder liner is unchanged except for the raising of the exhaust port, which extends the exhaust period from 150 to 160 degrees of crank angle. According to our measurements, there is a very slight change to the bypass and third port periods, now 127 and

(Continued on page **35***)*

ROUND-UP

by Peter Chinn

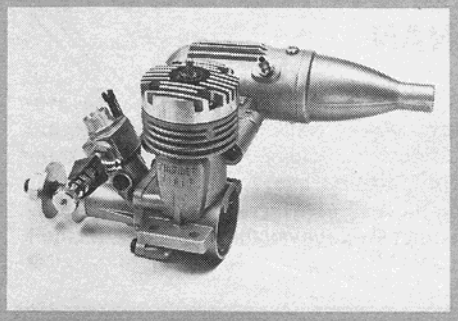
THUNDER TIGER 15



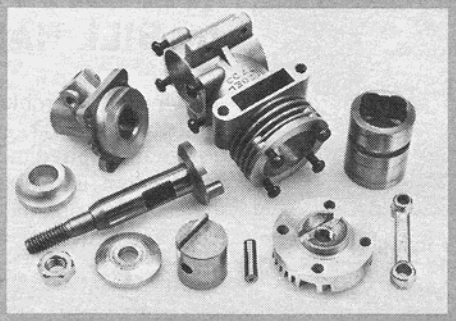
Thunder Tiger 15 is a low-priced sport engine from Taiwan suited to RC beginners.

SPECIFICATIONS

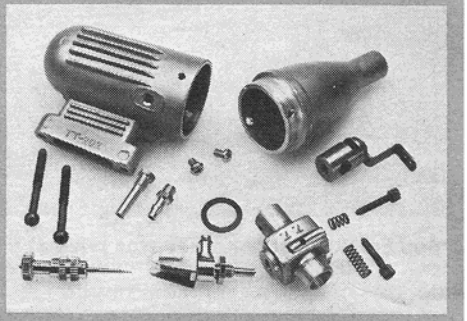
Type: Air-cooled, single-cylinder, side exhaust, two-stroke cycle with crankshaft rotary-valve and crossflow scavenging.
Bore: 15.0 mm (0.5905 in.)
Stroke: 13.8 mm (0.5433 in.)
Displacement: 2.439cc (0.1488 cu in.)
Measured Compression Ratio: Approx. 7:1
Speed Control: Thunder Tiger barrel-throttle carburetor.
Checked Weights: 156 grams (5.5 oz); 193 grams (6.8 oz).
Manufacturer's claimed power output: 0.26 bhp
Manufacturer: Chung Yang Industries Co. Ltd., Taichung, Taiwan 400.
U.S. Importer: Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92708.



TT-15, complete with muffler, is one of the least expensive .15 engines sold.



Internally, the TT-15 is obviously based on the Japanese Enya 15-III engine.



Muffler and carburetor are of conventional design and construction.

• The Thunder Tiger Model Company, as you might suppose from this name, is an oriental enterprise. It is an offshoot of the Chung Yang Industries Company Ltd. of Taichung, Taiwan. The main activity of the parent company is the manufacture of sewing-machine components.

The decision to enter the model industry was taken in 1973 and the first small production batch of engines was made early in 1974. The design of this first engine was closely modeled on that of the Japanese Enya 15-III. About 4,000 of these motors were made, practically all of them being sold locally. In 1975, an improved Series II version of the Thunder Tiger 15 was introduced and about 14,000 of these were sold, some of them in overseas markets. It was followed, in due course, by the Series III model described here, which has been exported to many countries including the U.S, the U.K, France, Germany and Australia. The Thunder Tiger company has also introduced .10, .20 and .25 cu in. motors. All are plain bearing, shaft rotary-valve, sport type engines that are low priced and are available either with a standard venturi insert and needle-valve assembly for free flight or control line use, or with a throttle type carburetor for radio control use.

As we have already remarked, the original Thunder Tiger 15 was closely modeled on the Enya 15 and, although the external appearance has been altered, these origins are still visible. For example, despite what appears, from the outside, to be a conventional bypass passage between the casting and the cylinder liner, no such passage exists. Instead, the cylinder liner, like the Enya, has a very thick (2.75 mm) wall with a pair of internal flute type bypass ports diametrically opposite the single unbridged exhaust port. Ports are timed to remain open for 116 degrees (bypass) and 132 degrees (exhaust) of crank angle. The lapped cast-iron piston has a conventional straight baffle and is coupled to the unbushed diecast aluminum conrod with a 4 mm o.d. full-floating tubular wristpin having brass pads. The finned cylinder head is of pressure cast aluminum with a cast-in brass thread insert for the glowplug and has a bowl-shaped combustion chamber slotted for piston baffle clearance.

Typical of all earlier Enya designs, and most of the current ones, the crankcase does not have a detachable backplate and therefore has a separate front housing, but

(Continued on page 35)

O.S. MAX-90RSR-M

(Continued from page 32)

The factory rates the Max-90RSR-M at a nominal 3.7 bhp. The speed at which this is achieved is not specified, although a claimed "practical rpm" range of 2,000-22,000 suggests that the peak output might well be realized at around 20,000 rpm. Presumably, the output figure also relates to the engine's capabilities with a suitable tuned-pipe exhaust system and/or a high-nitro fuel. Suggested prop sizes are 60 to 70 mm (2 3/8" to 2 3/4") diameter, using pitch/diameter ratios of 1.0 to 1.4 for deep vee hulls and 1.4 to 2.0 for hydroplanes.

Will it fit?

Max-90RSR-Marine mounting dimensions, less muffler:

Crankcase width: 47.5 mm (1 7/8")

Length (including flywheel and nut): 172 mm (6 3/4")

Height above c.l. (less glowplug): 89 mm (3 1/2")

Bolt-hole spacing: 58 x 30 mm (2 9/32" x 1 3/16") ■

OPS 3.5 SPEED-CAR

(Continued from page 33)

124 degrees, respectively.

The crankshaft and its bearings (12 x 24 mm 10-ball steel-caged rear and 7 x 19 mm 8-ball brass-caged shielded front) are practically unchanged, the only modification being a slight reduction in shaft bore from 9.1 mm diameter to 8.9 mm diameter and a partially drilled through (instead of entirely tubular) crankpin. The shaft port size is unaltered, but the wider port in the bearing housing has extended the intake period by about 6 degrees. According to our measurements, the valve now opens at 40 degrees ABDC and closes at 54 degrees ATDC.

In place of the molded plastic crankcase backplate, the latest model reverts to a pressure cast aluminum backplate, but continues to use an O-ring seal rather than a paper gasket.

In place of the earlier model's Perry carburetor, our sample OPS 3.5 Speed-CAR was fitted with a new type of OPS carburetor. This is similar to the OPS *Orrizontale* carburetor (see Part 2 of our "Carburetors and Throttles" article, July 1979 *M.A.N.*), except that the tubular throttle slide is of aluminum instead of brass, and operates with a direct push-pull action from the side instead of being linked through a bellcrank. A rubber bellows encases the outer end of the throttle slide to prevent its being contaminated with dust and grit. The carburetor has an 8 mm choke and, after allowing for the jet tube and secondary needle, effective choke area is approximately 31 sq mm, or about 50 percent larger than the choke area of the Perry-equipped RCA version, and can be expected to yield a worthwhile power increase.

The carburetor intake has a 16 mm diameter external lip for an air filter and our motor came equipped, as shown, with a good folded paper element filter. This, an Italian Locar filter made especially for OPS, has a diameter of 42 mm and weighs a modest 0.6 oz. Incidentally, the carb assembly is held in place in the engine's intake boss by a cotter pin and nut, which ensures that there is no risk of the carb and filter assembly vibrating loose.

Our tests of the original OPS 3.5 Speed-RCA yielded a gross output (less muffler) of 0.66 bhp at 22,000 rpm running on the recommended 5% nitro fuel. At the time, it was estimated that this might be increased to between 0.73 and 0.76 bhp by the use of 40% nitromethane. The manufacturer's claimed power output for the 3.5 Speed-CAR is 0.95 bhp at 25,000 rpm. ■

THUNDER TIGER 15

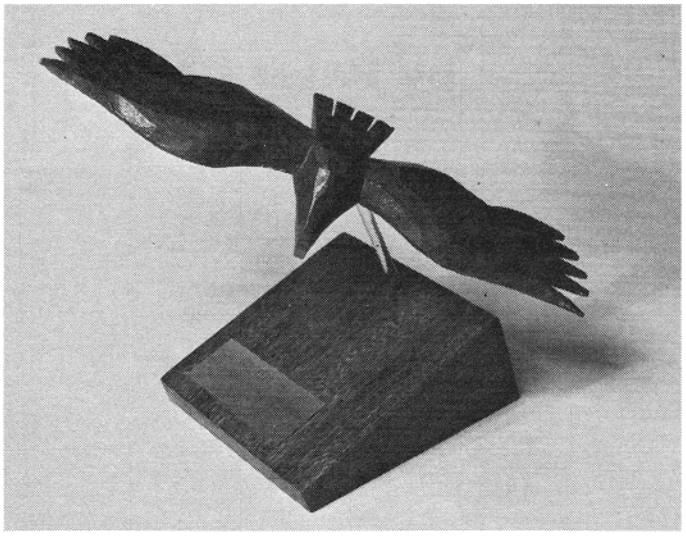
(Continued from page 34)

an iron crankshaft bushing is used in place of the Enya's bronze one. The crankshaft is conventional, with a 9.5 mm diameter journal, a 7.0 mm gas passage, and a 4.4 mm diameter solid crankpin on a full-circle crankweb with integral crescent counterweight. The rectangular valve port gives conservative intake timing: it opens at 30 degrees ABDC and closes at 40 degrees ATDC.

The carburetor is a barrel-throttle type with adjustable airbleed for idle mixture compensation, but is modeled on the Type 21 carburetor used by the O.S. Max-15 R/C rather than the Enya design. Also resembling an O.S. product is the muffler that comes with the engine. This is pressure cast in front and rear sections that are plugged together and secured with two screws. It has longitudinal cooling ribs, a brass priming nozzle, and a brass pressure fitting. It is attached to the engine with two long screws.

A nominal power rating of 0.26 (fuel unspecified) is claimed for the Thunder Tiger 15-III R/C, but the rpm at which this figure may be realized is not stated. It is, perhaps, worth noting that when we tested the Enya 15-III back in 1967, it delivered a gross output of just over 0.25 bhp at 13,700 rpm on 5% nitro.

One final point. The nominal bore and stroke of the Thunder Tiger 15 is given as 15 x 14 mm, which is the same as for the Enya. Our engine, in fact, had a measured bore and stroke of 15 x 13.8 mm, so its true displacement at just under 2.44cc or 0.149 cu in. was very slightly smaller. ■



A "Mooney Bird," featuring a carving by Walt Mooney mounted on a clear plastic rod. Brass plate identifies event.

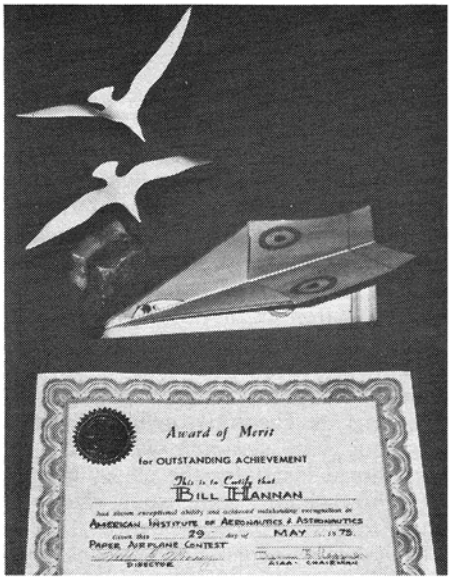
"Ben Franklin" ceramic key was prize at a kite flying contest. Ribbon allows award to be worn around the neck.

Create Your Own Trophies

(AT LITTLE OR NO COST)

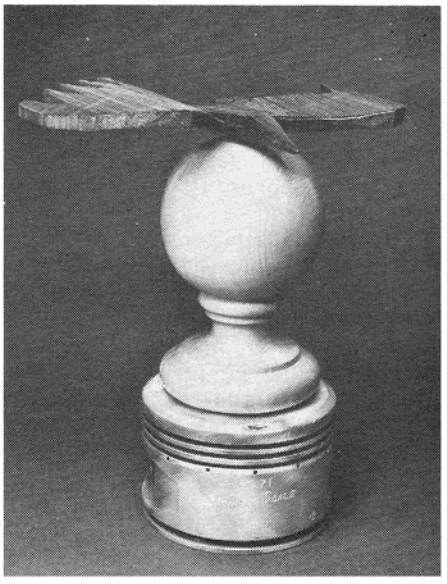
by BILL HANNAN

• One of the problems facing small clubs is the high cost of trophies. Then, too, many commercially available awards are rather uninspired in their designs, being obvious results of standardization and mass production. The accompanying photos depict some original trophies, all of which were created at low cost, and which offer distinction not available from off-the-shelf items. ■



Distinctive awards at AIAA paper airplane contest. Certificates are available at stationery stores; gulls and similar items from inexpensive giftware stores.

"Flying Pie in the Sky" award, like Ben Franklin key, was hand crafted. Why show a kite award here? Because it was won by a towline glider entered as a kite!

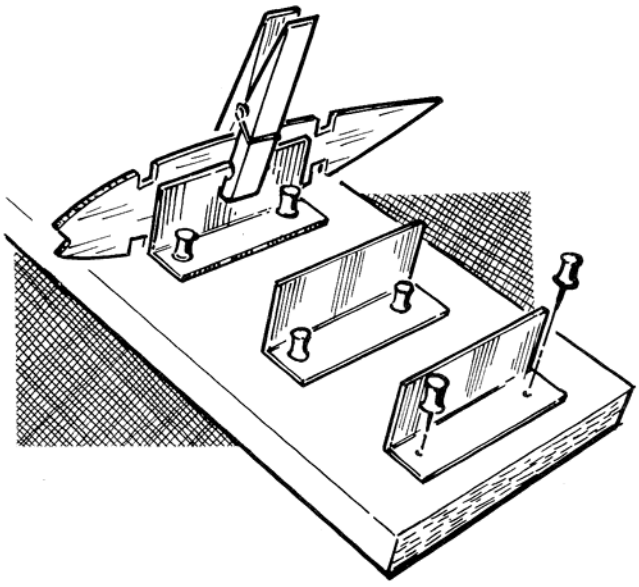


Another Mooney Bird, this one mounted on a piece of bedpost. Base is a real aircraft piston, suitably engraved with hand-held vibrating engraving tool.

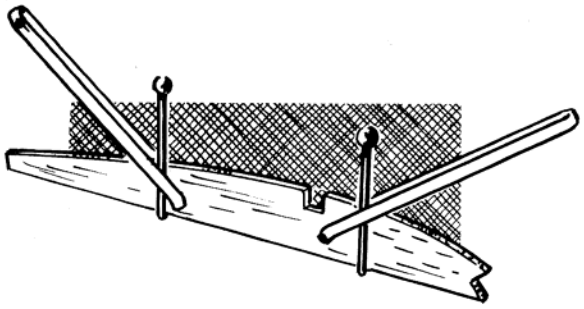
HINTS & KINKS

by JIM NEWMAN

Model Airplane News will pay $5.00 for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, Model Airplane News, 837 Post Road, Darien, CT 06820. Be sure your name and address are clearly written on each sketch, so that we can give you proper credit—and payment. For practical reasons, material submitted will not be returned.

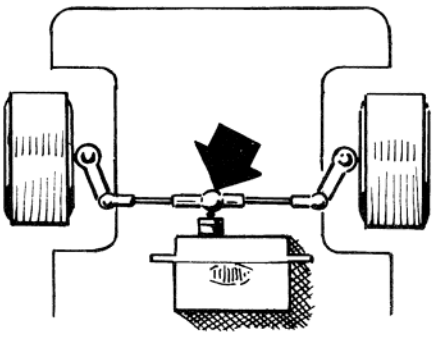


Short lengths of aluminum angle are used to hold ribs at 90 degrees to the bench, the ribs being clamped with clothespins or paper grippers. We suggest drilling holes to take map tacks, too. For symmetrical wings, line up trailing edges with a thread. A great wing jig! *John Ribitch, Lodi, CA.*

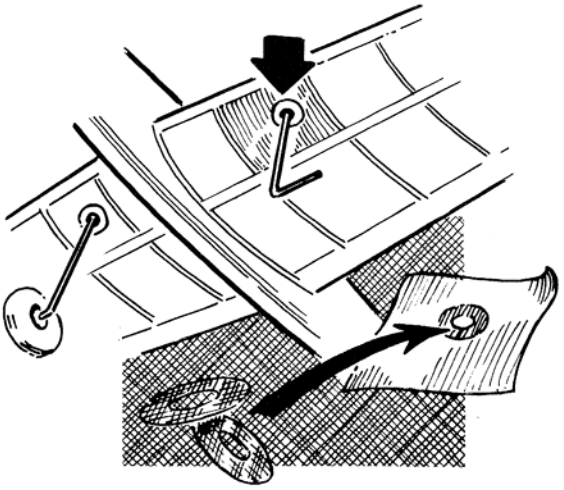


A way to hold very light ribs. Place pins vertically at rib stations, then clamp ribs to pins with bobby pins. Ideal method where rib stock is too thin to allow pinning through—example, Peanut Scale models. *Sammy St. Amour, Bedford, MA.*

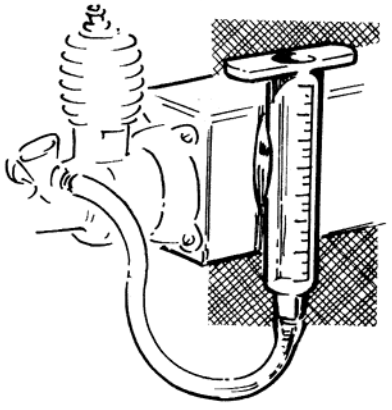
Save the spreader caps from glue or epoxy bottles and epoxy them to dowels. Super epoxy mixers and spreaders—cured epoxy just cracks off so they can be reused. *Sean Whalen, Westbury, NY.*



Prevent slop in the steering of model cars by using a Du-Bro Aileron Ball Link on the servo arm and track rod as shown by the arrow. *Mike Rutchka, Red Hook, NY.*

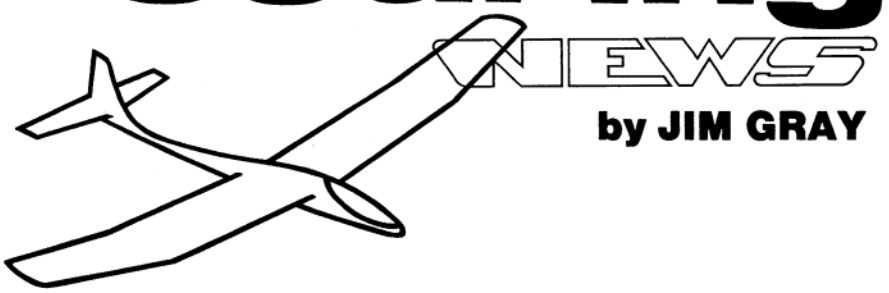


A very neat exit through the covering for landing gears. Use the gummed linen re-inforcing rings as used to strengthen punched holes in loose-leaf pages. Prevents tears in the tissue. Use a separate square of tissue to cover that bay. Punch hole in square, add ring, slip over gear, and dope down. *Mitch Pieronek, Grosse Pointe Woods, MI.*



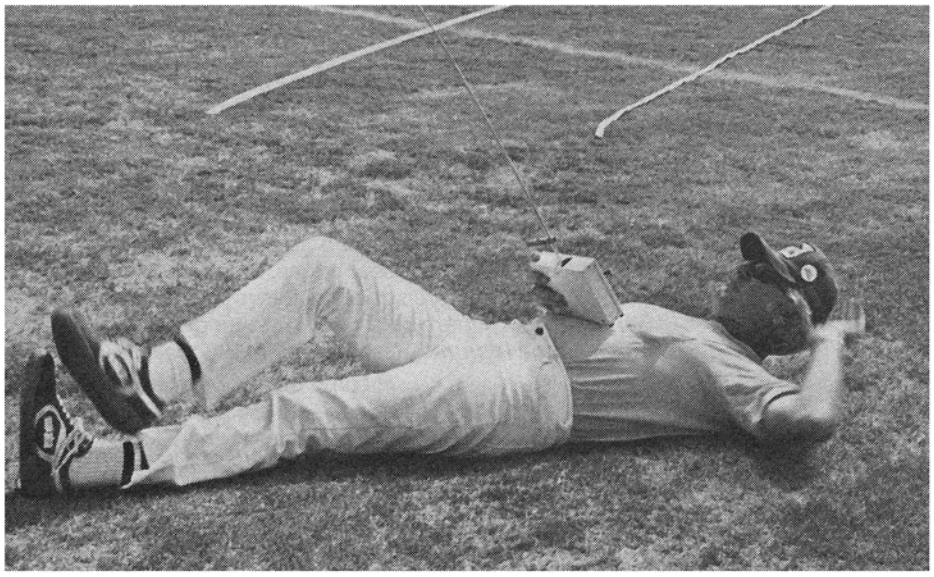
A hypodermic syringe with the needle and plunger removed can be converted to a useful, graduated, free flight tank. Glue to fuselage with tub sealer. *Martin Jones, Bel Air, MD.*

soaring NEWS



by JIM GRAY

• BEGINNER'S PERCH. Last month we discussed how to build the fuselage and tail sections of the glider (sailplane) of your choice. Assuming that everything has gone okay up to this point, and that you haven't yet stuck your fingers together with the cyanoacrylate (instant) glue, we ought to start those wings. What, you haven't finished the tail yet? Boy, are you ever s-l-o-w! Before we start the wings, I want to remind you to ask *yourself* a couple of questions: Did I install the tubes for the control rods? Did I put in the soda straw or piece of tubing to take the antenna wire inside the fuselage? Did I make room for the ballast box and/or extra servo? Did I make the tow hook adjustable, and reinforced inside the fuselage? Okay if you did, but if you didn't it would be neat to go back and do them. For one thing, it's messy to have to rip into everything to do those little chores after the fuselage is all sanded and covered. Besides, you want that antenna to be inside, out of harm's way, don't you? Inside, it doesn't cause that *drag* that makes your glider fly more like a brick than a feather. Looks better, too!



Ahh, those Torrey Pines Gulls. When Bill Hancock isn't hanging ten at the cliffs, he's laid back at the Hourglass Field thermal site. Whatta life!

Now for the wing. The very first thing you have to know about building a wing is that it must be straight, accurate, and true. Your new board must be flat, so that when you build the wing on it the wing will not be warped. Crooked and warped wings tend to make like a propeller, and cause the flight to be erratic, and impossible to trim properly.

Once again, cover your plans with waxed paper or plastic wrap. Pin the bottom spar down over the plans, aligning one edge with the best straightedge you can find. I use my carpenter's level, but you can use the straightest piece of metal you have available. As soon as the spar is in place, against the level along its length, and exactly where it should be on the plan, place pins every few inches along its length on one side. Now, take the straightedge away and, pressing the spar against each pin you have already placed, press pins into the plan along the other edge of the spar. Do not pin through the spar. Check that the spar is straight after pinning. If the trailing edge is to be notched for the ribs (I'd recommend it, for strength), use a couple of hacksaw blades taped together to saw the notches, after you have marked each station where the rib will go. Don't hurry—take your time and enjoy building as much as flying. When all the notches are cut, and the ribs fit snugly into each one—on a trial basis—pin the trailing edge to the plan, just as you did the spar, making sure everything lines up properly. If the airfoil shape is flat-bottomed, the rest is easy. If not, you will have to do some finagling. For the first design, I'm hoping that you have chosen a flat-bottomed airfoil, because I don't really want to discuss finagling at this point—later, maybe.

Now, pin the leading edge down on the plan, just as you did the spar and trailing edge, again keeping it straight. The framework is now ready for the ribs. Each rib should have been cut from the sheet balsa, if you bought a kit. Sometimes the ribs are all sawn and sanded. In other kits they are die-cut; that is, punched out by machine, but left in the mother sheet. All you have to do is press them out with your fingers, taking care not to split them, or damage them in any other way. After they are all ready, line them up and check for accuracy of spar notches, trailing edges, leading edges, etc. If you are lucky, they will all be as alike as peas in a pod. No, come to think of it, more alike than that. If they aren't, and should be, you will have to carefully make them so. Be careful here, because sometimes ribs that look *almost* the same shape and size have been made slightly different on purpose. One reason may be to accommodate sheeting on the wing root, or elsewhere, and the rib won't be quite as thick here. Maybe the notches are slightly different to take into account a dihedral brace, etc. Check them carefully, comparing them to the plan. Number each one with a felt-tip pen if they aren't already identified, so you will know exactly where it goes.

Now you are ready to glue them in place; the ribs, that is. Put each one onto the spar and flat against the plan, taking care to see that it fits snugly at the leading edge, and that the trailing edge of the rib is in its proper spar notch. The rib should be perpendicular to the plan, and not leaning one way or the other—*except* perhaps for the end rib, which sometimes leans on purpose to take into account the dihedral angle. Check the instructions and plans for this. Touch the joint between rib, spar, leading edge, and trailing edge with a drop of cyanoacrylate glue. It's now in place, hopefully permanently. After all the ribs are glued at each joint, take the top spar and glue it into the spar notches. If the notches aren't lined up, and if you have to bend the top spar, find out which notch is the worst and correct it by enlarging the front or back so the spar doesn't have to bend to fit. Make sure the spar fits all the way down into the notch. Now glue each one—rib to spar, rib to spar, all along the wing.

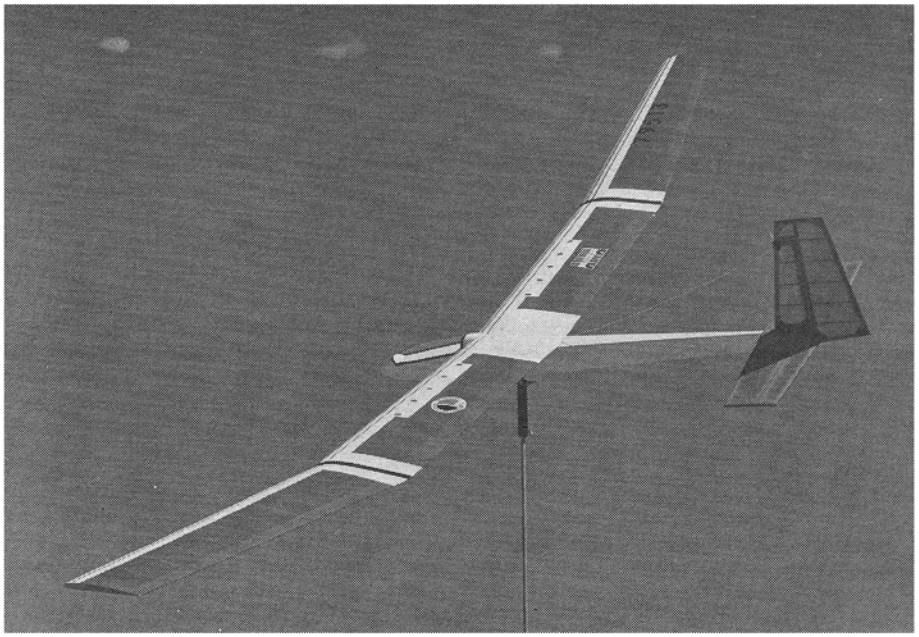
At this point, many builders remove the wing and go on to the next stage—particularly when they are looking for extra-light construction. I'd suggest that you take some Titebond or other white glue, thin it slightly with water, and "paint" each joint,

using a small watercolor brush. Allow to dry thoroughly. When you remove the wing, it will be strong. Some wings have false spars, or turbulator spars running along the top surface between the main spar and leading edge. If yours has these, glue them in place, too. Before removing the wing from the board, you will want to add the spar webs: pieces of balsa or plywood placed between the upper and lower spar caps. These tie the upper spar cap to the lower spar cap, completing the spar structure. Be sure the grain in each piece of webbing runs up and down, not sideways; that is, the grain should be perpendicular to the plan, not parallel to it. The reason for this is to better take the shear stresses that exist between the upper and lower spars in flight (on the winch or high-start, particularly). Make each one as accurately as you can, fit it into place so no gaps are showing anywhere, and touch with a spot of cyanoacrylate. Finally, "paint" these with Titebond, too.

Some wings have a "D-tube" leading edge structure, using sheet balsa planking that extends from the top spar to the leading edge, and from the leading to the bottom spar. This is a very strong and twist-resistant wing structure. If your wing has it, the usual method of construction is to build the wing framework directly on top of the bottom planking, gluing the spar, ribs and leading edge to it. Then the shear webs and top spar are added, and finally the upper planking is attached. This way, the D-tube is closed up while the wing is flat on the bench, producing a perfect warp-free structure. If wash-out (wing twist) is called for, this can be built in by shimming the trailing edge before adding the upper leading edge planking. Building in the wash-out in this way is more permanent than warping it in later, and is the preferred method.

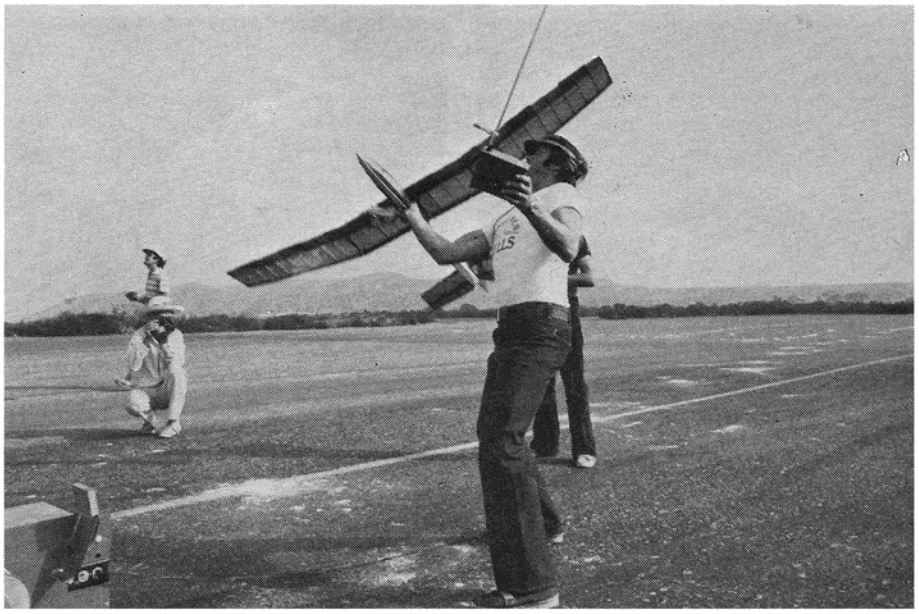
A trick to use when you must, for helping you bend the balsa sheet to the rib contour, is to wet the *outside* surface of the sheet *only* with a bit of moisture from a wrung-out sponge. The added water will cause the balsa on that surface to swell. Presto: an instant curve! Masking tape is wonderful to cut into small strips and help clamp the sheet balsa to the various edges. Wooden clothespins are good, too, as are rubber bands, pins and other things like that. Use your imagination. Even bean bags or shot bags can be used to hold down sheeted surfaces while glue dries.

You will have to add the wing-brace tubing to your wings, probably at the root section. Use *epoxy* here, and follow instructions exactly. Don't leave gaps. Pack the tubing in between the ribs and spars with scrap balsa or hardwood. Lock those tubes in place, because all of the stresses are concentrated here! It is best to have both wings built before adding the tubing that holds the wing rods, because you can line everything up first before epoxying it in place. That way, you can be sure the wings are straight with each other and perpen-



Roy Stephens of Kingsport, TN, built this magnificent Paragon, perennial favorite of the Unlimited class. Spoilers, MonoKote, Heathkit radio.

Alex Mladineo and his impeccable Aquila Grande at Hourglass Field, San Diego.



Bob Worley, another Torrey Pines Gull, stands up long enough to launch his two-meter Mirage. All TPG photos were sent in by Pepper Kay.

soaring

dicular to the fuselage. Also, the plans may call for adding dihedral before you epoxy the tubing in place. Each design is a bit different in this point of attachment, so read those instructions carefully!

Tip dihedral, or polyhedral as it is called, requires an extra brace—usually cut from plywood—added between the tips and inner wing panels. When you glue the tips in place, accurately raise them to their final position, and then brace them, block them, and pin them so they can't move *before* gluing the braces in place. Don't rely on the brace to be the right angle exactly, because it won't be! Prop those panels up as shown on the plan, at the exact distances shown. If the braces are not exact, you can trim them to be.

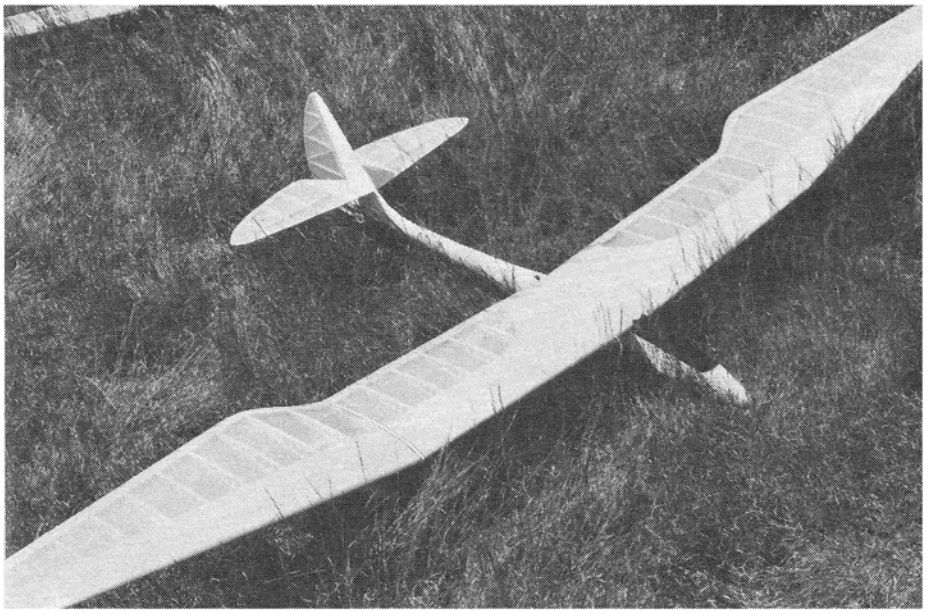
Finally, you will have to put the tips on. These are carved or sawed, or sliced from some basic stock such as balsa sheet or blocks. Tips aren't usually structural—or at least not as much so as the rest of the wing—so you can fudge a bit if you must. Shape them according to the plans and instructions, or to the shape your fancy dictates. They all work!

Build your second wing (right half, or left half) exactly as you did the first. Now you're ready for assembly, sanding, radio installation, and covering. We'll cover some of those things next month. By the way, you may want to weigh your wings to find out if one is heavier than the other. They should be the same, but usually are not. Add a bit of weight to the lighter one until they are the same. Don't add the weight until the wings are attached to each other; *then* balance them.

