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R/C MODELER

This Month's Cover

A breathtaking shot taken near Oahu's Blow Hole serves to enhance Chuck Cunningham's Miss Texas as displayed by Miss Sharlyene Kushiyama of Honolulu. Power is O.S. .90 with Mac's muffler turning a Zinger 14/5 prop. Radio is a 6 channel Proline and plane is finished in MonoKote. Fujichrome transparency by James S. Miura.

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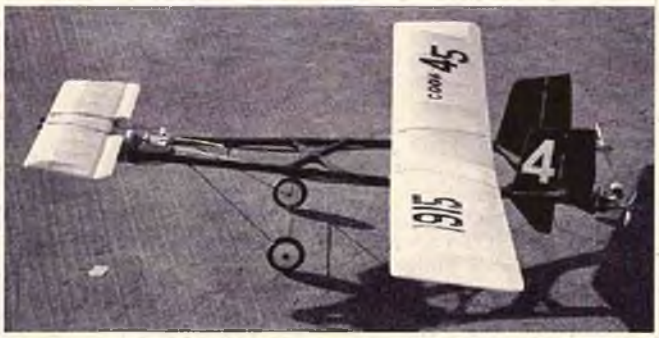
FROM THE SHOP

Don Dewey

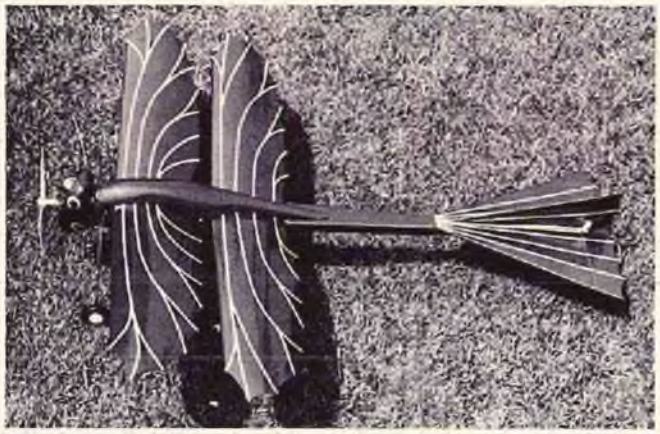
AERODYNAMICS! Hot dog, all of us who get involved with flying machines also get involved with aerodynamics. All we have to do is to mention the word in print and we get letters. It has to be the most controversial subject in aeromodeling.

In our September 1980 issue, Ken Willard mentioned the Star Cobra (feature article Dec. '80) in his Sunday Flier column and asked why the canard configuration enjoyed such a great reputation yet was seldom seen in either the full size aircraft or the model world. The response has been tremendous and Ken devotes his column to the subject this month.



RCM's R/C version of the 1915 Cook Riser 45 twin pusher, a very stable and efficient canard configuration.

No way am I going to get involved in Ken's dilemma, but I must mention that our staff and a good number of our readers have enjoyed flying models of unusual designs. In the canard category we conned Jack Headley into working up a construction article on an R/C version of the 1915 record breaking Cook Riser twin pusher. It is a strange looking machine, to say the least, but it sure flies like a good thing. The construction article appeared in our June 1979 issue. If you are interested, the plans (#766) are still available. Mr. Bill Rauch, Crofton, Maryland, was so impressed with the small one that he doubled the plan size, built one with a 98" wingspan and, after solving a few structural problems, has reported many enjoyable flights with this twin engine canard.



The Dickie Bug is an interesting application of a cascaded tandem wing design.

Ken's column also has words about cascaded tandem wing aircraft. Dick Tichenor did a construction article in our November 1976 issue that he called the Dickie Bug, (plan #664). That silly looking project was a joy to fly; in fact, several of our friends would borrow it to fly demos at various contests including sailplane meets. Spectator reaction was unreal, even while watching it buzz around the sky we could hear remarks like, "I see it but I don't believe it." It reminded us of the old saw about the bumble bee — theoretically it is impossible for the bumble bee to fly but he doesn't know it and goes ahead and does it anyway.

Well, Tichenor has done it again, he has doubled the dimensions and has a twice size Dickie Bug almost ready to fly. Would you believe over 1200 square inches of wing area? Weird!

Somewhat in the line with the approach used by George Privateer of the STARS, I am waiting for one of our guys to come up with a real flop in an original design so that I can name it AEPYORNIS. George, old buddy, look that one up in your Webster.

★

Our crew who attended the recent Tournament of Champions in Las Vegas had the opportunity to examine the complete line of merchandise that is being marketed by Circus Hobbies. They had already seen the JR radios at several trade shows last year and as good as they are, the radios were not new to them. Their excitement was over the IM Products kits and accessories. Quality and completeness is the name of the game and the prices are competitive. They quoted Jerry Nelson as saying that his boss will only allow the best, forget anything less. Also shown was the impressive Irvine Engines which are new to the American market. You will be able to see all these goodies for yourself very soon at your hobby dealers and at the upcoming trade shows.

★

A matter of pride. We spend a tremendous amount of time in building our model and when we show it to the world we are proud. When we put it through its paces in the air, controlled by our talent with the transmitter, again we are proud. And, too frequently, we are annoyed by the stigma of the toy image that a lot of people associate with the modeling activity.

Occasionally something occurs that causes us to stand a bit taller and to feel as proud as a peacock. Just recently we experienced such an occurrence when we received the following announcement from the world renowned Smithsonian Institute. Would you believe a six day seminar on model aircraft?

Smithsonian National Associate Program
Model Airplanes: Then and Now
February 22-27, 1981

There has been a revolution in model airplanes perhaps as great as the revolution in real aircraft, changing over the last fifty years from rather crude bamboo and wire approximations to scientifically detailed replicas of the real thing.

Come to the central point in the world for aviation fans, the National Air and Space Museum, to discover what an attractive, dynamic subject aeromodeling has become, and what an industry it has spawned. Lectures by the foremost talents in every aspect of aeromodeling, most of whom started model building as a hobby which led to professional involvements, will be supplemented by tours of both the Museum facility and the fabled Paul E. Garber Facility at Silver Hill, where the Museum's collection of model aircraft and model engines, most of an extraordinary, truly "museum quality," will be available for viewing.

The sessions on technique by the experts are augmented by reminiscences on the early aero-clubs by Paul E. Garber himself, the grand old man of modeling and Historian Emeritus of the Museum.

The whole panorama of model aviation, from the folded paper darts to modern "Quarter Scale" is covered with an abundance of film clips, slides, photos, and actual models by a unique team gathered together for the first time. The seminar is in response to incessant requests for professional coverage of the subject, and derives in large part from the tremendously successful aviation programs given in the past at NASM.

The whole wide ranging, rapidly changing panorama of radio control modeling will be assessed in a detailed manner. Dr. Walter

to page 197

SUNDAY FLIER

Ken Willard

The Case of the Curious Canard --- Or, the Canard Conundrum.

In the September issue of RCM I published a photo of the Star Cobra, a double delta canard configuration. Many of you wrote in for plans, and they were published (December RCM). However, I also requested input from aerodynamicists who might be able to enlighten all of us regarding canard performance. In brief, I asked the question, "Why, if canards are as efficient as their proponents claim, aren't there more of them?"

Although many of you wrote in, most of you included a sort of "disclaimer" that you weren't acrodynamicists, but gave your reasons why you thought canards were not really in the mainstream. Here are some of the letters.

First a letter from Ed Cameron, of San Jose, California.

Mr. Ken Willard,

I am not an aeronautical engineer, but I thought that I should respond to your question regarding canard versus conventional designs in the September column. I recently did some research on the history of canard airplanes for a class at San Jose State University. My major is in computers, but I have worked for thirteen years studying aerodynamic missiles and their performance. And, many of the missiles were canard designs.

Before the turn of the century, gliders with both canard and conventional configurations were successful. But, in 1896, Samuel P. Langley flew a steam powered model. The model had tandem five-foot wings and horizontal and vertical rudders behind. Langley failed to fly his man-carrying version, though he tried several times before the Wrights started to actively pursue their quest for the sky.

The flight of the Wright Flyer at Kill Devil Hills, near Kitty Hawk Bay, on December 17, 1903, set a short-lived trend, which made the canard design successful for about seven years. Whether the Luis Bleriot design --- a monoplane with tail feathers that crossed the English Channel in July, 1909 --- caused the Wrights to build the Model B, or not, is not certain. But, in September, 1909, Orville wrote to Wilbur, "The difficulty in handling our machine is due to the rudder (i.e., elevator) being in front, which makes it hard to keep on a level course . . . I do not think it is necessary to lengthen the machine, but to simply put the rudder behind instead of before." (The Wright Brothers by Charles H. Gibbs-Smith, p.26.) In 1910, the Wright Brothers produced the Model B, without a forward elevator. In 1911, Galbraith P. Rogers made his way from New York to California in a Model B. The canard design was thus relegated to museum status.

In 1943, Captain Masaoki Tsuruno, technical officer for the Japanese Navy, introduced a canard design as a solution to the need for a high-performance fighter. The Navy was so impressed that the Nakajima and Kyushu aircraft plants were ordered to start production of 150 planes per month. But, the "Shinden," or "Magnificent Thunderbolt," was to make only one flight, just 12 days before Japan surrendered. The new design --- the only canard airplane to be ordered for production in WW II --- never saw combat, and remained unproven.

With war over, the Mikoyan-Gurevich team of the Soviet Union produced the "Utka," or "Duck," a small civilian airplane. Like many of the canard designs which preceded the Mig UTKA, it was not easy to control, requiring constant pilot attention. It did not find acceptance with civilian aviators and faded away like others.

The canard airplane is more than a fascination. With today's computers to iron out the bumps, canards have begun to appear in civil, military, and private sectors. In the civil sector, the Russian TU-144 SST, the English LDA-01 Land Development Aircraft, and a new light business entry from the United States, the OMAC-I; In the military sector, the SAAB37 Viggen from Sweden, the KFIR-C2 "Young Lion" from Israel, and the newest designs from Grumman, Rockwell, and others bidding for a new fighter contract; and, in the private sector, the VariViggen, VariEze, and Long-EZ from the Rutan brothers all employ the latest aerodynamic wizardry to attain efficiency, maneuverability, and high-performance. The magic comes from the fact that these airplanes all fly tail-first --- they are canard airplanes.

Ed Cameron
San Jose, California

Ed doesn't attempt to explain the canard, but I found his brief history of the configuration very enlightening.

Ed skipped from the early designs to the period of the early 1940's. In-between, there were several developments.

One of the most interesting was the DeLanne "Duo-Monoplane." Although not really a canard, DeLanne did have the "tandem wing" concept, similar in many respects to the Star Cobra. A letter from Richard Sprague, Livonia, Michigan, discussed the design features.