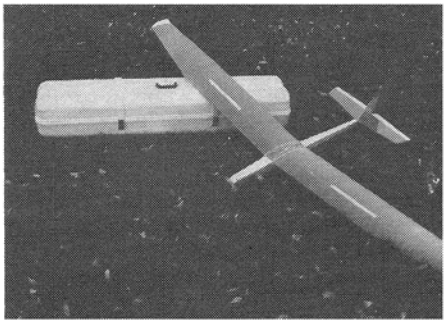
While you built the wings, you noticed that not all the spar strips were exactly equal in quality. Some of the wood could be bowed or warped or twisted. *Don't use these!* Select each strip of spar stock, and leading and trailing edge stock, to be straight and as close to the same weight as possible. The wing's the thing, and every bit of your performance is dependent upon the quality of your wings. Build 'em right.

Oh, oh; almost forgot. You must shape the leading edge to the proper contour, all along its length. I use a small sanding template to do it after I plane and rough-sand it to shape. First, draw a line with felt-tip pen exactly in the front center of the leading edge, and all along its length. Using a razor plane, start removing small slivers of stock, working carefully, right to that line. Don't remove the line, but approach it from above and below. Then make a template of the leading edge shape you want, cutting it out of a balsa or hardwood block, and making it slightly oversize. Line it with a strip of sandpaper, and glue the sandpaper in place with contact cement or similar stuff. Now you can use the template as the final shaping tool to trim the leading edge to the exact contour shown on the plan. It is not critically important, but it sure helps the flying, and makes the wing behave as the designer intended. More next month . . .

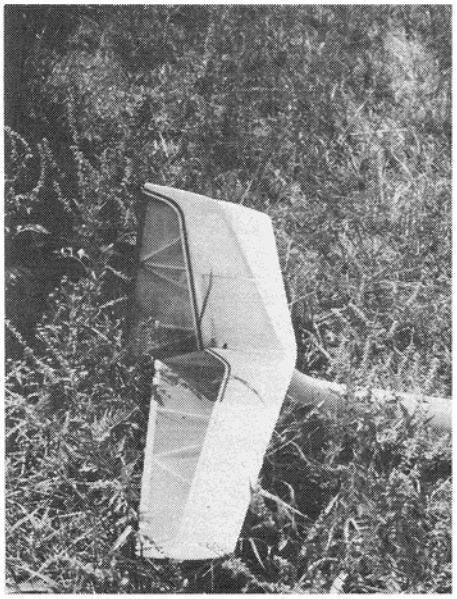
(Continued on page **41** *)*



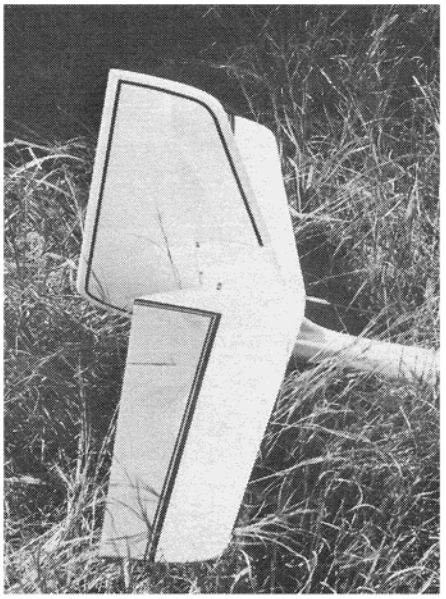
Jim Tyrie's Bird Of Time hides in the grass at Granite Glider Guiders' field in Bedford, NH. Bird has transparent yellow MonoKote wings, white epoxy painted fuselage.



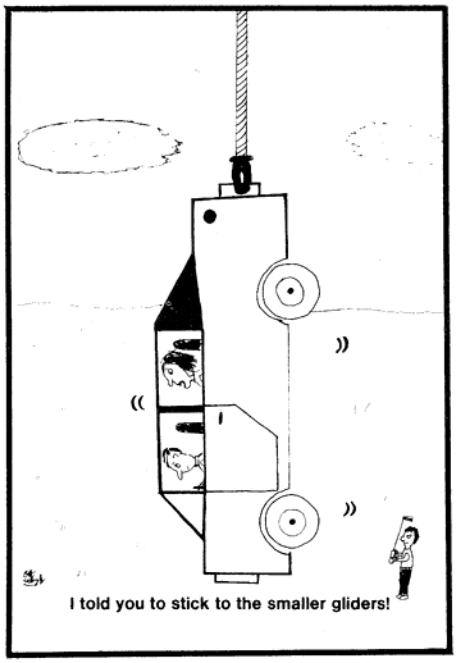
Nova Plastics' "Bird's Nest" box will carry gliders up to 110" wingspan.



Two Aquila tails, showing aerodynamically balanced rudders. This has small tab...



...while this one has much larger tab for greater balancing force.



SOARING NEWS

(Continued from page 40)

WHAT'S GNU—A NOSE FOR NEWS. Or . . . no gnus is good gnus (if your nose knew what the gnus knew, you'd not need this news). But . . . the *Wind Dummy* is good news, indeed. It's new and newsy—the newsletter of the IMSF, Intermountain Silent Fliers of Salt Lake City, Utah; edited by Claude Kresser. *Wind Dummy* is full of good information for glider guiders everywhere, and I'd recommend it highly. In fact, I'm going to quote something from the section called, "Beginner's Circle" written by IMSF past-president Doug Dorton, covering (not a pun) the subject of "What Color To Make It?"—meaning your R/C glider. This is so good and timely that I've included some of Doug's more salient points:

". . . Dark-colored wings are easier to see at high altitudes . . . make the wings and tail some dark color (at least on the bottom): red, blue, brown, black. Don't use white, yellow or cream. Make the fuselage white. This gives the best chances for good visibility and orientation when the aircraft is just a speck against some cloud. A small piece of chrome MonoKote on the fuselage or tail can help you find a plane you've lost sight of. Anybody who doesn't *(I think he means* does—*JHG)* cover the wings and tail of his thermal ship with transparent MonoKote ought to be taken out and horsewhipped.

"As for the covering, stay away from the low-heat, low-priced spreads for covering the flying surfaces of open-structure, balsa framing. Most designs require warping of the wash-out, or at least straightening of building twists, and only MonoKote is capable of holding the set. Also, many designs are very flimsy until a stressed skin is put on, and the low-heat jobs just don't get it done. The low-heat materials are great for solid structures like the fuselage and, of course, are great for foam wings."

From this, it would seem to be a good idea to cover top surfaces with light colors, and bottom surfaces with dark colors. However, I've always had excellent luck with *transparent* yellow or orange MonoKote, preferably orange, because it can be seen against either clear blue sky, or against cloud. I've also had good luck with transparent red, except in the late evening or on very dull, dark days. I guess it's different for each pilot's eyesight, and you'll probably have your own favorite color for best visibility. How about it, gang, write and tell me what you have found best, and I'll print the consensus.

Write Claude Kresser for your copy of *Wind Dummy* at 1869 Monterey Drive, Salt Lake City, UT 84121.

CONNECTICUT MYSTERY—CONTINUED. In the May issue, I brought you a report from Connecticut about the man whose gliders have been attacked and ravaged by animals appearing from nowhere? Well, there's more! Here's a sequel to the tail (tale . . . oops, sorry).

John Donohue writes once again to tell of his latest problems:

"Thanks for your letter of January 25th . . . so far, I am the only individual between Groton, New Haven and Middletown who has purchased a glider larger than a hand-launch in over a year! This surprises me, as (animal attacks aside—I have had three to date) I have found some excellent soaring sites. One site even has contrary airflow. Depending on the day, above 200 ft. or so, this site has a flow 180° to the lower slope air. A real challenge!

"After writing you, I encountered two more animal attacks—all on the same wing. This is getting unpleasant! After the dog ate my wing, I brought out the iron and some new material and re-covered the wing. Our *former* cat jumped on the table and ripped the same wing and the same group of ribs to pieces. I heard this and grabbed the animal and he ripped *me* to shreds. I am still healing.

"Using the other half of the roll, I re-covered this wing several days afterward and went out to fly. On the second flight off the towline, a large bird hit the same wing, slightly forward of the top spar, and ripped the covering! My wing now has red Super MonoKote on top with an orange tip, while the inboard panel underneath has gold and the outboard panel red. Why am I being attacked this way?

"P.S. The cat's not dead, just banned from the house. He and I don't communicate any longer. (Signed) John Donohue."

(Sid Axelrod: How about a new color? Bird and animal-proof?—JHG)

FAI MATTERS. There are clubs all around the country that have just about abandoned out-and-out thermal duration contests. As one member said, "They are about as exciting as watching grass grow!" For excitement, fun, and speedy (no pun) rounds, fly FAI-type tasks. Thermal tasks have become almost landing contests because everyone has learned how to max the duration, and the only tie-breaker left is the landing score.

In 1981 the FAI tasks will count thermal duration for only 26% of the total score, so you'll see more speed and distance events—and sailplanes designed with these in mind. I'd recommend that you read Dave Thornburg's series of articles in *R/C Model Builder* on this subject, beginning with the April 1980 issue. Remember, Dave was there (in Belgium, 1979) and knows whereof he speaks. I disagree that *all* contestants will design to the 11-pound and 24-ounce/square foot maxima, but a depressing number will. Therefore, as Dave suggests, we'd better be ready with equivalent designs of our own. Slope pylon guys know how to do it. Maybe we oughta listen . . .

The First Symposium on Design of Radio Controlled Sailplanes, held in 1978 at the Aero Club Vergiate, Varese, Italy, was received with enthusiasm by modelers everywhere. Thirteen papers were submitted by model builders from Italy, France, the U.K., Germany, Switzerland, and the U.S. These papers covered many aspects of construction, design, aerodynamics, meteorology and related subjects of particular interest to the RC sailplaner.

This will announce the *Second Symposium,* to be held at the end of September 1980, at the Vergiate airport in the Flight School room. Papers are invited from aeromodelers interested in the various aspects of RC sailplane design. Participants are requested to observe the following rules:

1. Text should be *typewritten* in English, French, German, or Italian.
2. Drawings are to be inked; black only.
3. Participants should confirm their intention to submit a paper by the end of June, giving a brief title and summary.
4. Subject matter is restricted to RC sailplane design and all related topics.
5. Complete papers must be submitted before the end of August, so that copies may be bound and submitted to all those who submit a paper. Thus, all who attend may be free to discuss other papers at the symposium, as well as their own.

All correspondence should be directed to Bartolomeo Del Pio, Via Binaghi 7, 21019 Somma Lombardo (Varese), Italy.

Those who submit papers are, of course, also invited to attend the symposium; but it is not *necessary* to attend if you wish to submit a paper.

It should be mentioned that this area is the technical center for both full-scale and model sailplane activity in Italy, and there are many, many fascinating things to see and do while there.

If enough folks are interested in attending, maybe we could work out some kind of travel "package." Let me know.

HUMOR DEPARTMENT. Speaking of fun, Ethan Gallogly, age 14, of Westport, Connecticut, submitted a cartoon that tickled our (staff) funnybones. Anyone who has envisioned bigger and better sailplanes/launching apparatus will instantly recognize himself or herself. Ethan is a student at Colytown Junior High, and a member of the Country Squire Modelers in Norwalk. His interests in models include RC gliders, RC powered aircraft, RC boats (hear that, Don?) and Rockets. This is Ethan's first published cartoon, and we hope he will keep up the good work—as well as his fine sense of humor!

MORE GLIDER HAMS. N3IK, Ike Kerschner, and I have had a couple of real nice CW QSOs on 3560 kHz, at 8:30 p.m. on Monday evenings, eastern standard time. We'd like to invite others to join us at that time and frequency, and we'll go as slow or as fast (within reason) as you'd like.

Ron Blecha, W0WHY, 221 North Garber Avenue, Ninden, NE 68959, would like to sked some glider hams. Write him for time and frequency.

SOARING NEWS

(Continued from page 41)

Pete Carr, WB3BQO, Ridgway, PA (see Callbook for address), would suggest a 'phone get-together at 3910 kHz at 9:00 p.m. (eastern) on Wednesday evenings. He mentions that K2DE, Dave Lear, and WD8PRG, Joe Bertin, would be other possibilities for this "sked."

George Rouse, K1KKY, Pawtucket, RI, and Frank Morton, K1ADK, also of RI, might like to sked you. Drop 'em a line, at their Callbook address.

Lou Hemphill, WD0EYP, Columbia, MO; and Scott Hamilton, K5ZOH, of Denton, TX, have all-band capability, and Scott prefers RTTY for those who have it. Write them for a sked. These fellows tried to QSO on 14,305 plus or minus 5 kHz on Wednesday and Thursday evenings at 0130 Z, but I haven't heard whether they made it or not.

I know of many other hams who are glider nuts, too; if they would like to write me for planning a net or sked, I'll put it in this column for all to see.

Incidentally, for some areas 2-meter QSOs would be a good possibility. Just let me know.

MORE WHAT'S NEW. As I mentioned recently, Fourmost Racing Products has a fine, captured releasable tow hook for only $5.95. Better still, since the last time I wrote, they have modified the hook housing and made it easily attachable to the fuselage structure by four "tabs" that accept screws or bolts. The best feature, in my opinion, is that the hook completely disappears into the housing, leaving a flat, flush, no-drag surface on the bottom of the fuselage. Get one—you'll like it a bunch. Write Fourmost Racing Products, 4040 24th Avenue, Forest Grove, OR 97116, if your dealer doesn't have them in stock. If you're in *that* big of a hurry, call (503) 357-2732 and ask for Ralph Cooney. Tell him *Model Airplane News* sent you!

The BIRD'S NEST is a new home and roosting spot for your bird . . . er, ah . . . *glider*! Boy, you oughta *see* this elegant and roomy packing, carrying, storing, and traveling case for your favorite sailplane. It's made from durable, high-strength ABS plastic, and will accept models having up to 118" wingspans that divide into two or three sections. The stabilizer should be removable, too. But the nice part is the weight and quality of the product, combined with its appearance.

The Bird's Nest is shipped in two halves, which you must put together by attaching one half of the aluminum piano-type hinge, using pre-driven Plasti-Rivets. Just line up the hinge, place the rivets in the holes already drilled, use two washers, and tap the projecting part of the rivet.

The Bird's Nest is reinforced by molded ribs, also supplied with the box, and the box has molded-in recesses to accept the ribs. You even get some scraps of plastic to mix with acetone (not supplied) to make the cement that holds the ribs in place. Each rib has projections on its concave surface, and these "teeth" are just right for rubber bands (also supplied). You also get some sheets of foam plastic packing material for protecting your "bird."

After you have hinged and ribbed the box, you lay the wings in the top half, and hold them in place by stretching rubber bands between convenient ribs, or parts of the same rib. You cover the parts of the wings where the rubber bands cross by means of the foam plastic sheet. In the bottom half of the "nest" you place the fuselage and stabilizer, attaching them the same way. Your transmitter will also fit in the box at one end. Actually, you can carry two fuselages, two sets of wings and two stabilizers, plus two transmitters!

The instructions are complete and simple to follow, and the box should assemble in just a few minutes—*but* you must let the ribs or frames set after cementing them in place, and the recommended time is 24 hours, so do it on a Friday night so you can fly Sunday! Your Bird's Nest has a carrying handle, toggle-over latches, and even "feet" to support it when you set it down. It is white, with a "pebbley" texture, and will be ideal for adding decals, club insignia, lettered names, and other decoration. It will go into an airplane cargo hold, and I would think that even the most careless of stowage wouldn't hurt the contents much—it's that strong! This is what you've been needing and wanting; so get it *now*, from Nova Plastics, Inc., 20 E. 10th, P.O. Box 661, Kearney, NE 68847; telephone (308) 236-5527. Ask for Larry Beshore, and tell him that *Model Airplane News* and Jim Gray recommended it. What? Oh, yes, I almost forgot . . . the price direct from the manufacturer is a very reasonable $59.95 plus UPS shipping, as we go to press.

Plan to attend the Greater Michigan Modeler's Show, October 3, 4, and 5, 1980, at the West Eight Mile Artillery Armory in Oak Park, Michigan. The Indian City Radio Control Club will host the event. For more information, write ICRCC, c/o Earl Hickman, P.O. Box 145, Wyandotte, MI 48192. There will be exhibits galore, and fun for everyone. Hours are Friday, October 3, 12:00 noon to 9:00 p.m.; Saturday, October 4, 10:00 a.m. to 9:00 p.m.; and Sunday, October 5, 10:00 a.m. to 5:00 p.m.

This show rivals Toledo's show, and is also conveniently located in the Detroit area. Facilities include protected areas around the static display tables, twenty-foot aisles, a pool for boats, a track for cars, an outside demonstration area, and much, much more. Bring the family for a weekend of enjoyment.

That's about it for this time, folks. Keep those cards and letters coming, because I really enjoy them, and I like your comments and questions. Jim Gray, P.O. Box 186, Peterborough, NH 03458. ■

FOR ENGINE LOVERS

(Continued from page 7)

The .246" hole you put in the bushing stock will guide the drill through the hole true, providing you don't clamp the rod down. Just hold it tightly so that it can't jump out of your fingers. You should now have a rebushed rod that still won't fit the crankpin because it is .250" i.d. and the crankpin is .250" o.d.

Take a piece of No. 320 wet-or-dry sandpaper and roll it up on an undersize drill shank until the roll will just slide in the bushing. By pushing and twisting in and out, you can now hone out the bushing until it will spin freely on the crankpin without being a sloppy fit. You can check the rod for trueness by inserting drill shanks in the two holes and miking across both sides. If the rod holes are not parallel, the drills can be tweaked to bend the rod true.

4) You can only bush a rod that was not bushed originally if there is enough material there so that the rod won't weaken. In general, avoid messing with forged rods as they usually won't hold up.

5) Why not let me know what engine you want to build a rod for, and as soon as I get my shop going again, we'll use it as a photo project?

6) Boring out the wristpin hole in an old piston is pretty tricky, as it is most important that the hole stay square with the bore. Also, you get into edge distance problems in the wristpin boss area of the piston. If you were to buy special oversize reamers, and have a piece of 4130 or 4140 steel tubing hardened and ground .004" or .005" oversize, this might be feasible. Again, I don't know what engine you are talking about, but in general I'd avoid it.

A future column will be about lapping. Tools you can make, compounds, grits, sources, the works—hang on, it's coming!

Incidentally, back in the April 1980 column, I said that Vic Garner "does some custom work on various engines." Oops! I've since gotten a very nice letter from Vic, but he says that he's "up to (his) eyeballs in work" and is not presently doing custom work. Sorry I steered you wrong on that one, readers.

Keep those letters coming—just write to me in care of *Model Airplane News*. Until next month . . . ■

IF YOU WANT TO BUILD PERFECT WINGS, YOU NEED A . . .

PERFECTLY FLAT BOARD

by ROY ANDERSON

• During construction, sailplane wings are very flexible and fragile things that conform to the surface on which they are built. If the work surface has a warp, so will your wing. Commonly used building surfaces such as doors, kitchen counters, and floors are not reliable to maintain flatness. Age, gravity, and humidity have done or will do their thing to the building surface in very short order. "Roy's Building Board" is designed with leveling nuts at one-foot spacing under the building board to forever maintain flatness and warp-free wings.

CONSTRUCTION. The 1" x 4" foundation is constructed first. Tie crosspieces to long pieces with through-bolts and nuts and the 1" x 1" steel corner braces. In lieu of bolting, glued-and-nailed joints serve equally well. Install the 2½" x 2½" x ⅝" steel corner braces to the top of the long 1" x 4" pieces at one-foot spacing with wood screws.

After the braces are installed, turn the foundation upside down on the particle board. Mark the hole locations on the particle board for the carriage bolts. Use a 5/16" bit to drill holes through the particle board. With a bit slightly larger in diameter than the carriage bolt head, recess the top of the board for flush setting the carriage bolt head at each hole location. Install the carriage bolts in the particle board with washer and nut cinched tight against the bottom of the board.

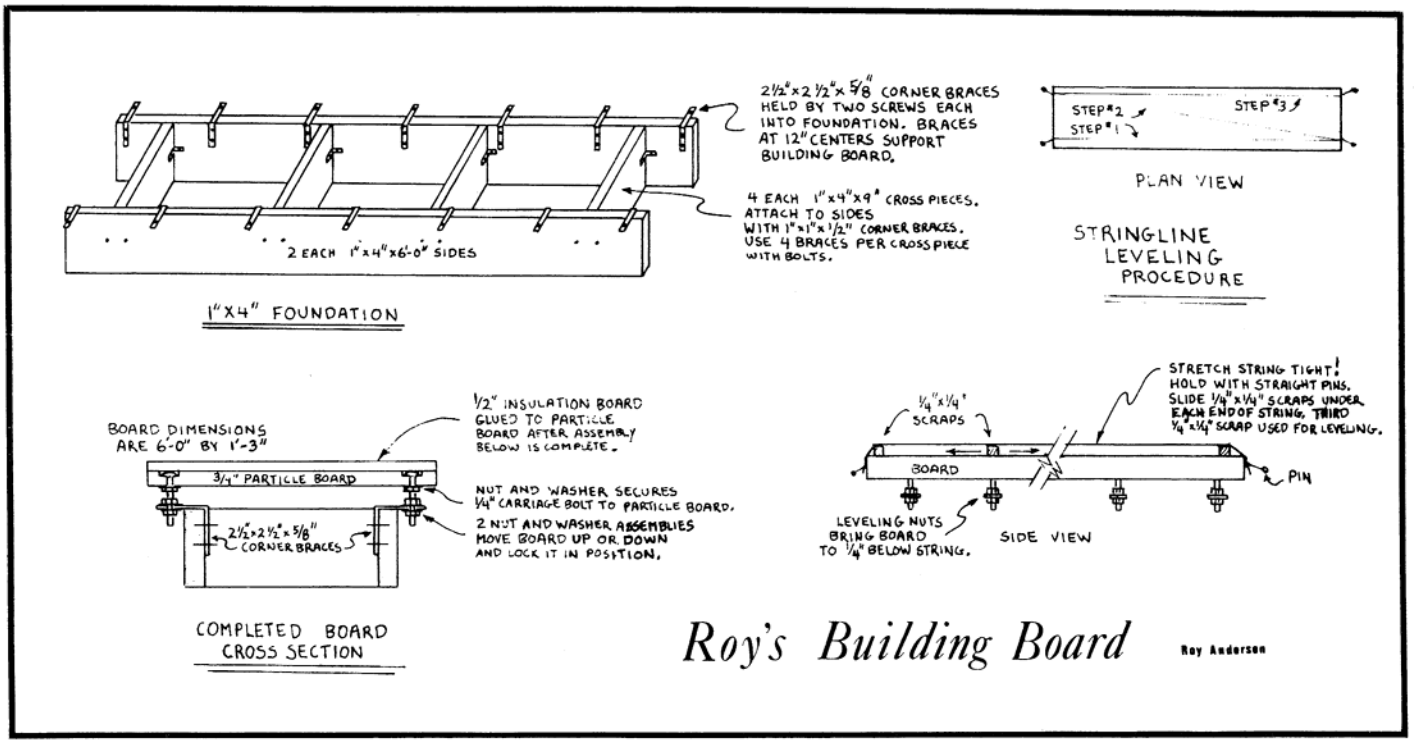
Lower the particle board on top of the foundation so the carriage bolts go into the 2½" brackets. Place a nut and washer on each of the carriage bolts above and below the 2½" brackets. Moving these nuts up and down provides the building surface adjustments.

Insulation board usually has a painted side and a non-painted side. The non-painted side is usually the smoothest and is preferred for the work surface. Apply aliphatic or white glue to the painted surface of the insulation board. Use weights or whatever to securely bond the insulation board to the particle board. After the glue is dry, construction is complete. As an added touch, a 1" x 1" grid of lines can be scribed on the top with a ball-point pen. Use string lines or a long straightedge to insure the straightness of the scribed lines.

MAKING IT FLAT. The board is leveled by using string lines in the three steps shown in the sketch. Cut a length of ¼" x ¼" square balsa scrap into three pieces. Start with Step 1. Stretch the string tight and hold it with pins. Slip the three balsa scraps between the string and the building board. Slide one balsa strip under the string to the end of the board. Do likewise with the second scrap to the opposite end of the board. The string should be suspended ¼" above the surface of the board. Use the third balsa scrap as a measuring device under the string and over each leveling nut location. Raise or lower the board at each location with the leveling nuts to bring the board to exactly ¼" from the string. After you are satisfied with the level of Step 1, proceed to Step 2. Adjust the nuts on the opposite side of those adjusted in Step 1. Proceed to Step 3. Adjust only those nuts under the string. The board is now flat!

Always check flatness prior to starting a construction project. The above technique insures that the board is a perfectly *flat* plane; however, it is not necessarily *level*. A carpenter's level and shims under the foundation can make the surface level, but

(Continued on page **76***)*

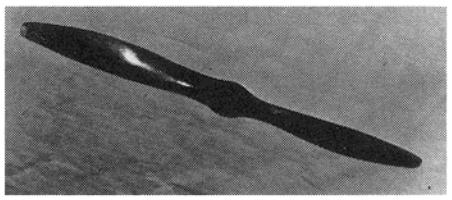


product NEWS

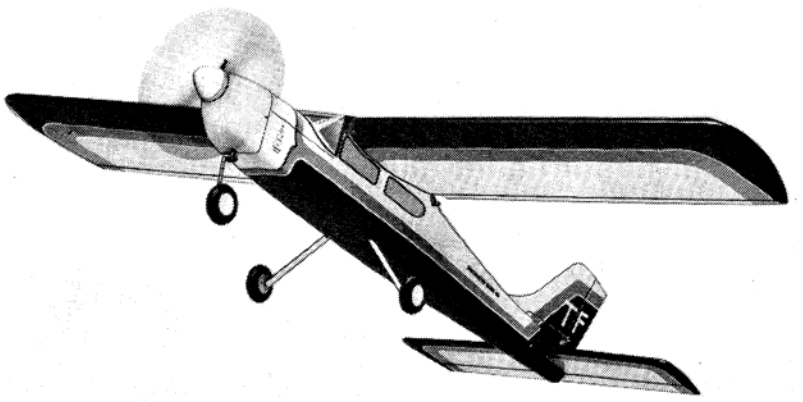
Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by MODEL AIRPLANE NEWS, or guarantee of performance or safety by M.A.N.

When writing to the manufacturer about any product described here, be sure to mention that you read about it in MODEL AIRPLANE NEWS.

GOOD BOOKS: Serious scale modelers are always looking for more information on their favorite airplanes, and one of the best sources is Squadron/Signal Publications, Inc., 1115 Crowley Drive, Carrollton, TX 75006. Four new books have been added to their list: *Superfortress,* the story of the Boeing B-29; *German Fighters of WW II,* which covers various aircraft used as fighters by the Luftwaffe; *F-5 in Action,* about the T-38 Talon/F-5, the most successful lightweight jet of modern times; and *A-26 Invader in Action,* which covers the attack bomber used in WW II, Korea and Vietnam. At your hobby shop, or write to Squadron/Signal.



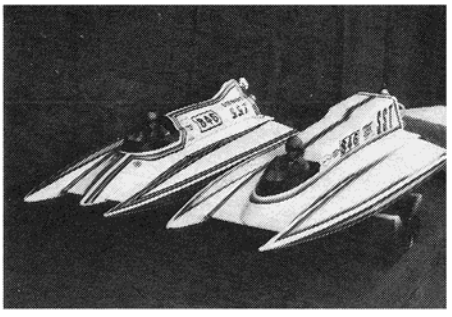
BIG PROPS: Fiberglass propellers for big engines are being made by J-5 Enterprises, P.O. Box 82, Belmont, Ontario N0L 1B0, Canada. Available in 18x6 for $8.95, and 20x6 for $9.95, the props can be bought at your hobby shop or direct from J-5.



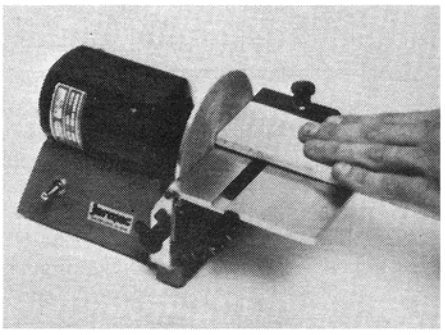
HEADMASTER SPORT 40: Top Flite Models, Inc., announces the addition of the Headmaster Sport 40 to their product line. Designed by Ken Willard, the model has a 60" wingspan with 720 sq in. of wing area. The Sport 40 is a variation of the popular Headmaster, a proven aerodynamic design.

Top Flite aids the builder by including printed fuselage sides, shaped leading edges and strip ailerons, injection molded ABS cowling, and aluminum motor mounts. The kit offers large, separate and easily accessible radio and fuel tank compartments, as well as differential aileron control for smoother flying. The full-size plans give step-by-step instructions, and a complete hardware package is included. The kit also comes with heavy-duty landing gear with steerable nose wheel. Top Flite's standard all-balsa construction is reinforced with hardwood at high stress points. All balsa and plywood parts are pre-cut and clearly marked for easy identification.

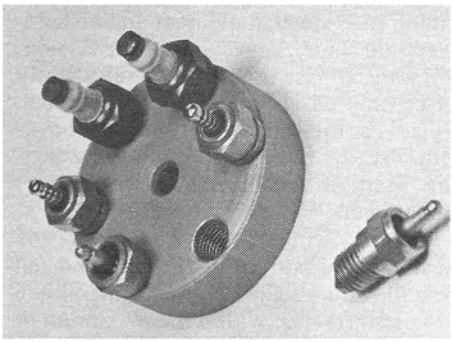
For information on this and other Top Flite models, plus the latest catalog and prop chart, send 50 cents and your request to Top Flite Models, Inc., 1901 Narragansett Ave., Chicago, IL 60639.



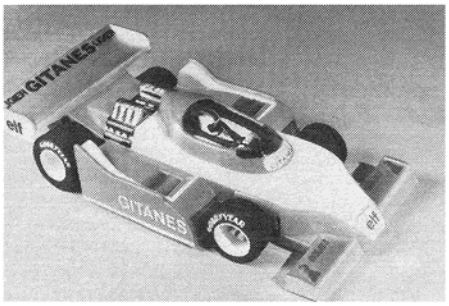
OUTBOARD BOATS: Stewart Scale Models, Rt. 2, Box 220-5, Thonotosassa, FL 33592, now has available a complete fiberglass outboard tunnel-hull kit. The SST is 27" long and 13" wide, comes with the deck already joined, and includes materials to build the radio box. You also have a choice of cowl styles, as shown in the photo. Price is $99.95 plus shipping, direct from Stewart.



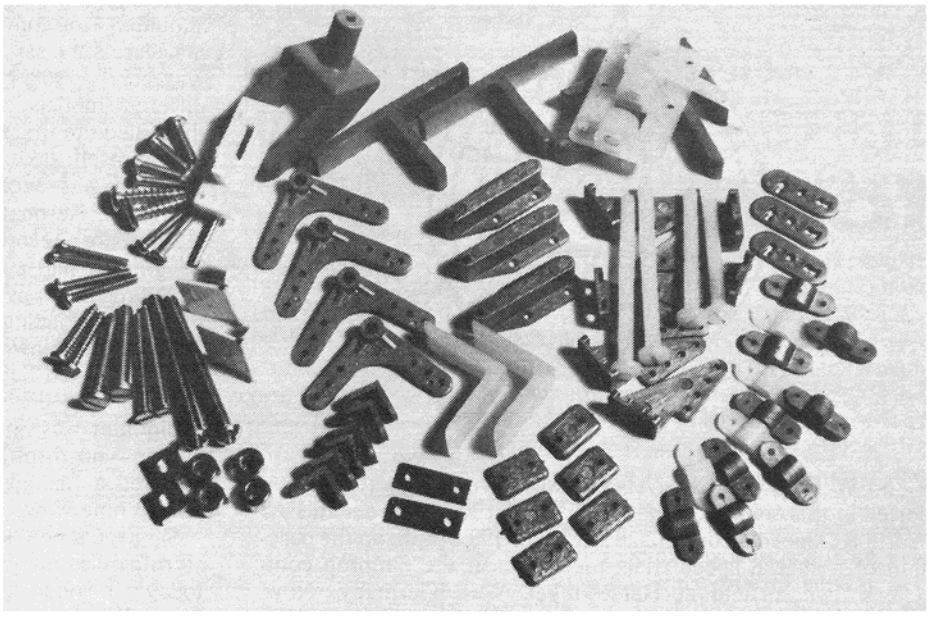
SANDER: The Jarmac disc sander has been made more useful by the addition of a tilting table, allowing angle sanding, mitering and chamfering, up to a 45-degree angle. The sanding disc is 4" in diameter, and uses self-adhesive sanding pads. Price of the new Tilt Table Sander is $77.50, at your hobby shop or direct from Jarmac, Inc., P.O. Box 2785, Springfield, IL 62708.



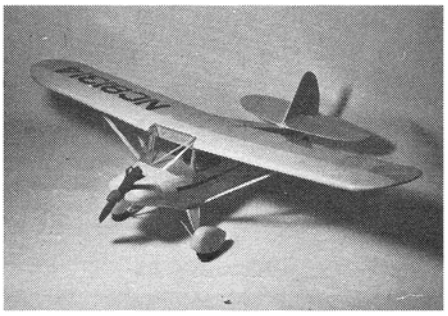
PLUG HOLDER: Harry Higley has a sixth sense when it comes to knowing what modelers need. He makes a raft of goodies, one of which is this glowplug caddy called "Harry's Six Pack." It's made of anodized aluminum, and the threaded holes are blind (that means they don't go all the way through) to keep your plugs clean and undamaged. The center hole does go through, so you can bolt the Six Pack to your field box. It costs only $2.98, from Harry B. Higley & Sons, Inc., 433 Arquilla Drive, Glenwood, IL 60425.



LIGIER FORMULA ONE: Last year Guy Ligier and his new racing car surprised the Formula One world with his back to back wins in South America. Parma International Inc., 13927 Progress Parkway, North Royalton, OH 44133, has duplicated the Ligier "wing car" body in 1/12 scale, in either clear or pre-painted "Lexan Parma" plastic. See it at your hobby shop, or write directly to Parma for price information.



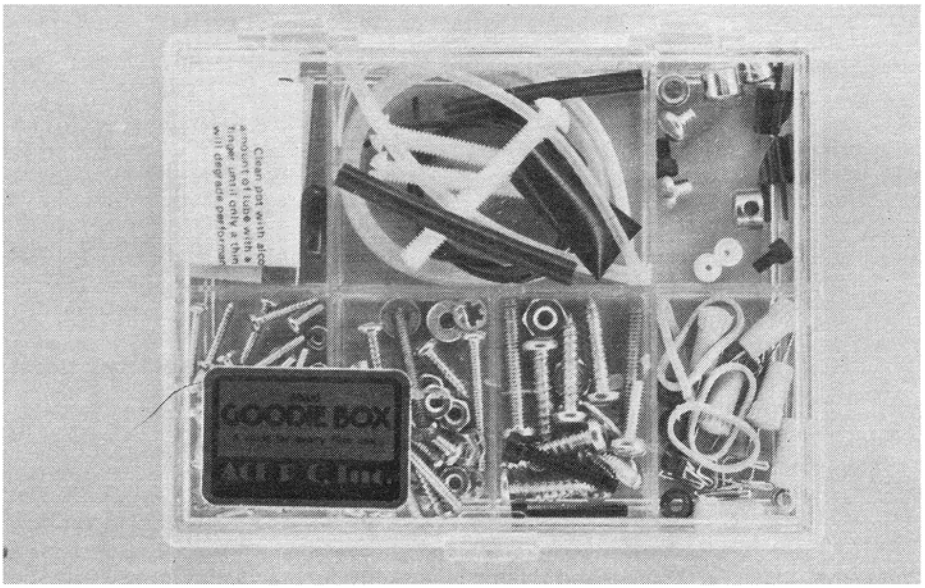
HARDWARE: Pica Enterprises, Inc., 2657 N.E. 188th Street, Miami, FL 33180, is now in the hardware as well as the kit business with this selection of useful items. The plastic parts seem to be both white nylon and glass-filled nylon, and include an assortment of landing gear clips, horns, bellcranks, hatch hold-downs, angle brackets and T-brackets. See them at your hobby shop.