Dear Ken,

I had to write you a few words on your bit on the delta wing canard with the 20 ducted fan, by Williamson and Bridges.

The 7 to 1 speed range that they have on their model is, in part, due to the slot effect from the front wing which reinforces the flow over the back wing. This concept was used in the 1930's by a Frenchman DeLanne.

His full size aircraft also had a 7 to 1 range; 195 mph top speed and landed around 38 mph.

Enclosed is an article from Air Trails

to page 195

CUNNINGHAM ON R/C

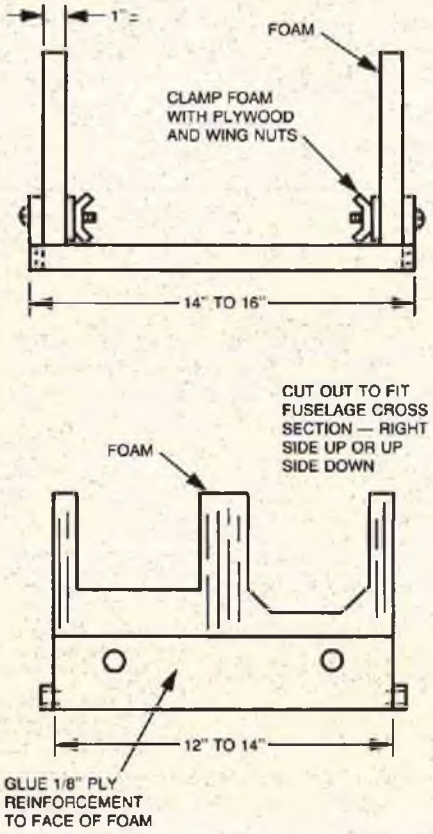
Chuck Cunningham

Well, once again, I screwed up. This time I had a chance to take some pictures that would really be interesting and --- guess what --- I had my camera, but all it had in it were four more color slide shots. I can't show you the pictures that I would really like to but let me tell you about it anyway.

Jan and I were on the last day of our vacation and had been trying to find, with only pockets of luck, RC interest in Austria, Italy, and Frankfurt, West Germany. Naturally, most of our time was spent looking at beautiful ruins, art, fascinating cities, good places to eat and such, but each time that we had a chance we would stop and look for a hobby shop. On our last afternoon we were wandering around Frankfurt and heard the sound of model engines. We found out that the entire city closes down at 2 p.m. on Saturday afternoon, so after walking around for several miles and finally finding something to eat at a celebration area set up to pay tribute to the Frankfurt' Opera Houses 100th Anniversary, we decided to track down the model engines.

Darned if we didn't wander into Frankfurt's Model Trade Show. Naturally we went in to see what German modelers are doing, and what German modelers are doing is the same as what we're doing --- they're building big models. The show was just about evenly divided between aircraft and boats. Multi engined airliners are really big (pun intended) there. A beautiful model of a Super Constellation was parked near the entrance, with what appeared to be about a 16' wing span and a fuselage length of about 12'. It was of all fiberglass and foam construction, and the builder was laying up another glass fuselage on a nearby table.

Many other large aircraft were spotted about the hall but the sight of two groups made my fingers itch for some black and white film so that I could show some of them to you. A scale glider of a pre-war type soaring aircraft was parked in one area, with a wingspan of 20'. You could put a medium sized kid in the cockpit of that yellow bird. Just beyond were two almost finished models, each 1/2 size. The first was a Fokker Triplane, with the top of the top wing just about 5' from the floor with 12" to 14" spoke wheels. Next to it was parked a 1/2 size Fokker E-III Eindecker, standing almost 40" high, not quite completed but, again, with the large spoked wheels. Engines that were on display were also interesting, among them was a Wankle-type gas engine with 110cc displacement. Keep in mind that the popular Quadra has a displacement of 34cc. Several other engines were evident --- a twin with a displacement of 80cc and a beautiful engine that had a recoil starter rope mounted on the rear of the engine, completely enclosed in a metal housing. This made me wonder why some enterprising machinist doesn't make a recoil starter to mount on the rear shaft of the Quadra. It sure would save wear and tear on the hands.



MAKE BASIC FRAME LARGE ENOUGH TO ACCOMODATE LARGEST MODELS — THEN MAKE SEVERAL FOAM INSERTS (CUT OUT WITH JIG SAW) ONE INSERT FOR EACH MODEL.

UNIVERSAL WORK CRADLE

The boat models were simply fantastic, and really got me interested in this phase of modeling. The models were, for the most part, very large, with tugboat types and military destroyers and cruisers everywhere. Generally the length of these ships was over 6'. Power is provided by large chain saw type engines. There was a large plastic swimming pool set up, about 30' in diameter, and the boats were running about this pond. One large, very terrific looking tug about 6' in length was churning about this mini-lake with great ease, its muffled chain saw engine hardly able to be heard. The largest boat model at the show was a model of an ocean liner, with a length of just about 16', so large that it had to be transported on a specially constructed trailer, and needed a winch to lift it into the water.

My problems were two-fold. First, I could not find anyone who spoke much English and, second, I could not find anyone who had any black and white film that I could purchase since all of the stores in the city were closed.

We did have a great time for a couple of hours just wandering around, trying to talk to modelers and exhibitors, without much result. The next time that I travel, I'll always keep a roll of black and white handy so that I won't miss out again.

We had another stroke of blind luck, this time in Italy, when we managed upon the offices of Italy's only model magazine, Modellistica, which has been published for 25 years. The Managing Director is Vittorugo Chiodo. We managed a couple of hours of conversation via an interesting translation by his pretty and vivacious secretary, Monika. She spoke some English, but my Texas drawl was confusing to her, so what I wanted to say to Victor I said to my wife Jan, who, in turn, told Monika. Jan's much clearer English enabled Monika to tell Victor in Italian what I had to say. Makes it a bit hard to carry on a conversation, but it was fun and we had a great time. Victor introduced us to Benito Bertolani who is the Italian pattern champ. Benito was leaving in just a few days to compete in the Las Vegas Tournament of Champions. Benito said that if I thought that it was a bit tough trying to wander around Italy not speaking any of the language, try wandering around the US not knowing any English. He's got a point there. Everywhere that we have been in Europe we can find someone who speaks a little English, even some Texan. Benito puts out a kit line and an accessory line known as BB Models, and has a really terrific line of retracts. If anyone is interested in importing the BB line, let me know and I will give you his address.

It's just as much fun trying to talk RC to a modeler who doesn't understand your language as it is hanging out at the local hobby shop or flying field. The common language is RC, and this unites us all.

★★★

The other day I was out in my garage doing some repair work on my new aircraft, Miss Fort Worth. My large plywood work table was full of junk and clutter, so I set Miss Fort Worth down on top of a tall padded stool that I sometimes sit on. I went

to page 184

FLYING LOWE

Don Lowe

Last time we talked a bit about our preparation for the 1980 Las Vegas Circus Circus Tournament of Champions competition. Well, the 1980 event is history now and the results in terms of winners are very similar to T.O.C. results in previous years. We discussed the special airplane requirements and full scale aerobatic competition type patterns flown. As it turns out, regardless of the fact of difficult aircraft requirements, only a few aircraft problems were evident in the actual competition. This is undoubtedly a tribute to the skill and careful preparation of the competitors and their supporters. I seemed to have more than my share of problems with radio problems with my number one ship and two flameouts in my backup ship.

The hot combination in propulsion proved to be the twin engine geared (2:1) .60's set-up that four of the five finalists used. In fact, every geared twin engine made the finals. Obviously, the engine system was an important reason for these people making the finals, however, they also had to fly extremely well to get the job done! The Webra twin .60 arrangement was flown by Wolfgang Matt (3rd), Gunter Hoppe (4th) and Jeff Tracy (5th). The perennial winner, Hanno Prettner, flew his own version of the twin .60 geared set-up. Matt, Hoppe and Tracy all told me of the great developmental difficulty in getting the system to work and it proved to be a last minute choice of gears that did it. Wolfgang informs me that Webra will, in all probability, market the twin engine set-up.

The impressive thing about the two engine arrangement is the use of standard pattern engines (right hand rotation) operating at standard rpm's. The thrust available with the 20/10 prop was phenomenal. It permitted these flyers to execute very clean vertical maneuvers with rather large ships (16 + pounds).

Propulsion systems used by others ranged from a direct drive .90 used by Phil Kraft and J. Brink, and a Quadra used by Toni Bonetti, as well as a Y.S. 120 by Matsui, to belt drive systems (Cline drive) used by Dave Brown, myself, Mark Radcliff, and several others. In fact, Jim Cline's unit was the most popular system there. As it developed, a single .90 on this unit had to work very hard to develop the needed thrust for really good vertical performance. Several used modified engines to get this performance. A little tabulation at this point may be of interest: (See chart).

It's interesting to note that over half the flyers used Jim Cline's "Master Climb" 2:1 belt drive unit. The system worked very well and it's quite remarkable that even though the unit was designed for a .60, it has been used with Rossi .90's with about twice the horsepower. Typically, the system with a stock Webra or O.S. .90 will turn an 18/10 Top Flite prop about 6800 rpm. My modified O.S. .90 turned close to 7500 rpm static. This is a significant increase in horsepower. Unfortunately, you don't get this without penalty. The engine must be set up very carefully to prevent piston and ring damage. The engine mixture must be carefully set to prevent lean runs. In fact, I wouldn't advise operating one of these units without an inflight mixture control. My engine was tached in the air at 17,500 to 18,000 rpm! The Rossi set-ups were tached at over 20,000! I would not advise the average modeler to operate engines in this fashion, since it's very easy to damage things! The stock O.S. or Webra/Cline Drive system will fly 15-16 pound airplanes very well for normal flying without the danger of costly engine damage. The engine/drive unit development that we went through is a story in itself and, hopefully, I can tell you more about it in future columns. Suffice it to say that it wasn't easy. The Rossi .90 combination was especially difficult and seems to match results experienced by others around the world using this very powerful engine.

The biggest difficulty that most of us had with the Rossi was configuring a fuel system that would work reliably. We literally went through hell solving this problem and Jim Cline and I are still trying some things. Essentially what this engine needs is a pump / regulator / carburetor system that will handle the operating frequency and flow volume. It's also apparent that it would be desirable to isolate the tank and vent system from the tuned pipe since we encountered conditions of reverse fuel flow from the tank into the pipe and **into the engine** under certain conditions with resultant flameout.