NEW R/C PLANS: A new line of 1/2A R/C sport and scale plans is being offered by Tom Thumb Sky Tracings. First off the line are a 34" span Piper Vagabond, a 36" sport design and a 72" span glider. All three designs feature lightweight balsa airframes, plastic film covering and enough built-in stability for low time R/C pilots. All plans are diazo-process printed from inked original artwork. All patterns are drawn full size. No additional information is required to build these models.

Several additional 1/2A designs, including the Jodel D-9, the Japanese Experimental Aircraft Association's (JEAA) S-1, and the Douglas AD-2 Skyraider are in various stages of plan and building development. These should be available by April 1980. The catalog will be updated as these plans are completed.

Tom Thumb Sky Tracings are priced at $5.00 each or 3/$12.00. A coupon is included in the catalog worth $1.00 toward each order. For further information, contact: T. Houle, 11333 N. Lake Shore Drive, Mequon, WI 53092.



GOODIE BOX: That's what Ace R/C calls it. What it is, is a little plastic box full of emergency items that you can tuck in your field box. Included are wheel collars, bolts, nuts, washers, self-tapping screws, pot lube, pins, grommets, heat-shrink tubing, keepers, nylon bolts...more than 100 items in all. At $6.95 it's a good buy, especially if it saves you a trip home, or lets you fly instead of being a spectator. At your hobby shop, or direct from Ace R/C, Inc., Box 511, 116 W. 19th Street, Higginsville, MO 64037.

foreign NEWS

by PETER CHINN

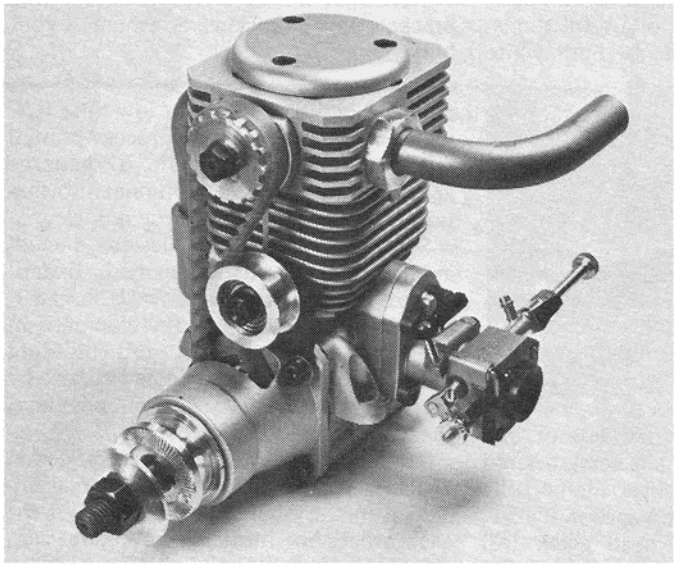
• NEW FROM GERMANY. Twelve years ago (it was reported in this column at the time) Werner Kaseberg set an FAI World RC Speed record of 320 km/hr, or 198.8 mph, on the occasion of a special speed trials meet held at the Simprop company's own airfield at Harsewinkel, West Germany. Now, Simprop, one of Germany's leading RC equipment manufacturers, has announced that it will be producing a kit based on Kaseberg's model.

Actually, although the general design of the model, a shoulder-wing configuration with long tail moment and no landing gear, is the same, there are some changes to the kit version. Kaseberg's 1968 model was, in fact, one of several slightly different models, all based on a design by Wilbert Schoenfeld, that filled the first five places at the Harsewinkel meet; Schoenfeld, himself, taking fifth place. Among the other entries, incidentally, was Wolfgang Matt of Liechtenstein, the present World RC Aerobatics Champion, who placed seventh.

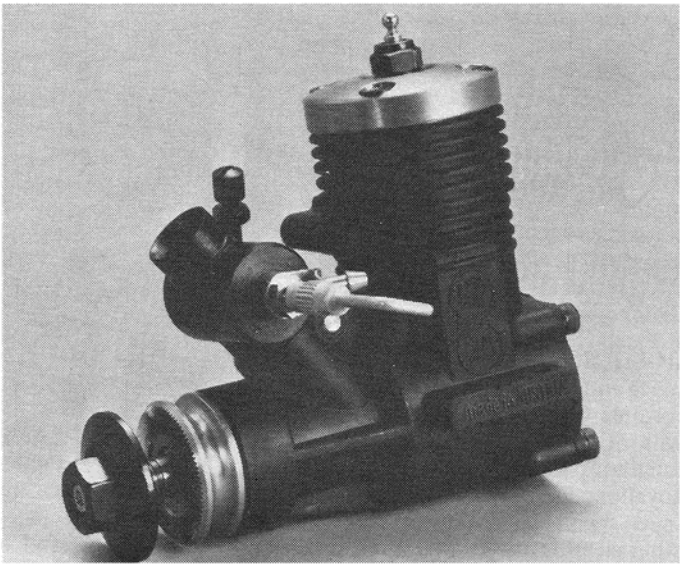
Kaseberg's record model had a wingspan of 42 in. and was 45 in. long. It had a total horizontal surface area (wing and tail added together) of 418 sq in., and weighed slightly under 4 lb 6 oz, giving a loading of 24 oz/sq ft—just within the maximum of 24.6 oz/sq ft allowed by the rules. The model was powered by a specially tuned Super-Tigre G.60 rear rotary-valve control-line speed engine driving a Bartels 10x12 CL speed prop. Radio equipment was Simprop on two channels only—elevator and aileron—no throttle and no rudder being fitted. Construction featured a fiberglass fuselage and a balsa-planked expanded-polystyrene wing.

Simprop's new kit version also has a fiberglass fuselage and styrofoam cored wing but, presumably in order to accommodate today's heavier, tuned-pipe equipped engines, is somewhat larger. Wingspan is increased to 48 in., length to 51 in., wing area to 475 sq in., and total area to 593 sq in. All-up weight is quoted

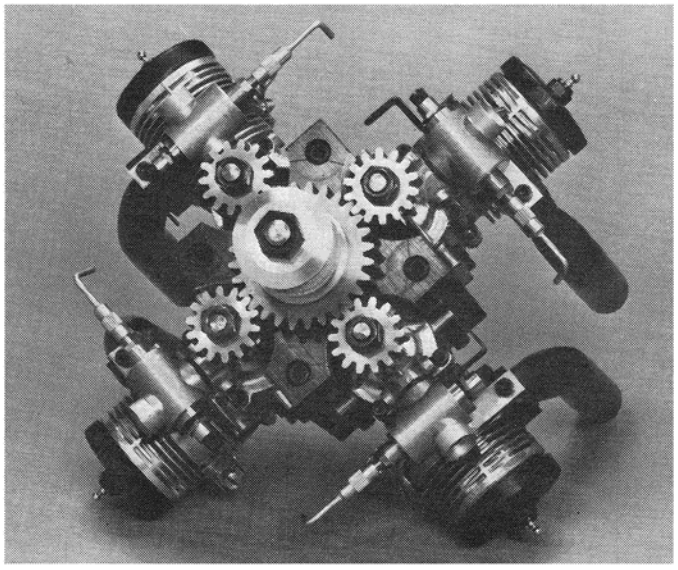
(Continued on page **47** *)*



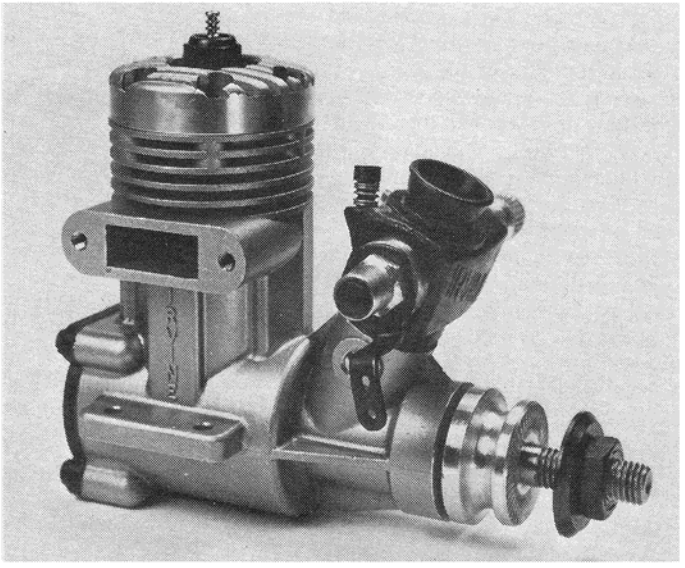
Webra T4 4-stroke with Aspin valve and crankcase induction.



New HP.20 from Austria has black Thermex treated castings.



Are you ready for four HP.40 engines geared together at 2:1?



Production version of Schnuerle-ported English Irvine 20.

as 2.5 kg (5.5 lb), which gives a loading of approximately 21.4 oz/sq ft. The prototype model shown at this year's Nuremberg Fair was powered by an upright Super Tigre X.60 front intake rear exhaust engine with ST tuned pipe. The kit, incidentally, will be priced at approximately one hundred dollars in Germany.

Among the many other interesting new RC models shown at Nuremberg that are expected to be seen in kit form over the next few months was a one-third scale Pitts-Special by Topp-Modell. Intended for engines such as the Webra 91, O.S. 90FSR, Fox Twin or one of the small chainsaw motor conversions, it is expected to sell, in kit form, for about 580 Deutschmarks or approximately 300 dollars.

Something quite different in semi-scale RC models is Engel's massive Lockheed U-2. Intended to perform in true motor-glider fashion on engines of up to .61 cu in. maximum, it has a wingspan of 3.8 meters (12.5 ft) and is 2.2 meters (7.2 ft) long.

Large RC soarers are a continuing feature of the German model industry and the largest of this year's many new offerings appears to be Multiplex's elegant Alpina which spans over 13 feet.

No entirely new German engines have been announced for 1980 production. However, the 3.48cc Bernhardt HB 21-PDP engine, previously available only in car and marine versions, will now be obtainable in a standard RC aircraft type with conventional finned cylinder head and the smaller Perry Micro carburetor.

Also, the Webra .90 four-stroke cycle engine that was announced in February 1979 but was then extensively modified is, at long last, in production.

This engine (now known as the Webra T4) is quite unlike anything else on the market. Instead of poppet valves to control the inlet and exhaust periods, it has an Aspin rotary valve in the cylinder head. In the prototype, the rotary valve was seen to be driven by a toothed belt from the rear of the engine: the carburetor was a Webra TN type mounted at the back of the head and an exhaust pipe with a 180-degree bend conducted the spent gases from the front of the head. The prototype also used a conventional crankcase with integral front bearing housing.

In the production model, the toothed belt drive to the Aspin valve is taken from the front end. The valve itself is driven through a pair of bevel gears in the head. The main casting now consists of a barrel type crankcase and integral finned cylinder casing, the front housing containing the crankshaft and bearings being a separate bolt-on unit. There is an adjustable jockey pulley attached to a bracket on the front housing to maintain belt tension.

The Aspin valve, for the benefit of readers unfamiliar with this somewhat rare type of overhead valve gear, can be likened to the disc valve used by some rear induction two-stroke cycle engines; but instead of being flat, the Aspin valve, which forms the roof of the combustion chamber, is conical. It rotates at half crankshaft rpm and has a port that uncovers, in turn, the inlet port, glowplug and exhaust port.

Another, even more unusual feature of the Webra is its induction system. Instead of having the carburetor attached to the cylinder head (as in the prototype and some other model four-cycle engines) or to an intake pipe (as on the O.S. FS-60 and Kalt FC-1), the T4 has its carburetor (a Webra Dynamix) mounted on the left side of the crankcase, just above the mounting lugs; mixture is drawn through this, via a reed valve, into the crankcase and then out through the other side and up through a transfer pipe to the head.

Why such complication? It might be supposed that the purpose of passing the mixture through the crankcase is to ensure that the bottom end of the engine receives ample lubrication. (The engine runs, like other current model four-strokes, on a normal methanol/castor-oil two-stroke fuel.) The design of the engine, however, indicates that this was not the sole original purpose of this departure from orthodox practice.

Let us consider, for a moment, the question of supercharging a four-stroke engine. A supercharger is a pump or compressor, the purpose of which is to ram a denser fuel/air mixture into the cylinder for extra power. Superchargers are usually rotary compressors that are driven either from the crankshaft or, as in the case of turbochargers (originally used by aircraft such as the Allison V-12 engined Lockheed P-38 but now being used for certain high-performance passenger cars), by a turbine driven by the exhaust gases.

The sealed crankcase of a single cylinder (or an opposed twin) two-stroke motor also acts as a pump and it must have occurred to many designers that, since, in a four-stroke engine, there are two crankcase pumping cycles for every power stroke, it might be possible to use the crankcase as a means of supplying a denser charge to the cylinder.

To do this, it would seem desirable to separate the two crankcase charging periods by using a pair of non-return valves. In other words, after the piston, on its upward (compression) stroke, draws the first fresh charge from the carb through the non-return valve into the crankcase, this must be forced into the transfer pipe on the downward (power) stroke and trapped there by a second non-return valve. The second upward (exhaust) stroke of the piston then reopens the first valve to allow the crankcase to be "topped-up" with fresh gas, after which the first non-return valve closes and the inlet valve in the cylinder is opened to allow a well-compressed charge of fresh gas to be admitted as the piston descends.

It would appear, from our examination of the engine, that the Webra T4 was originally intended to operate in just such a manner. As already stated, there is a reed valve immediately behind the carburetor and this acts as the first non-return valve. It is contained in a special housing on the left side of the crankcase. A similarly shaped housing is attached to the opposite side of the crankcase, and this was obviously designed to accommodate a second reed valve between the crankcase and the large-bore intake pipe leading to the cylinder head. In the current production T4, however, the second reed valve has been discarded and the manufacturer's explanation for this is that the engine has been found to perform satisfactorily without it.

SWEDEN. The addition of crankcase charging to a four-stroke engine is not a new idea and, in November 1977, two years before the Webra T4 appeared, we had a letter from Torsten Bovik of Trollhattan, Sweden, proposing just such a motor but using front and rear rotary-valves for the induction and transfer of the charge.

Obviously, one does not easily get something for nothing and, with crankcase charging, some power is absorbed in additional pumping losses, so that the full potential of the increased charge weight within the cylinder is not completely recovered at the crankshaft. Nevertheless, Mr. Bovik, an engineer with Volvo-Flygmotor, calculated that with careful attention to the dimensions of the transfer pipe, a power increase of at least 10-15 percent would be possible.

At about the same time that Torsten Bovik was dreaming up his version of the crankcase charged four-cycle motor, another Swedish modeler, quite unknown to him, who was living in the north of Sweden, about 350 miles away, was also working on a crankcase charged four-cycle engine. This was Arvid Holmbom and his engine was subsequently illustrated in the Swedish magazine *Allt om Hobby*. It is a horizontally opposed four-cylinder motor of 10cc (.60 cu in.) displacement and is called the BVS-4410.

This engine draws mixture from a single Perry carburetor mounted below the center of the crankcase. Presumably the BVS-4410 has the crankcase divided centrally, and probably has a rotary valve between the front and rear chambers so that the mixture is fed to the front and rear chambers alternately. From the crank chambers, mixture is transferred to the cylinder heads and the inlet valves through large diameter gas-tight tubes enclosing the pushrods. However, it is not clear whether there are valves between the crankcase and transfer tubes in order to isolate the first and second crankcase charges.

Arvid Holmbom spent between 500 and 600 hours in constructing the BVS-4410. The engine has been claimed to have an output of nearly one horsepower at 10,000 rpm which, if accurate, is very good for a 10cc multi-cylinder four-cycle motor.

(Continued on page **48** *)*

FOREIGN NEWS

(Continued from page 47)

Before we leave the subject of four-cycle engines and Swedish ones in particular, giant-scale enthusiasts may be interested to hear about a Damo prototype seven-cylinder radial engine owned by Gregor Martensson of Stockholm. A photograph of this engine was recently sent to us by Torsten Bovik. It appears to use Damo FS-218 cylinder assemblies and, assuming that the FS-218's bore and stroke (24 x 20 mm) are unaltered, therefore has the very considerable displacement of 63.33cc or 3.865 cu in. As on the FS-218, the valve rocker gear and pushrods are exposed, but the pushrods are at the front; the heads are therefore turned through 90 degrees and have the fins machined at right angles to the rocker shafts instead of parallel with them. The engine uses spark ignition rather than glowplugs and there is a distributor mounted vertically at the rear.

We have no performance figures for the engine, but if its output per cylinder is comparable with that of the FS-218, a figure of 3.5-4.0 bhp would not be an unduly optimistic estimate of its potential. We have not heard whether Damo intend to put this engine into production.

AUSTRIA. After so many years of making only .60 and .40 cu in. engines, the Austrian Hirtenberger factory has announced an entirely new smaller model in the shape of the front rotary-valve HP.20. Unlike the current HP 40 and HP 61 models, it has a one-piece main casting embodying the crankcase, front housing and cylinder casing, but this has the black Thermex finish of the HP Gold Cup series and, like all HP engines since the very first ones in 1965, it has Schnuerle scavenging. The carburetor is a two-needle type similar to that fitted to the HP 40 models.

A simple method of coupling two, three, or four HP 40 motors together in a geared reduction drive was also displayed at Nuremberg. As the photo shows, the motors are simply bolted around a four-sided central shaft housing to produce a flat-twin, a V-twin, a four-cylinder radial, or even a three-cylinder unit. Each engine is fitted with a 14-tooth pinion which meshes with a 28-tooth output gear. The HP 40 is powerful, yet is lighter (only 9½ oz bare) and more compact than most current 40s, so a four-cylinder unit like that shown in the photo should make a pretty powerful package for a big scale model.

UNITED KINGDOM. As in Germany and France, so it is in Great Britain—new domestically produced motors appear rather infrequently nowadays. A significant British-made addition to the market, however, is the Irvine 20 shown in our other photo. Sturdily built, well finished and powerful, it is giving the imports a run for their money in the 3.5cc class. Basically, it is a scaled-down Irvine 40, complete with Schnuerle scavenging, Dykes-ringed aluminum piston running in an investment cast steel cylinder liner, twin ball bearings, and an Irvine automatic mixture control carburetor similar to that currently fitted to the popular K&B 40 R/C.

The Irvine 20 comes with a bolt-on expansion chamber type muffler and weighs 8.85 oz complete, or 7.5 oz less muffler. It has a bore and stroke of 0.650 x 0.640 in., giving a displacement of 0.2124 cu in.

GRAUPNER. Arising out of our item in the February "Foreign News," a lot of readers have written to ask how they may acquire a Graupner catalog and/or Graupner products.

Graupner model products were distributed in the U.S. some years ago, but as the value of the dollar declined against the Deutschmark, Graupner prices became less and less competitive and imports finally ceased. However, we are advised by the factory that they are now trying to establish a new distribution setup in the U.S. Meanwhile, Graupner suggests that *M.A.N.* readers wishing to obtain the catalog or products should contact one of the following German export houses: (1) Ferd. Rasch & Sohne, Gerh.-Hauptmann-platz 1, D-2000 Hamburg 1. (2) Fischer, Sonnenstrasse 2, D-8000 Munchen 15. (3) P.W. Feldhaus, Schilderstrasse 46-48, D-5000 Koln.

The 1980 edition of the Graupner king-size catalog is currently in the course of preparation and will be available in August. To U.S. customers it will cost DM 15.-, or about $8.00 at the current rate of exchange. (This is by surface mail. Airmail cost is high: DM 31.-, or about $16.00 total.)

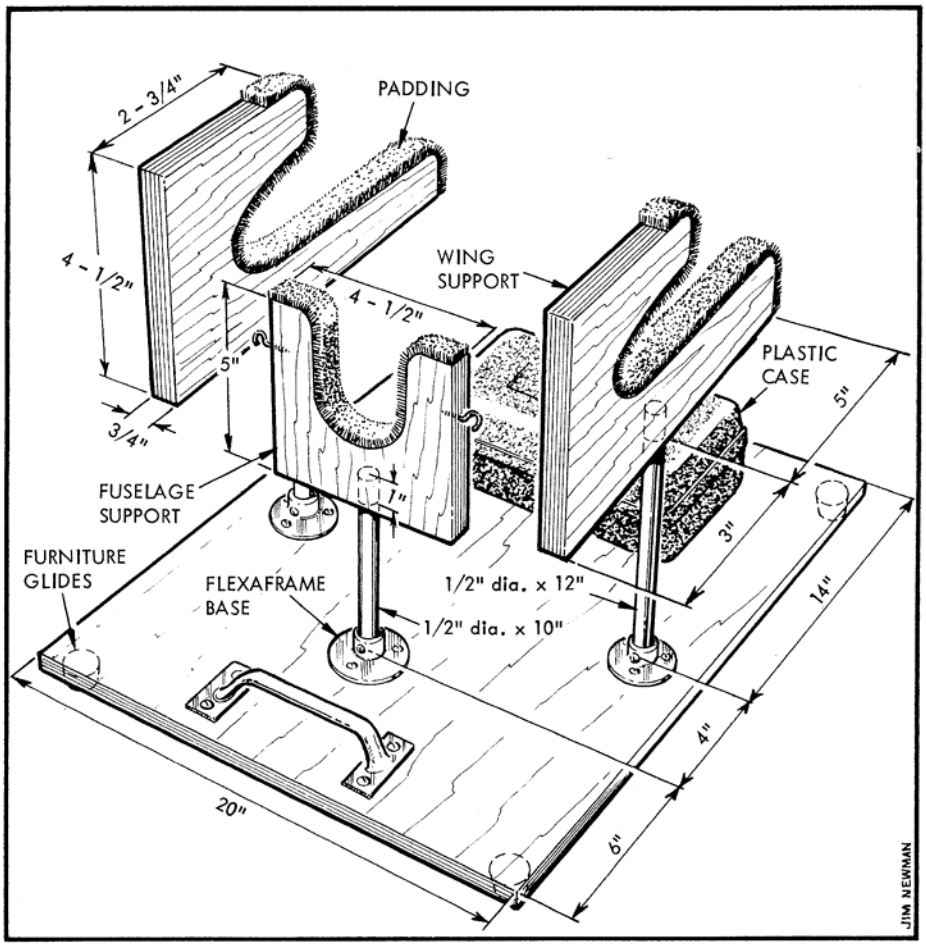
AIRPLANE CADDY

A HANDY HOLDER FOR RC AND CONTROL LINE MODELS–AT THE FIELD OR IN THE SHOP.

by RICHARD STEWART

• Four years ago, when I flew control-line stunt models, I designed a multipurpose caddy. Most stunt models (having engine size of .35 and larger) are difficult to start in the upright position due to an inverted engine, muffler, and closed cowling design. Inverting the plane to start the engine is faster, but usually requires help and is awkward, to say the least. The caddy solves this problem. By placing the plane (inverted) in the caddy, procedures such as fueling, starting the engine, and adjusting the rpm are accomplished with no additional help. The result is faster starts, no fuel spills, better engine settings, and, in the area of safety, less chance of a finger slipping into the propeller.

The caddy is also very handy during model construction, particularly during the final phase of covering, painting, and adding decals. It could serve as a test stand to hold your model during the break-in of a new engine, too. (I recommend the use of a strong rubber band across the fuselage to hold the model down during extended runs.) I've built Sig's Chipmunk, Super Chipmunk, Akrobat, and Mustang, all of which fit nicely into the caddy. Although today I am flying only RC models, I still find the caddy very useful at the flying field and in the workshop. By changing the position of the uprights, I can now use it as a holder for my Quickie 500 while transporting it in the car and while in the pits at the flying field.

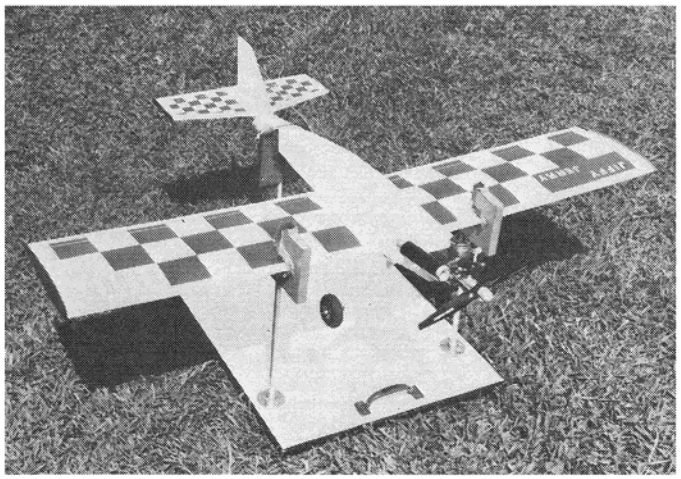


CONSTRUCTION. The base and wing/fuselage supports were cut from ¾"-thick plywood, since this is what I had available, but 1"-thick pine could also be used. The inside portion of the supports should be lined with a protective material to avoid scratching the model's finish. The uprights were made from ½"-diameter aluminum rods attached to the base with "Flexaframe" bases from the Fisher Scientific Co. These parts may prove to be too expensive, but there is no reason why ½"-diameter wooden dowels and an extra wooden block for a base anchor couldn't be used. The rods should be permanently fastened in the supports with epoxy cement. At the base, the rods should be held in place by screws so that the caddy can be quickly disassembled for transporting.

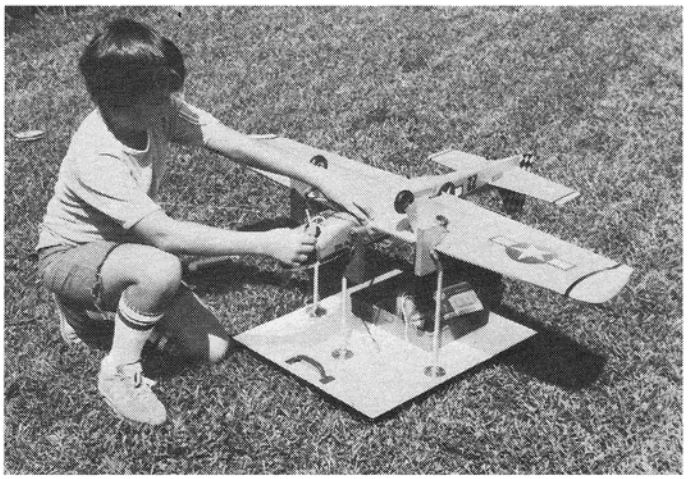
Bassick furniture glides were added to the bottom to protect the base from wet ground and dirt. A carrying handle is also helpful.

An optional storage box can make the caddy a complete flight box containing battery, props, fuel, lines, etc. All wood should be finished with fuel-proof dope, and protective material should be glued to the supports with fuel-proof cement.

I'm sure that you'll find this a simple but very useful idea! ■



Model supports can be located to hold wings and tail, as shown here with upright RC airplane, or placed to hold wings and nose...



...as with this control line stunter, making it easy to start inverted engine. Built-in toolbox is a convenient feature.

control line NEWS

by HARRY HIGLEY

• THE WRAM SHOW. The WRAM Show is what you've come to expect of an RC trade show. Most major manufacturers have booths in which to show off their new products. An abundance of people come to see all this, and there are times when an observer is locked into a mass of people and can't move in any direction. There are long lines to get food and the concrete floor leaves your legs numb. But we modelers are a special breed—we can ignore adversity while using the opportunity to converse with the people who make the supplies we all use. It's a chance to ask why you're having trouble and a chance to express satisfaction, an opportunity to learn about new techniques and to ask about new items. A control line flier doesn't let the fact that these shows are for the masses of RC enthusiasts discourage him or prevent him from coming.

Bill Boss, an ardent scale and carrier flier, AMA officer and model aviation promoter, was on hand. The Nats dates and site were finalized only the week before. Bill was happy with the choice and tells me we'll see him again then—only, like the rest of us, he'll have his ships and be flying.

After five years I finally got to meet one of my most loyal contributors, John Miske. John's most recent effort appeared in the January issue. You'll recall (or can check the issue) that it was the A to Z of how to join foam wing halves. He's also sent photos of the Garden State Circle Burners' contests and is always pushing Old-Time Stunt. He was able to supply me with a set of deBolt All-American Senior plans; I built several of these as a youngster and would like to do it again. John works for Bright-Star, which makes the No. 6 Ignition dry cell. This is the great big battery many of us still prefer to use to light glowplugs, and John was kind enough to send me a couple. Two of these wired in parallel usually will last a year, don't need recharging, and will never burn out a plug. Most glowplugs were designed for this battery long before nicad became so common.

Control Line Speed enjoys considerable popularity on the East Coast, with Frank Garzon being one of the more active fliers. I was able to see Frank briefly and chat about the prospects of this year's Winston-Salem meet. Frank's most serious event is "C" Speed, in which he does quite well. I've been receiving letters requesting that more info on Speed be included in this column, so I'll be drawing on the knowledge that Frank and people like him have accumulated.

The WRAM Show left no doubts about the imminent increases in fuel cost that we may expect. The price of glowplugs, with their platinum filament, isn't going to drop either. All this makes Bob Davis' diesel conversion heads very attractive, since his fuel sells for about the same as glow fuel but goes much further. Bob and my Canadian friend Frank Anderson have agreed to write a basic "how to do it" article for those of you who might wish to read a bit before trying diesel operation. Most of the

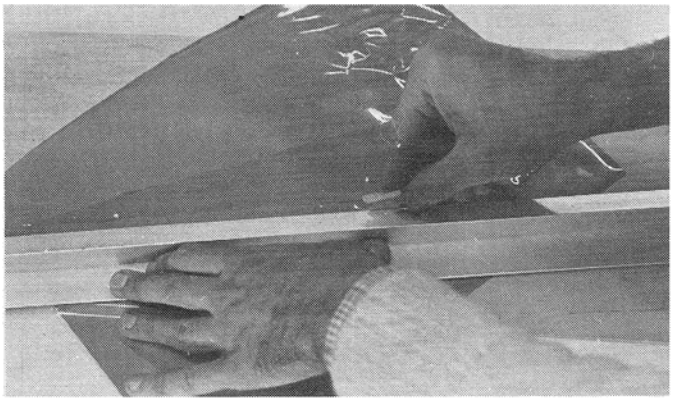


Photo 1. Position stripe on wing and cut through covering.

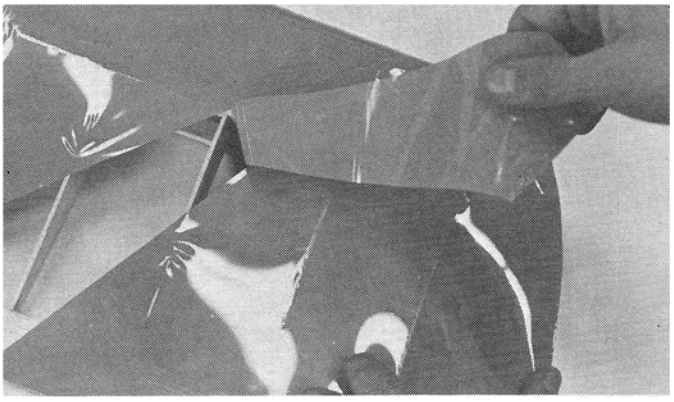


Photo 2. Remove cut-out stripe section from wing covering.

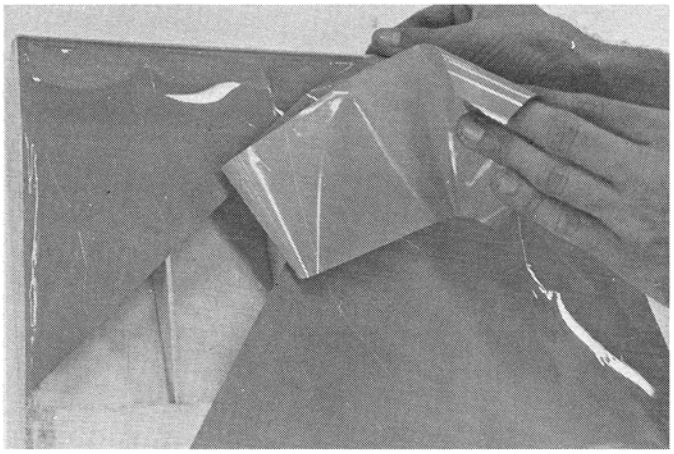


Photo 3. Place trim piece in position, overlapping edges.

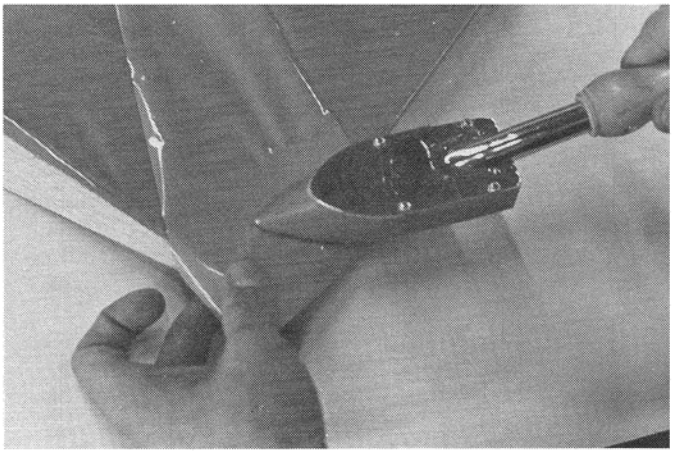


Photo 4. Tack the trim piece in position, beginning at the...

AMA VP Vince Mankowski and son Vince Jr. with their 1/2A Mouse Racers.

John Poynter with beautiful blue stunter.

existing folklore about it is thirty years old and wasn't based on any careful research.

Almost every modeling function has a former world stunt champ and the WRAM Show was no exception. Bob Hunt, also a member of the Garden State Circle Burners, was representing *Flying Models*. Bob has a new job with them as an editor, so we look forward to seeing the magazine have some more fine articles like the recent one on former world stunt champ Bill Werwage's Juno. Bob is also working on a prop drive for a stunt model. Sounds like fun. Stunt is presently the USA's strongest international modeling event, which accounts for finding so many world champs.

One manufacturer heavily into new control line kits is Sterling Models. They have a very nice profile Hellcat for a 35 to 46 engine. Their newest offering, called the Viper, utilizes some of the high-performance Cox engines. With traditional construction and modest price, the model has a lot of appeal. Unlike many 1/2A models, it features a built-up fuselage. A newcomer could probably learn the more difficult stunts by flying this ship in a weed field.