The quality of flying at this competition was, on the average, good. It was apparent, however, that proficiency was influenced by the numerous patterns that we had to master (7). It's interesting to note that all finalists earned one or more zeros in their first finals known pattern due to mistakes; even Prettner the perennial winner! It was also apparent that Hanno was extremely well prepared with much evidence of a very professional aircraft/control system/engine set-up. Jeff Tracy told me that he (Jeff) had worked for over a year intensively preparing for the event and hadn't once flown the finals known pattern prior to competition! It's also very obvious that to ever beat Hanno in this competition one must be willing to expend the effort necessary to be at least equally well prepared! Jeff joked that with the money he won at the competition he is now only $60,000 in the hole! Seriously, however, the level of competition at the T.O.C. now demands preparation equal to any highly competitive mature sport; in my estimation equal to an Olympic event. Phil Kraft told me that he burned over 50 gallons of fuel preparing for the event. If I'm invited to return in '82 I think that I will retire from my job and spend full time at it! Take that Hanno! Now aren't you worried?

There is no question but what the T.O.C. has fostered a very accelerated pace in aircraft, equipment and propulsion development. We who participated have learned a lot in aircraft design and lightweight structures development,

to page 183

	ENGINE	AIRCRAFT
H. Pettner	Twin Webra 60's	Dalotel
D. Brown	OS 90/Cline Drive	Ulery Laser 200
W. Matt	Twin Webra 60's	Ulery Laser 200
Gunter Hoppe	Twin Webra 60's	Cap 21
Jeff Tracy	Twin Webra 60's	Cap 20
M. Radcliff	OS 90/Cline Drive	Ulery Laser 200
I. Kristensen	Twin O.S. 60's/Cass Drive	Laser 200 (Mallory)
D. Lowe	OS 90/Cline Drive	Ulery Laser 200
D. Weitz	Webra 90/Cline Drive	Dalotel
D. Koger	Rossi 90/Cline Drive	Ulery Laser 200
P. Kraft	Webra 90	Zlin 526
R. Brand	Webra 90/Cline Drive	Dalotel
S. Helms	Webra 90/Cline Drive	Dalotel
T. Bonetti	Quadra	Cap 20
I. Matsui	YS 120	Laser 200
R. Gilman	Webra 90/Cline Drive	Dalotel
J. Brink	Webra 90	Zlin
L. Castaneda	Rossi 90/Cline Drive	Dalotel
S. Rojecki (Demo Pilot)	Rossi 90/Cline Drive	Zlin 526

SUPER DUPER

By Noel L. Rozelle

Photos By David Lowell

The Super Duper Joy Stick is built from standard size balsa and although some splicing is necessary on the fuselage sides, I prefer this to buying 4' wood and having a lot of scrap left over.

If you have built any of the planes I have designed, the 1/2A Hornet, Super Joy Stick and Joy Stick, you will find that I follow the same basic theme in my designs and building techniques — simplicity and strength.

The Super Duper Joy Stick came about because I received many requests for a larger version of the Super Joy Stick, which is built for .25 engines and is an outstanding fun-fly and sport model. Unfortunately, some of the old timers are hung up on .60 size aircraft and won't fool with anything smaller. After blowing up the Joy Stick to the same size as an Ugly Stick and beefing it up to handle the extra loads, I built the first prototype and realized why they like big models better. There was no problem trying to jam all the radio gear in since there was loads of room; in fact, the one I just completed has an extra 12 ounce tank in it for smoke. Sixty size engines are also a welcome change from the smaller ones which can sometimes be a little temperamental. As for flight characteristics, big planes definitely fly better. The wind doesn't affect them as much and they can be seen at a greater distance. They also land a good deal slower because the wing loadings are usually much lighter.

Some of the comments that prompted this model came from die-hard Ugly Stick and Contender fliers. The comparisons they made to these great old standards were very favorable toward my Super Duper. They went like this: "It is as stable a low wing airplane as you will ever fly and it's great for a novice flier's transition from a trainer to a full-house aircraft." "In fun flys it is almost unbeatable, as it will take a pretty good bash without being put out of commission and it is extremely maneuverable and precise for spot landing and limbo type events."

It is even a great model for breaking into pattern. I'm not putting it into a class with pattern planes because it's not, but for pre-novice through advanced class it is far better than a lot of planes the novices choose to fly and much more forgiving.

I could have written that the Super Duper won the Masters class at the Albuquerque pattern meet last summer and it did, but it was the only entry in that class so, although it performed all the maneuvers well and turned in a fair score, there was no competition, so you can see how rumors get started. The Super Duper did, however, turn in very respectable scores in pre-novice, novice and advanced, against some good competition.

Where the Super Duper really comes into its own is in the hands of a Sunday flier, or at fun fly events.

A group of guys I fly with have been covering a lot of contests in the southwest and we fly the .25 size Joy Sticks, only we use .40 size engines in them. They are almost unbeatable in most of the fun fly events. They have all the power and maneuverability you could ever ask for in a fun fly type plane. Although the .60 size doesn't have the awesome vertical performance of the .40's, it is every bit as quick to land in a musical pylon contest and as precise an airplane as you could ever want in a blackjack or spot landing contest. We've flown in a lot of contests and the only thing that will consistently beat a Super Duper Joy Stick is another Super Duper Joy Stick.

So let's start building. First, as always, familiarize yourself with the plans. It's so much easier than going back and saying to yourself, "Oh, so that's how it's supposed to go."

As I mentioned earlier, you may not like some things in the construction — specifically, the wings are rubber banded on, but that's my own preference. You can use hardwood wing hold-downs and nylon screws if you wish. Also I'm sort of a frugal person and I don't mind splicing a chunk of balsa here and there. The rear end of the fuselage is spliced and the longerons are spliced. The reason for doing this is just to keep from using 4' lengths of wood which come at a premium price and are sometimes hard to find at your local hobby store. If you wish to use 4' wood, please be my guest. Now that this is settled, let's start building.

CONSTRUCTION

Fuselage:

(1) Cut the fuselage sides and bottom sheet from 3/16" x 4" x 3' balsa. (See Photo #1, layout.)

(2) Splice the tail end onto the fuselage halves. This joint does not have to be very strong because the longerons will be spliced at a different location. (See Photo #2.)

(3) Now after cutting the **crossgrain** doublers from 1/8" x 3" x 36" balsa, glue or epoxy them in place on the insides of both fuselage halves. (See Photo #2.)

to page 18

JOY STICK

SUPER DUPER JOY STICK
Designed By: Noel L. Rozelle

TYPE AIRCRAFT
Sport/Fun/Pattern Trainer
WINGSPAN
61 Inches
WING CHORD
12 Inches
TOTAL WING AREA
720 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1¼ Inch
O.A. FUSELAGE LENGTH
48" (Incl. Spinner)
RADIO COMPARTMENT AREA
(L)11" x (W)3 ' x (H)3"
STABILIZER SPAN
21⅜ Inches
STABILIZER CHORD (Incl. elev.)
6" Average
STABILIZER AREA
123 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7¼ Inches
VERTICAL FIN WIDTH (Incl. rud.)
6½" (Avg.)
REC. ENGINE SIZE
45-.61 Cu. In.
FUEL TANK SIZE
12-16 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail., Throt.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Balsa and Hardwood
Empennage ..... Balsa
Wt. Ready To Fly ..... 88-96 Oz.
Wing Loading .....17.6-19.2 Oz./Sq. Ft.

Daughter Stacy showing off dad's Super Duper Joy Stick. Photo by Bill Laskar.

Any of you modelers who have built Noel's Joy Stick will welcome this .60 size version. It does all the good things the smaller one's do, only it does them easier and better.

(4) Next, glue and pin the 1/2" triangle stock longerons to the **inside top** of the fuselage sides (see section A-A on plans). Make one right side and one left side.

(5) Next, glue the bottom longerons in place. The front lower longerons are glued on top of the crossgrain doublers.

(6) Cut out the fuselage top sheet from a sheet of 3/8" x 4" x 36" balsa, and starting at the front, glue and pin the fuselage sides to the top sheet. (Check plans — the top sheet is not glued between the fuselage sides — it sits on top of them.)

(7) When the glue on top is dry, remove the pins from the top sheet and glue the rear bottom sheet in place after sanding any excess glue from the longeron joint. This assures a good fit.

(8) Next cut out the lower front fuselage sheet from 3/8" x 4" x 36" balsa and glue it in place.

(9) If you have cut all the parts neatly and accurately, the front end of the fuselage should be square and ready to accept the 1/4" ply firewall. Use a square to check the fuselage sides and bottom, using the top sheet for a reference. Sand where necessary and fit the firewall directly to the front of the fuselage and mark the top.

(10) Next, from the plans locate the thrust line and draw a line horizontally across the firewall; also draw a center line from top to bottom and place your engine mount on the firewall, center it on these lines and mark and drill the mounting holes. Place 6-32 blind nuts on the back side of the firewall and glue them in place. (See Photo #3.)

(11) After preparing the firewall for mounting, epoxy it in place on the front of the fuselage. Masking tape may be used to hold it in place while curing. Reinforce firewall backside with additional strips of 1/2" triangle stock (inside fuel tank compartment.)

(12) If you are going to use the wing dowels to hold the wing on, locate and drill the holes, then cut the 1/4" dowels and trial fit them but do not glue them in place at this time. This will make it easier to sand and cover the fuselage. You will notice the significance of the cross grain doublers now. They keep the dowels from splitting the fuselage sides when you make one of those unplanned hard landings out in the boonies. This type of construction can save some major repairs.

(13) Next, screw on the engine mount and mark and drill the nose gear hole. The hole should be far enough forward to allow clearance for the steering arm. If the arm you use interferes with the firewall, you can cut a small indentation in the firewall for clearance. Also at this time you can drill the holes for your steering cable and throttle cable in the firewall.

(14) Mount the engine, leaving plenty of room behind it for any plumbing from the fuel tank. After all, if you think of these things ahead of time you can avoid a problem further down the line.

(15) Install the 3" spinner onto the engine shaft to use for a guide for the cowl, then cut the cowl blocks from 3/8" balsa and fit them to the firewall and glue them in place.

(16) While the two side cowl blocks are drying, you can cut the bottom cowl blocks from 3/8" balsa, sand it to fit and glue it in place.

(17) Remove the spinner and engine and glue in the 1/2" triangle stock in the corners of the cowl and replace the engine with spinner and mark where the spinner ring will go and remove the engine again. (See Photo #4.)

(18) Cut the spinner ring from 1/16" ply, using the spinner as a template. Glue it in place and rough sand the cowl to blend in with the spinner. (See Photo #4.)

(19) Rough sand and contour the rest of the fuselage and don't be afraid to round the corners off. (Check cross-section on plans.) Rounding the corners well gets rid of unnecessary weight and takes away the boxy look of the fuselage.