Perhaps the greatest opportunity to learn was provided by Top Flite Models with their MonoKote demonstration. Sid Axelrod, Top Flite's president, has performed it thousands of times, but recently Mark and Charlie Bauer have taken on the responsibility at the shows (the Bauer family are all avid control line fliers). Since we've devoted a lot of space in the last few issues to covering with film, it's appropriate to include a part of the demo. I apolo-

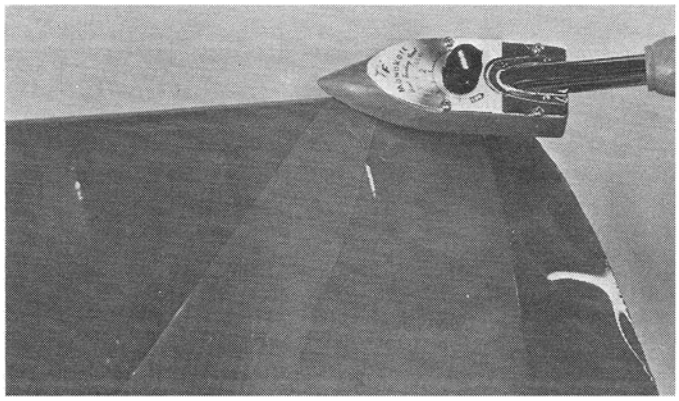


Photo 5. ...corners, using gentle pressure to avoid scratches.

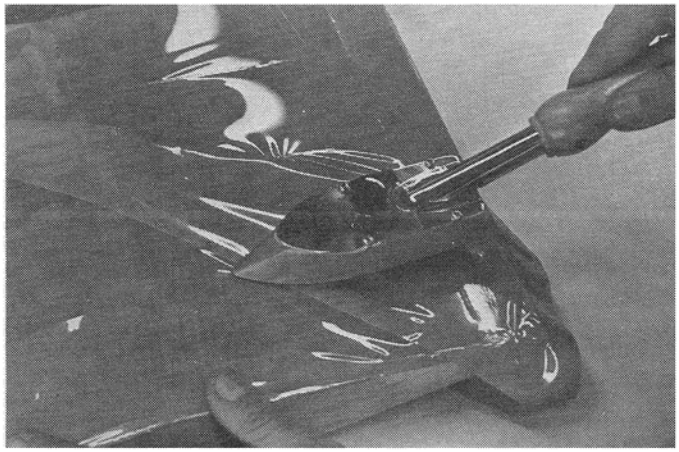
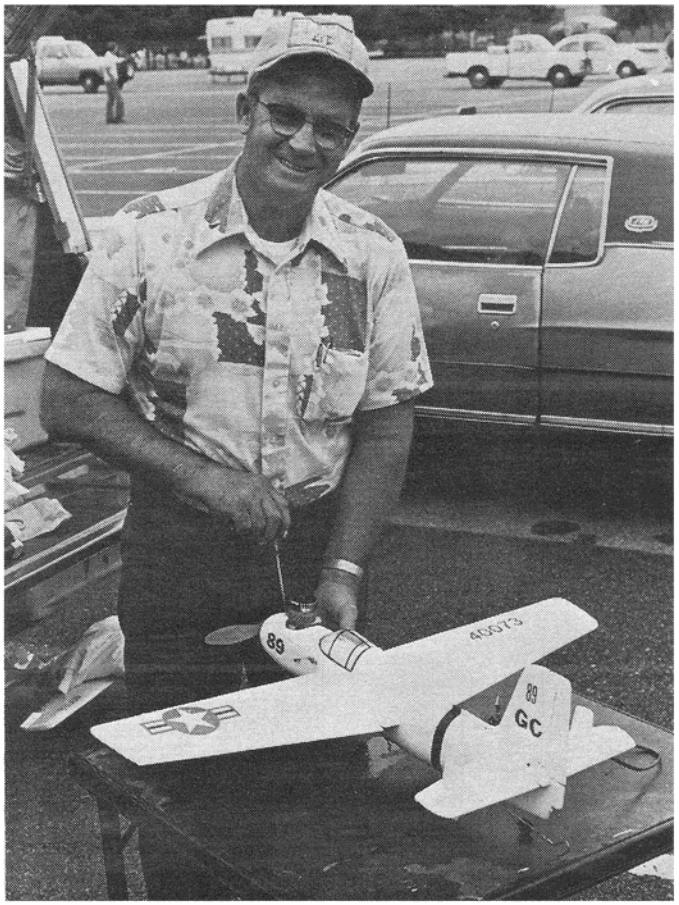


Photo 6. Seal the edges of the trim piece, then shrink tight.



George Collins prepares his OS 65 powered Sterling Guardian.

gize for the photo quality, but the lighting was terrible.

The object is to put a stripe, such as a sunburst segment, on an open wing structure that is already covered. Since the area being covered is quite large, bubbles would surely be trapped between the two film layers, which would be rather unsightly. Part of Top Flite's demonstration shows how to apply such a stripe. As has become our practice, we've numbered the photos and these numbers are referred to in the following text material.

The stripe is cut from a piece of Super MonoKote, using a metal straightedge and single-edge razor. The clear backing is left on the stripe at this time so that dust isn't attracted to the adhesive. Next, the newly cut stripe is positioned on the wing with one edge 3/8" to 1/2" from its final location. See *Photo 1*. Lay a straightedge about 1/4" from the stripe edge and cut through the wing covering. When the stripe is put in its final position, the wing covering will extend about 1/4" under the stripe. Now repeat the process until a piece of the wing covering that is the shape of the stripe but 1/4" smaller in dimensions can be removed as shown in *Photo 2*. We are trying to have a narrow band of wing covering under the trim stripe and open structure beneath the rest of the trim piece. Then no bubbles will be trapped as there is nothing under the trim.

The piece of trim is positioned in place after removing the clear backing. The dry adhesive on the trim will tend to adhere to the wing covering, but this isn't a permanent bond and the trim can be repositioned any number of times. A hot iron is run lightly around the border of the trim to make the bond permanent. This is most easily done by tacking the corners first, then doing the entire stripe. *Photos 4* and *5* show this. With care, you won't have scratched the film. You would be well advised to use a heat gun for the final shrinking, but an acceptable job will result by lightly touching the surface with the iron as shown in *Photo 6*. With all the colors available, there can be no reason for not having as dazzling a ship as you might wish.

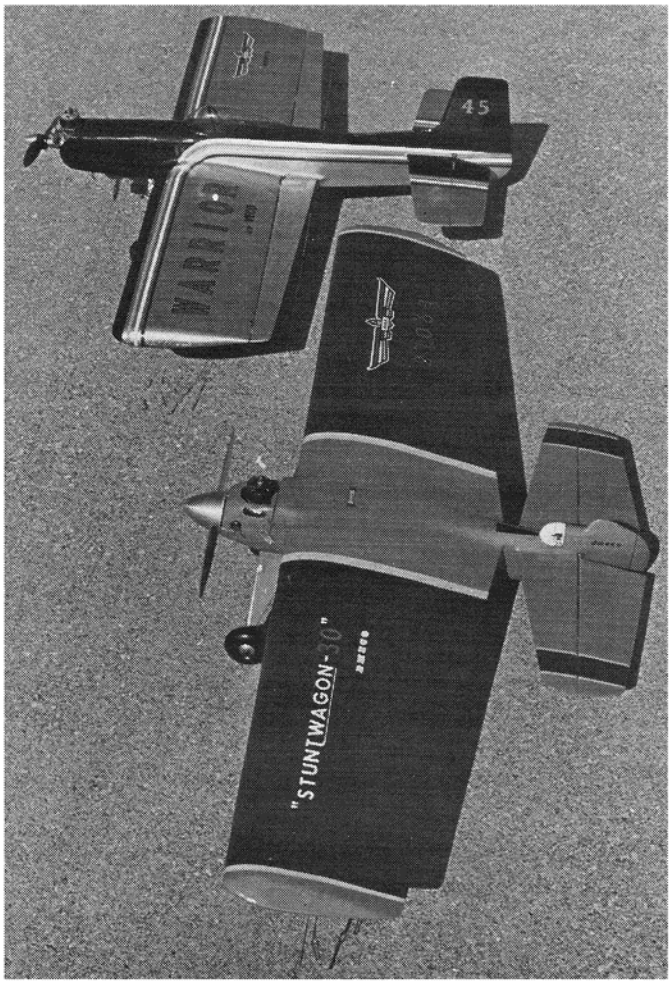
This is only part of the MonoKote demonstration and only a small fraction of what can be learned at any of the trade shows. For the economy-minded modeler, the swap shop nearly always offers some kind of bargain or other. This time it was new Thunder Tigre 15s for $5.50 each. That's a lot of engine for the money. I'm looking forward to seeing what I can scrounge up at Toledo.

MAIL BAG. Since we've written a bit about diesel ignition it seems like the right time to publish part of a letter by Albuquerque's Phil Shew. Phil and his teammate Les Pardue are always promoting FAI Team Race, an event where only a diesel stands a chance. For attracting competitors to this activity, Phil is suggesting an approach that might work for others as well. He also presents a strong case for FAI Racing. Phil writes:

"I was getting ready to mail you the enclosed flyer when I thought maybe a bit of explanation might be in order. We've decided to promote FAI Team Race in this area, and we're going to take a little different approach than any I've heard about to date. We think TR is without question the best control line racing event going: The rules are well defined and *very* stable. The best engine for the event is built right here in the U.S. Engines last *much* longer than equivalent glow motors. Fuel is inexpensive and the ingredients are readily available. (Have you priced nitro lately?) The planes are nice-looking and fly great. You don't have to worry about burned-out glowplugs or dead batteries. Diesels restart.

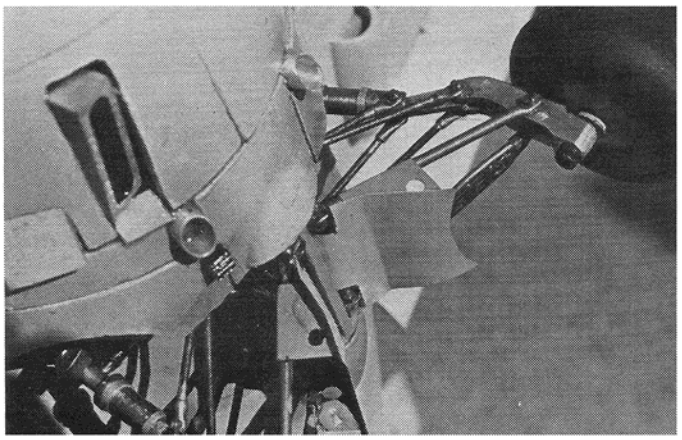
"We think the problem to date is that there's no intermediate competition level for those who might otherwise fly the event but aren't interested in world class

(Continued on page **53***)*



Old-time stunters by Doug Dahlke: deBolt Stuntwagon 30 in the foreground, Veco Warrior in background. Both date from the '50s.

Husband and wife team of Fred and Joyce Margarido with their Super Tigre 29 B Speed entry. They're from San Francisco.



Ken Long's F4F Wildcat landing gear is a study in complexity.

CONTROL LINE NEWS

(Continued from page 52)

competition or aren't capable of competing at that level. It would be similar to expecting every carrier flier to be competitive at the Nats—it's just not going to happen. And if Nationals-level competition was all that was available for carrier fliers, I'm sure interest would evaporate. Yet that is the situation in Team Race today—you're either a super star or an aspiring super star, or you don't fly TR at all. As a result, everything that is written about TR is aimed at the world class competitor. Read that stuff for very long and you'll soon believe that team racers can outfly an electric starter, catch planes at full speed, are taller than Too Tall Jones, and eat, sleep and breathe TR 370 days a year. The fact of the matter is that anybody can fly and enjoy Team Race. We plan to offer enough opportunities to compete on a local level to make it worthwhile for someone to build a plane and get started. Consequently, we're sponsoring TR at Buckeye in January, holding a two-day contest over Memorial Day weekend, and including TR at our Duke City Contest over Labor Day, plus one or two club contests scattered throughout the year.

"I don't know how successful we'll be, but we're going to give it our best shot and see what happens. A plug in your column would go a long way toward getting us off on the right foot. (Signed) Phil."

Herb Gauck, from Hollywood, Florida, has recently rejoined us as an active flier after an absence of 24 years. Some of his questions are asked often enough to answer here, as all beginners and returning "older" CL types often ask them, too.

Q. What is the current address of the AMA? They used to advertise in all the model airplane magazines.

A. Academy of Model Aeronautics, 815 Fifteenth St. NW, Washington, DC 20005.

Q. Was Bob Sargent joking when he wrote ". . . that I pay over $80. . ."? What are the current dues?

A. Dues are $25 per year, which includes 12 issues of their commercial publication, *Model Aviation.* The magazine and insurance are a good buy for the money, particularly since there is some doubt about whether home-owners insurance will still cover our activities. The $80 Bob is referring to represents the dues for *all* the many special-interest groups. If you're interested in Stunt, Combat, and Navy Carrier, you'll want to join the three societies devoted to those activities. Bob Sargent feels, as do I, that the many newsletters should be incorporated into *Model Aviation,* which would make it a better magazine and relieve the societies of the burden of distributing hundreds of newsletters. We haven't been successful yet, but AMA remains "open" to the idea.

Q. Do all, or almost all, competitions require an AMA membership?

A. The San Francisco area has their own AMA type organization known as WAM (Western Associated Modelers) that sanctions and insures contests. Outside of WAM Country you must belong to the AMA to compete.

Q. Can I renew my original number that was issued in 1953?

A. There is no guarantee that your old number hasn't been reissued, but if it is open they will probably give it to you. They charged a dollar for this service in the past; I don't know what the current fee is.

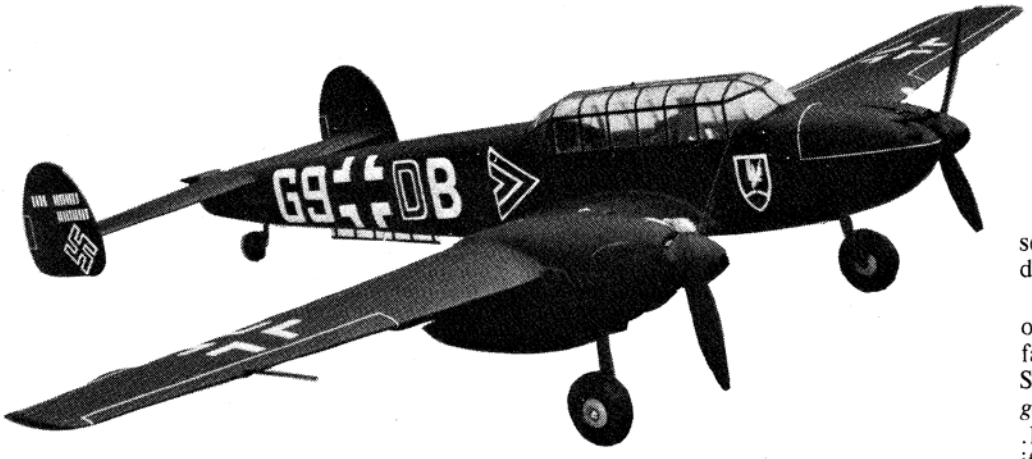
George Lieb, from Omaha, Nebraska, sends along the following tip for building a profile-fuselage model:

"First I build a profile model with no wing cutout. When the fuselage is finished, I drill a hole and jigsaw out for the wing. This is easier than trying to build in the opening. Next, around here we have a very simple but very strong method of holding the wing in a profile model. Make the fuselage cutout slightly large so the wing slides in easily. Then tack the wing in place with a few drops of 5-minute epoxy. After the epoxy has hardened, tape the wing joint very tightly on one side of the fuselage. Hang the plane up by one wing tip with the *taped side down.* Now use *slow-hardening* epoxy, and put glue in the joint all the way around. Keep putting glue in until the joint is completely filled. You may have to put more glue in the next day because it soaks into the wood. I've mounted solid, built-up, and foam wings this way, and never had one come loose. Just make sure that there are no openings in the wing or the epoxy could run in and glue the controls, too. I don't know who thought up this method, but I'd never seen it until I moved here."

SOME NEW TERMINOLOGY. My oldest son, stationed on the USS Midway, came home on leave and deluged us with all manner of jargon and convenient abbreviations that the Navy uses. For practice, the Navy sends a carrier a few hundred miles out to sea where it cruises in a large circle. This is known to the Navy men as a "Doughnut Cruise." The possibilities for application to control line Navy Carrier—with its curved deck and circular flight path—can raise a smile as just the words "Doughnut Cruise" have a comical sound. A related term is "Bingo." As a noun, it means a conventional landing field near the Doughnut Cruising ship. If a new pilot misses a couple of landings or gets the jitters, he is waived off and told to land at the Bingo Strip where he has a lot more room. As a verb, a pilot who must resort to this humiliation is said to have been "Bingoed." I look forward to judging the Midwest Navy Carrier Association contest this fall. If a contestant touches the ground, whips or is to be disqualified for any reason, he will be told, "Your Doughnut Cruise is over; land at the Bingo field."

That's about all for this month. I haven't made plans for next month yet. I'll be at the Toledo trade show, looking for items that are of interest to those of use who go in circles. As you engage in the various activities this summer, take a few pictures and send them along. We prefer large 5" x 7" black and white prints, but aren't too fussy and will accept a standard color print on gloss or matt paper (textured papers don't turn out well). ■

Bf110 NIGHT FIGHTER

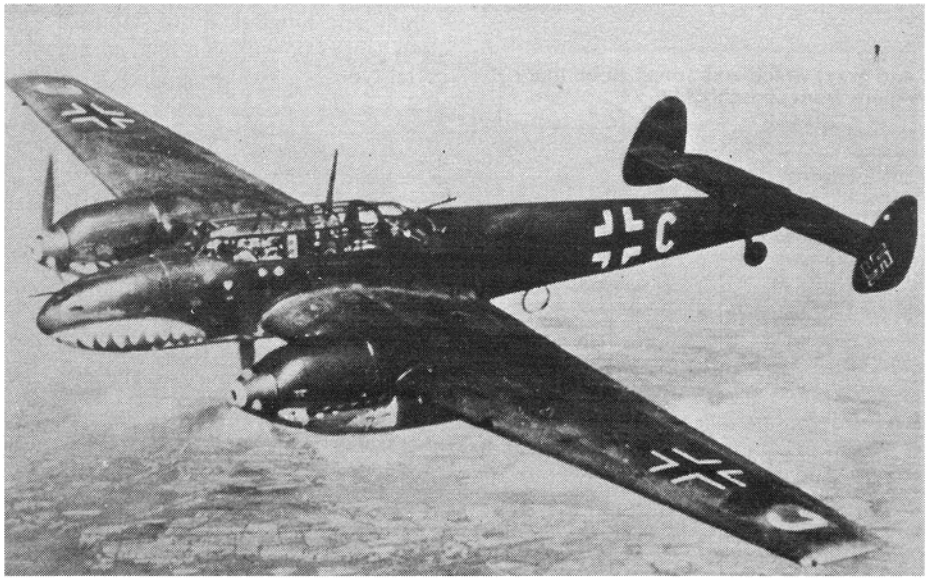


by Walt Musciano

A standoff-scale control line model of a unique and interesting aircraft.

MESSERSCHMITT Bf110
TYPE: Control Line Scale
WINGSPAN: 39½ inches
WING AREA: 227 square inches
LENGTH: 30 inches
ENGINE: Two .15-.19

• The full-size Messerschmitt Bf110 has so captured my interest that this model is the third Bf110 I have built, in varying sizes, and all have been very interesting and successful projects. The Messerschmitt Bf110 was one of the first attempts to develop a true strategic fighter with long range and heavy fire power. Designed originally to clear the sky of enemy fighters, the *Zerstorer,* or "destroyer," failed in its task during the Battle of Britain, but went on to become the most successful night-fighter in the world, with more nocturnal victories than any other airplane. The twin-engined, two-seater Messerschmitt Bf110 became a destroyer of bombers instead of fighters.



This Bf110C-2 belonged to ZG76, the unit that scored the first night-fighter victory even before an official night-fighter force was established.

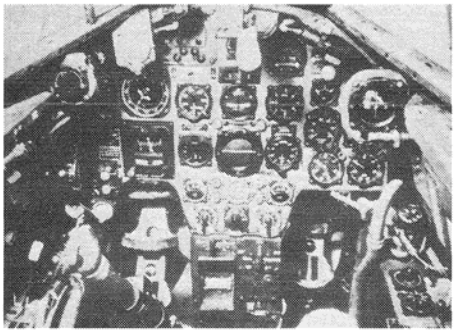
Our model is a ¾" standoff scale replica of one of the Messerschmitts flown by famous German night-fighter ace Werner Streib when he led *Gruppe I* of *Nachtjagdgeschwader No. 1* in 1941. Engines from .15 to .19 cu in. displacement can be used; if funds are short and you have two similar but not identical engines, it is possible to fly the model with a .15 and a .19. Mount the larger or more powerful engine in the inboard nacelle and throttle the engines to equalize power if necessary. The prototype model is powered with two Fox .15 engines. Our model is not difficult to build; no complex structure or planking is necessary, and the cockpit canopy can be made from a flat sheet of plastic in one piece! Because it is impossible to enclose the engine cylinders, we elected to use horizontally mounted engines to make the powerplants as obscure as possible in profile.

WING STRUCTURE is made first. Trace and cut out the hard balsa spar halves and plywood spar joiners. Glue the joiners to both sides of the spar halves, which will automatically align the spars to the proper dihedral. Set aside to dry, with heavy weights or clamps holding the joint. While the spar assembly is drying, trace and cut the ribs to shape. Glue the ribs into the spar notches, egg-crate fashion, and glue the bellcrank mount into this assembly by fitting it into the slots in the spar and ribs. Attach the wire leadout lines to the bellcrank and bind and solder the ends. Pass the wires through the holes in the ribs. Attach the clevis and forward portion of the pushrod to the bellcrank and bolt the bellcrank to the mount. Sand the wing structure lightly with sandpaper mounted on a large sanding block to be sure that the ribs and spars are smooth before covering is applied. Re-glue all joints after sanding.

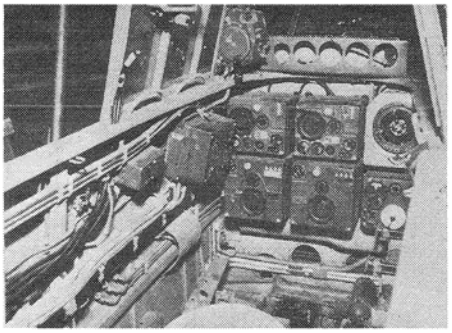
WING COVERING is cut from ⅛" sheet balsa, and the various pieces should be butt-joined together very firmly and then cut to the wing outline shape, about ¼" oversize to allow for camber, etc. The

Bf110 NIGHT FIGHTER

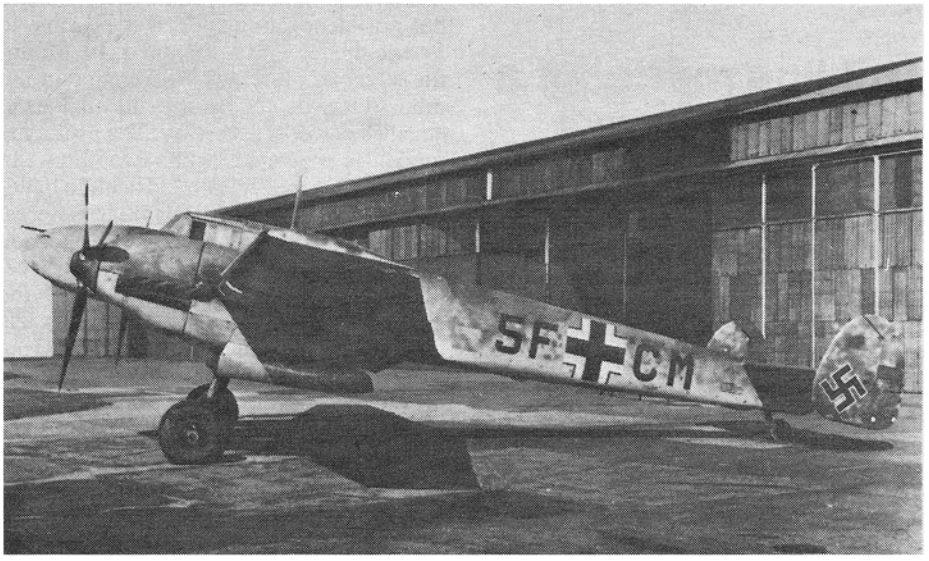
wing is covered in four sections: the top and bottom of each half. The bottom is covered first. Mark off the location of the spar on the assembled covering and then apply glue to the bottom of the spar. Press the framework against the covering, and be certain the spar is in the proper location on the covering. Hold with pins until dry. Now apply glue to the ribs forward of the spar and press the covering against the ribs. Hold with pins. Repeat this for the ribs aft of the spar and set aside to dry. Using a sharp knife or razor plane, gently bevel the leading and trailing edges of the bottom covering to follow the contour of the upper camber of the ribs. When trimming is complete, finish off with sandpaper on a block. The upper covering is installed as described for the lower, except that when glue is applied to the ribs it must also be applied to the bevelled surface of the lower covering for attaching the upper covering. Again, hold in place with pins until dry. Repeat for the other wing half. Remember to firmly attach a one-ounce piece of lead to the inside of the lower covering of the outboard wing tip (right wing when looking from the rear) before the upper covering is cemented in place. It is also important to trim the covering sheets at the root ribs so the covering sections meet neatly at the center line. This should be done before the covering is glued in place; cut, fit and cut again. When everything is thoroughly dry, the covering is carefully trimmed along the leading and trailing edges. Cut the covering flush with the tip ribs and add the wing tips. Trim and sandpaper the entire wing with a block and move on to the fuselage.



Pilot's cockpit. Notice the console on each side, throttles on left.



Radio operator's (rear) cockpit, looking forward. Machine gun faces aft, not shown.



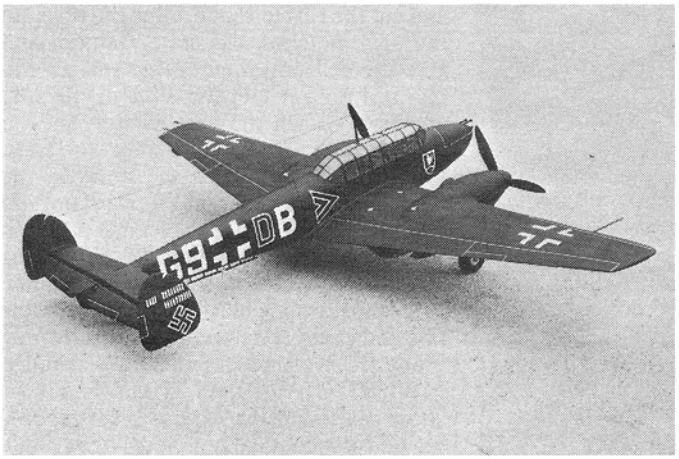
Bf110C-4 in mottled camouflage of light blue and gray, which was found to be more effective than all-black for blending in with the glare from searchlights.

BASIC FUSELAGE construction consists of sheet balsa sides and bulkheads with 1/2" and 1/4" top, bottom and nose. First cut the fuselage sides and bulkheads to shape and glue the bulkheads between the sides in the proper location. When cutting the fuselage sides, be certain that the wing and stabilizer cutouts are accurate because they control the incidence angle—which should be zero. Also bevel the sides at the rear as shown in the plan top view and glue the sides together. Use pins, rubber bands or clamps to keep the fuselage sides pressed to each other and against the bulkheads until the glue is dry. Now carefully pass the control rod through the holes in the bulkheads, and cement the fuselage sides and bulkheads to the wing. Apply several coats of glue to the inside of the fuselage/wing joint and set aside to dry thoroughly.

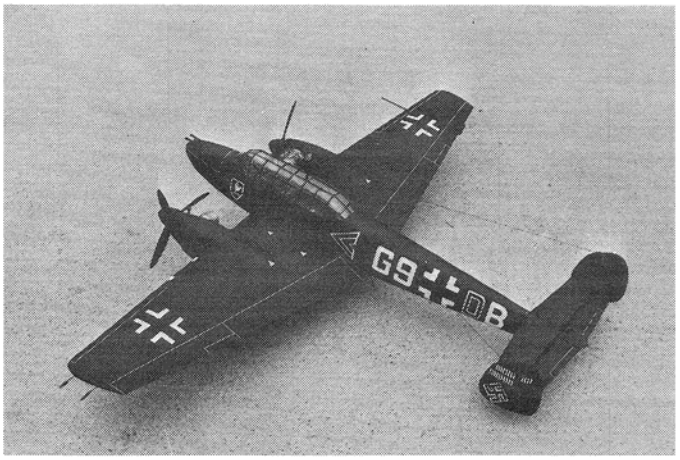
STABILIZER construction begins by gluing the ribs into the spar notches. When dry, sandpaper the frame and cover with sheet balsa. This should be done in the same manner as the wing. Sand smooth.

ELEVATOR halves are cut to shape and carved or sanded to the proper section. Join the two halves with the control horn. Glue the ends of the horn wire into holes in the elevator and hold the wire against the elevator halves with strips of cloth wrapped around the wire and to the elevators, well glued. Sandpaper the elevator assembly and hinge it to the stabilizer with cloth hinges or with commercial nylon or metal types.

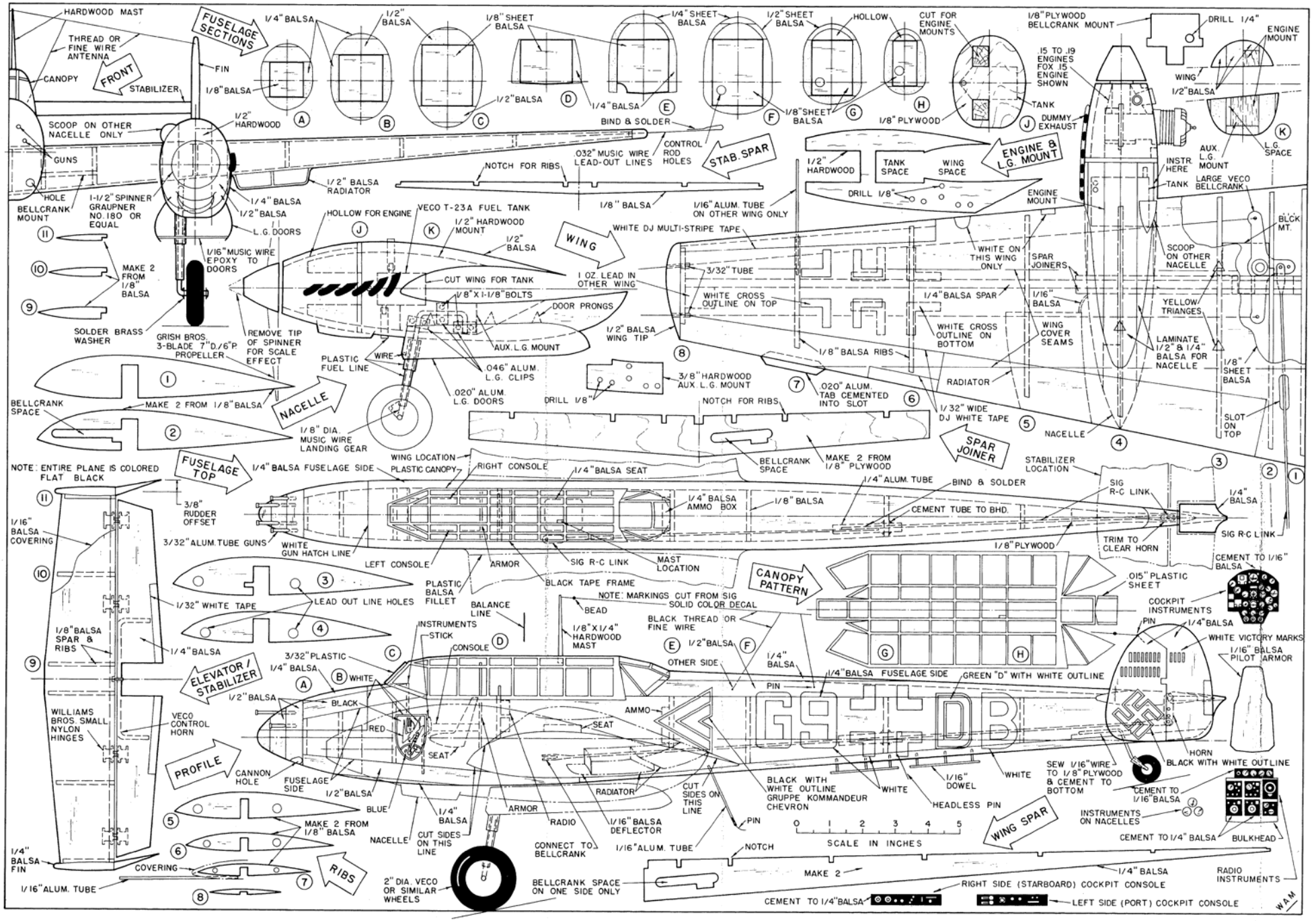
(Continued on page 57)



Large clear canopy requires some cockpit detailing; see plans, and cockpit photos on this page. Canopy is one piece of plastic.



Small tabs on wing trailing edge should be bent so that outboard one is up, inboard is down. All trim is from tape and decal sheet.



FULL-SIZE PLANS AVAILABLE . . . PAGE 130

Bf110 NIGHT FIGHTER

(Continued from page 55)

CONTROL SYSTEM is completed by attaching the rear portion of the pushrod to the control horn after first passing the unit through the holes in the bulkheads. Fit the stabilizer atop the fuselage and cut away the inner surface of the fuselage sides to clear the pushrod and horn. When the fit is good, and the horn and pushrod can move freely, glue the stabilizer to the fuselage. Slip a length of 1/4" aluminum or plastic tubing loosely over one of the pushrod sections. This will keep the rods from snagging on the bulkheads when the tube is attached later. With the elevator and bellcrank temporarily taped in neutral position, the ends of the two pushrod sections are joined by binding with fine, soft wire and soldering. Check controls for easy movement and then glue the aluminum tube to the bulkhead.

RUDDERS AND FINS are cut to shape, trimmed to a streamline shape, and the fins glued to the ends of the stabilizer while the rudders are glued to the fins, offset as the plans show.

FUSELAGE TOP & BOTTOM are cut to shape following the contour of the top view. The fuselage bottom between the wing and tail must be cut to clear the bottom of the wing. Bend the tailwheel strut to shape and sew firmly to a plywood mount. Pass the wire strut through a hole in the fuselage bottom and very firmly glue the plywood to the inside of the fuselage bottom. Glue the bottom to the fuselage sides and the wing. Apply more glue to the tailwheel strut attachment from the inside of the fuselage. The fuselage top between the cockpit and tail is first assembled from 1/4" and 1/2" balsa and then very lightly tack-glued to the fuselage sides after it has been cut to fit the stabilizer. Carve the top to shape and then,very carefully, pass a razor blade along the seam to remove the top. Hollow it out as the plans illustrate and glue it permanently in place. Top and bottom fuselage forward covering is laminated from 1/4" and 1/2" balsa and glued in place. When dry, sand the front of the top and bottom covering to make them even with the nose bulkhead "A" and laminate the 1/2" balsa nose in place, using plenty of glue. When dry, carve the fuselage nose, top and bottom to the shape shown on the fuselage sections. Sand smooth.