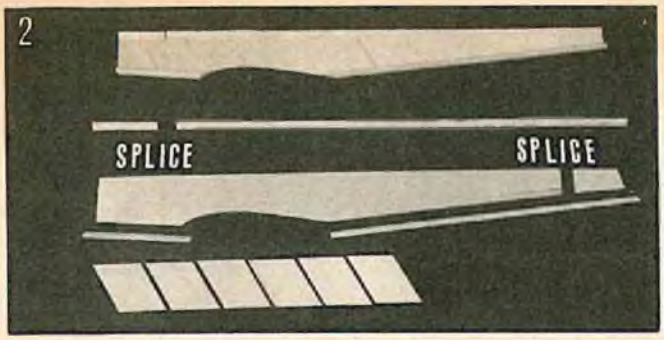
(20) The only other things that may be necessary to do to the fuselage before covering is to check the alignment of the wing and stab in relation to the thrust line. The thrust line, stab and wing should all be

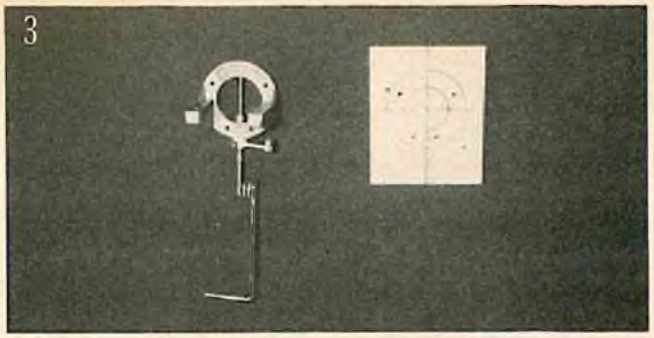
MATERIAL LIST AND CUTTING LAYOUT SHOWN IN PHOTO NO. 1

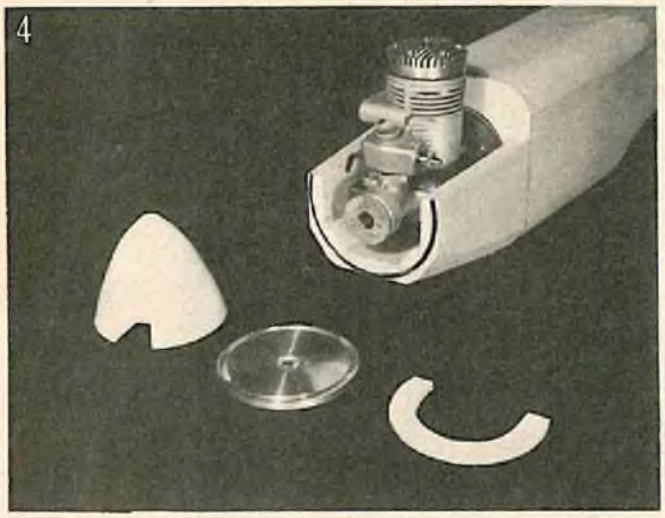
1 (4 req'd) 1/8" x 2" x 36" — wing trailing edge.
2 (1 req'd) 3/8" x 3" x 36" — elevator & two wing tips.
3 (1½ req'd) 1/8" x 3" x 36" — fuselage crossgrain doublers.
4 (2 req'd) 1/8" x 3" x 36" — center section ribs & center sheeting.
5 (5 req'd) 1/8" x 3" x 36" — main ribs & center sheeting.
6 (1 req'd) 3/8" x 4" x 36" — vertical & horizontal stab & lower front fuselage block.
7 (1 req'd) 3/16" x 4" x 36" — lower rear fuselage sheet & rear fuselage add-ons.
8 (1 req'd) 3/8" x 4" x 36" — cowl blocks, rudder & dorsal fin.
9 (1 req'd) 3/8" x 4" x 36" — fuselage top sheet.
#10 (2 req'd) 3/16" x 4" x 36" — fuselage sides.

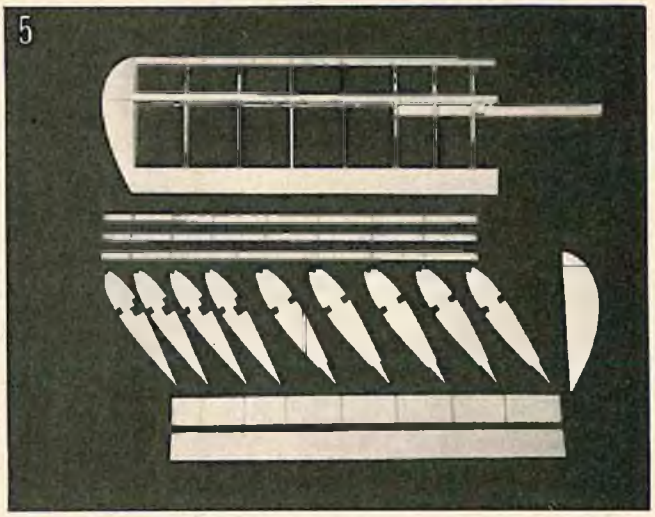
NOT SHOWN IN PHOTO

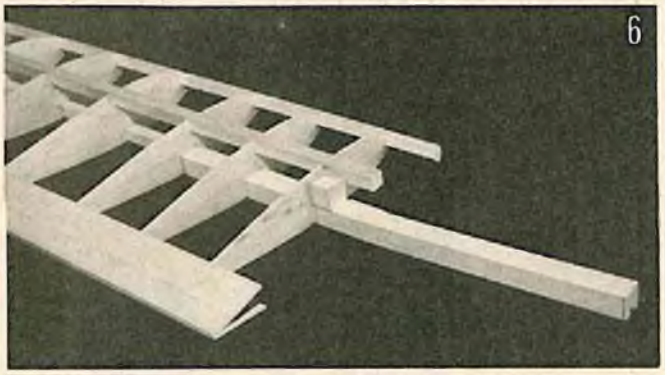
2 pieces of 3/8" x 1½" x 36" tapered trailing edge stock for ailerons.
5 pieces of 1/2" x 36" triangle for longerons on fuselage corners.
6 pieces of 1/2" sq. x 36" for wing spars and leading edge.
2 pieces of 5/32" music wire for gears.
1/4" ply for firewall.
1/16" ply for spinner ring.
1/4 dowel rod for wing hold-down and a piece of 3/4" x 2" x 24" basswood, pine or any semi-hardwood for the landing gear brace and blocks. Use your favorite brands for hinges, horns and all other hardware.

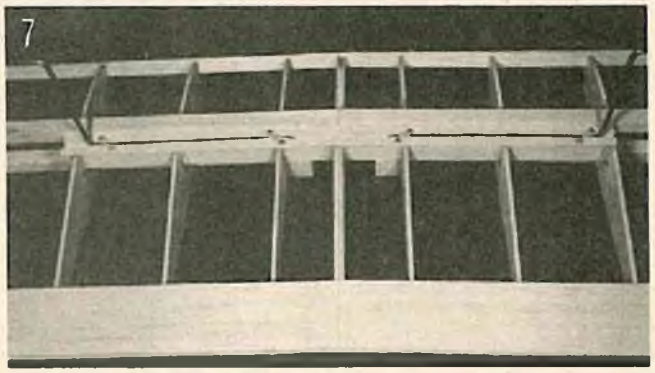


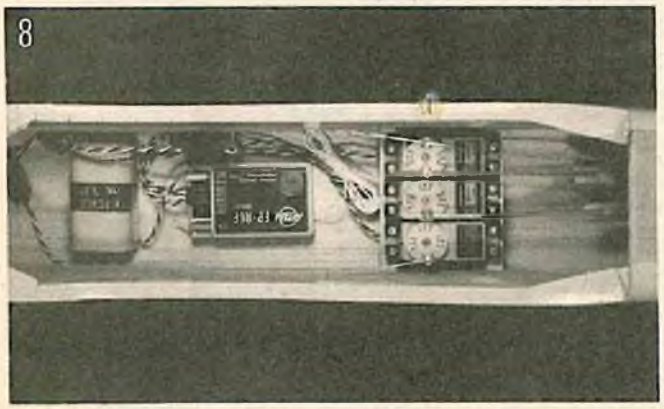












(Photo #2) Fuselage side detail & splicing.
(Photo #3) Engine mount & firewall detail.
(Photo #4) Shaping the nose to the spinner.
(Photo #5) Completed panel & parts for other one.
(Photo #6) Gear support block in place.
(Photo #7) Landing gear installed.
(Photo #8) Uncongested radio installation.

zero degrees incidence to each other and of course the wing and stab should be parallel. Sand the wing saddle to fit the wing after it is built and when everything is fitted and aligned, final sand and cover the fuselage with your choice of film covering or finishing material.

Wing Construction:

(1) Cut ribs, trailing edge, center planking and wing tips after checking layout (Photo #1) and cut spars, leading edge and center brace from patterns on the plans.