ENGINE NACELLES are laminated 1/2" and 1/4" balsa with a 1/2" hardwood core that serves as an engine mount and landing gear mount. The laminations are assembled, one at a time, directly on the wing. First cut the hardwood core to shape, being certain that the engine and tank spaces are correct for the equipment to be used, and drill the 1/8" holes for the landing gear bolts. Slide the hardwood mount onto the wing and check to see if the fit is snug at the correct location. Trim as required and cut into the wing for fuel tank space. When the hardwood mounts fit the wing properly, they should be glued securely in place. Cut the plywood bulkhead to shape, drill hole for the fuel line, and glue firmly to the engine/landing gear mount. Now cut the 1/2" balsa pieces to fit over the mount to form the correct nacelle profile and glue in place. Slip the fuel tank into its space in the mount and glue firmly. Cut the 3/8" hardwood auxiliary landing gear mount to shape, drill the 1/8" holes, and glue very firmly to the engine/landing gear mount, being certain to align the holes. Bend the landing gear struts to shape—being sure to make one right-hand and one left-hand strut. Cut out and drill holes in the LG clips. Bolt the landing gear in place running the bolts through both the engine mount and auxiliary LG mount. Check the alignment and then smear glue over the clips and nuts and bolts. The 1/2" balsa nacelle laminations are each cut in two pieces divided along the center line. Trim each piece to clear the fuel tank and landing gear, and trim carefully to fit the contour of the upper and lower wing camber. Be certain to add the plastic fuel-line extensions to the fuel tank before the tank is entirely enclosed.

When all layers have been fitted, and the glue is thoroughly dry, the engine cowl should be constructed in the same manner, but the 1/2" balsa should not be glued to the engine mount. Glue only to each other, and spot glue to the bulkhead. When dry, carefully carve the entire nacelle to shape with a sharp knife, remove the cowls carefully, and hollow as shown. At this time it is advisable to bolt the engines to the mounts and cut away the cowl to clear the engine cylinder and air intake. Check the balance of the model, and if tail-heavy, remove the nose piece, hollow, and add lead weight to balance the model. Re-glue the nose in place, and add the propeller and spinner. At first I used scratch-built three-bladed propellers and scratch-built fiberglass spinners; I later installed Graupner No. 180 1 1/2" three-bladed spinners and Grish Bros. 7 x 6 three-bladed propellers, all of which proved very successful on my model. Shape the cowl to fair into the spinner. Remove the engine and apply several coats of sanding sealer to the cowl interior, engine mounts and bulkhead. Secure the engine mounting blind nuts to the engine mounts and glue the cowl in place. Make a small Plastic Balsa fillet around the nacelle installation.

RADIATORS are cut from 1/2" balsa and carved to shape. Notice the notch near the middle of the radiator. This is in line with the flap outline and, on the full-size plane, the rear of the radiator housing moves with the wing flap, hinging in the notch. Make a small fillet all around the radiators after they are cemented in place.

PAINTING should not be started until the entire model has been well sandpapered with fine and extra fine sandpaper and the small Plastic Balsa wing fillet is complete. You can use any finishing method you're familiar with, but here's my technique: Apply several coats of Aero Gloss Sanding Sealer to the entire model and, when thoroughly dry, sand with extra fine sandpaper. Be sure that each coat is dry before the next coat is applied. Continue the application of sealer, sanding between coats, until the surface is smooth and free from grain. Then thin the sealer about ten percent, apply a few more coats, and sand gently with No. 500 finishing paper. The prototype model has fourteen liberal coats of sealer. The cockpit interior should also receive a few coats of sealer. Holes should now be carefully made in the nose for the machine guns and the cannon tunnels. Apply sealer in the cannon tunnel holes and sand. The entire model is painted flat black. We used Aero Gloss Military Flat Hot Fuel-Proof Dope—Flat Black 30-4. Thin the dope with about ten percent thinner for brushing. Apply two coats.

EXTERNAL DETAILS such as exhaust stacks, machine guns, landing gear doors, wing tabs, plastic tube landing gear covering, fuselage bottom antenna, and machine guns are now added before further painting. Drill 1/64" holes in the aluminum tube to add realism to the guns. The exhaust stacks can be carved from hardwood, sealed and glued in place.

COCKPIT interior is painted light green, and while this is drying the equipment can be fabricated. The pilot's seat is made with 1/16" balsa sides and stiff card bottom and back, and is the full-width between the consoles. The pilot's seat, armor plate and instrument panels, radio blocks, ammo stowage, and bulkhead "D" are painted gray after sealing. Radio operator/gunner's seat is light brown. Paper instruments can be cemented in place, or Tatone or similar instruments can be used. Shoulder and lap harnesses can be added to the pilot's seat and lap harness to the gunner's seat, made from stiff paper. Control stick is wire.

COCKPIT CANOPY has no compound curves and can be cut from a flat sheet of plastic. Trace onto stiff paper and cut out. Bend and tape to shape as a test, check the fit on the fuselage, and make corrections as necessary. Then tape the paper pattern to the plastic sheet and cut the plastic to the shape of the pattern. Bend the plastic to shape and hold in position with thin strips of tape. The curved portion on each side of the canopy top can be molded with the fingers for gentle bending. When the canopy has been formed and the fit is good, the seams should be glued with Hot Stuff or other cyanoacrylate. This glue is colorless and very strong, but will not bridge a gap between the two pieces to be joined—the pieces must be in contact with each other for this thin glue to work properly. With the tape in place holding the plastic to the proper shape, apply the glue on both sides of the tape strips and from the inside and outside of the canopy. When thoroughly dry, remove the tape carefully and apply more glue. *Read the*

precautions before using the glue in order to avoid injury. Allow a half-hour drying time and then final-fit the canopy to the fuselage. If the fit is good, glue the canopy to the fuselage and, when dry, add more glue all around the canopy joint with the fuselage. Cut out and attach the thick plastic bullet-proof windshield to the canopy windshield with Hot Stuff.

FINAL PAINTING consists of two or more coats of Flat Black dope that is thinned with about fifteen percent thinner. Be sure to protect the canopy with masking tape during this painting. Remove tape when dry.

MARKINGS can be added now and these are cut from solid color decal sheets such as those sold by Sig. Notice that the insignia crosses on the bottom of the wing are larger and located closer to the fuselage than those on the top of the wing. The chevron, letter "D," night-fighter insignia and swastika are made with layers of cut out decal pieces. For example: The letter "D" is made by tracing and cutting out a large white "D" and a smaller green "D" from the decal sheet. First apply the white "D" and, when dry, apply the green letter directly atop the white decal, centered carefully so the white outline thickness is constant. The chevron and swastika are prepared in the same manner, i.e., cut the white as a base and then add the smaller black image directly over the white, centering carefully.

The night-fighter insignia requires several layers of decal because of the many colors. This marking appeared on most early German night-fighters and represented a white hawk riding a red lightning streak on a black sky, striking England on a blue sea in a map of northern Europe. First trace, cut out and apply the large white shield; not just the white outline, but the entire shield. Then cut out and apply the black sky, followed by the blue sea. Don't forget to leave the white separation line between the blue and the black areas. Next is the red lightning flash and then the white hawk. When tracing the image on the decal, trace on the reverse (paper) side, in reverse image of course. Cut to shape with very sharp scissors and apply with tweezers.

The canopy frame is cut from black DJ or Sig tape and is applied now. The antenna mast is glued firmly into the hole in the canopy, painted black and then black thread is run from mast to fins with connecting lines to each side of the fuselage. Ailerons, flaps, slots and trim tabs, plus the machine gun hatch outlines, were simulated with thin white tape, 1/32" wide, on the prototype model. We used DJ Multi-stripe white plastic tape cut into 1/32" strips. The tape is well suited to our model because it can bend around curves such as around the engine nacelles and around the nose. Tape is best cut by sticking it to glass such as a window and cutting with a single-edge razor blade along a metal straightedge.

FLYING should not be attempted until the final balance is checked. All should be well if the preliminary balancing, previously described, was completed. The added weight of the sealer and paint on the rear should be offset by the spinners and propellers. Test flights should be from a paved surface using fifty-foot lines. The engines should be run and adjusted before the model is brought to the flight circle so that the needle valves are properly adjusted for reliable operation and quick starting. Never use balky engines on a multi-engine model. I start the outboard engine first and then the inboard engine so the outboard engine will stop first. If a long delay is encountered in starting the second engine, the fuel tanks should be topped off just before takeoff. Flight lines up to seventy feet can be used once you become familiar with the model. Happy flying!

Materials (wood is medium balsa unless noted otherwise):

(3) 1/4" x 3" x 36" for fuselage sides, top and bottom, spars, elevators, rudders, and nacelle sides

(2) 1/2" x 3" x 36" for wing tips, fuselage top and nose, radiators, and nacelle laminations

(8) 1/8" x 3" x 36" for fuselage bulkheads, wing and stabilizer ribs, and wing covering

(1) 1/16" x 3" x 18" for stabilizer covering, pilot seat sides, instrument panels, and pilot armor

(1) 1/2" x 3" x 18" hardwood for engine/landing gear mount

(1) 3/8" x 3" x 6" hardwood for auxiliary landing gear mount

(1) 6" x 12" x .015" clear plastic for cockpit canopy

1/8" dia. x 18" music wire for landing gear

1/8" x 6" x 18" plywood for spar joiner, nacelle bulkheads, bellcrank mount, and tailwheel strut support

(1) 1/16" dia. x 12" music wire for tailwheel strut and LG door brace

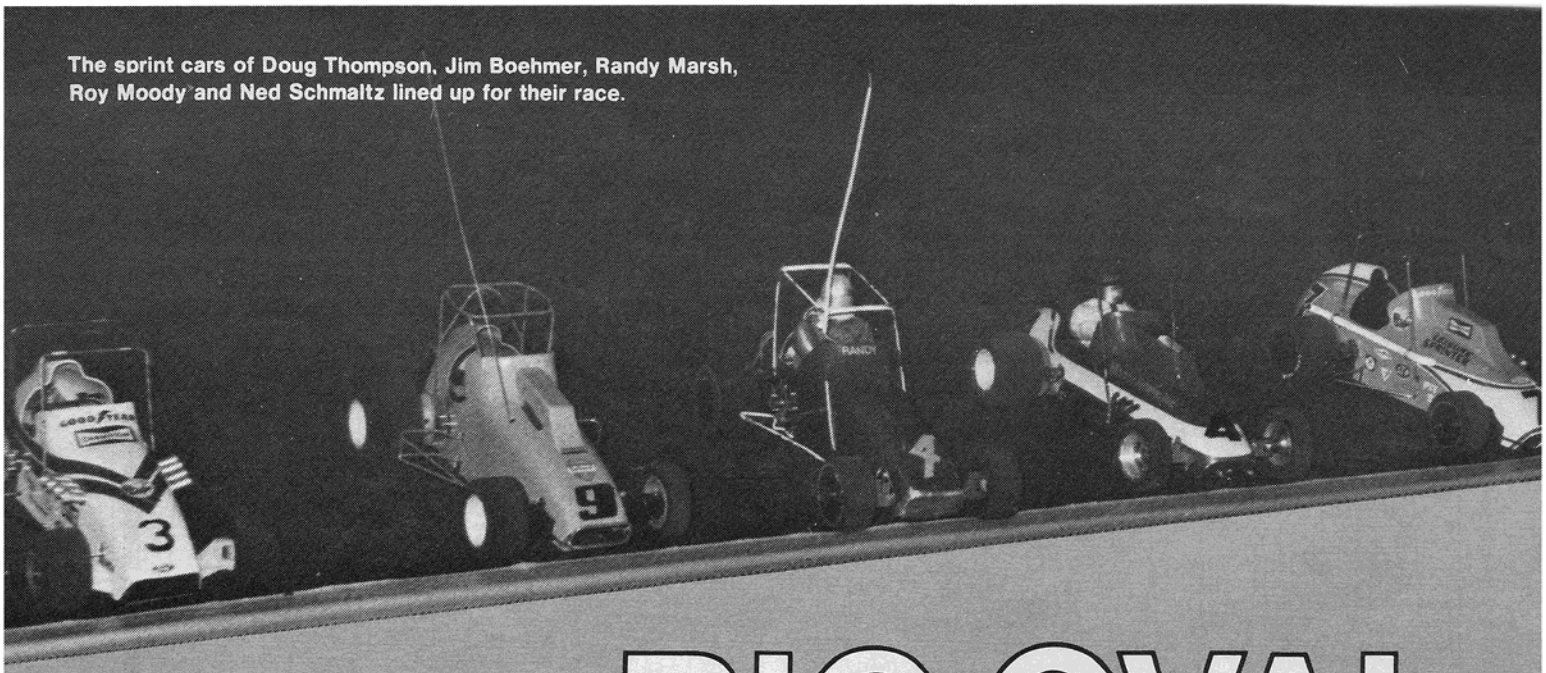
(1) .020" x 3" x 12" aluminum for landing gear doors and wing trim tabs

1/16" dia. x 6" aluminum tubing for pitot tube and trailing antenna housing

3/32" dia. x 8" aluminum tubing for machine gun barrels

(2) Sig R-C Links (or equivalent) for control rod

Miscellaneous: Large bellcrank; control horn; Williams Bros. small nylon hinges; Graupner No. 180 1 1/2" three-bladed spinners; Grish Bros. 7 x 6 three-bladed propellers; 16 ounces Aero Gloss Sanding Sealer; 10 1/2 ounces Aero Gloss Military Flat Black 30-4 Dope; 1 1/2 ounces each Aero Gloss Swift White and Stinson Green (mix to a light green for cockpit interior); 1 1/2 ounces Aero Gloss Camouflage Brown Dope; 1 1/2 ounces Aero Gloss Gray Dope; 3 1/2 ounces Aero Gloss Thinner; fine, extra fine, and No. 500 sandpaper; medium and extra large plastic fuel line for tank connections and landing gear covers; Veco T-23A (or equivalent) fuel tanks; glue of your choice; Aero Gloss Plastic Balsa; 1/16" dowel; Sig Solid Color Decal Sheets in the following colors: Red, White, Blue, Black, Green; Fox .15 Glow Plug Engines; one ounce lead weight; straight pins; .032" music wire; Hot Stuff; DJ Multi-Stripe White and Black Tape 1/16" wide; assorted nuts and bolts. ■

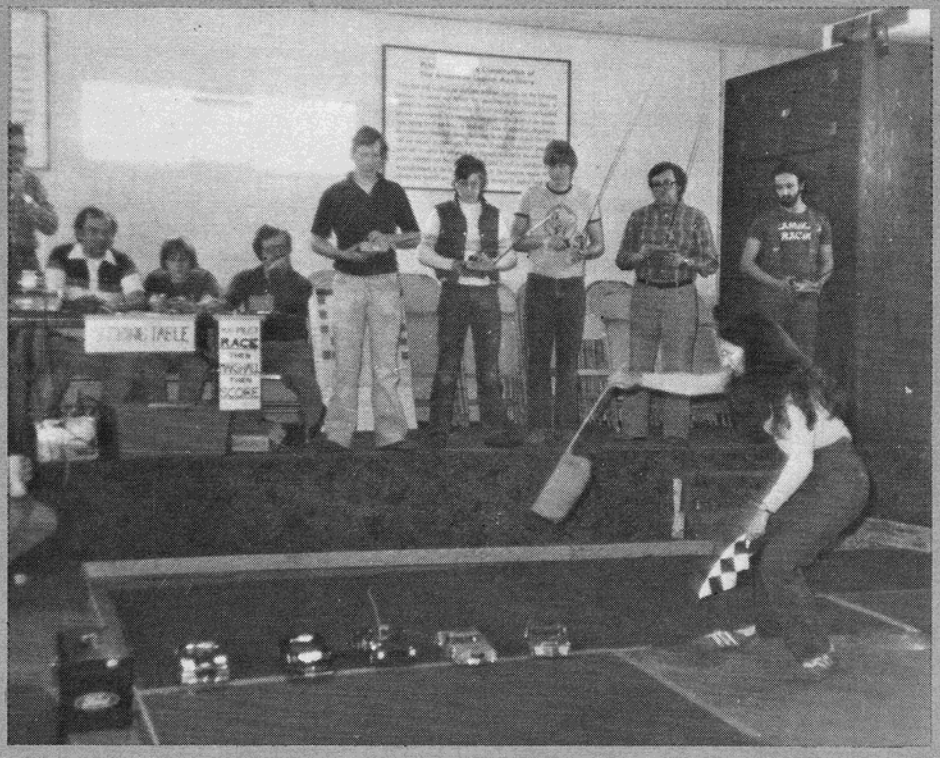


The sprint cars of Doug Thompson, Jim Boehmer, Randy Marsh, Roy Moody and Ned Schmaltz lined up for their race.

THE BIG OVAL

An example of how easy it is to organize an indoor car race.

by ROBERTA MOODY



Diane Moody starts a stock car race. Elevated stage is an ideal drivers' platform.

Bob Paradis and Steve Schubert with sprint cars. Steve built three of them.

Timing and scoring are important. See last month's issue for details of system.

• It had long been a dream of Roy Moody's to put on a race featuring the sprint car he designed. Steve Schubert, who had built a half-dozen of these sprint cars from Roy's plans, was also anxious to see several of them run a race. So Roy rented the little American Legion Hall on 171st Street (an access road running parallel to I-80 near the Halsted Street Exit on Chicago's south side) in East Hazel, Illinois, for $10 an hour, and scheduled the Big Oval Race for February 10, 1980. The hall is relatively small, but was large enough to accommodate an oval race for 1/12 scale battery-powered model cars.

It was decided to run three classes of cars: sprint, modified, and stock. The sprint cars run were built according to Roy's design that appeared in the April 1979 *M.A.N.*, and the modified Pintos followed the design featured in the April 1980 issue. The stock car class was limited to body styles used on full-scale oval tracks.

Announcements of the race were printed up and placed in area hobby shops, and the upcoming event was announced at a CRCC (Chicago Radio Car Club) meeting and in the Club newsletter. We even had two entrants, Ned Schmaltz and Doug Thompson, who drove all the way from

(Continued on page 60)

THE BIG OVAL

(Continued from page 59)

Toledo, Ohio—a distance of over 250 miles. And Greg Jones, in Chicago to attend a training school for IBM but originally from Portland, Oregon, asked MRP to send him a stock car for the race.

Two 25-foot lengths and two 17-foot lengths of indoor/outdoor carpeting were laid down in a sort of squared-off oval. When someone mentioned to Roy that the "Oval" was more of a rectangle, he had our daughter Diane make up a sign that read: "First Annual Wreck-Tangle."

A scoring table, public-address system, and frequency board were set up on a stage at one end of the room. The stage also served as a drivers' stand. Tables for pits were set up along one wall, and a few were located at the far end of the room opposite the stage. A transmitter impound table was set up just outside the kitchen.

In the Legion Hall kitchen, coffee, rolls, popcorn, and cola drinks were made available to the racers for a small donation to a tin-can "kitty." Racers who wanted more substantial fare for lunch could drive a few blocks to restaurants along Halsted Street. A 45-minute break for lunch was taken after qualifications and practices and before the races began.

Qualification laps around the sixty-foot oval were made in two-lap runs. Each driver made two qualification runs, and the best time of the two was taken to place him in the heats. An electronic stopwatch was used for timing these runs. There were two heats for stock cars, one for modified cars, and two for sprint cars. Drivers had come prepared to change frequencies, so five-car heats were easily arranged.

Though Greg Zielinski's modified Pinto run of 7.35 seconds was Top Qualifier for the day, the sprint cars were, on the whole, the fastest cars of the three classes. Randy Marsh took T.Q. honors in the sprint car class with a 7.58. There were three other qualifiers under eight seconds in sprint cars: Jim Boehmer at 7.78, Roy Moody at 7.95, and Doug Thompson at 7.98.

A two-minute trophy dash was run for each class of cars. Greg Jones won the stock car trophy dash, Greg Zielinski the modified, and Randy Marsh the sprint car. Zielinski had made thirty laps in two minutes with his modified Pinto, the same car with which he had taken T.Q. for the day.

Two heat races were run for each group of drivers. Heat races were eight minutes long, and the winner was the driver who got the most laps and sections in that time.

The usual scoring system of writing down elapsed seconds for each lap could not be used, since at four seconds or less per lap the scorers simply could not be expected to write fast enough to keep up! Instead, the laps were counted by pushing a button on each clock-counter as its car crossed the start/finish line. The number of laps made were shown on the console in front of the race announcer. After each race, the number of laps and sections was written down next to the name of each driver on the paper adding-machine tape used in the announcer's console. Since there were two heats, each driver had two scores next to his name. (See the June 1980 issue of *M.A.N.* for a description of this scoring system designed by Roy Moody.)

Several drivers made over one hundred laps in the eight minutes allowed. Making so many loops in such a short period of time is enough to make anyone a little dizzy, and a few drivers chose to sit down while driving so as not to become unsteady on their feet.

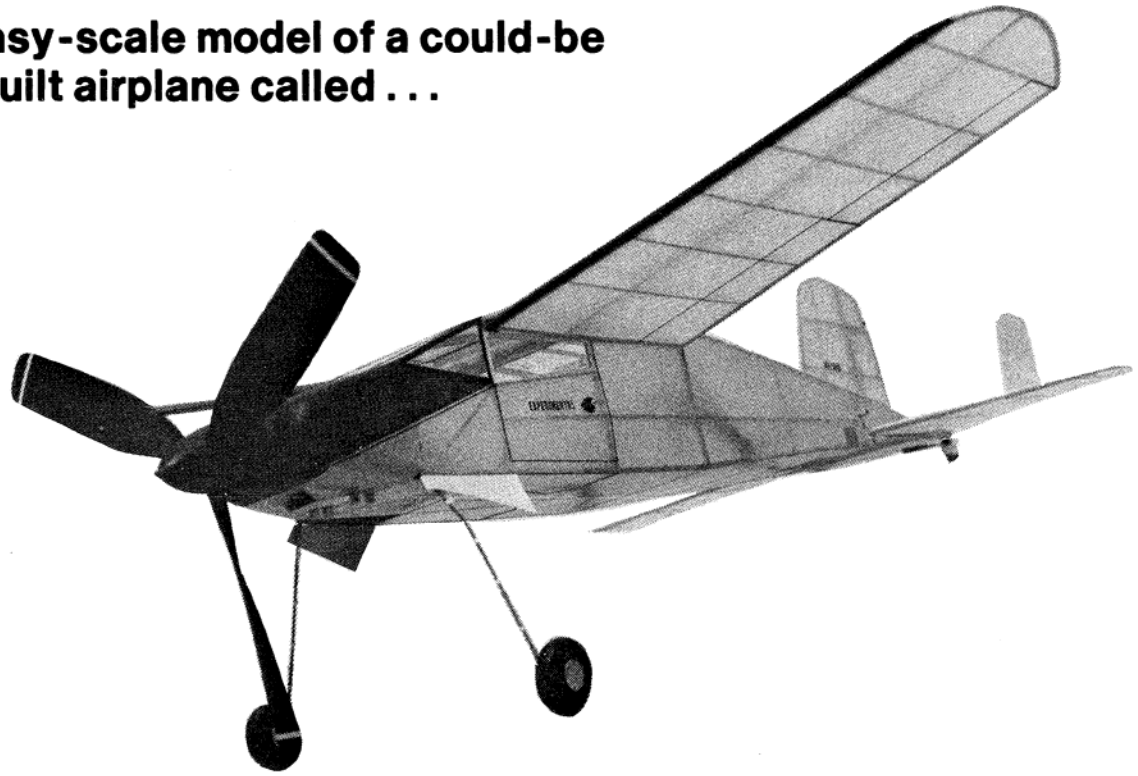
The first-place finisher in each class was awarded a key chain with a pewter fob representing the type of car he or she had raced. Greg Jones took first place among the stock cars with his blue MRP car, Greg Zielinski topped the sprint car class with his roadster sprint car, and Diane Moody was first in the modified class with her dad's red modified Pinto. Ribbons were also awarded for first through fifth place in each class.

Total expenses for the Big Oval Race were $98; $80 for the hall, $15 for the key-ring trophies, and $3 for ribbons through fifth place in each class. Twenty-four racers paid $3 each to race, plus some loose change for food. (If the entry fee had been $4, then all the expenses could have been met by 25 entrants. If you think about it, a $4 entry fee is hardly more than the price of a movie, and a day of racing can be a lot more fun, too.)

Most of these racers knew each other and had raced against one another before. Some have become very good friends—namely, those who have raced at the "Buffalo Speedway" in Steve Schubert's basement, which will accommodate about twelve racers at a time. This event, then, was more like a party among friends, and there was the fun of competition but none of the rivalry seen at bigger race events. Most of the participants were heard to say, "We've got to do this again!" Ned Schmaltz said that he would even be willing to make the long drive from Toledo to join another such Oval Race.

So, if your group can rent a small hall or empty store space, provide a few ribbons and small trophies, and chip in a few dollars apiece, you can spend an enjoyable evening or Sunday afternoon having fun with fellow radio-control model car enthusiasts. ■

A fantasy-scale model of a could-be homebuilt airplane called . . .

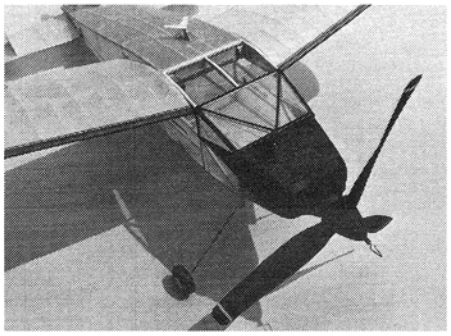


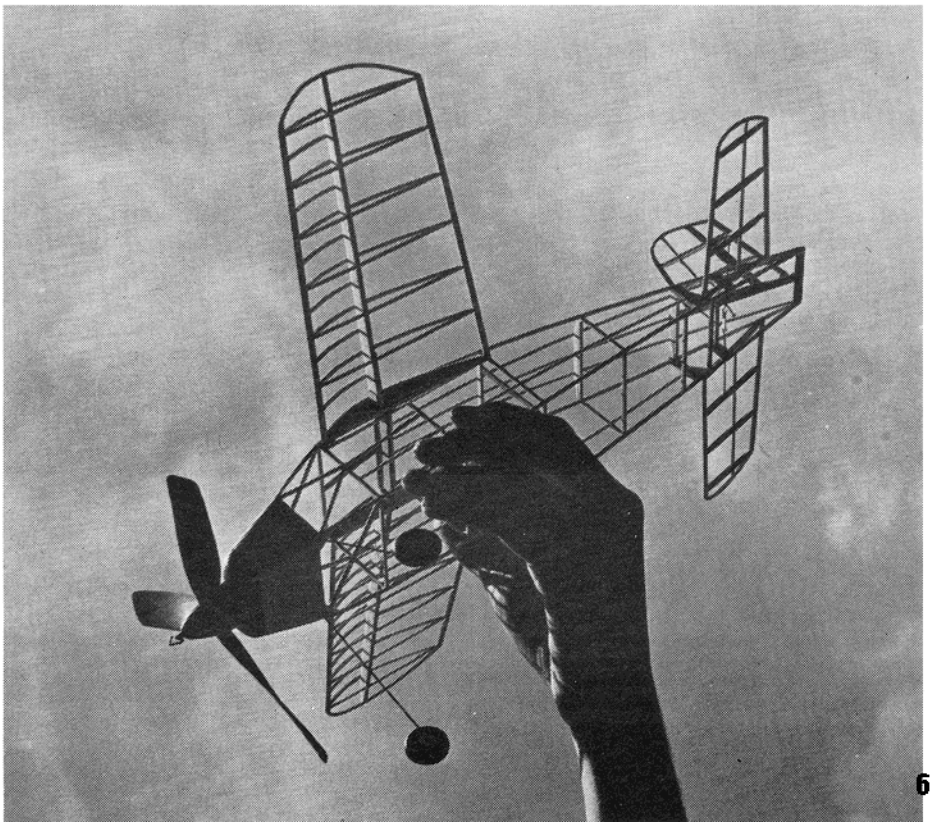
HYPERWIND

by Nick DeCarlis

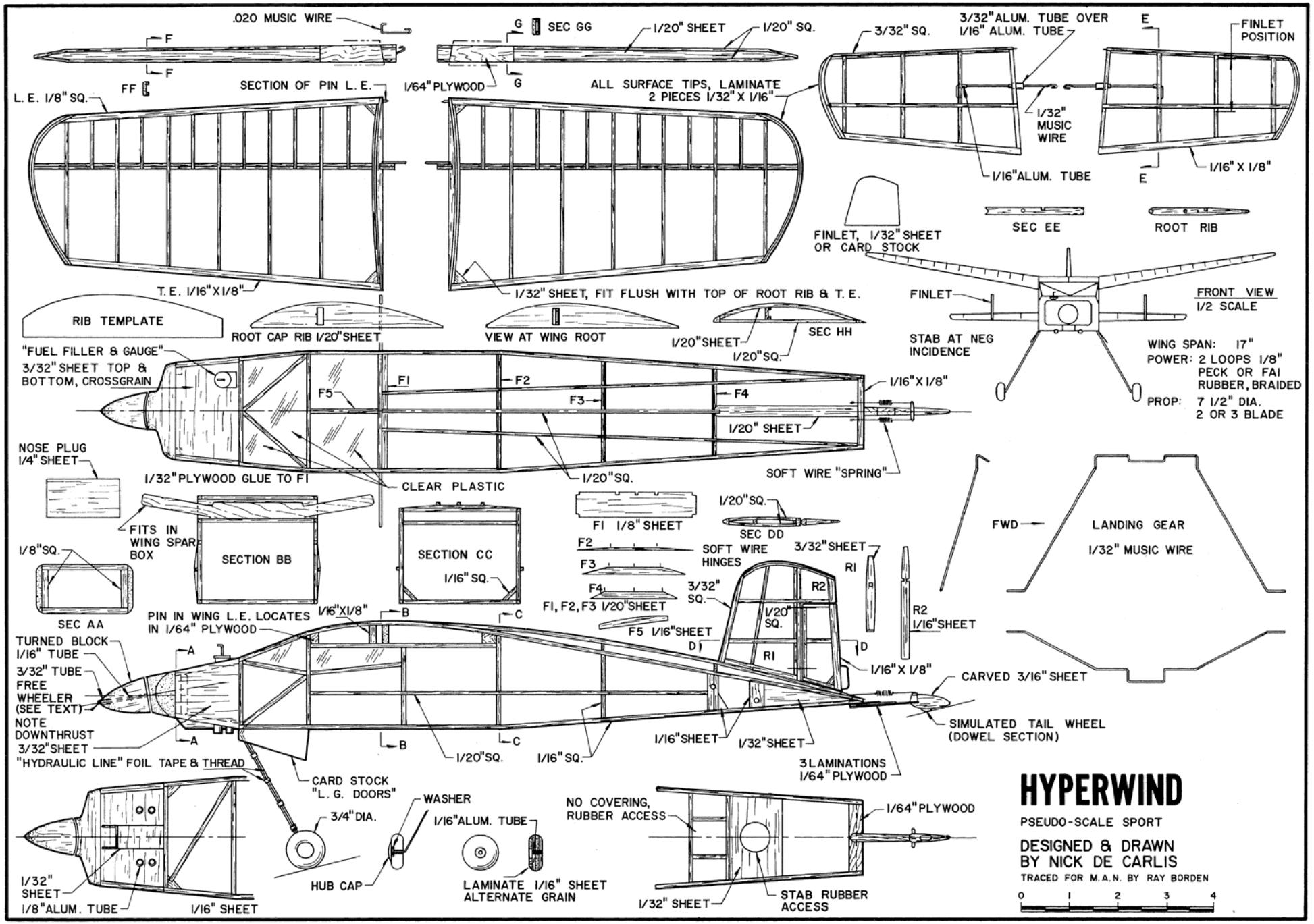
HYPERWIND
TYPE: Free Flight "Fantasy Scale"
WINGSPAN: 17 inches
WING AREA: 48 square inches
LENGTH: 17 3/4 inches
WEIGHT: As light as possible
ENGINE: Rubber

• The Hyperwind is a high-performance homebuilt capable of speeds in excess of 200 miles per hour—that is, it *would* be, I am confident, if one were to be constructed! The model presented here is *not* scale. It is, rather, a *pseudo*-scale model designed mainly to appease a fantasy for a homebuilt design. The fantasy involves an "aerial contraction" of the Sorrell Hiperbipe, and the Wittman Tailwind. I liked the novel aspect of a wide lifting fuselage on the Hiperbipe, but biplanes never did much for me. Enter the Tailwind, with its single wing. For even better aesthetics, let's taper the panels and make them cantilevered, thus eliminating the struts. We'll stick with the basic Tailwind rudder, but have a new all-moving "stabilator." Finally, Hyperwind will receive a retractable landing gear, not unlike the type installed on several Tailwinds. Of course, the gear won't retract on our model, but the mere simulation of such leads many





Windows and windshield framing do a lot to enhance the scale-like qualities of this exceptional model. Huge three-blade prop is distinctive, easy to build. Framework (right) is delicate but strong.



FULL-SIZE PLANS AVAILABLE . . . PAGE 130

HYPERWIND

onlookers to believe that the model *is* scale!

The model shown in the photographs is the second prototype. The first was an all-yellow bird that met an early demise with a tree that I'm certain was a relative of Charlie Brown's kite-eating friend. When I finally retrieved the model, only the prop, cowl, landing gear, and wing panels were salvageable. Flight testing had not progressed far enough to show the model's capabilities, so a second Hyperwind was constructed. The new model wouldn't outfly an AMA Cub until I tried installing finlets; it would then average 45-50 seconds in dead evening air. A shortage of large fields locally prevented me from testing its thermal-riding abilities until I traveled to Jacksonville, Florida, for the annual Rebel Rally. After a few test hops, I managed two flights in the two minute vicinity. Pleased for the moment, I decided to rest the model for a while, and went to fly my peanut scale models.

Around this time the thermals really started to move across the runway, and I put up three out-of-sight flights (3½, 5, and 5½ minutes) with peanuts! Needless to say, I didn't dare take the Hyperwind out of the car. I didn't relish the thought of losing it, as I had yet to take photographs of it, and the model was not equipped with a dethermalizer. After all, it wasn't really intended to fly very long, even with a thermal.

I still have the second Hyperwind, and it continues to be one of my favorite models, especially for early-evening flying. The air is still and Hyperwind spirals straight up—literally clawing for altitude—and then slowly spirals down, the prop freewheeling, ready for another flight. If this all sounds interesting to you, read on. Many of the construction details refer to non-functioning details, which may be included or omitted as desired.

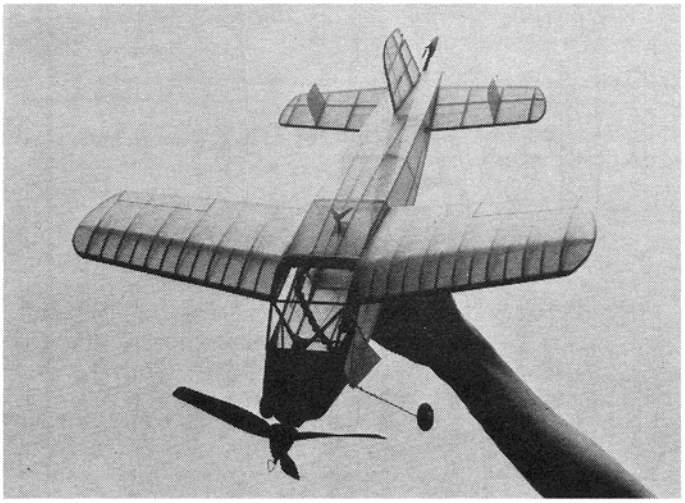
CONSTRUCTION. Start with the fuselage. Two basic sides are constructed in the conventional manner, one over the other to insure their being identical. Since the fuselage is fairly large for 1/16" square stock, be sure to use firm strips. Add all the sheet reinforcements indicated on the plans. These parts are important, so do not omit any or reduce the size of balsa from which they are cut. When the sides are dry, add all the crosspieces by your favorite method to end up with a basic box. I prefer to cut all the crosspieces in the cabin area first, which are of equal length, and glue them all to one side. When nearly dry, I add the second side, and make sure everything is square and aligned. Once dry, the front and tail crosspieces may be added, followed by those in between. Note the additional crosspiece shown in section C-C.

Several small gussets from 1/16" square strips may be added into the corners as also shown in section C-C. They seem to strengthen a lot, with almost no penalty in time or weight.

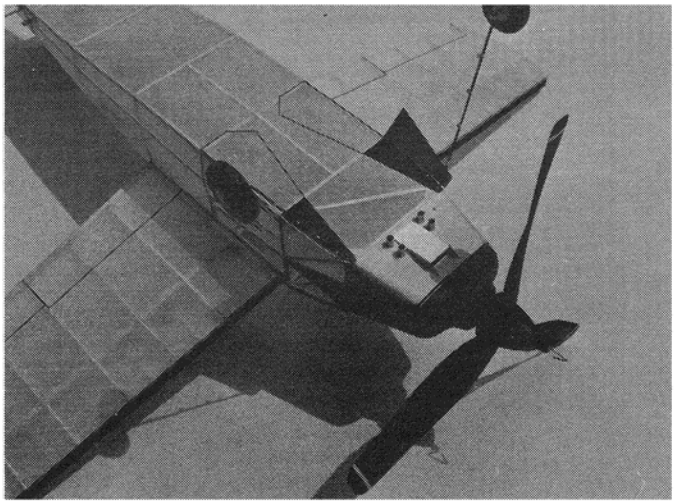
The landing gear is bent from 1/32" diameter music wire as shown on the plans. Glue it in place as the cowling is installed, which is from 3/32" sheet. Note that on the top and bottom pieces the grain runs sideways. Add the 1/8" square reinforcement to the inside edges of the cowl sides, referring to section A-A. Also add the 1/16" sheet gussets on the fuselage bottom where the landing gear struts exit. Refer to the bottom view of the cowl area. While working at the front of the fuselage, add the 1/16" square pieces that make the "V" on the windshield. Cut F5 from 1/16" sheet and install as indicated between the two crosspieces over the cockpit.

Make the wing stub spar at this time. It may be of 1/32" ply, although mine was laminated from two thicknesses of 1/64" ply joined with cyanoacrylate (such as Hot

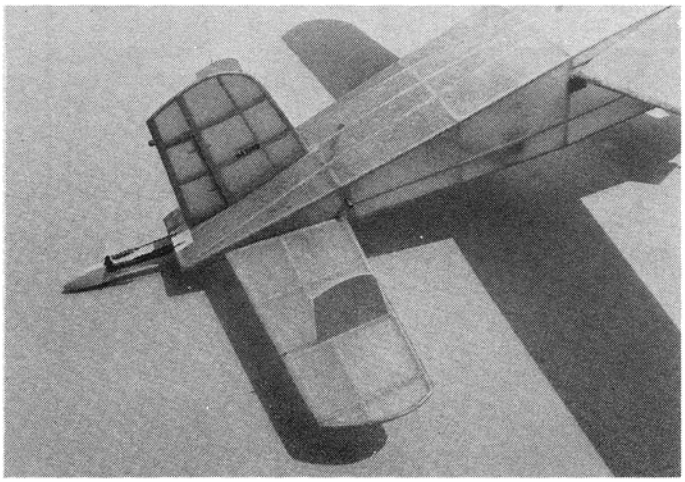
(Continued on page **64***)*



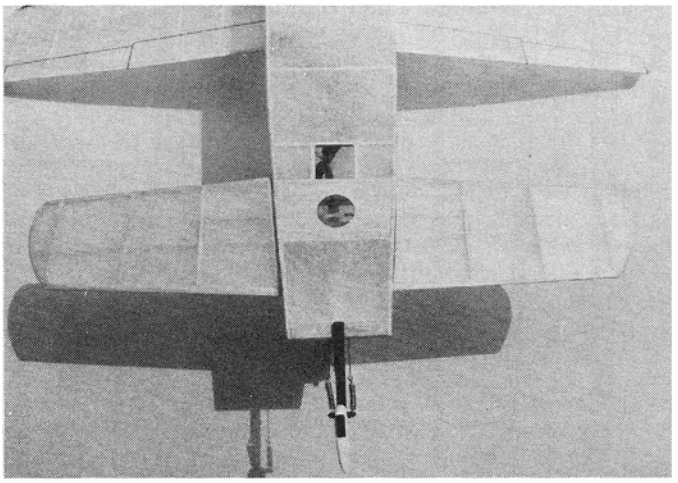
The blend of Hiperbipe and Tailwind is evident in this photo.



Carb air scoop, exhaust pipes, "retract" gear details shown here.



Vertical finlets on stabilizer were necessary additions. See text.



Access to plug-in stabilizer mounting is through hole in fuselage.

HYPERWIND

(Continued from page 63)

Stuff). Note that just ahead of section B-B (on the fuselage) there is a small 1/16" x 1/8" piece in the wing mount area. Fit the stub spar just aft of these small uprights, but don't glue anything. Next cut out F1, and glue in place as shown. The stub spar will be glued to F1 later on.

Direct your attention to the bottom-aft area of the fuselage. Note that there is an additional crosspiece under the motor peg to allow access. This open area is further reduced by the addition of two small 1/16" square pieces, running fore and aft between the two crosspieces. This is to keep airflow disruption to a minimum. Aft of that is light 1/32" sheet fill with a 5/8" diameter hole cut in it to allow access to the rubber band that will hold the stab sections to each other as well as to the fuselage.

A small rectangular piece of 1/64" ply is glued under the tail crosspiece to serve as a mount for the simulated leaf-spring tail gear. If you don't intend to install that detail, the mount may then be dispensed with.

Next cut out formers F2, 3, and 4, and glue in their respective locations on the fuselage spine. Then add the 1/20" square stringers. Note that the center stringer ends over F4 (the 1/20" sheet rudder platform completes the transition to the tail crosspiece), and that the forward ends of the stringers set in notches along the top of F1. The 1/20" square side stringers may also be added at this time, keeping in mind that they fit flush with the uprights at their beginnings and ends.

Add the 1/64" ply pieces around the wing mount area if you have not done so already. Do not drill the small hole in the forward piece yet, as the plan shows only an approximate location. If the 1/64" ply presents a problem, use 1/32" material. The forward piece will serve as a locator for a pin in the wing's leading edge that will determine incidence. The aft piece will prevent the rear-inboard corner of the wing panel from puncturing the fuselage tissue on hard landings.

The nose block is from soft balsa block glued to the 1/4" sheet nose plug. The fit to the front of the fuselage should be snug. To shape the nose, first cut the nose block to the shape shown in the side view. Then draw a 3/4" diameter circle on the front. Fit the nose block to the fuselage, and trace the outline of the cowl on the backside. Remove, and begin rough shaping. If one attempts rough shaping with the nose block mounted on the fuselage, damage to the fuselage is likely. Refer to the plans for the proper contours. When the shape is nearly correct, fit to the fuselage and complete final shaping and sanding. Drill a 1/16" diameter hole in the nose block, beginning through the center of the circle that was drawn on the front. Note the downthrust. Then glue in a section of 1/16" diameter aluminum or brass tubing with cyanoacrylate to serve as a bearing. An alternate Bill Henn style bearing may be made as follows: Drill a hole through the nose block as directed above, only make it 1/4" in diameter. Cut a 3/4" length of 1/4" *inside* diameter aluminum tubing, round off one end slightly with sandpaper, and force the tubing into the nose block. Now take two of Peck Polymers' large nylon bearings, and press one into each end of the tubing.

Now for the tedium of the wings. If it sounds like I don't like to build them, it's because I don't! But at least these split-rib structures make it a little more interesting, and are not nearly as hard to make as you might think. If you've tried the technique before, I think you'll know what I mean. The first step for the wings (as well as the other flying surfaces, discussed later) is to laminate the tips from a 1/32" x 1/16" strip of basswood (on the inside of the curve) and a similarly-sized strip of balsa (outside). To do this, soak the two over-length strips in hot water. While waiting for them to become pliable, lay some plastic wrap (*never* use waxed paper) over the plans, and push pins through the plan along the inside edge of each tip at 1/8" intervals. Take the strips and blot off the excess moisture. Spread a small amount of white glue evenly along one strip, join the other to it, and form against the pins. Use additional pins against the strips to hold them in place, and allow to dry very thoroughly before attempting to remove.

While the tips are drying, cut a rib template from some cardboard, aluminum, or plywood. Cut a piece of 1/20" sheet the length of the template (grain running lengthwise), and place the template near the top with the edges even. Make one or two gentle cuts along the template with your brand new No. 11 blade, move the template down 1/16" or so, and make another cut. You should now have one sliced rib before you. Make 14 in all, plus a few spares. Then cut 12 false ribs from a piece of 1/20" sheet 1 3/8" wide using the forward portion of the template.

By now the tips should be dry. If so, remove them and the pins from the plans. Pin the leading and trailing edges down in the proper locations. All the rib bottoms are from 1/20" square strips cut to fit snugly between the leading and trailing edges. Cut and glue these in at this time.

The basic wing spar is cut from 1/20" sheet, with 1/20" square strips glued over the edges. Look at section F-F to see how the strips are placed. Then cut the 1/64" ply parts that are glued over the strips in the root section to form a shallow box when viewed from the end. It is into this box that the stub spar will fit to mount the wing panels to the fuselage. Glue the spars to the rib bottoms, and add the laminated tips, noting that they are raised slightly to contact the tips of the spars.

Now the sliced ribs can be added. Each will have to be individually trimmed to fit. As the chord decreases towards the tips, so shall the sliced ribs decrease in length. Always trim from the trailing end of the ribs. Once these are in, the false ribs may be added. Simply glue them in place, allow to dry, and trim the trailing ends flush with the rear edge of the wing spars. Be sure that the root ribs are angled towards the tips to account for dihedral. The root gussets are cut from scrap 1/32" sheet, and glued so they are flush with the upper surface of the wing. Their main purpose is to prevent wrinkles in the corners when covering.

Bend two small hooks from .020" music wire, except for the hook portion, and fit these into and through the small holes in the root cap ribs, which are cut from 1/20" sheet. Complete the hook bend, and glue the root cap ribs in place. Using cyanoacrylate, fasten the hook against the root cap rib, as well as against the forward side of the wing spar that projects through the root cap rib. Finally, carve and sand the leading and trailing edges to the proper cross-section.

Now you will see why we waited to glue the stub spar. Fit each wing panel to the fuselage by inserting the protruding sections of the stub spar into the box portion of the wing spar. Note that the part of the wing panel spar that extends past the root cap rib fits into the fuselage side. The stub spar should be able to contact F1. If not, shim it with card stock, thin balsa or ply. With the panels still in place, trace around the stub spar against F1 to mark its location. Remove the panels, and glue the stub spar (and whatever shims found to be necessary) to F1 using cyanoacrylate.

By now you should be curious as to how the wing incidence is set. First drill a .020" diameter hole in the leading edge of each wing panel from the root towards the tips to a depth of 1/4" or so. Sink a section of a straight pin (with the head cut off) into the hole so that the point projects 3/32". Glue in place with cyanoacrylate. If you now fit the panels back on the stub spar, you will note that the pin will contact the small 1/64" ply plate installed earlier. Position each panel for a slight amount of positive incidence, perhaps two degrees, and mark where the pin hits the ply panel. Remember, the plans show only an approximate location. Remove the wings and drill a 1/32" diameter hole in the marked location. When the wings are refitted, the pins will fit into the holes to set the incidence. The wings are held to the fuselage by stretching a small rubber band between the hooks glued to the spars. A piece of 1/32" music wire with a small hook bent on one end is useful for coaxing the rubber band from one panel, through the fuselage and to the other panel, which is then fitted against the fuselage. For rubber bands, I prefer the small type used by orthodontists because they stretch well, yet will not collapse your structure with undue tension. Three of them hooked together will suffice for mounting the wings.

The rudder shown on the plans is a rather extravagant structure designed to resemble actual aircraft construction methods. The first prototype, however,

utilized a simple flat structure of 1/16" square strips, which you may choose to duplicate instead. If so, skip this paragraph. If you choose to be daring (and maybe time-consuming), here is how to construct the second prototype's rudder. It is assembled, for the most part, "in the air," and care must be taken so as not to build a twisted structure. Laminate the curved tip in the same manner as the wing tips. While it is drying, add the 1/16" x 1/8" trailing edge to it over the plans. Make the trailing edge in one piece, from top to bottom, separating the movable portion later. Cut out R2, and glue a 1/20" strip to its front. Glue R2 to R1, holding them over the plan so that the proper angle between them is achieved. Add the 1/20" square strip spar that fits into the square hole in R1. When the tip/trailing-edge assembly is dry, glue it to the R2-R1 assembly. Add the 1/16" x 1/8" piece that forms the bottom of the movable rudder, only tack-gluing it to the base of R2. Now add the 3/32" square leading edge. Cut the 1/20" square ribs to the proper length, then gently roll an X-acto knife handle over the inboard side to give them a slightly curved contour before gluing them in place. Finally add the additional 1/16" x 1/8" pieces that complete the formation of the movable rudder. When all is dry, the leading and trailing edges may be sanded to shape. Then the movable rudder may be cut away, and its leading edge rounded. After covering, the two parts are rejoined with two small lengths of soft wire.

The stabilator halves are a little more conventional in construction, yet unorthodox in attachment. You will note that the ribs are from 1/16" x 1/8" strip stock. Cut the pieces to the proper length, then cut a notch in the front where the leading edge will fit. Note that the root rib and the one adjacent to it have holes to be drilled; complete this before assembly. Laminate the tips, then set them aside. When pinning down the 1/16" x 1/8" trailing edges, block them up with scraps of 1/32" sheet. Glue the ribs against the trailing edge, add the spar, and finally the leading edge. When they are dry, the ribs can be sanded down to the trailing edge as shown in section E-E.

Bend the stab attachment hooks from 1/32" diameter music wire, noting that the hook itself must be capable of passing through a 3/32" diameter hole without damaging the hole. The purpose of having small lengths of aluminum tubing over the wire is to increase the gluing area of the wire, and at the root to provide a locating bearing. Be sure to slip the needed pieces of tubing onto the wire before completing the bends. Note that at the root rib the 3/32" diameter tubing fits over a 1/16" diameter piece. Slip the wire/tubing assembly into the stab half from between the second and third ribs towards the root. When the wire and tubing parts are in their proper positions, glue everything in place with cyanoacrylate. To mount the halves to the fuselage, the hook on each stab half is fitted into the opening aft of the rubber peg. The two hooks will be visible through the access hole in the bottom of the fuselage. An orthodontic rubber band is then stretched between the hooks with the aid of a pin or a small piece of wire. As on the wings, a pin sunk into the leading edge is used to determine the incidence of the stab halves. On the fuselage, the pin should contact the triangular gusset that fits against the back of the rubber peg reinforcement. Once the optimum setting is found (through test flying), a 1/8" square of card stock with a pinhole in the center is glued in place over the correct hole in the gusset; in this way, the hole will not become enlarged.

With all the basic framework out of the way, we can now direct our attention to some of the other components that will complete the model. While the wheels may be of the ready-made plastic variety, homemade balsa wheels weigh considerably less, and often look better since they can be internally retained. To make them, start by cutting eight discs from 1/16" sheet slightly larger than 3/4" in diameter. They needn't be perfect. Drill a 1/16" diameter hole in the center of each, and then glue four discs together to make a basic wheel. Rotate the grain of each disc 45 degrees when laminating so that the wheel will be strongest with the grain evenly dispersed around the circle. Now mount the wheel in a Dremel Moto-Tool mandrel of the type used to hold cutting discs. Put a washer on each side of the wheel to prevent the mandrel from crushing it. Now mount the mandrel in the Moto-Tool, and turn the wheel to final shape by using 320 wet-or-dry sandpaper. You will be surprised how fast it will shape the balsa.

Remove the wheel, and using an X-acto knife, carefully cut out the recessed portion on one side of each wheel. This recess will allow the retainer to be concealed by hubcaps. Glue a short length of 1/16" diameter aluminum tubing into the wheel for a bearing. Now is the best time to paint the wheels. I usually brush on two coats of flat black enamel (to fill the grain), sand lightly, then spray with flat black enamel from a spray can, such as Testor's. The hubcaps are four discs cut from thin aluminum, such as an offset printer's plate. Drill 1/32" diameter holes in the centers of two of them. Lay the discs on a piece of cardboard, such as from the back of a pad. Then roll a marble over each one, while at the same time pressing down. The result is that the hubcaps will take on a convex section. The inboard hubcaps (with the holes drilled in them) may be glued to the side opposite the recess. Fit the wheels on the landing gear, and solder a small brass washer onto the wire, making sure the washer fits easily in the recess. Trim the excess wire flush with the washer, and glue the remaining hubcap over the recess, being careful not to get any glue on the washer or bearing.

The model will fly on a variety of propellers. Probably the best bet from an endurance standpoint is a prop based on a design from a recent article by Bill Henn. The hub is from aluminum tubing, with blades of formed 1/64" ply. These are attached to small sections of dowels, which fit into the aluminum tube hub. I later returned to the prop I had started with, however: a 7 1/2" diameter three-bladed affair made from two 7 1/2" North Pacific plastic props. While the three-blader produces more drag during the glide (even though it freewheels), it produces a dramatic climb, and simply looks neat on the front of the Hyperwind. The two 2-minute flights mentioned earlier were with the three-bladed prop, so it's not exactly a detriment to the Hyperwind's flying ability.

To make the three-blader, start by cutting two 7 1/2" props in half. Take three of the blades and trim the cut faces of the hub to 120°. Take a 1" thick block of wood large enough so that a 7 1/2" diameter circle can be drawn on it and drill a 1/32" diameter hole in the center of the circle as straight as possible. Draw three lines on the block out from the hole, spaced at 120°. Push a piece of 1/32" diameter wire into the hole so that an inch or so projects from the block. Using regular plastic model cement from a tube, glue the three blades together around the wire, while lining up the blades over the three lines. Use a pin against each tip to hold the blades in place against the wire while they dry. Leave it overnight, then spread a fillet of Sig Epoxolite around the hub. This will make a really strong unit. Epoxy may be substituted, but will not work as well. As a final touch, the blades should be sanded with 320 wet-or-dry, and the prop should be balanced.

The spinner will probably end up as more work than the prop. Start with an appropriate stack of 3/4" diameter discs, laminating them over the same wire used to form the prop. Be sure to keep rotating the grain of the discs. When dry, a thin woodscrew (with the head removed) is twisted into the base of the spinner to allow it to be chucked in the Moto-Tool. Turn the spinner to its final shape in the same manner as the wheels. Then the base is hollowed and notched to accept the prop. Now glue the prop in place, being liberal with glue. A 3/4" diameter 1/64" ply disc may be cemented on the back of the spinner to complete the unit. Don't forget to drill a hole in the disc first so it can be aligned with the prop center. Now successive layers of glue can be used to fill any of the gaps present between the edges of the notches and the blades. When all is smooth, brush a few coats of flat enamel on the spinner and the root portions of the blades, and sand smooth. A final sprayed coat of flat black, as on the wheels, will finish everything off nicely. The lines on the blade tips are from 1/16" wide white graphics tape.

(Continued on page 70)

free flight NEWS

by DAVE "VTO" LINSTRUM

• PROPS: 2 E-Z BLADES. This month, our "Beginner Briefing" deals with the subject of formed rubber model propellers. The great popularity of the San Diego Orbiteers' P-30 event shows how much FFers hate prop carving (the event requires use of a plastic prop of 9½" diameter) for rubber models. Hacking a helical pitch prop from a solid blank of balsa is truly a challenge—but there is another way. George Perryman, consummate rubber model maestro, simply warps wet sheet blades over the stove. However, sheet blades for the rest of us are best warped over a form. Next month, Jim Jones will explain how to make an exact pitch form in his article "What's Up Front." Meanwhile, we suggest you try cylindrical forms such as a dryer duct, gallon paint can, or cider jug. Blades can be made for either outdoor props (with freewheeler or folder hub) or indoor, with thinner blades (and rigid hubs, possibly adjustable for pitch during trimming) usually of light wood. For outdoor, laminated blades of 1/32" or 1/16" sheet are desirable—gluing the lams helps hold the pitch.

We suggest you consult the plans for the

Your choice of P/D will determine which TABLE to use. The (r/R) Ratio will determine the size of the can or cylinder you can use. You can eliminate all stubby cans whose diameters are ¾ or greater than their heights. A 3" dia. x 4¼" can just makes the min. (r/R) Ratio of 3.0.

A study of the (r/R) Ratios will show that the prop diameter will determine the min. and max. diameter of cylinder you can use. A 16" dia. prop can be made on cylinders having diameters ranging from 3¼" to 5½", and still be within the 3.0 and 5.0 (r/R) Ratios.

Example: 8" Dia. and 8" Pitch. Check for (r/R) in TABLE P/D = 1. You have choice of five radius values with r = 4". (1.3", 1.15", 1", .9" and .8") Assuming that you have a 2" dia. can or cylinder (1"=r), this places your prop in the 4.0 (r/R) row, in which you find Θ angle to be 19.5°, and ∝ angle of 76.3°. You can draw these angles on paper and transfer them to the can. Note that the helical path should be "r" or 4" long between the vertical lines. Use this helical path on which to lay your prop blank.

P/D 1.0

r/R	Θ deg.	∝ deg.
3.0	28.5	82.2
3.5	22.4	76.3
4.0	19.5	76.3
4.5	16.8	74.5
5.0	15.0	74.4

P/D 1.25

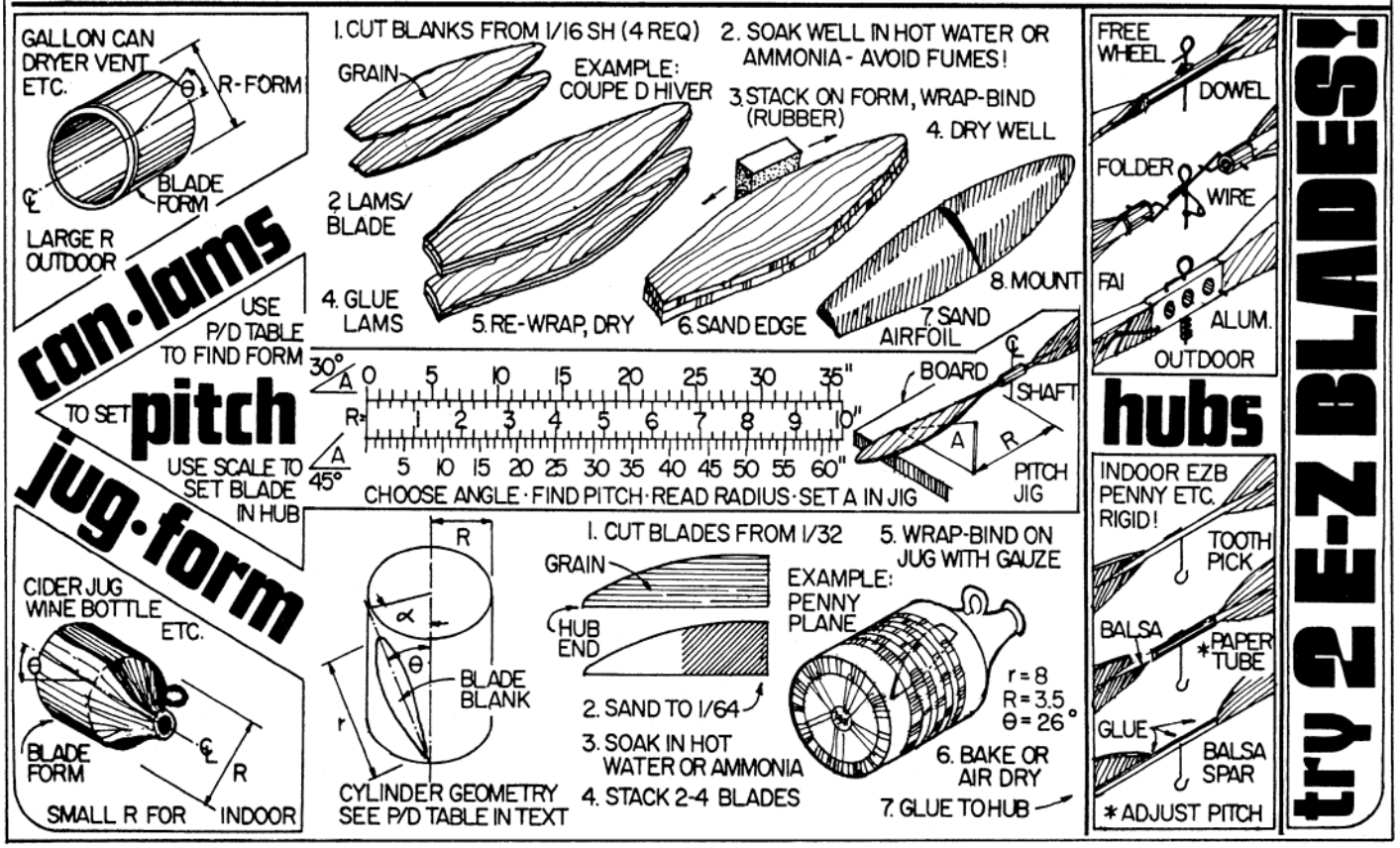
r/R	Θ deg.	∝ deg.
3.0	26.5	76.6
3.5	21.7	74.0
4.0	18.2	71.6
4.5	16.0	71.0
5.0	14.3	70.8

P/D 1.5

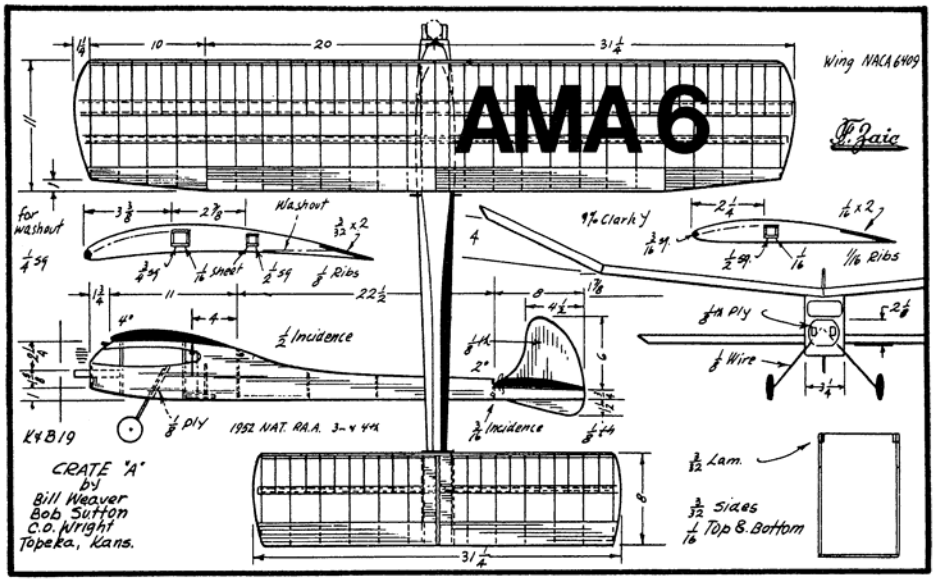
r/R	Θ deg.	∝ deg.
2.5	32.3	76.5
3.0	24.5	71.2
3.5	20.2	69.1
4.0	17.1	67.5
4.5	15.0	66.7
5.0	13.4	66.3

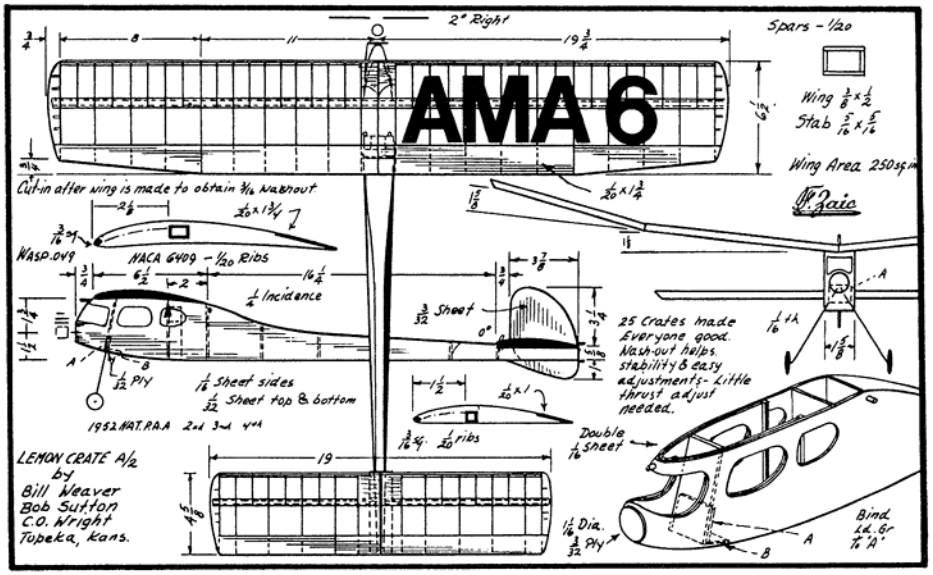
P/D 2.0

r/R	Θ deg.	∝ deg.
2.5	26.8	64.6
3.0	21.2	62.2
3.5	17.5	60.2
4.0	15.1	59.7
4.5	13.3	59.4
5.0	12.0	59.4



The late Charles O. Wright, "AMA 6," was one of the free flight greats. Shown below, in drawings from Frank Zaic's Yearbooks, are two of C.O.'s designs. See text for more.





model you are building to find out what diameter and pitch prop to use. Often a blade shape will be shown on the plans for a carved prop. You can use this to cut sheet blanks. Try to use the same hub as shown on the plans. For outdoor, a freewheeler needs a small ratchet at the shaft and a folder needs hinges, possibly alum tubes on wire hub or wires on an FAI Supply metal hub. For indoor, the shaft is securely glued in the hub, which may be a balsa stick, or tissue tube, or a round toothpick. Dowels can be used for scale models where prop drag in glide is no problem.

There are four basic steps to forming sheet props. First, select the form using the table shown with the drawing. The paint can works well for Coupe d'Hiver, the cider jug for Pennyplane. Dryer duct or a wine bottle may suit EZB props. Next, cut blade blanks and soak them in ammonia or hot water. Wipe off excess and strap to the form with gauze or rubber strip at angle found in table. Let dry overnight or bake at 150°F for one hour. If laminated, glue lams with Titebond and rewrap on form (no heat). Finally, attach to hub, setting angle as shown on pitch "scale" in drawing. Support blades on 30° or 45° triangles at radius from shaft that matches "P."

ADIOS, AMA SIX. We don't normally do obituaries in this column, but we will make an exception here to note the passing of a hero. There don't seem to be many heroes anymore, but in our youth we very much admired and emulated a free flighter with the AMA number "6" on his models. This distinguished gentleman got that low number by virtue of having been the sixth President of the Academy of Model Aeronautics, the national aeroclub that sanctions competition model aviation in this country, hosting the Nats and World Champs. AMA numbers are a status symbol of sorts, with low numbers going to officials and leader members. To have the number "6" is to be recognized as unique; it is a symbol of service to aeromodeling.

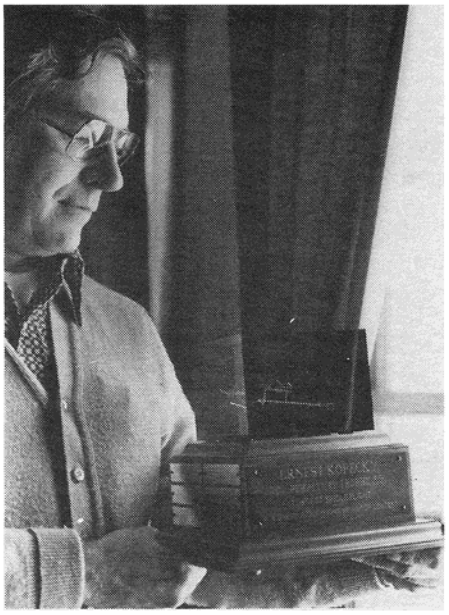
FFers active at Midwest contests or the Nats during the Forties and Fifties will all recognize the name "C.O." Wright as one of the greats of that era of contest flying. He was a friend to all of FF, contributing to AMA organization, model design development, and the spirit of the sport. He was a dear friend to such greats as Sal Taibi and Carl Goldberg, and a hero to those youngsters whom he took under his wing, to educate and stimulate with the lore of flying free. "C.O." was always up there in the Nats results lists; he was a determined competitor as well as teacher. He had a house full of trophies collected on the contest circuit, and a basement full of models, ready to go into the station wagon for another FF meet somewhere. A veritable fleet of models sported AMA "6" on the wing.

We recall with nostalgia our first visit to that house at 111 Greenwood in Topeka,

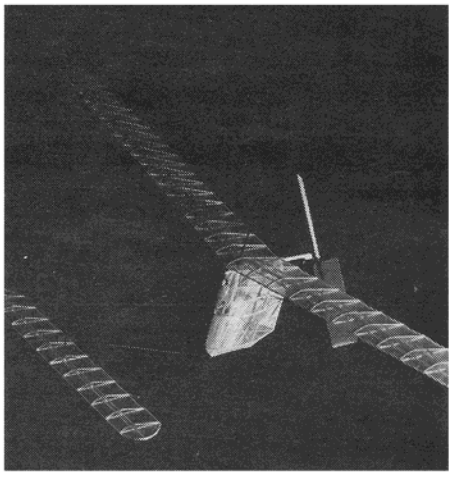
with the big porch welcoming you under great shade trees. This was the home of the hero—the guy we had seen win so many meets with his beautiful flying machines. Now we inspected them up close, and saw the clever use of sheet trailing edges cut at the tips for wash-out, and the amazingly strong sheet box spars that kept wings warp-free. We studied stabs strapped to balsa boards (rejects from the Goldberg balsa mill) and wrapped with corrugated cardboard—again to stay warp-free. We saw hot Wasps and Holland Hornets, souped up "greenhead" K&B .19 and

(Continued on page **69***)*

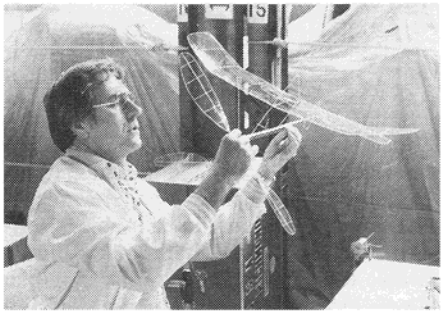
Jim Richmond, reigning Indoor World Champ, with Rushbrooke Trophy.