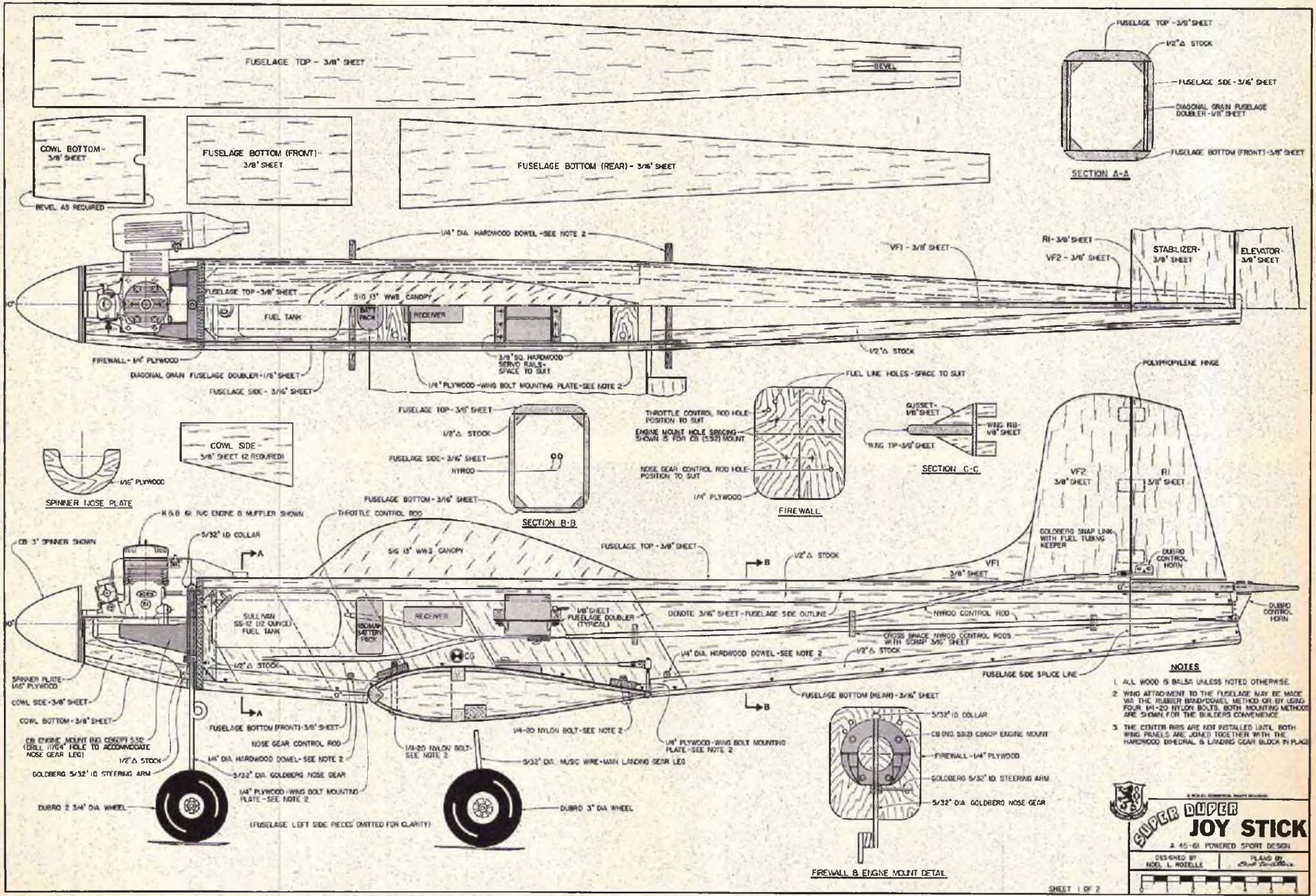
(2) Pin the trailing edge to the plans on top of a flat building surface and place a scrap piece of 1/4" square under the lower spar to elevate it to the proper height to accept the ribs.

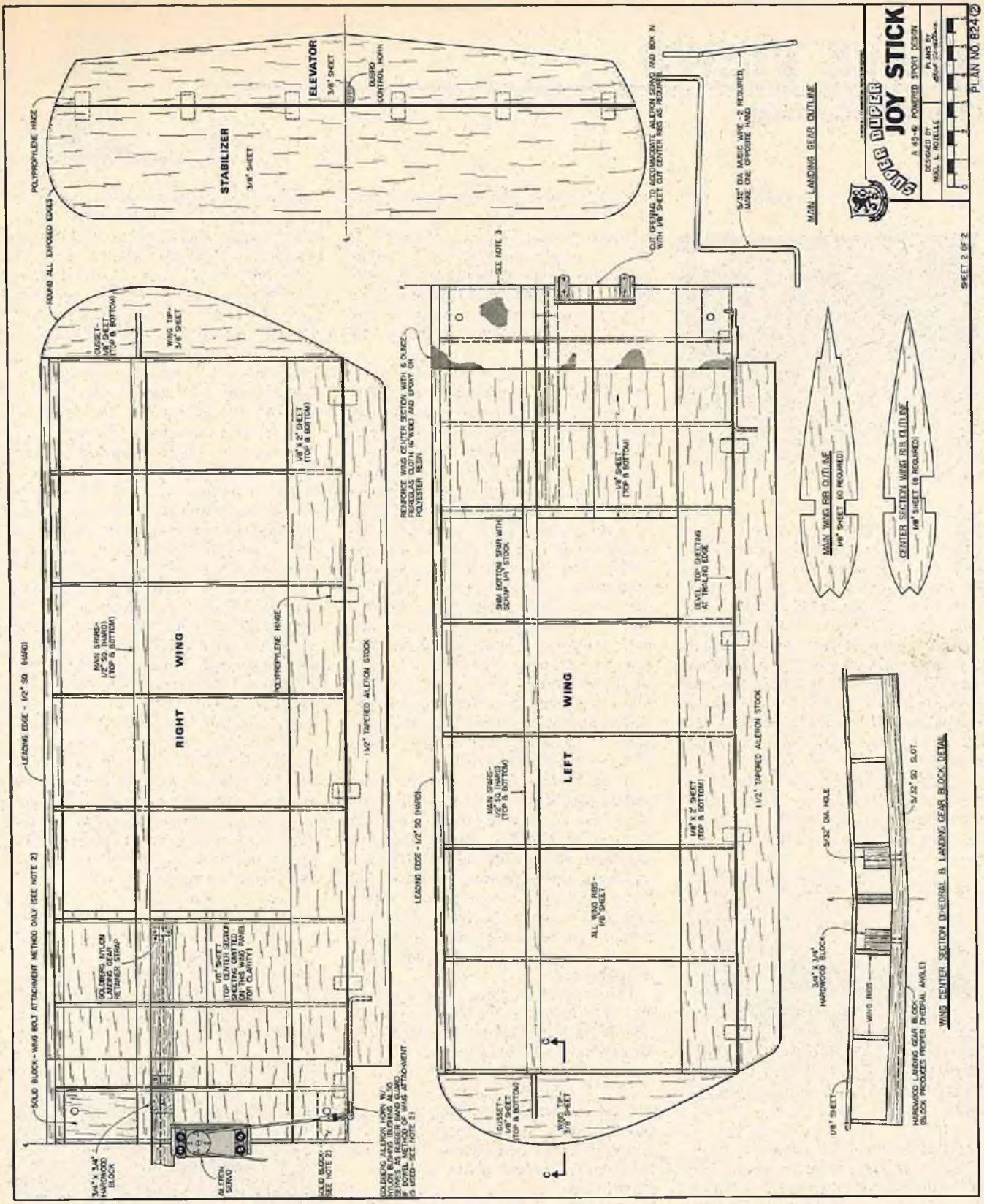
(3) After propping up the spar, place all the ribs in place except the center rib and glue and pin them, remembering to check for squareness with a small modeling square.

(4) When all ribs are dry, remove pins and place top spar in place and glue and pin it.

(5) Slightly bevel the rear of the top trailing edge to make a good glue joint

FULL SIZE PLANS AVAILABLE — SEE PAGE 190





where the two trailing edge pieces come together and glue it in place.

(6) Next, glue and pin the leading edge in place and when dry, remove the wing from the building board.

(7) Repeat steps 1 through 6 to build the second wing half, referring to Photo #5 if you have any questions.

(8) After cutting out and notching the center brace, fit and glue it in place on one half of the wing using epoxy. See Photo #6 for center section detail.

(9) Next, epoxy the gear support block in place on the inside of rib #2 as shown in Photo #6.

(10) Fit the second wing half in place, trimming where necessary for a good fit and, when this is done, slide the two remaining center ribs in place on the half of the wing the gear brace is glued to. Join the two halves with epoxy, then slide the two center ribs into place and glue and pin them in place until dry. If both wings have been built accurately, the wing will be straight if joined carefully and the proper dihedral angle will be formed by the center brace.

to page 174

SCALE VIEWS

Claude McCullough

More On "Able Mable"

Able Mable is second from left, just behind the Skyraider.

In the April 1980 Scale Views I reported on the Martin AM-1 Mauler on display at the Naval Air Museum and made the rash statement that I thought it might be the last surviving example. I was soon straightened out. Mike Rounds (Westmont, Illinois) sent along a picture of the Mauler on outdoor display in Pensacola at the NAM and said he had heard that there was another one at the Bradley Air Museum in Windsor Locks, Connecticut. Then Ken Brown (Coos Bay, Oregon) who is building a Mauler, sent along a set of photos of the Confederate Air Force's AM-1. Ken made a trip to Texas to take them. The subject is being restored and probably will be displayed before long with a fresh paint job.

The CAF AM-1 is being restored to flying status.

I called the Naval Air Museum to check on the current status of their aircraft. They told me that due to vandals and the weather, it had become necessary to move most of the outside display into storage. The high salt content of the Pensacola air is a natural phenomenon that can't be changed but what can you say for creeps who deliberately destroy historical treasures. Unfortunately, this means that the NAM Mauler is no longer available to the public and will not be until proper indoor space can be built in the future. I had quite a time getting the Museum's phone number, starting with the wrong Pensacola area code in my phone book's listing and being given two wrong numbers by the information operator, one for an irate lady who made me promise to call the phone company and make them quit bothering her with Museum phone calls. So if you want to call for information on aircraft on display indoors or other information, try (904) 452-3604.

The Bradley Air Museum was badly damaged by a freak tornado in the fall of 1979 and 23 of their aircraft were destroyed. A call to Museum Director Phil O'Keefe (203-623-3305), who turned out to have a model building and RC background, brought the welcome news that the Mauler was being restored and will, in due course, be put on display. In the meantime, arrangements can be made to see and photograph it by payment of a reasonable Special Access hourly fee for the required escort. The regular Museum collection is open at 10 a.m., 7 days a week. Admission is $2.00 for adults, $1.00 for children. You can see a Spitfire XIV, Corsair, P-47 Thunderbolt and a Spanish Airforce HA1112 among others. New donations of aircraft are rapidly replacing those lost in the storm. It's at Bradley International, 2 miles off Interstate 91 at Exit 40.

If any Scale Views readers know the whereabouts of more Maulers, write in and let the rest of us know of them. They were last in the hands of Naval Reserve squadrons. The Bradley and Navy Museum birds came from Aberdeen, Maryland. Are there more there? Incidentally, Mike Rounds is a former Chicago Scalemasters member and says that the group is now inactive. Too bad. They did some great things for scale.

The RCM full size plan of the Mauler is No. 217 which sells for $9.50. Available from RCM Plans Service, P.O. Box 487, Sierra Madre, California 91024.

Smoke Signals

Everytime we do something on smoke generation, mail comes in, so we think it is a subject of high reader interest. Let's hear first from Phil Lebow of Los Angeles:

Dear Claude,

*Regarding the possible smoke preparations mentioned in the July 1980 Scale Views column: The chemical George Lieb mentioned is titanium tetrachloride, not "Technichloride." Please, please, please do not use or recommend the stuff. It is **dangerous!** The vapors in any concentration can cause complete destruction of the skin and mucous membranes. One cubic centimeter swallowed is the fatal dose. Check your poison control center for horror stories on this one. Vapors can destroy your vision. This chemical has been used by movie companies when they need smoke from something small. In low concentration, breathing the vapors is like being tear gassed. I think the movies have replaced titanium tetrachloride with liquid nitrogen for smoke by now.*

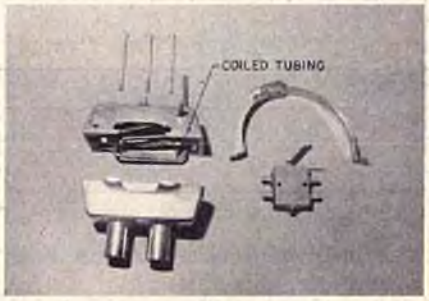
As far as Dowanol DB, Butyl Carbitol, Glycol Ether, and Diethylene Glycol go, these are not quite so bad. Don't swallow any, of course. The thing here is to avoid breathing the vapors, especially when burned or heated. Continued exposure to vapors can cause unconsciousness, brain damage and lymphatic failure. If you must use them, turn your smoke on in the air and turn it off before you land to clear the manifold. The smoke may smell kind of good, but it isn't. Mixing with Marvel Mystery Oil may be a good idea since it lets these solvent/detergent liquids digest something besides you and your airplane. The smoke from anti-freeze and water is similar. Anti-freeze is polyethylene or poly propylene glycol. Probably not as fierce stuff if thinned with water.

As an alternative, try automatic transmission fluid. It is an extremely high detergent light oil. Try a generator box in the exhaust with wavy (corrugated) plates inside for greater vaporization area. Plate metal should be thin. Put the generator box close to the exhaust for more heat. Insulate the chamber if necessary.

Thanks for your time.

Sincerely,
Phil

Thanks for the cogent safety comments, Phil, we can never emphasize that enough. As I said in the June issue, don't mess with chemicals lightly, always get professional advice on characteristics and cautions.



Glenn Carter, Secretary-Treasurer of the International Model Aerobatic Club and editor of its newsletter, sent in some interesting smoker ideas. He believes the output from the usual diesel oil smoke system is improved by the use of a device he

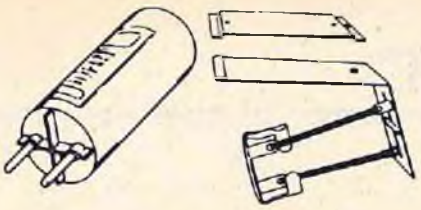
has installed in a Tatone Manifold. The oil is pre-heated by routing it through a coil of copper tubing inside the manifold before it is injected. The temperature rise makes it vaporize and smoke more efficiently.

Glenn has experienced some problems with neoprene tubing popping off the fittings in a smoke system because the tubing tends to swell from exposure to diesel oil. He makes use of the common bread wrapper "twistee" to hold them on in company with a ridge on the brass tubing fitting made of a loop of copper wire soldered in place. Looks simple and effective. Glenn mentions that care must be taken to prevent diesel oil from draining into the engine crankcase when the engine is not running as happens if the valve is opened. He suggests a red "Caution" decal on a shielded switch for "smoke on" control. He distrusts plastic tanks for oil, uses metal tanks for safety.

Superior cartridge is 1½" x 6", weighs 7 oz.

One way to get a good smoke trail for a demonstration without the need of a specially equipped model is to use a fireworks type of cartridge that can be fastened in place. The Superior Signal Company makes one that produces about 3 minutes of dense white-to-grey smoke. I've used them and had some problems getting the fuse lit in the engine slipstream because the flame blows out. A glow type of cigarette lighter works better. Or maybe you can take a glow plug and make a lighter out of it. A clamp-type of bracket can be made from beer-can stock. A bolt and wing nut loosens it to allow quick cartridge replacement. Eyelets bent into the top provide a method to snap rubberbands around the fuselage and hold the bracket in place. Tower Hobbies lists them in their current catalog at $2.50 each.

Another burning type cartridge is the Le Maitre, made in England. While the duration is only 30 seconds, they are available in colors --- red, blue, green, white and yellow/orange. The neatest bit is that contacts are provided on the cartridge for electric ignition. No fuse is needed. The cartridges weigh only 2¾ oz. and are 1⅜"



dia. by 3¼" long. The manufacturer says that virtually no heat is transmitted to the surface of the cartridge. A carrier kit includes a quick change mount, micro switch for connection of the ignition to a servo, hook-up wire and clips. The mount weighs 3¼ oz. The carrier kit sells for 9 pounds and a box of a dozen cartridges is 2.50 pounds. (The British pound is currently worth around $2.40, not $1.40 as a typographical error had it in a past Scale Views column.) The Le Maitre is distributed by L.S.D., 316 Purley Way, Croydon, Surrey, England. (Telephone 01-681-3266.) Seems like a red, white and blue triple-color trail would make a great finale for an airshow.

In a recent issue of the Showgram, the newsletter of the AMA Show Teams, Jack Salmon, Team Manager of the Alpha Aquadron Team commented as follows:

"We are still not satisfied with the smoke system we are using and would like comments from any other team who may be more successful with it. We are currently using the new DuBro smoke valve and except for the fact that the smoke liquid gets used up pretty fast, it seems to be functioning well. The quality of smoke leaves much to be desired, essentially from the fact that it dissipates so rapidly. If you have seen full scale planes trailing smoke, you would have seen that it hangs in the air for a long time. So far we haven't been able to duplicate that. We have managed to get some Butyl Carbitol which we are mixing with Diesel fuel and some Casite. This gives a nice white smoke but, as noted, it disappears fast. Has anyone had some different experiences? We would appreciate hearing from you."

I'm with Jack, let us hear from you. This smoke exchange has turned up some useful information and from his comments it is clear we still don't have the act tuned up. Maybe we have a case of scale effect here? The ideas we have featured above, Glenn's pre-heater and Phil's hot-plate generator, are on the right track, I'm sure. But one little engine only generates so much heat and can only vaporize so much fluid. You get to the point where squirting in more fluid to generate more smoke will end up cooling off the manifold to the extent that it will not make the fluid turn to smoke. In this case only better mixes or different chemicals can improve the trail.

Scale Bookshelf

Pilot's Notes. Reprints of the original government issued military handbooks. 95 pence, plus 15 pence postage. Published by Air Data Publications, Back West Crescent,

The foldout view of the Firebrand's panel is typical of the illustrations in a pilot handbook.

St. Annes-On-Sea, Lancashire, Great Britian.

Modelers looking for cockpit deatils of WW II era aircraft should check out this company's wares. They have 87 different exact reproductions of the official manuals given to pilots for reference and study. On top of all the usual notes on flying characteristics, handling, performance, systems, pilot techniques, procedures, etc., there are photos of the instrument panels and cockpit controls. While heavy on the English aircraft side, there are many U.S. types available. More are on the way. The list is too long to reproduce here but I will send a copy to anyone who sends me a self-addressed stamped envelope and requests the pilot notes catalog.

U.S. Army Aircraft 1908-1946 and USAF Aircraft 1947-1956 By James Fahey. These little "bibles" have long been considered the handiest compact source of information and reference on the subject available. Not much to read, small pictures and no three-views. Just page after page of data and numbers. If the Air Force procured even one aircraft of a type, you will find it here, when, where, serial number, etc. Every serious student of military aviation history should have these slim volumes. For long periods they have been unavailable and much sought after collectors items. Now this 2 book set is offered by aviation book dealers for $5.95. The new book catalogs of Historic Aviation, 3850 Coronation Road, Eagan, Minnesota 55122 and Zenith Aviation Books, North Branch, Minnesota 55056, both carry it. Incidentally, if you don't have the fine catalogs offered by these two firms, send for them. No charge and each is packed with great books for scale model builders.

to page 171

ENGINE CLINIC

Clarence Lee

Dear Mr. Lee,

I have a Viking "65" engine manufactured by Macval Mfg., Co. of Burbank, California. If you are not familiar with this engine here is what I know about it:

Ignition Engine.

Two cylinder — horizontally opposed.

First of all, I would like to know more about the engine (i.e., is it .65 cu. in; is the mfg. still in business, etc.?).

Second, I have been thinking about converting this engine to use with glow plugs. However, I am not sure whether or not it is feasible and how to go about making the conversion; can you help?

Third, is this engine a collector's item and, therefore, should I reconsider my second question and be content with a "rare piece of machinery?"

Thank you for your time and assistance. I have been an R/C modeler for over ten years and have enjoyed learning about engines from your column. Thank you again!

Very best regards,
Steve Cougill
Alberta, Canada

I am very familiar with the Viking .65 as it was manufactured only a few miles from my home and place of business. The Viking came out in 1946 and was another one of the engines of that era produced when war contracts ceased and the owner of a wartime machine shop was looking for another product to market. A considerable number of machine shops turned to the model engine business following WW II. The first Vikings to be produced ran fairly well but did not perform as well as other twins of similar displacement such as the Vivell, Ace, and Wasps. Due to the poor performance and modelers preference for single cylinder engines, the company only manufactured the Viking for a short period of time. Quality seemed to deteriorate rather than improve probably due to slow sales. The company hung in there until the introduction of the glow plug and also produced a small run of glow versions. However, like many engines of that era, the additional loads imposed by glow operation were more than the engine could handle and cranks broke, rods broke, etc. The company ceased operation of the engine but continued to produce a carburetor intended for automobile use. This carburetor was very similar to our R/C model carburetors in that it used a rotating barrel. Although I never tried one of the carburetors myself, I had a friend who did and performance was pretty bad although it was supposed to be superior to stock carburetors used on Fords, Chevrolets, etc.

Sometime in the late 50's or early 60's a fellow named Dan Sitter purchased the tooling, fixtures, and remaining stock of parts and started offering engines to engine collectors. Dan did this for several years and then sold the project to Ralph Mroch in Denver, Colorado. Ralph presently manufactures the REMCO .29 ignition engine for old time free-flight enthusiasts and also is reproducing the old Forster .29 and .99. I got into the act in a small way here when Ralph received a bunch of rough crankshaft forgings that needed finishing and cylinders that had not been honed to fit the pistons. I finished up, if I remember correctly, 50 crankshafts for Ralph and had K & B fit the pistons and sleeves. A lot of problems were encountered fitting the pistons and sleeves, due to badly out of round and tapered cylinders that would not true up in honing, so not too many of the pistons and cylinders were usable. Ralph later sold the project to a fellow named Herb Hodapp in Minnesota, and Herb continued to turn out a few engines until all the usable parts were gone. For a while Herb made some reproduction parts but I believe he has discontinued this lately.

So with the engine being available over the years, it is not considered a "rare" find by collectors. However, with more and more fellows becoming interested in the hobby of old time engine collecting, the value of the Viking is increasing due to the law of supply and demand.

I do not know exactly how many Vikings were produced but I imagine over the years as the engine passed through several hands there were at least 1500 to 2000 — judging by the serial numbers of the engines I have seen and owned. Of course you never know what number the manufacturer started with. Some start with 01, 100, 1000, etc. The engines I have been familiar with were in the range between 500 and 1500.