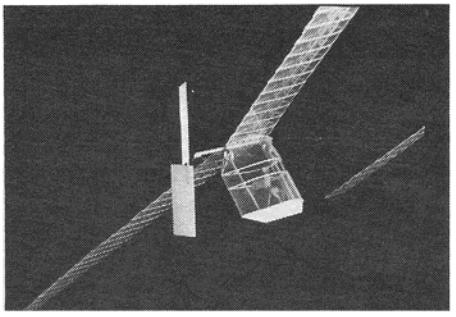
Here's Jim with the Kopecky Trophy for longest single flight at World Champs.



...Albatross man-powered English Channel crosser. See text for complete details.

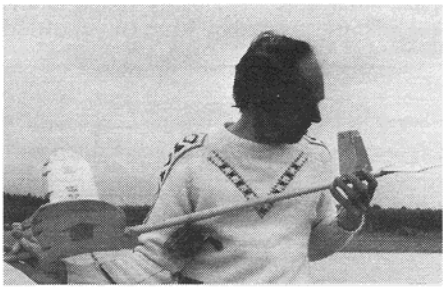


Richmond's "Cat Walker" F1D indoor ship appears on logo for 1980 WC.

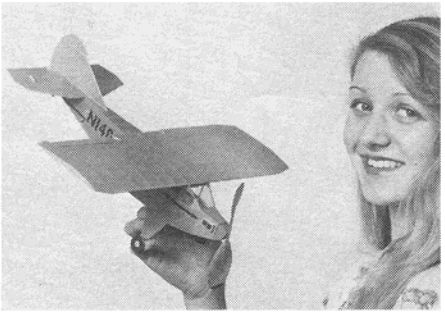


Greg Thomas built this incredible "peanut" scale model of the Gossamer...

A classic "VTO" vertical takeoff as executed by Sue Weisenbach.



Peter Allnutt adjusts circle tow and rudder on his "Skywalker" glider.



Lorraine Patchette with peanut Fike by England's John O'Donnell. Photo by J.O'D.

FF NEWS FLASH: TWO WAKE RECORDS BROKEN

Our Taft correspondent, Toni White, sent us the late-breaking news that hubby Bob White, designer of the famous "Vol Libre" F1B Wakefield, and Jason Kendy (also flying the design) set new AMA Records for Wakefield on March 8, 1980. Bob broke the record held by fellow SCAT club member Bill Bogart since 1971. The old score was 39 min 46 sec, and the new record an amazing 57 min 10 sec—a truly phenomenal feat by the "Godfather." Jason's record in the Senior Class is 19 min 48 sec. A tip of the "FFN" hat to both these fine fliers in the prestigious Wakefield Class—the World Class of rubber Free Flight.

FREE FLIGHT NEWS

(Continued from page 68)

.23 engines ready to haul models to thermal heaven. The Wright workshop *was* heaven!

Having been thus blessed by our hero, and provided with plans to his Half-A PAAload design "Lemon Crate," we returned home to butcher some balsa and try to win some contests. Amazingly, the advice and help did the trick, and we won a gold watch provided as a prize by Pan American! That was a turning point in our love for FF and admiration of our hero. His "Crate" designs, as he called them, were developed with architect Bill Weaver and protege Bob Sutton—but they also flew well for scores of modelers. The large-size ships were covered in orange silk and tissue, and the small ones in yellow, thus earning the endearments "Orange Crate" and "Lemon Crate" from designer Wright. White tissue stripes at the poly breaks were another trademark of those models, giving them a certain class.

We did not see our mentor for a few years after that, but his ideas and devotion to FF remained with us in the Army and in college, which led us back to that Kansas heaven, in a new era. Now we were dazzled by an extravaganza of "Stardusters," the design that Taibi created and "C.O." loved. Gone were the days of PAAload, but now the Wright basement had every size of "Duster," including a huge "900" covered in yellow-gold silk and named "Gold Duster." It sported a howling Super Tigre .60 and hauled the AMA "6" wings heaven-ward like a Saturn rocket! It was a beast, tamed by the beauty of Wright's expert trimming technique. It won more Class "C" trophies than we can recall. We began building "Dusters" and we started to win again, influenced and enthused with the Wright approach. He was truly a dedicated teacher, inspiring success in his FF students.

Charles O. Wright of Topeka (born in 1895 in Santa Fe, Missouri) was indeed a teacher—and principal of the Atchison (Kansas) High School. He later served as Executive Director of the Kansas State Teachers Association and Editor of "Kansas Teacher" magazine, as well as writing books on the subjects of sociology and educational history. He served on White House Conferences on Education and Youth, and received many educator awards. While he valued these, it was his Nats trophies that he held dearest!

Modeling awards bestowed on "C.O." include the AMA Fellowship, AMA Hall of Fame, National Free Flight Hall of Fame, and local recognition of his leadership in model aviation. His devotion to youth and aerospace education was widely known and recognized. From our point of view, we will be ever grateful for the kind and patient tutelage that we were privileged to receive from this "Santa Claus" of FF (yes, he did look a bit like a rotund, baldpate, white-haired Santa) from Topeka.

"C.O." Wright passed on to thermal heaven on February 23, 1980, at the age of 84, having lived a life full of achievement. Along with FFers across this great nation, we send our condolences to his wife Ruth, son Bob (a flier of some note in his youth), and daughter Alice. We will miss him, but his presence will be ever with us. To those "Star Wars" fans out there in Free Flight Space, you will understand the analogy that comes to mind. "C.O." was the hero of our youth, the "Ben Kenobi" of FF who did so many wondrous deeds, who had such great spirit. May the Force be with you.

WARBIRDS COLLECTION. While in the Atlanta airport recently, we discovered a display of fine aircraft sketches called "Warbirds," done in an unusual ink style by artist Joe Milich of Denver. The collection comprises over 90 drawings, with repro sizes of 6x8 or 11x17, available matted or framed 16x20. Famous craft like the "Flying Tiger" P-40E Warhawk, the Spitfire, P-51, F4F Wildcat, PBY Catalina, F4U Corsair, F4 Phantom, and Messerschmitt Bf109G are included. The drawing style is superb and scale modelers will drool over the views. Prices are reasonable—$5.50 for an 11x17 print, only $2.50 for a mini-print, and $8.50 for a matted 16x20; add $2.50 for postage. These signed, limited edition prints are collectors items and memorabilia for aviators and modelers alike. For the catalog/order form, send an SASE to Warbirds Collection, Joe Milich, 11131 W. Exposition Dr., Lakewood, CO 80226. If you happen to be in the Atlanta airport (a busy place), then just grab one off the display. (Pay for it, of course!) Be sure to tell Joe that "FF News" sent you.

NEW NEWMAN ENTERPRISES. Jim Newman, the well-known British "export" who has developed many new model designs (including the excellent kit engineering on my award-winning "Starstream" A/1 towline glider, while he was at Midwest Products) and done a superb job of illustrating *M.A.N.*'s column "Hints & Kinks," has now embarked on a new venture. He is the genial and most knowledgeable proprietor of International Scale Plan Service at 4 Cleveland Terrace, Hobart, IN 46342 (an SASE with $1.00 postage will get you a plans list—use a No. 10 business envelope), as well as the head of Jim Newman Associates, Technical Illustrators. His expertise in matters of scale models dates back to his experience in the RAF and working time in the British aerospace industry (notably for Bristol and British Aircraft) before he immigrated to the "colonies" in the early Sixties.

Regular *M.A.N.* readers have seen Newman's stylish pen-and-ink drawings not only in his column, but also as illustrations for various articles. He has a special skill in illustrating situations with the incisive wit of an editorial cartoonist, yet he can handle the most complex technical devices just as well. He uses standard technical illustration techniques with a certain flair that makes his drawings, like those of Frank Zaic which we admire in the *Model Aeronautical Yearbooks*, unmistakable and enduring in interest.

The International Scale Plan Service is based on the MAP line of plans from the British monthly magazine *Aeromodeller*, plus other sources that Jim has arranged. The MAP plans are superbly drafted, full of detail, and the choice is simply astonishing. To get the info to properly make a choice, you really need an *Aeromodeller Plans Handbook*—this is available from Jim for $3.75 postpaid. He has many plans in stock and can obtain others quickly. While the emphasis in his plans stock is RC, he handles many FF scale plans. These are suitable for AMA Scale in either gas or rubber—no peanuts in this line. There are also many other FF types in the catalog, for contest or sport.

The technical illustration service (on a free-lance basis) may also be valuable to modelers who are engineers or involved in industrial work. Jim has an excellent background in doing cutaway drawings, detailed assembly drawings, complex diagrams, and presentation drawings. So if you are a modeler with a business that needs illustration, here is a chance to give some assignments to another highly skilled aeromodeling enthusiast!

If you are looking for scale plans, but are not sure what to order, Jim will give free advice if you will simply send him an SASE. While the MAP plans line is also available in Australia, Canada, Finland, France, Germany, Holland, New Zealand, Spain, Sweden, Switzerland, and South Africa, we think you will get the best advice and service from Newman right here in the USA!

INCREDIBLE GOSSAMER PEANUT. Scale modelers have been eating their hearts out ever since the novel "Gossamer Condor" and "Gossamer Albatross" Man-Powered Aircraft came on the scene. Designed by Dr. Paul MacCready of Pasadena, an ex-modeler and former AMA National Champ in Free Flight, these devices have been pedaled/piloted by Bryan Allen to the Kremer Prize twice! At the Bakersfield NFFS Symposium, MacCready showed slides and films of the "Gossamer Albatross" being tested and also flown over the English Channel. This creation of modern technology and innovative design (it is pure ingenuity) is very much like a large microfilm indoor model as it floats through the air. It is certainly an exciting thing to watch, and an inspiration to modelers everywhere.

Now a scale modeler in Minneapolis has met the challenge and created a Peanut Scale version of the "Albatross" Channel Flyer! Using Doc Martin's new Peanut rule that allows either a max 13" wingspan or a max 9" OAL, Greg Thomas of the Minneapolis Model Aero Club has made an incredible model. Doc seems to think it

(Continued on page 70)

FREE FLIGHT NEWS

(Continued from page 69)

is an AMA Scale since the boom should be included in the OAL, but Greg felt that the pod under the wing (see photos) was the body that could not exceed 9". Whatever, the rubber-powered ship is a novel idea.

Thomas did his usual fantastic job of construction (he regularly wins at MMAC club contests, the Nats and NIMAS Record Trials) on this 34" span, 2.6 gram, clear-microlite-covered aircraft. The 1/8" diameter motor tube is made of 1/64" sheet and the wing scallops, made on a form, are 1/32" square—very light construction for a scale ship! Greg has been using a foam blade prop and this has caused some problems under high torque, which is something the full-size ship never had (Pilot Allen had to pedal like crazy to get it off the ground), and he is switching to a balsa fan. He first flew it at the MMAC December Indoor Meet. If you would like further details, write Greg c/o John O'Leary, MMAC, 11425 Kell Circle, Bloomington, MN 55437. Please send an SASE and tell them that "FF News" sent you.

Modelers who might want to make their own version will find the September 1979 issue of *Aeromodeller* an invaluable resource. It has a special article by Ron Moulton and Martyn Cowley on the "Albatross," with an exciting in-person narrative on the Channel crossing. The airframe and personalities are well detailed and an excellent three-view is included. To order this back issue, or other numbers, try the Aviation Bookshop at 656 Holloway Rd., London N193PD, England. Send them an International Money Order for one British Pound and the unique "Albatross" issue will be on the way to you by Air Mail. It is truly a memorable event when a man-powered "model" makes such a flight, and the *Aeromodeller* staff recorded it in breathtaking detail. Get your souvenir copy today.

WILL RICHMOND REMAIN CHAMP? That is the question F1D indoor fliers worldwide are asking themselves as they prepare for the World Champs at West Baden, Indiana, June 20-24. USA flier Jim Richmond of Atlanta won the title at Cardington last time with some outstanding flying, and he will be defending the title on home ground in a site where he has done over 44 minutes (the Northwood Atrium, whose plan is symbolized in the World Champs logo, along with Jim's model). We wish Jim all the luck in the world, which he will need to compete against the world's best. USA Team Members Ray Harlan, Pete Andrews and Erv Rodemsky will do *their* best to win. You can still be a spectator, for only $100. See details in the June "FFN." ■

HYPERWIND

(Continued from page 65)

The simplest way to freewheel this prop is to first drill a 1/16" diameter hole straight through the prop-spinner assembly. Then take a piece of 1/16" diameter brass tubing that is 1/8" shorter than the hole, and solder a 3/16" long piece of 3/32" brass tubing so that 1/16" of it projects. Simply file a ramp-type freewheel notch into the wider tubing, and glue into the drilled hole with cyanoacrylate.

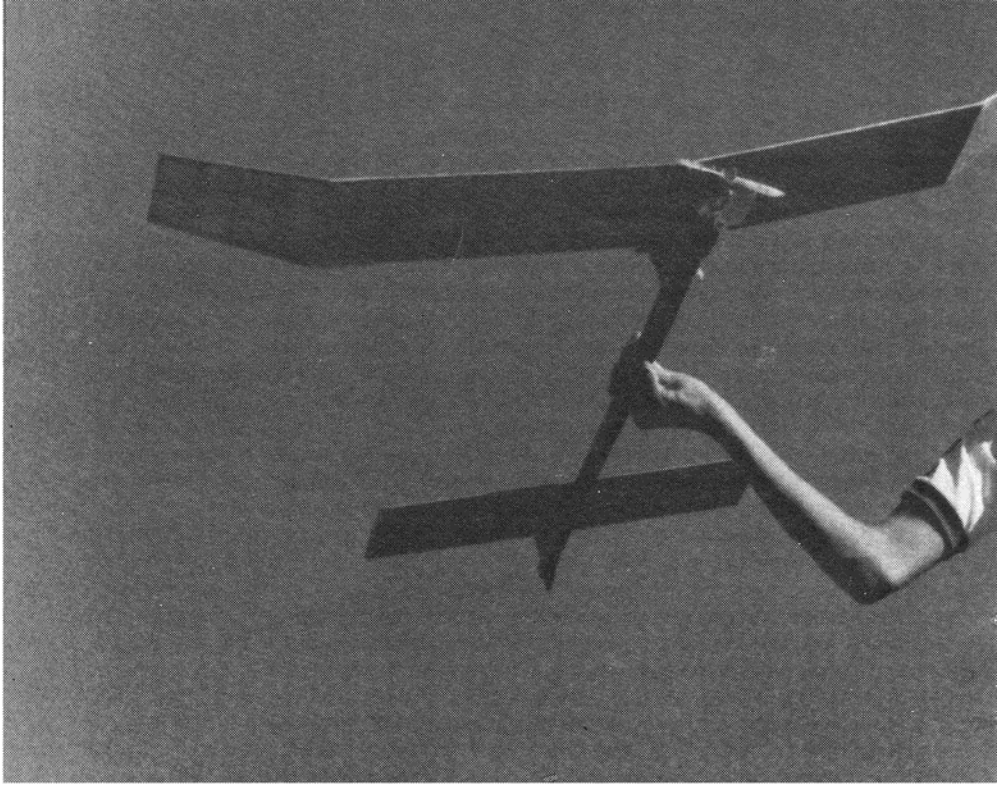
Make sure all the frames have been sufficiently sanded with 320 wet-or-dry (preferably with a block). A little extra time spent in this department will make for a much nicer covering job. The covering material is Japanese tissue, which I prefer to attach with a diluted white glue mixture. Since I used a rather coarse tissue, I found it necessary to apply two thinned coats of clear dope. Had I used a finer tissue, such as the type sold by Peck-Polymers, I probably would have dispensed with the dope and instead sprayed the model with a light coat of 3M Scotchguard. The model in the photos is white with black trim. Clear plastic windows are attached with white glue, with 1/16" wide graphics tape for framing. The lettering and registration are small rub-on graphics lettering, applied to scraps of tissue, trimmed closely, then applied to the model with thinned white glue. The registration, N4790D, contains my initials as well as my AMA number. Interestingly enough, a midwestern Cessna carries the actual number! Aileron and flap separations, as well as the trim pinstriping are from 1/32" wide flat black graphics tape. Those long landing gear struts looked painfully bare to me, so I added a dummy brake line of thread held in place by folded-over pieces of 1/16" wide tape as used on the prop tips. The finlets, of 1/32" sheet or card stock, may be cemented in place on each stab half.

I would like to make some comments on fuselage details. Remember that these details are purely aesthetic, and while they do add a lot to the appearance of the completed model, they may be left off if desired. This is especially true if super-endurance is your game. Under the cowl is an air scoop, as well as the exhaust pipes. The scoop is fashioned from card stock, while the pipes are from 1/8" diameter aluminum tubing. On the top of the cowling is the dummy fuel filler cap, which may be fashioned from scrap plastic or balsa. Next to the "retractable" landing gear struts are the forward doors; these are of card stock. The larger main doors remain closed except during the retraction cycle (!) so these need only be represented as lines on the tissue.

Of all these details, the one which will probably attract the most attention is the simulated leaf-spring tail gear. The leaves are cut from 1/64" ply and laminated together. The wheel pant is carved from soft balsa, while the tail wheel is simulated, being a section of a dowel glued to the base of the wheel pant. On the forward-top portion of the pant is the bearing (mine was from hardwood), and on top of that is the control horn, which is cut from 1/64" ply or card stock. The spring leaves and the bearing should be painted either gun metal, or flat black. The final touch here is to grind some graphite, and rub it on the leaves to give a real metal look. The wheel pant should be painted the same color as the rest of the model. The control cables are from thin enameled wire (like from a small electromagnet). The springs are simulated by winding the thin wire around another wire or tube of 3/32" diameter.

By now the model should be ready for flight testing. See if the model balances somewhere near the usual location. Make a test motor of two loops of 3/32" rubber. Underpowered flights with this motor will tell you much more than test glides. My model ended up needing more positive incidence on the left wing panel than the right, 1/16" left rudder, and considerable up-elevator to achieve a satisfactory left-left flight pattern. When the model seems to be behaving properly, progress to a braided motor from two loops of 1/8" rubber.

Even if you don't build the Hyperwind, perhaps it will serve as a catalyst for you to construct your own fantasy airplane. I would very much like to hear about your efforts in Pseudo-scale! Nick DeCarlis, 1721 NW 68 Terrace, Gainesville, FL 32605. ■



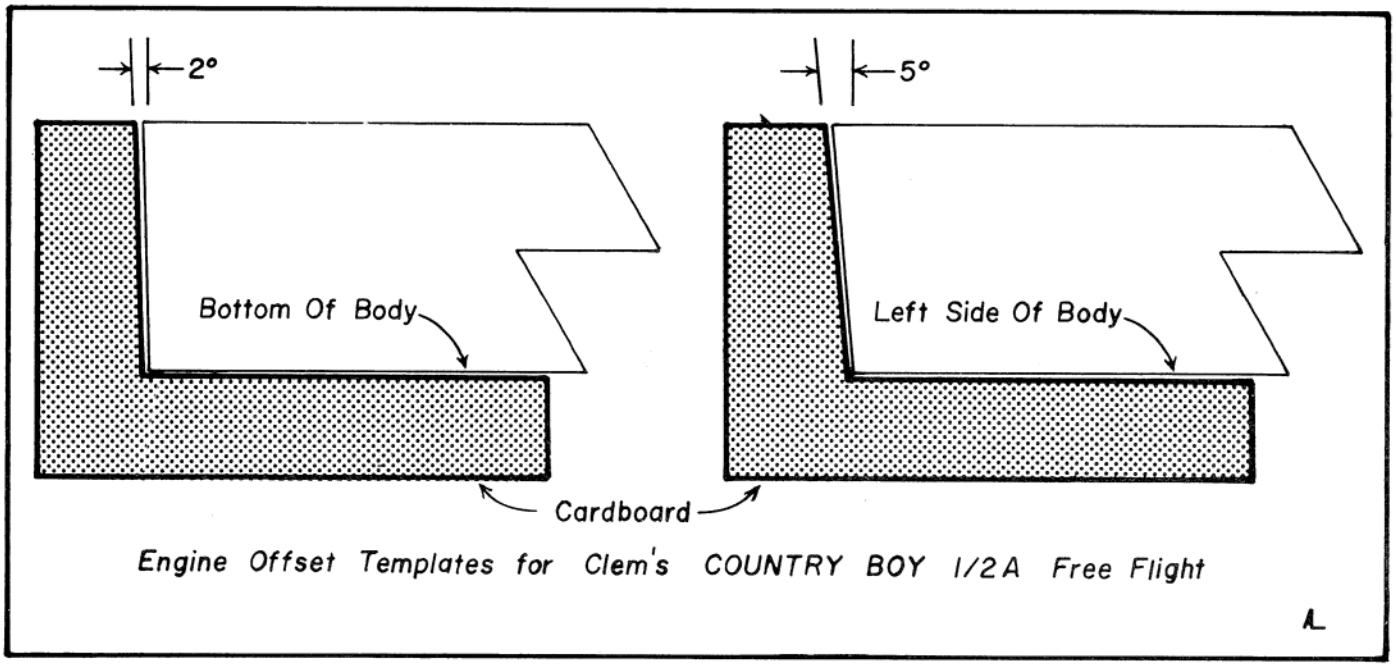
JIM CLEM'S COUNTRY BOY

by AL LIDBERG

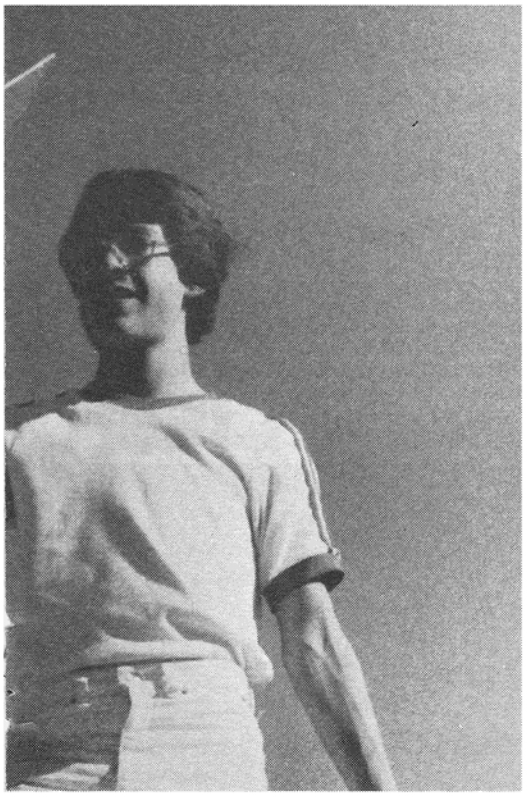
A GOOD WAY TO GET INTO ½A CONTEST FREE FLIGHT.

• Jim Clem needs little introduction to anyone who has flown free flight models for a few years, but for those who are not familiar with him, some background information is in order. His designs have been quite successful in local and national competition, the most recent example of his work being the Witch Hawk that won the '79 Nationals and set a record in the process. It was published as a construction article in the December 1979 *M.A.N.*, and many of Jim's other designs are available as magazine plans or as kits from Sig or Clemcraft.

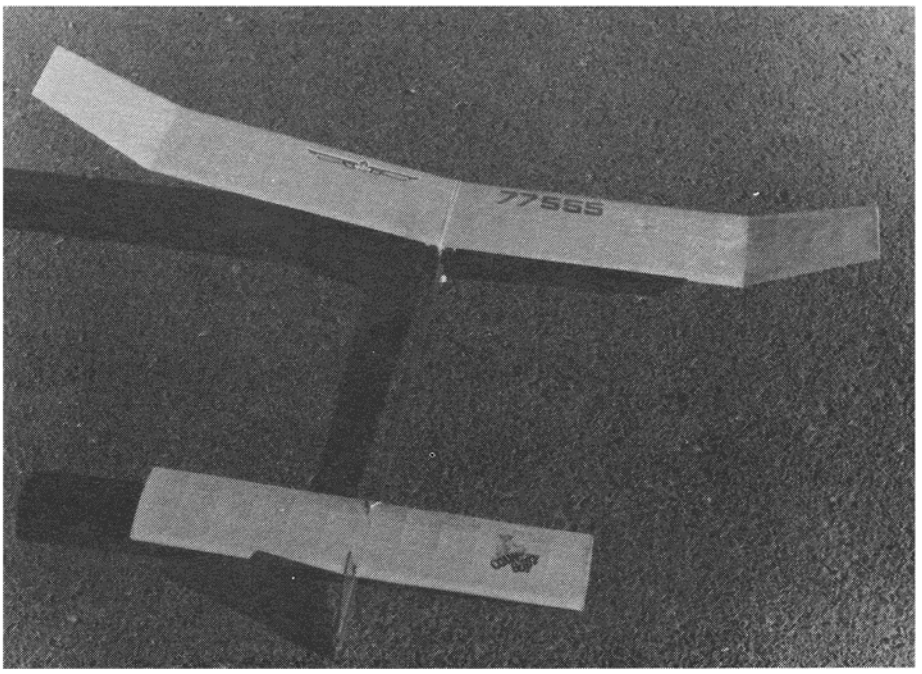
For those who prefer building from kits, Jim offers the Country Boy ½A FF kit through Clemcraft. (The company's address and another mail order source are listed at the end of this article.) We were lucky to be able to see and buy the kit at a local shop here in Phoenix called Grandma's House, owned by Russ Oliver of J&R Models. For power we chose the (world's) standard Cox TD .049 and mounted it on a Tatone tank mount. Surely there must be other engines that would be usable, but it's hard to think of any that would be comparable to the TD. The Country Boy plan shows mounting arrangements for both the tank mount and the short beam mount. When the short mount is used, a pacifier (pressure tank) or built-in tank is necessary. Having had good results pre-



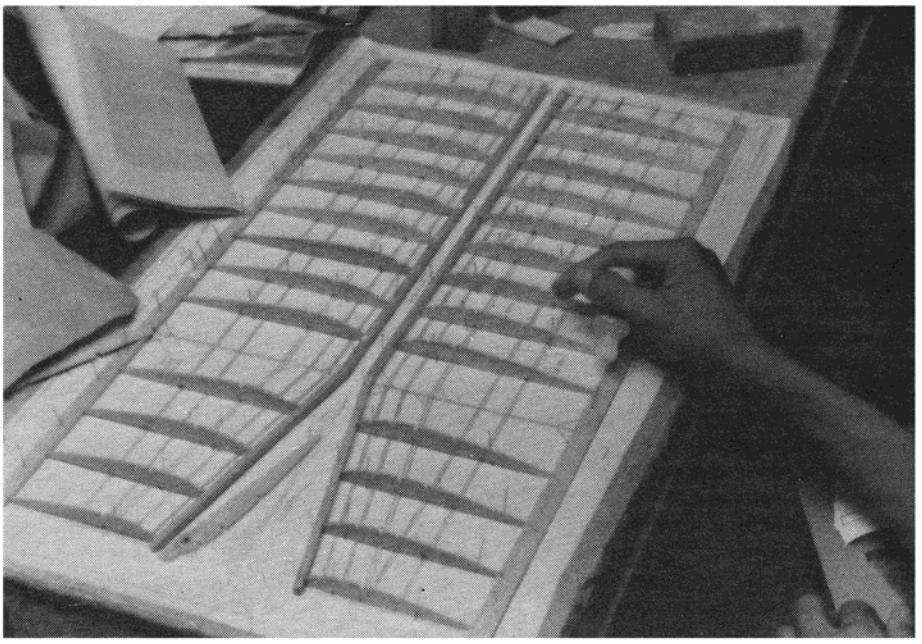
Engine Offset Templates for Clem's COUNTRY BOY 1/2A Free Flight



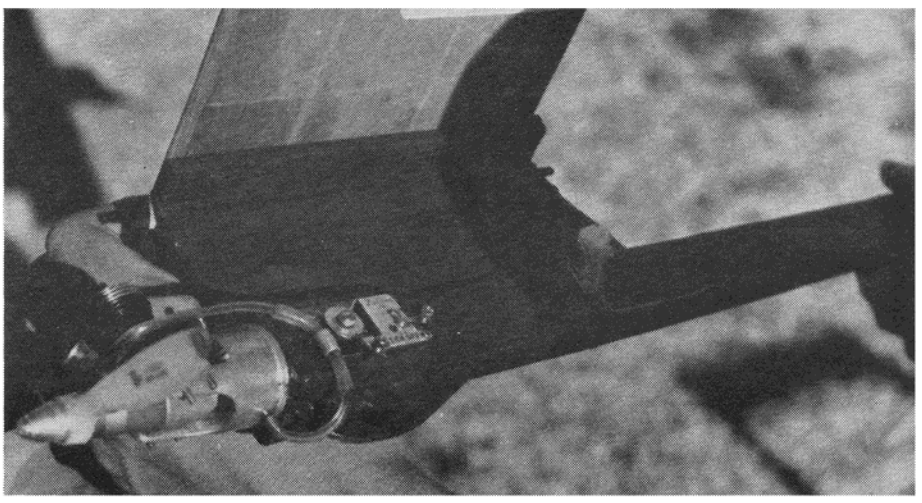
Mike Lidberg and the Country Boy.



Simple straight lines are apparent in this photograph. Definitely easy to build.



Wing panels are built flat. Good die-cutting, plus Hot Stuff, makes assembly quick.



Tatone tank/mount and timer shown here. Hole in skid is for pacifier tank if used.

viously with the tank mount and its simplicity and convenience, we chose to use it. Later on, as we look for more power, the pacifier tank will be tried. The combination of short beam mount and pacifier tank would be the lightest choice.

The model shown in the photos was constructed and flown by Michael Lidberg, a 15-year-old junior. Mike had previously flown a Starduster 350 with the TD, but with the 12-second engine run rules for Category I contests, that airplane was just too big and heavy to gain sufficient altitude, although it did have a nice glide. Rather than complicate matters with a highly tuned, special engine, we thought a smaller model would be a more practical solution. Mike had seen a Country Boy ½A flying very well at a local contest so that made our choice easier.

The kit is very conventional and should cause few problems in assembly for anyone who has built several kits. Construction is quite like that of the Starduster family, with one difference being that the flat body is built over the plan and the body sides are added later. (Stardusters are built by gluing pieces to one side of the body and then adding the remaining side.) Before constructing the body a choice needs to be made about the type of engine mount that will be used. With the appropriate mount on hand, construction goes along very well and, due to excellent die-cutting, can be completed in just a few

(Continued on page 73)

F&B: COUNTRY BOY

(Continued from page 72)

evenings. Mike had some trouble with the plywood wing joiners as they were neither die-cut nor printed, but it was an easy chore to trace them from the plan and then saw them to shape.

An important point to remember for easier flight trimming of magazine plan or kit models is that the builder should strive to faithfully duplicate any "adjustment" features called out on the plans. For the Country Boy, Jim shows the motor offset as 2° downthrust and 5° left thrust. To help get the motor mount pointed in the right direction, I made some little "L" shaped templates out of cardboard for Mike to use while sanding the front of the body. One leg of the "L" is held against the straight bottom or side of the body while the other leg is used to show where to trim. One template was made up with a 2° offset for the downthrust, which was sanded in first. Then the side thrust template was made and used in the same manner. With a compound angle like this, the shaping should be checked frequently as sanding is done. Special care needs to be taken to ensure a flat gluing (or epoxying) surface for the firewall.

After everything was sanded to shape, the wing and tail were covered with Plyspan tissue from Sig. The Plyspan is very tough—even after a few dozen flights there's only one hole in the tissue, and that' was due to a wandering hand-launched glider. Over the Plyspan we used clear butyrate dope and topped that with clear Hobbypoxy. Jim recommends covering the body with tissue also, but due to time problems we skipped that and used colored Hobbypoxy. With the types of fuel necessary for good runs in a TD (25% nitro and up), fuel-proof finishes are a necessity. Epoxy or the iron-ons are about the only materials that will tolerate these strong fuels.

The dethermalizer (DT) on the Country Boy is a bit more involved than many others because of the remote location of the DT fuse. Some designers feel that the normal rear-of-the-stab location of the fuse is bad for two reasons. One is that getting the fuse lit can be very difficult when it is out on the end of the body. The other, and more serious, reason is that there can be slight trim changes as the fuse burns down. Sure, a piece of fuse doesn't weigh much, but the effect is magnified by the leverage involved in a two-foot-long body. Both these reasons lend support to the remote fuse idea, where the fuse is located very close to the model's CG or balance point. The fuse is much easier to reach when it is near the wing, and there are no leverage effects regardless of fuse length. The Country Boy uses a piece of strong fishing line, supplied in the kit, running from the stabilizer's trailing edge down through a piece of aluminum tubing and then forward to the fuse for hold-down force.

Getting the model together, we discovered that the CG location matched the plan (weight may be needed forward or aft to get the model to balance — don't try to fly unless the balance is right!). A few warps were steamed out to make all the surfaces perfectly flat and then the recommended 1/8" x 1/2" trailing edge stock wash-in piece was added under the right wing. This is a nice way to add trim changes as it is easier to keep a flat panel flat than it is to remember how much wash-in or wash-out is supposed to be in which panel. A piece of TE stock glued to the bottom of the wing panel, sharp side forward, can easily be trimmed off, or added to, for adjustment purposes.

Glide tests were then done, but I consistently find that I can't learn much from hand gliding, except to discover sharp turning tendencies. It's always hard for me to figure out a proper gliding speed when throwing a model. Getting the model up in the air with power allows it to find its own glide speed. Of course, some models are drastically out of trim when first built, and it's a wise idea to use a short engine run and a very short fuse on the first few flights to preserve the model until you can remedy glide problems.

With the Country Boy, glide turn trim was easy—just a scrap of 3/32" sheet under the LE of the stab on the right side, to tilt the stab for right turn. However, we did have a really bad glide stall following a short full-power climb, which also needed some work. We added some balsa shims at the rear of the pylon to take out some wing incidence to fix the glide; this also took care of the climb. Jim has some excellent trimming instructions included with his plan; be sure to read them carefully.

Anyhow, we were fortunate in getting the model flying very nicely in about four flights. I said "fortunate," because Mike finished the model just in time for a contest. The fifth, sixth and seventh flights were official ones. No, Mike didn't win, but he got all his flights in and managed to place fourth. After exchanging the .049 for an .051, he flew in Class A the next day. Again, he completed his flights and placed fourth or fifth. There are very few juniors locally flying power events, so he was competing against six or seven pretty good open fliers. All in all, the first weekend of flying the Country Boy 1/2A was fairly painless. Now we can get busy and experiment with other props, the pacifier tank, some fine tuning of the flight trim (i.e., very thin shims under the LE or TE of the stab; minor CG adjustments), and picking "good air."

Mike and I agree that the Country Boy 1/2A is a good model to recommend to other modelers. Thanks, Jim, for another good design.