As far as converting your own engine to glow operation — I would not recommend doing it. It will not last through a gallon of fuel. The lower ends of the rods are retained by aluminum straps which are, in turn, retained by two counter sunk screws. These aluminum straps for the bottom part of the rod let go right away.

As a closing note, the Viking which had a painted red crankcase and anodized red timer assembly was also sold in a blue version with the name ground off the case called the Wizard. This was the manufacturer's effort to get a bigger piece of the market, as is often done.

Dear Clarence,

With the big boom in Quarter Scale, many large displacement engines have appeared on the market. Many of these engines are converted oil-gasoline chain saw engines. And, some are converted into glow engines. My question is this: If you can convert an oil-gasoline burning engine into a glow fuel burning engine, why can't you convert a glow engine into a gasoline burning engine? I realize that there is no economic advantage in using gasoline instead of methanol, etc., but what I'm really after is that since these oil-gas engines burn so much cleaner (Roper, Evera, etc.), there is less mess to clean up after a flight. Also, the residue, in time, stains the paint and makes the model smell.

I am especially interested in converting a K & B .40.

Sincerely,
Greg Louie
Stockton, California

Greg, you haven't been reading the ads in the magazines. There are several fellows offering the service of converting present day glow engines to spark ignition. Any glow engine can be converted provided the design of the engine will allow for machining the front of the crankcase to hold a timer assembly.

There is an economic advantage in that a spark ignition engine running on gasoline will run three to four times as long on the same amount of fuel as a glow engine on glow fuel. However, the same power will not be developed. You have the additional weight of a coil, condensor, and batteries, and spark ignition plays havoc with radios. Radios have to be isolated, connecting wires shielded as well as the spark plug lead, etc. Most of your converted chain saw type engines use a magneto that does not require a separate coil and batteries, however, most of the spark conversion units for the smaller conventional glow engines do.

As far as clean up and less mess — you still have to burn a minimum of 20% oil the same as for glow. The converted chain saw engines use a lower oil content due to lower operating rpm, use of needle bearings, etc.

to page 26

from page 24

However, converted .60's and smaller engines still require the higher oil content.

Dear Mr. Lee,

Is it possible and advisable to enlarge the Perry carburetor venturi if a Robart pump/regulator is used on a No. 8011 K & B .40 R/C engine? If possible, what will be the parameter to watch — idle?

Thank you,
Richard Sobczak
Wind Lake, Wisconsin

It is pretty difficult to enlarge the venturi on a Perry carburetor due to the pressed in spray bar jet. This has to be pressed out (and can be easily damaged), the barrel drilled larger, and the spray bar pressed back in. The chances of goofing something up are pretty good.

If you want to go to a larger venturi, the easy way is to install a .61 K & B carburetor. The No. 8011 K & B .40 has an aluminum reducer that is removed. The front plate casting is then the correct size for the .61 size carburetor. This is done since K & B also offers the engine with Perry pump and .61 size pump carburetor. However, I would not recommend using the pump carburetor with the Robart Pump. It is getting a little large. The standard .61 carburetor will give the best performance for your application. The pump version of the K & B .40 was intended for Formula 500 racing prior to acceptance of the Schnuerle type engines for this event. It was never intended to have a tick over idle, linear acceleration, etc.

The .61 size carburetor will only fit the later style front plates. Early No. 8011's had smaller intakes so the front plate would have to be replaced with the later larger model. The crankshaft, bearings, etc., are interchangeable.

Mr. Lee,

Let me start off by thanking you for the answers to my engine problems that you have given me as a result of reading about other modeler's problems in your column. The information I've gained has been very valuable.

I'd like to relate an experience of mine for your comment.

About 2 years ago I purchased a K & B .61 Series 75 engine with Perry pump and carb. In the time that I've owned it, I have had no problems with it, until recently.

After 2 years of frequent flying it became time for an overhaul. I ordered the necessary parts from K & B Mfg., including the bolt and gasket kit. After carefully overhauling the engine, I reinstalled the engine in my plane and proceeded to go through a break-in procedure following the guidelines that you've often recommended in your column.

The engine ran perfectly for about 5 minutes and then quit cold. No leaning out, no going rich, no warning whatsoever.

Over the next 3 months I, and anyone else I could get, checked everything we could think of (tank, fuel lines, the fuel itself, glow plug) you name it, we checked it! It was all to no avail. It would only run 4 to 5 minutes and quit for apparently no reason.

Finally I discovered a clue. While changing the ring after an unintentional lean flight, I discovered some varnish just outside the mating surface of the head. This indicated that there was some leakage between the head and the sleeve even though I had been careful to evenly tighten the head bolts and install the new head gasket that came with the gasket and bolt kit. Wait a minute! Did I say head gasket? I couldn't remember taking one off the engine when I originally disassembled it and, after checking other new engines of the same kind, I discovered that they didn't have head gaskets installed at the factory.

I removed the gasket from my engine, lapped the head to the sleeve to remove the old varnish and tried it one more time. The engine ran perfectly.

This obviously leads me to believe that this engine should not have a gasket. Why then does K & B include one in their repair kit?

Bill Monroe
San Diego, California

The Veco/K & B .61's up through 1970 used a head gasket. If the engine has a die cast head it requires a gasket. The 71 models changed to a machined aluminum head that did not require a gasket. However, the compression ratio was a little high and some problems with throwing the prop and rough idle were experienced. The use of the .015" gasket helped eliminate these problems. In 1972 the combustion chamber shape was changed and the gasket was no longer required. K & B just markets the gasket/screw kit in one form figuring if a guy has an engine with a gasket he will use it and if not he won't use it.

Adding the gasket to your engine had nothing whatsoever to do with the stopping of the engine. This was coincidental. You must have tightened the head incorrectly or something. The only thing the addition of the gasket would do would be to cause a slight top end power loss (unless higher nitro fuel was used) but would improve the idle (lower idle speed). Lapping the head to the sleeve probably removed some irregularity that was causing the gasket and head to leak. Maybe during the first disassembly you dinged up the gasket surface or it may even have been defective if a new sleeve was used when you overhauled the engine. I have had quite a few go through my hands that required a light machine cut to smooth up. However, the gasket should have taken care of any minor roughness due to machining.

At any rate I am glad you corrected the problem and others will know where to look if they experience similar trouble --- especially after an engine overhaul. I get engines in all the time with leaking heads due to fellows removing the sleeve with pliers and badly dinging up the seating surface.

Dear Clarence Lee:

I am having aspirations of flying a Pitts Special by Byron Originals — a 1/4 Scaler. My problem is what to use as a power plant. I have two very good .61 R/C engines, one a Veco and the other a Blackhead Webra. Byron Originals puts out a Byro Drive System which utilizes a single .61 engine. I've heard that this system or engine cowl causes a heating problem. Is this due to the possibility that the engine is overworked? Also, would the 2 + 2 Super Drive System be better by Cass Engineering? I like to bore holes in the sky and I don't like to drive to get enough air speed to do stunts. Please comment.

Inquisitive
Richard L. Mirdo
Fallon, Nevada

The Byron Pitts is a big heavy airplane and requires all the power it can get. This is why Bryon recommends using "piped" Schnuerle type engines. They do have a little more power than either your K & B .61 or Webra Blackhead. Either would fly the airplane but not with the performance you are evidently after.

The engines do run hot. This is partially due to being cowled and partially due to heat from the tuned pipe. In fact, one area many fellows are neglecting is cooling of the tuned pipe in enclosed installations. One well known local flyer and hobby shop owner had a Byron Pitts actually go down in flames due to fire caused by heat from the tuned pipe. So it is most important when enclosing the tuned pipe that adequate cooling air be supplied to the pipe as well as the engine.

There is no substitute for displacement. I personally think the Cass unit utilizing two .60's with reduction drive, or one of the converted chain saw type engines, is the preferable way to go. This is especially true if you want to bore holes in the sky. Although expensive, the Kawasaki that I reviewed two issues back would haul the Byron Pitts with power to spare.

Dear Clarence,

I have a strange problem that I hope you can help me with. I have an HP .61 engine that will only run backwards --- it runs extremely well. When I bought the engine I did not realize it was opposite rotation. What, if anything, can be done with it to make it turn as normal, or will pusher props work? I sincerely hope that it can be made to run properly, as out here in the sticks it's a pretty difficult task to find pusher props or any kind of modeling materials.

Yours sincerely,
A.H. Melville
Saskatchewan, Canada

Without seeing your HP .61, there is no way for me to know if it has a counter rotating crankshaft in it or not. Frankly, I doubt it. The chances are pretty good that you are flooding the engine when starting

to page 170

SILENT POWER

Jim Zarembski

Flight line at KRC First Annual Electric Fly.

On September 28, 1980, the Keystone R/C Club of Hatfield, Pennsylvania (Near Allentown), hosted the First Annual "East Coast Electric Fly." This event was intended to promote electric flying and was strictly a fun-fly. Bob Kopski, the Electric Fly Manager, reports that 24 entries were flown in the first year event. Events included best looking model, longest flight time and most aerobatic.

Austin Gutman's RCM "Yellow Jacket" (Plan #800). Green and white MonoKote with Astro 10 on 14 cells. Won 2nd in most Aerobatic and was judged noslest electric entered.

John Henderson's magnificent original 6' Astro 05 powered glider. E385 airfoil, 575 sq. in., 36 oz. First Place in "Best Looking" and First Place in "Longest Flight Time." Unplugs, folds, and otherwise collapses and packs into attache case along with transmitter, field gear. Super job!

Bob reports that the weather was warm and sunny with 5 mph breezes after a morning calm. One of the advantages of an electric contest is that the deep conversations and camaraderie is never interrupted by motor noise. All of the fliers had a tremendous time. In fact, many of the spectators claimed they would join the Silent Power movement just to participate in next year's contest.

This contest was put together rather quickly by the Keystone Fliers. Advertising was limited. However for 1981, Mr. Kopski promises that the event will be carefully planned and will be advertised thoroughly. Watch this column for the date and place.

Heinz Koerner with Quad Astro 020 original. Two inboards winding up. Heinz will switch two outboards on, then let go.

Happiness is a large electric fleet. Heinz Koerner deciding which to charge up first. (Rear to Front): Astro 25 in Silent Squire; Astro 05 Conglomerate Glider; Astro 075 10 cells original aerobatic; Astro 02 scaled down Olympic; Quad Astro 02 original twin 075 Partenavia. More electrics in motor home!

Arthur Garzan's Sweet Stick Astro 25 10/4 nylon prop weighs 5 lb. 2 oz. Won 1st place in "most aerobatic."