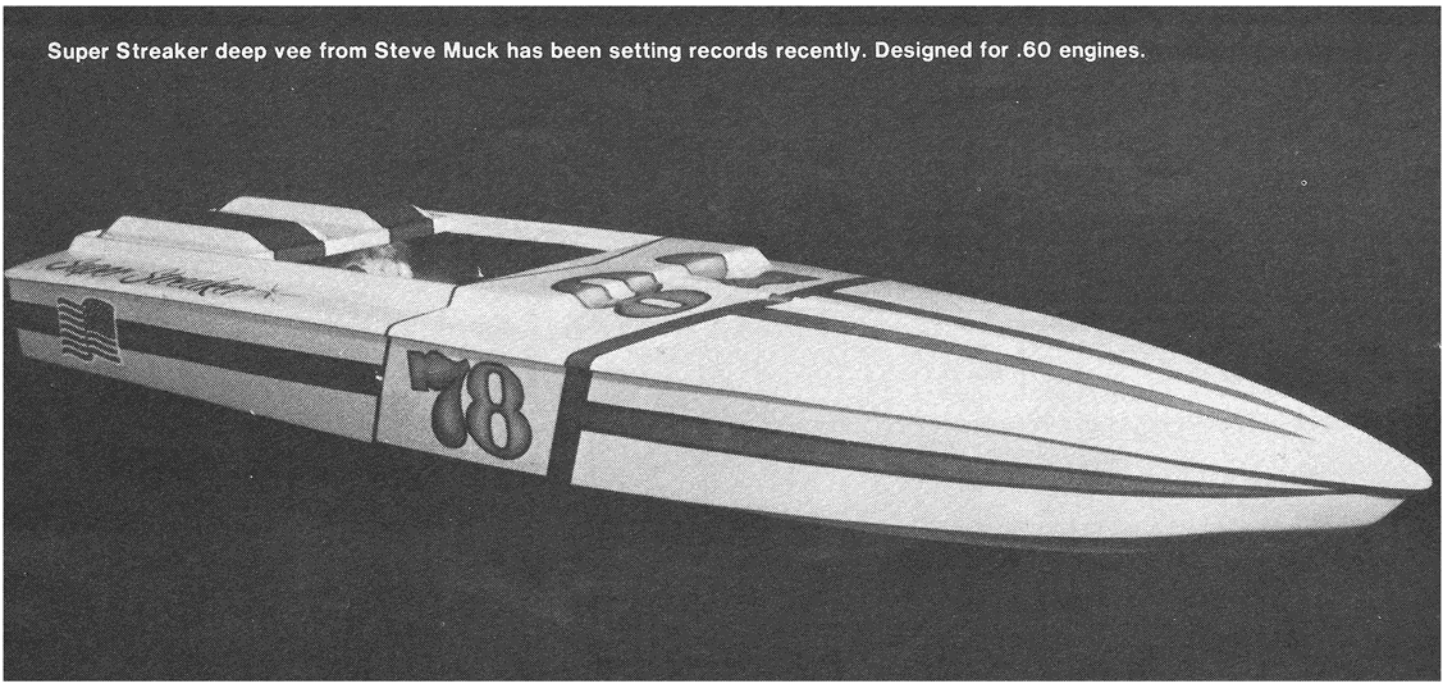
(An excellent source of information on trim problems and their solutions is an article in *Model Aviation,* August '79 issue, by Ralph Prey, entitled "How to adjust that high-powered AMA gas free flight." You may also want to take a look at the construction article for the 1/2A Country Boy which was published in the March '77 *Model Aviation.*)

A couple of mail order sources for the Country Boy 1/2A kit are (in these inflationary times it would be a good idea to write for current prices and shipping costs before ordering):

Clemcraft, P.O. Box 524, Sand Springs, OK 74063. Jim also offers the Okie Bird, which won 1/2A at the '79 FF champs at Taft, and a kit for the Witch Hawk.

FAI Model Supply, P.O. Box 3957, Torrance, CA 90510. Send for the FAI catalog—lots of neat FF supplies and kits, including FAI and Pirelli rubber.

Jim has also offered to assist any builder having problems. You can write him at 10 East 31st Place, Sand Springs, OK 74063, or you can call him at 918-245-3649. ■



Super Streaker deep vee from Steve Muck has been setting records recently. Designed for .60 engines.

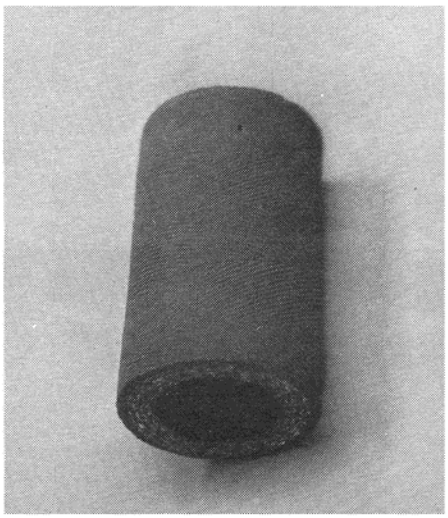
powerboat NEWS

by JOHN OIAN

• This month let's take a look at a couple of things you can do to make you and your boat more competitive. There have been many articles written and much work done to improve engine and hull performance, but some of the areas where large gains can be made with little technical wizardry or financial outlay are quite often overlooked. You have probably picked the best engine available, possibly modifying it yourself or even having the work done by an engine builder. Most likely the boat hull was built very carefully, with lots of attention paid to getting it light, strong and straight. Your props are balanced and all underwater appendages have been honed to a razor's edge. So far so good. But have you ever considered the fact that how *you* run the boat will have a more profound effect on your overall performance than any of the above factors? We've all seen the Hot Dog, with his super modified motor and special trick hull, who goes out on the lake, makes a couple of blazing passes around the course, and then usually flips or blows a plug. Or if he does survive, he gets beaten by a so-so boat that is slower but more precisely driven around the course.

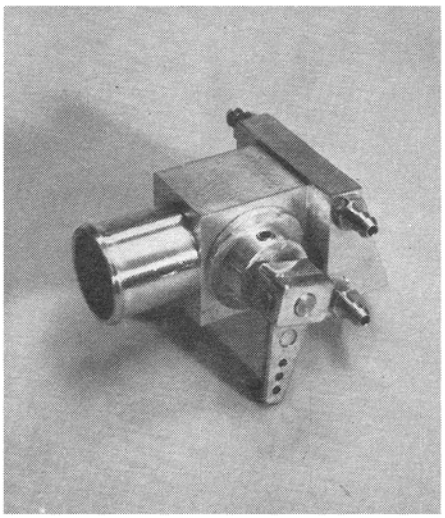
Everyone starts a race with the same challenge facing them: to complete a specified number of laps around the course in the shortest possible time. How far you make your boat go beyond the minimum distance required to complete the race is almost totally up to you, and usually detrimental to your performance. Let's take a typical race and see what can happen. For our hypothetical contest, let's use a course that has 330-foot straightaways and a corner radius of 46.2 feet. Five laps around this course will give a distance of 0.9 mile—or will it?

Now for our two competitors. First we have Mr. Consistent. His boats are reasonably fast and he is very careful how he drives the course to stay as close to the turn markers as possible. Opposing him we have Wild Man—you all know the type. His boats are extremely fast and generally all over the course.



Fiberglass-reinforced silicon tuned-pipe coupler is from Prather Products.

Prather starting belt has teeth on both sides, circumference of 17½ inches.



Excellent exhaust throttle from Prather, in 3.5 and 7.5 sizes, two angles.

Now to the race. At the start, Consistent is within a couple of seconds of hitting the start on time, while Wild Man, on the other hand, is about half a lap late for the start on the opposite side of the course, trying to catch up. Consistent runs the whole course within about five feet of the turn markers. Wild Man, however, is flying down the straights, trying to catch up. At the same time, he is overrunning the course and going wide about forty feet on each corner. Let's take a look at what is really happening. The minimum distance traveled for 5 laps is 4,752 feet (0.9 mile). Consistent, running 5 feet wide, will have covered about 4,908 feet during the 5 laps. Meanwhile, Wild Man, with his late start and his extra 40 feet on the corners, will have run about 6,483 feet in completing the same race. If both finish with a running time of 100 seconds, Consistent will have averaged 33.45 mph, while Wild Man had to average almost 11 mph faster—44.18 mph—just to keep even. If, on the other hand, both boats had the same average speed of 33.45 mph, Wild Man will have been beaten by 32 seconds or 1,575 feet (1.66 laps)!

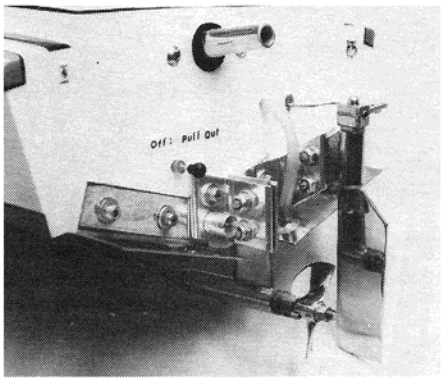
This may seem like an exaggerated example, but next time you're at a race watch closely. Forty feet wide and half a lap late are not that uncommon. So what, you say. Well, I don't care to remember the number of times I have been beaten by a lot less than a lap and a half, and a lot of times it has been by a slower boat with a better driver. Let's work a little on driver modification and see if our times at the races don't improve substantially. All you Mr. Consistents can now go to the refrigerator for a sandwich and a beer while the rest of us do a little catching up.

Consistency only comes with practice—lots of it. You've got to go out to the lake, set out some marks, and drive, drive, drive. When you finally realize that for each 10 feet you go wide around the corners (the initial radius of the turn doesn't matter) you give your opponent 62.8 feet each lap, it doesn't take too long to realize that this is a very fertile area for improvement. Maybe even more important than that new "Super Twister" propnut you've been wanting to buy. Each boat is going to have its own cornering characteristics, and the only way to find out what they are for your particular boat is to get out and drive it.

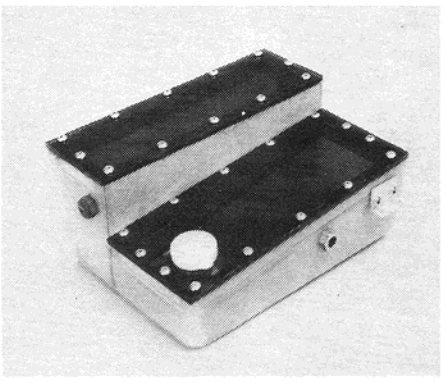
The start is another place where a good many races are won or lost. How many times have you said, "I was only 1/8 of a lap early for the start," but in reality what happened was that you started the race 7/8 of a lap behind? Not a good position at all. It took me quite a while to figure out how the consistent starters always seemed to be somewhere near the starting line when the gun went off. The key to a good start is planning. Notice how the people who get consistent starts seem to be very careful about when they launch their boats. I'd always start my boat when the fancy struck me, and then run quickly to the water's edge and launch it. Why use the clock? The only thing it seemed to be good for was to let me know when I had spent too much time trying to start the boat and was now out of the race, or how late I was for the start.

To get consistently good starts, you must know how much time it takes for your boat to make a lap and then launch your boat a multiple of that time before the start of the race. You may find that you can regularly make 26-second laps, and if you launch your boat 104 seconds before the start, upon completion of your fourth lap you will be in a good position for the start of the race. Nice, but have you ever tried to judge 104 seconds accurately on a 30-second clock while also trying to watch 4 other boats? If just 4 seconds are added to the lap times, however, you will now be running 30-second laps, which is comfortable for all but the slowest boats, and you can synchronize your trips around the course with the hand going around the clock. It is then relatively simple to launch

(Continued on page 76)

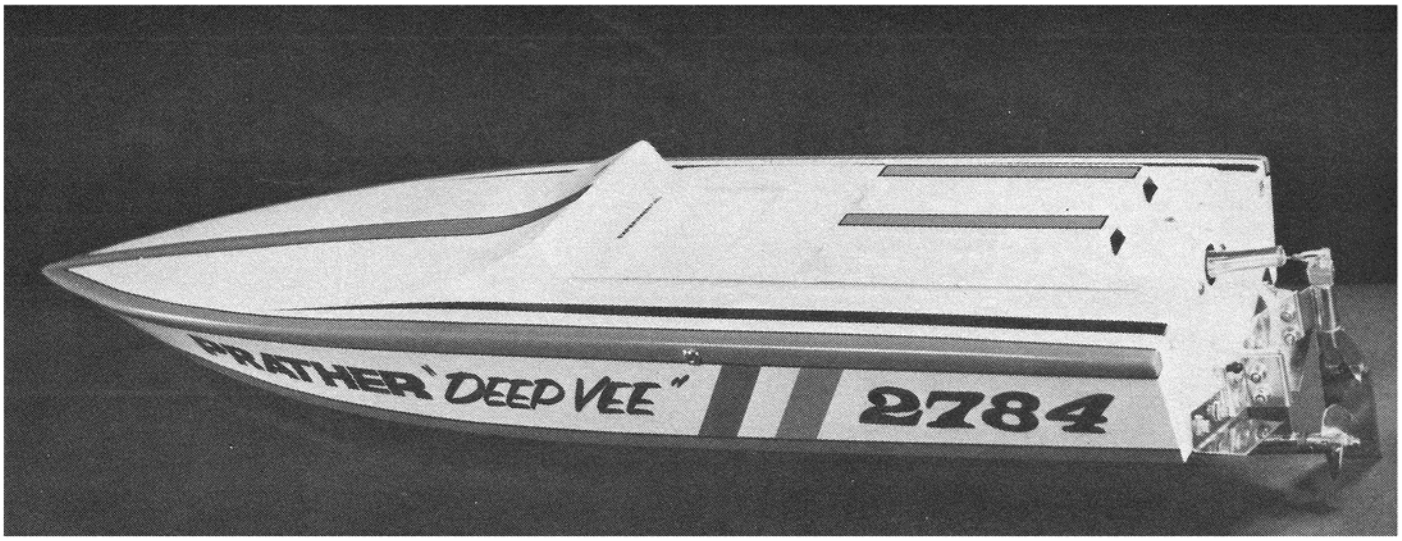


Prather's deep vee running hardware set is aluminum and stainless steel.



Epoxy-glass radio box is stepped for pipe clearance. Available from Prather.

Filled-nylon ratchet-action hose clamps are another Prather Products goodie.



Following the successful Prather 40 boat is the new 20 deep vee, designed for 3.5cc engines. Hull is epoxy-glass.

POWERBOAT NEWS

(Continued from page 75)

the boat when the hand is straight up, two minutes to go for example, and four laps later you should be ready to start the race.

One of the neatest things about this system is that you have two times each lap to check and reevaluate your position. Assuming that the clock is in the middle of the course, when you are in front of the clock the hand should be up, and when you go behind the clock the hand should be down. Slight corrections should be all that is necessary to keep you right on the clock. On the last corner go a little long, and when the gun goes off you should be within a reasonable distance from the starting line and really moving. Now you can watch all the others trying to make up that half a lap. Sound simple? Well, it is, but it will still take some practice to get it right.

With all this new-found speed, you need some place to go and test your mettle, right? How about the NAMBA Nationals? This year they will be held in Tacoma, Washington, August 2-9. You will have to be quick about it, though, as the entry deadline is July 1. There will be a new event this year—the Sport 40 class. This event is not being run in Florida at present, but it should be interesting, especially if they can keep it a truly sport event. For more information, write to Leo Dreith, 2406 151st St. E., Tacoma, WA 98445.

I received an information sheet recently from Prather Products. It seems that Terry is getting into the boat business in a big way. He has a new 20-size Deep Vee along with a whole bunch of other goodies for boaters. Like his 40 boat, the new one has an epoxy glass hull rather than the traditional polyester-glass seen in most other designs. This makes the boat somewhat stiffer and much lighter, and cuts down on the post-molding shrinkage associated with the polyester resin. The hull and deck come joined, with engine rails, bulkheads and flotation provided. The boat broke the "A" Deep Vee record at the 1979 NAMBA Nats. Terry is well-known in Formula 1 circles for his excellent workmanship both in airplane kits and in engine reworking with his "Terry Tigers." Along with the boat, he also has a hardware kit, radio box kit, and exhaust throttles for both the K&B 3.5 and the K&B 6.5/7.5. These are available in both 12° and 20° configurations. There is also a fiberglass-reinforced tuned pipe coupler and a reusable nylon hose clamp to take the place of the usual tie wraps. For more information and a full listing of Terry's products, write to Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744.

This must be record-breaking deep vee month, as I also received a flyer from Steve Muck's R/C Boats for their Super Streaker Fiberglass Deep Vee, which holds the NAMBA record for the "X" Deep Vee as well as the IMPBA "F" class record. The boat features an overlapping rub rail to make joining the hull and deck easier. The engine rails and transom doubler are already in place, with holes drilled for an engine mount. There is also a hardware package available for the boat. For more information, write to Steve Muck's R/C Boats, 6003 Daven Oaks, Dallas, TX 75248.

Another new and handy product is available from Richard Preiser of Preiser Precision Products. It is a set of "T" handle allen wrenches in a convenient stand (so they won't get lost quite so easily). In addition to the standard set of wrenches, a metric set is also available. Write to Preiser Precision Products, 2116 NW 62 Ave., Margate, FL 33063.

Please keep your letters and comments coming so I know what you would like to see in this column. John Oian, 3265 New Haven Ave., West Melbourne, FL 32901.

FLAT BOARD

(Continued from page 43)

many builders prefer to have the board tipped slightly toward them. The board is self-supporting, so it can be put on crooked floors, stepladders, desks—anywhere convenient for building. The dimensions of the building board presented in this article are sized to construct 6-foot wing panels. The dimensions can be varied to suit your particular building preferences and available space. The board is rigid enough to hang on a wall when not in use.

Material list for a 6-foot board:

(2) 1" x 4" x 6'0" pieces of lumber
(4) 1" x 4" x 9" pieces of lumber
(1) 1'3" x 6'0" piece of 3/4" particle board
(1) 1'3" x 6'0" piece of 1/2" insulation board
(16) 1" x 1" x 1/2" steel corner braces
(32) 1/8" x 1 1/2" machine bolts with nuts and washers
(14) 2 1/2" x 2 1/2" x 5/8" steel corner braces
(28) 3/4" wood screws
(14) 1/4" x 2" carriage bolts, full thread with three nuts and three washers each. ■

yachting NEWS

by BOB HARRIS

• Last month I said I'd give you a peek inside my toolkit, so that you, too, can know what to forget to take with you to the lake and on trips. The list concentrates on oddball things, in the hope that you are less likely to need tips on the normal or obvious stuff. Here goes:

Handtools

1. Various pliers
2. Small files
3. Assorted screwdrivers
4. Pin vise and a set of miniature drills
5. Rechargeable or 12-volt soldering iron, and maybe a small butane torch
6. Razor saw, X-acto-type knife (the kind with a guard or cap)
7. A squeeze-bulb turkey baster or a fuel bulb, with about 12 inches of fuel tubing on the end, to use as a bilge pump
8. Assorted Allen wrenches and miniature nut drivers
9. A small awl
10. Small scissors, a good pocket knife, single-edge razor blades

Supplies

1. Stay wire and swaging sleeves
2. Sheetline
3. Needle and thread (in a pill bottle)
4. Brass fittings, No. 0 and No. 1 nuts, bolts, woodscrews
5. Match solder, matches in waterproof thing
6. Mirror
7. Plastic baggies
8. Aspirin, bandaids, other such stuff (and your spare pills if you're on some kind of medication)

Sticky Stuff

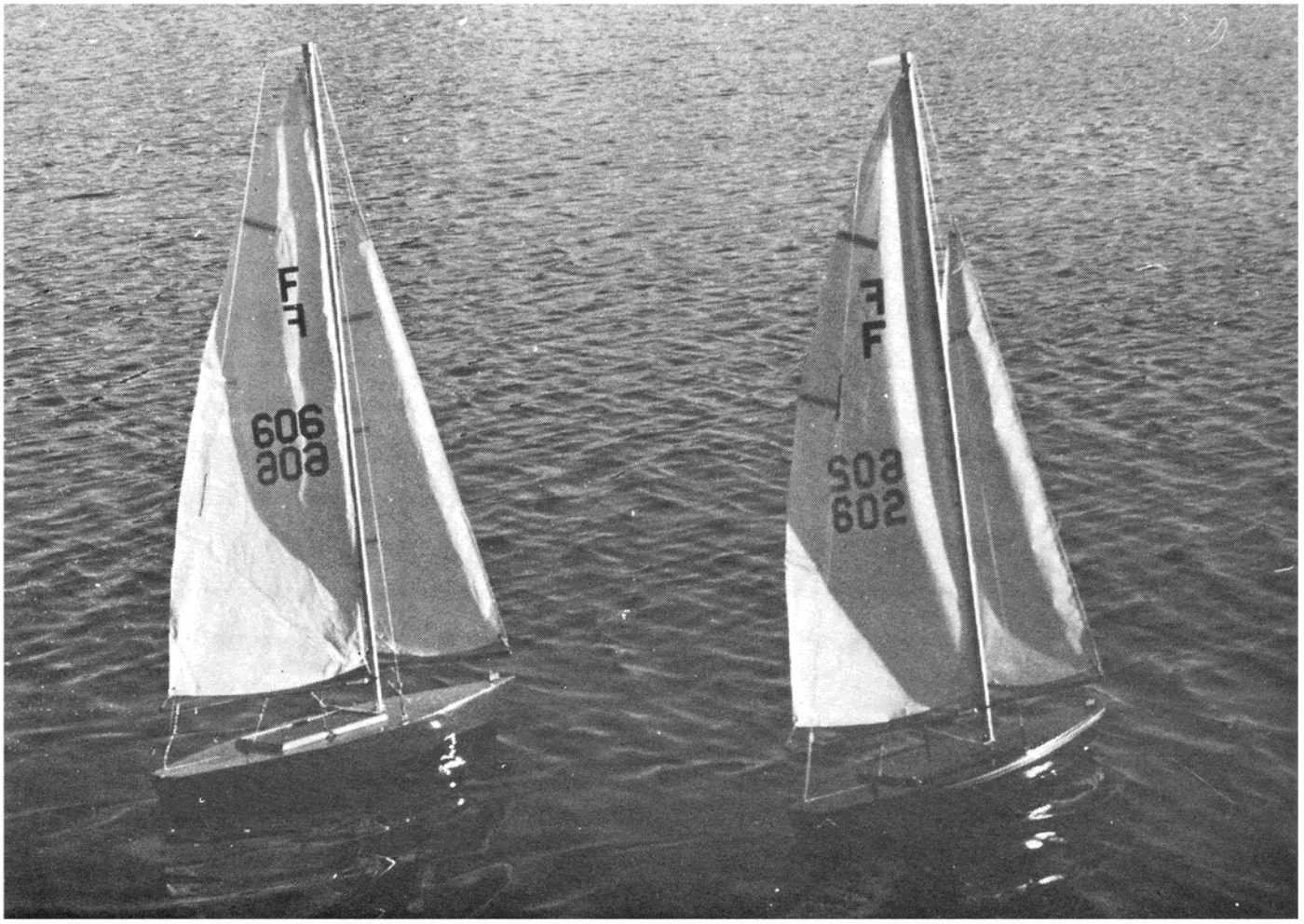
1. Masking tape
2. 5-minute epoxy
3. Double-sided (servo-mounting) tape
4. Resin and catalyst
5. Loctite
6. Popsicle sticks, some cardboard pieces, and some paper napkins for mixing, holding and cleaning up after epoxy and resin
7. A little modeling clay, for making dams around epoxy, etc.
8. Some kind of clamp (I like doctored-up spring clothespins, rubber bands, etc.)

Slippery Stuff

1. Light oil, in a hypodermic-like oiler
2. Lubriplate (waterproof)
3. Silicone spray and extension tube
4. Graphite dust in a "puffer"
5. Contact cleaner/lubricant

Spares

I'm a bit nuts on this point. I carry everything I can imagine ever needing, *especially* if it's electronic and I know I can't fix it in the field. I've had enough of



Rob Nelson sent us these photos of his club's one-design boats, skippered by a group of RC sailplane fliers (!) in Fresno, CA.

driving long distances to sail, and then not sailing (and bear in mind, most hobby shops aren't open on Sundays) because of some piddly two-dollar widget, and I ain't about to tempt fate no more in this regard! Hope this helps.

Now, last month's "whaddayaknow?" questions.

Question 1: Tightening the backstay has a tendency to loosen the leach of the mainsail, letting it flop open. The effect of this is, of course, to make the main look smaller, which decreases weather helm. The only other important consideration in this adjustment is that tightening the backstay *does* have the effect of tightening the jibstay also. This places more strain on the jib swivel, and, far from facilitating the "winging" of the jib, has just the opposite effect. So, answer "D" is not correct, but it does tell you something you should know.

Question 2: I have seen a lot of otherwise practical and knowledgeable skippers do this—it's a bad thing to do! Answer "B" is correct. Reason is involved with the possibility—even the probability—that one or the other of the paralleled batteries is going to be discharged before the other, or that if that doesn't happen in the normal course of things, one or the other may fail for reasons of age or something. What happens in this case is simply that the failed battery acts as more or less of a "short" across the good battery, and being then of lower resistance to current flow than the SCU motor, draws the current out of the remaining battery. Also, it does this *regardless* of whether the SCU is running or not, and, in the worst case, will create such heat that you literally cannot hold the battery in your hand. Fire below decks is a serious hazard in craft of *any* size!

Question 3's correct answer is "B." On the other hand, if you move the pushrod farther out on the *servo arm,* the opposite takes place. Neither has any bearing on the speed with which things happen. This is the kind of thing that provides the golden opportunity to make silly mistakes under pressure in a regatta, so you'll be better off getting it straight in your head right now. Write yourself a note on the underside of your toolkit lid, along with the one about "left is port, right is starboard."

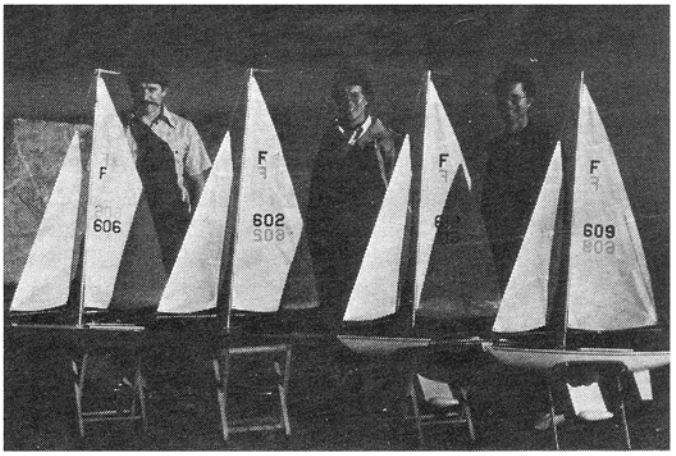
I'd like now to give the rest of this column over to Rob Nelson of Fresno, California, who originally wrote the following letter to Rod Carr, who, sadly, has given up his column in another magazine. Rod turned it over to me; with minor editing, here it is:

"I'm a long-time and avid sailplane flier, and have been interested in model sailboats for three years. Back then I bought a (sailboat kit) and had fun sailing it, but something was missing. I wanted to race but couldn't get others (boaters) interested. It would really be neat to have a bunch of guys with one-design boats get together and race. I had also been talking to some of my flying friends about the joys of RC sailing, and last winter they started to listen. I suggested we all get (yacht kit no longer made) and had visions of one-design sailing dancing in my head. However, the company had gone out of business. Since none of us wanted to spend a lot of money on a kit we finally came up with the idea of making our own boats, pooling our resources and making five one-design boats from scratch! By building *everything* ourselves we figured the cost could be kept low (the cost per boat—for ten boats—finally worked out to $45 complete, ready to sail, less radio). I really pushed the one-design aspect to keep everyone together in our 'club,' knowing no one had a faster hull than anyone else. Everyone agreed to strict one-design.

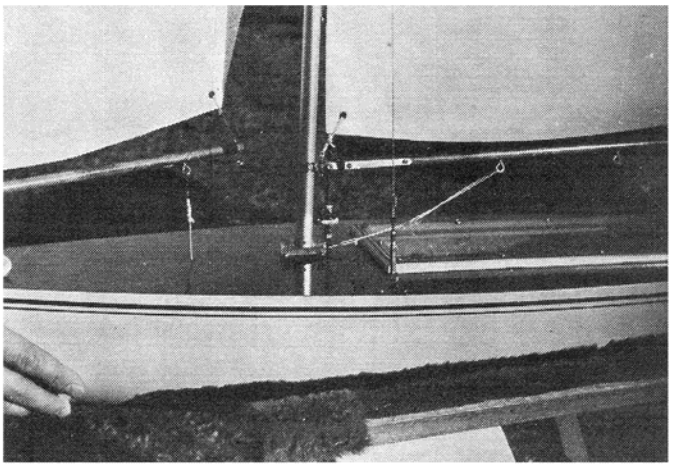
"Since I was the only one with experience with model sailboats and had worked with fiberglass, I, and another guy with experience, volunteered to design and make the hull. Word spread about our plan and the group swelled to ten. A couple of people volunteered to make the winches (similar to Probar), someone else the brass fittings, rudders, battens and so on. Each

(Continued on page 79)

609's sails look like they were slept on, but they still work.



Four of seventeen identical boats built by the group. "F" on the sail stands for Fresno One-Design.



All hardware and winches scratch-built by the club members.

YACHTING NEWS

(Continued from page 78)

of us would make something.

"We decided to make a prototype before getting into the making of parts for ten boats; that way, if changes were needed they could be made before making all the patterns for 'production.' In about three weeks the hull mold and first winch were done, and we called everyone together one evening to see the winch and to mold our first hull. To say the least, everyone was excited, since making an easily duplicated hull and winch were our biggest hurdles, and it looked like we were over them.

"Work proceeded on the prototype and it was done in about four weeks. We had help cutting the sails, but everything else we did alone. One Sunday we launched our beauty and it outsailed my old boat even though it wasn't tuned up. After sailing, we felt that the CG should be moved (we moved the keel weight aft about 1/2") and the sails should be re-cut (they had too much 'pocket'). All in all, we were pretty proud of ourselves. Now, all we had to do was make ten more boats (all?).

"Everyone went to work on the different parts. We made patterns and molds for everything, and since all hulls and major parts came from the same molds, all the boats were as identical as possible. The sail patterns were cut from masonite, and the sails were cut using a hot knife *(to seal the fabric where cut—BH)* and 2.2-ounce Dacron cloth. The corners were reinforced and then zigzag stitched (even our wives got into the project). A mold was made for keel weights and old tire weights were scrounged for lead. Decks were cut from mahogany door skins, masts made from 1/2" aluminum tubing, shrouds and stays from plastic-coated leader line. The winch had 10 brass gears and a reduction ratio of about 750 to 1. All brass fittings were made from brass stock and were much like existing fittings; some lathe work was necessary.

"In three weeks we had ten hulls produced, with 1/4" spruce sheer strips installed, and two bulkheads resined in. The keel was made by bolting the weights to the fin and then bolting the top of the fin to two wood strips resined inside the hull. Hull finish was done by each individual; we chose not to use a gel-coat layup to save time, but this required some filling of pinholes, then sanding and painting. I designed the rigging and helped everyone rig their models. Hatches were left up to the individual and are the only things (beside radio and hull color) that vary from boat to boat. Everyone had RC experience, so radio and winch were no real trouble to install.

"We started racing Sunday afternoons and Thursday evenings after work, and really have been having fun! Frequencies are coordinated so that about eight of us can sail at the same time—it's great to see all those boats on the water! Since I have done a lot of big boat sailing (Hobie Cats), I laid out a triangle course on the lake, and helped the others with sailing and tuning their boats; they were surprised that it takes a lot of skill to sail a boat competitively.

"On Sundays during the summer, we bring the families along to race and have picnics; our wives have done some racing and enjoy it very much. We always draw a crowd and many people show interest, asking where they can buy similar boats. They are a little surprised when we tell them that ours are made from scratch. We found that quite a few wanted their own, so we made extra hulls and parts—so far we have 21 hulls, of which 17 are built and sailing. We tell everyone who wants to race with us that they must keep their boats one-design, no modifications. We have set up some one-design rules that must be adhered to. All major parts must come from our molds and patterns with no modifications. Since our gear supply has dried up, we don't make the winches anymore, so the Dumas Probar is used.

"All in all, this has been the most gratifying project I have ever been involved in; a lot of work, but a lot of fun, too.

"As I mentioned before, the cost of the first 10 boats was about $45 per boat. Major parts breakdown was as follows (all costs are approximate): winch, $22; sails, $4.50; brass fittings, $2.50; deck, $1; mast, $3; keel, $1; rigging, $1; miscellaneous (brass screws, eyelets, etc.), $5. The cost of the prototype was $90, including the hull mold and some of the supplies later used in the production boats, but we sold the prototype for $125, thus recouping our costs.

"We have named our boat the 'Fresno One-Design.' Some of the statistics are: length, 36 inches; beam, 9 1/8 inches; mast height, 4 feet; overall height, 5 feet 1 inch; weight, 10 1/2 pounds minimum; sail area, 600 square inches maximum. While we are not set up to go into mass production, I am sure we will be building quite a few more Fresno One-Designs in the coming months. Again, I am really surprised at the interest every time we sail.

"Well, I really didn't mean to write so much, but I think it is kind of unique that a bunch of guys could get together and come up with something really nice. This letter might sound like I am bragging, and I guess I am. I'm just proud of the whole project and wanted to share it."

I think Rob has every reason to be proud, and is justified in doing a bit of bragging. The group has encountered and overcome any number of reasons to just say "it's too much for us to do," and kept on going! Whether by luck or by design, they picked on a size and configuration that, in my opinion, can only become more and more popular in the years to come. With smaller cars and smaller living quarters (*and* lower ceilings) now starting to show up for reasons we all know, the 36" size is great; small enough for easy transport and storage, but big enough to allow substantial building. Rob's original letter was written in early 1979, and since that time they lost their lake because the city prohibits swimming and was afraid that the group would swim to rescue a disabled boat. Others, so the decision went, might see them doing this and be encouraged to swim also. But Rob's group only went down for an eight count, since they started out to build an electric-powered RC rescue boat from a spare Fresno hull, suitably modified (we have one of these in my club, too, and I'll do a piece on it soon). So now they can use the lake again and all is well. This was another opportunity for them to throw up their hands and surrender, but they didn't, and I guess (I hope) this is the kind of spirit that the hobby will see more of. And the group still flies sailplanes, too.

I hope there is something in Rob's letter that you can use or benefit from. His address is 4471 E. San Gabriel, Fresno, CA 93726, and although he has not said that any of his material is available, I guess he'd at least answer letters, if you send along a self-addressed stamped envelope.

I'd like to do more of this kind of thing if you'd be interested. It could be a letter about your group's accomplishments, or, if I happen to get a question that I think would be of general interest, I'll include it here—but it's really up to you, since I can't publish what I don't get!

Would you be interested in swapping club patches/pins? I have some from my club and am thinking of putting together a display; I'd exchange one of mine for one of yours—but, of course, I only need one from any model yacht club. When I run out, I'll have to stop, but will return whatever I can't exchange. As usual, my address is 7628 Dunston St., Springfield, VA 22151.

And AMYA's address is: Barbara Maire, AMYA ExecSec, 2716 Briarwood Dr. W., Arlington Heights, IL 60005—$10 for an individual membership, $12.50 for a family living at one address. Good Sailing!

Greece City Xanthi by Night

Old City Xanthi Street

Old City Xanthi House

Xanthi Central Square

Xanthi Lake Vistonida

Xanthi River Nestos

Xanthi Old House M.Xatzidakis

Hisat * H.E * Plans