Here's One For You

A friend recently made an abrupt landing with his Astro 05 powered Super Malibu. Some onlookers called it a definite crash. In any event, the prop was broken but no other damage was observed. The prop was replaced and the motor was charged. When the Astro 05 was turned on, the motor ran in reverse. Yes, the right prop was used. I've never heard of this in the 6 years I've been flying electric. An electrician has suggested that the sudden bump during the landing reversed the magnetism of the magnets. Any help?

Junior Skylark

In 1975 I built and flew a twin Astro 020 model of my own design and, quite frankly, was not thrilled with its flight performance. Since that time I did not see another twin 020 until this past August when Keith Shaw of Ann Arbor, Michigan, visited the Toledo Weak Signals field to demonstrate his twin 020 model. It looks a lot like a scaled down Partenavia P-68. Flight performance was superb. Unfortunately, I don't have a photo of this model.

Shortly after this flight session, I dusted off the box of a Carl Goldberg Junior Skylark and began to punch out the parts from the die-cut sheets.

The Junior Skylark is a nostalgic model aircraft for me. In 1969 it was the first powered aircraft I ever built and the first one I ever MonoKoted. Unfortunately it never flew.

Jim Zarembski's Jr. Skylark electric twin. Photos by S. Skornicka

The new twin electric version was built strictly to Carl's plans with only a few exceptions. First the fuselage former at the leading edge of the wing was not used so that the flight batteries could be placed in the nose. Secondly, the motor nacelles were constructed differently than the plans for the Astro 020's. It is basically a box with a 1" balsa front with a hole in it for the 020.

To page 165

POWER BOATING

Howard Power

We will start off this month's column with a couple letters:

Dear Howard,

First, please let me introduce myself to you. My name is John Goodyear, a keen model boat enthusiast and member of the Sheffield Ship Model Society.

An American pen-friend of mine, Kirk Westfall, suggested that I might write and introduce myself to you as he considers you to be one of the U.S. hydro experts. I hope you don't mind me taking him up on this offer. We in England are very, very short of expertise regarding hydros, tunnels, etc., our racing being virtually restricted to mono hull multi-racing around the "Naviga" M course. A few enthusiasts like myself have attempted to get hydro-racing accepted in the U.K. and have had some articles printed in Model Boats in an effort to attract interest. I am afraid our efforts have failed miserably! One or two of my club members, however, are now trying once more to "have a go" with tunnel hulls (Octura Wildcats) and, hence, the main point of my letter. Would you and your friends be willing to answer some of the many problems we are certainly going to experience? Kirk has been most kind indeed to me personally and provided me with a lot of solid information already which I am going to pass on. Several gaps in our knowledge still exist, however, and we are still only novices.

Subject to your acquiesence I shall ask my friends to direct their letters straight to you since I now live some fifty miles away from Sheffield.

As an aside, what do you think about our clubs sharing general information, newsletters, etc.? If you are interested please drop me a line and I will see if we can get things started from this end.

Just one final thing before I close — how the hell do you in the States manage to go so much faster than us in all events?

Hope to hear from you.

Regards
John Goodyear
2, Mead Way
Highburton, Huddersfield
HD8 OTG
West Yorks, England

I would be pleased to help you in any way I can. I can best get you answers if you will be as specific as possible about your problems. I am reprinting your letter in hopes that other clubs and individuals might start a correspondence with you. As for your question about the speed difference between the U.S. boaters and those in Europe, there probably are several reasons for our higher speeds. Our boats have been developed with sprint racing on an oval course in mind. Your racing, being restricted to the M course, requires a much more maneuverable hull which doesn't have the speed capability of our designs. Your engines will not develop as much horsepower since European noise restrictions tend to reduce pipe efficiency. In the States we use a high nitro content fuel (40% to 60%) which further increases the horsepower available to us. We also are blessed with a good selection of high pitched props that are readily available. These items, if available to you, will allow you to match our higher speeds.

Dear Howard,

I recently purchased my first R/C boat, a Prather 31" Deep Vee. In a recent issue of RCM I noticed that your wife, Beverly, won the K & B Ladies Day race with one of these boats. I was wondering what prop, strut depth, pipe, etc., you used on this boat. Also, are there any modifications made to your engine?

I hope to compete next year with my boat and would appreciate any tips you might give me so that my boat will be as fast as my competition.

Yours truly,
Jeff Perin
Annapolis, Maryland

You have made an excellent choice by entering competition with a deep vee hull in the small engine class. There has been a tremendous increase in the number of entries on the West Coast in the A monoplane class. This increase in interest has been, no doubt, due to the fact that at least three excellent small deep vee designs are now available for the modeler to choose from: Steve Muck's Little Streaker, Westcoast Marine's Wardcraft 20X, and Al Prather's 31" Deep Vee. All of the above boats are excellent, competitive hulls. The Prather boat is most popular with the beginner because of the excellent instruction book that comes with the kit. The hardware kit is excellent and an optional hatch cover is also available. The hatch helps keep water from entering the hull and really improves the appearance of the boat. The epoxy glass hull construction is unique in model boating and is not only very light but strong.

Bev's boat has the strut mounted parallel to the keel at a depth of 11/16" measured from the bottom of the V to the center line of the drive shaft. We use an Octura 1740 three-bladed prop that has been slightly modified. Each blade has its area reduced by filing a triangular section that is 1/16" deep at the hub and intersects the trailing edge at the blade tip. An International Products 20 Mono pipe is mounted with a length of 8⅜" from exhaust port to the end of the pipe diverging section. By using 60% fuel you should be able to turn this prop 22,000 rpm.

We use a K & B 3.5 engine, Prather water cooled exhaust throttle and pipe pressure on the fuel tanks. Our engine has a stock high port liner. The piston has been heat treated (600° for an hour and quenched in ice water) so that a squeaky, tight fit is achieved. The piston has a 3/16" high notch cut in the skirt that matches the two boost ports (the ones directly opposite the exhaust port). A McCoy full circle boat crankshaft available from C & H Inc. is substituted for the original. Use of the McCoy crankshaft requires that the motor front housing be rotated 180 degrees. This crank is stronger than the stock part and has the advantage of placing the venturi opposite the side of the boat to which the flywheel throws water that collects in the bottom of the boat. An Aeromarine Products Easy Bailer is mounted in the stern. These items plus the hatch cover insure that the engine doesn't flame out at the worst possible time. The rod has its oil holes opened up to 1/16" for better lubrication.

We have found that if you use high nitro fuel and run the engine over 21,000 rpm, rear bearing retainer failure occurs frequently. This has been eliminated by modifying the big crank bearing. You should use two new bearings which have the retainers removed by bending the tabs and prying. The balls can then be moved to one side of the races and the whole bearing will fall apart. Use a Dremel #9903 tungston carbide cutter to make a notch on one side of the inside of the outer race and on one side of the outside of the inner race. Go slow and cut these notches to such a depth that if you try to push a ball into the assembled races, the ball will only enter by a hard push. Using a heavy grease to hold the balls in the race grooves, assemble the two races with as many balls as you can. By lining up to two notches you then insert balls by pushing them in until you have a total of seventeen balls in the bearing. Bearing and crankshaft failure will be very rare with this set-up. In fact, we have run this same engine all season and it is still running strong. This motor must have several hours running time accumulated considering that we have competed in four deep vee events which each involve at least four heats of ten minutes each, nine district heat races, the NAMBA Nationals 1/2 hour enduro, A Deep Vee and A Mono heat racing events,

to page 164

AVRO 504K

By Gordon E. Whitehead

AVRO 504K
Designed By: Gordon E. Whitehead

TYPE AIRCRAFT
1/9 Sport Scale
WINGSPAN
48 Inches
WING CHORD
6½ Inches
TOTAL WING AREA
585 Sq. In.
WING LOCATION
Biplane
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord

DIHEDRAL EACH TIP
4 Chan. 1¼", 3 Chan. 2¼"
O.A. FUSELAGE LENGTH
39½ Inches
RADIO COMPARTMENT AREA
(L) 9" x (W)2¾" x (H)3"
STABILIZER SPAN
13¼ Inches
STABILIZER CHORD (Incl. elev.)
6½ Inches
STABILIZER AREA
80 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
6¼ Inches

VERTICAL FIN WIDTH (Incl. rudder)
6 Inches
REC. ENGINE SIZE
.20-.30 Cu. In.
FUEL TANK SIZE
2-4 Oz.
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
3-4
CONTROL FUNCTIONS
Rud., Elev., Throt.,(Ail.)
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, Ply and Spruce
Wing ..... Balsa and Spruce
Empennage ..... Balsa
Wt. Ready To Fly ..... 64 Oz.
Wing Loading ..... 15.75 Oz./Sq. Ft.

This ship caused me some gray hairs! For years I'd wanted to build the Avro 504K --- "the classic trainer" --- "the ideal scale model" --- the world's first true "buddy box" system. So what was it that prematurely aged me? The first flight of the ship — that's what! As I'd successfully flown most of my ships straight off the board, and as this one was only finished hours before the annual "Old Warden All-Scale Meeting," I decided to test fly her at the venue.

So, I get to the meeting, my flight slot arrives, the H.B. 20 fires first go, and she's off! Trundle, trundle, bonk, bonk, and with a last little jig, she's airborne. But what's this? The ailerons don't work! You can see 'em flapping like paddles in response to my frantic stick stirring, but the ship just seems oblivious to my demands. In a gentle left turn, she banks inexorably towards a ukie circle and, steepening the bank, she joins a circulating Hawker Fury for half a lap. Inexplicably, as if sensing danger, she gently lands next to the u/c pilot, whose adrenalin has by now begun to spout out of his ears!

A serious thinking session ensues, while I wait for my next flight slot. A friend who's recently been flying a 6' Avro (on T.V.) recommends a spot of nose weight, as undeniably she was twitchy on elevator. So on goes three ounces of lead, and the next flight eventually takes place . . . with the same flight pattern, only the ukie fans are resting this one out.

Home we go, and a few taxi runs in the garden to produce one reason for poor performance flying-wise — a leaky plug causing loss of power after about twenty seconds. Now we know we can concentrate on the trimming, and the moral here is to test fly without the cacophony of sound present when all six frequencies are in use! At the

Revel in the thrill of piloting your own model of the R.A.F.'s immortal first dual-control trainer — or at the very least, read this guff and digest a few handy trimming tips.

strip, she bounds into the air. She answers to aileron deflection but seems to want to turn in the wrong direction even though the controls are hooked up correctly. However, she is well up and going strong and then I really lose all aileron control. I fly her a while on rudder-elevator, and on landing (after a few practice approaches), I discover that the aileron servo has gone kaput.

The next time out, the RX battery goes flat in mid-flight, all controls go to the stops, and she spins in splitting her seams and busting her wings. By now my dear wife had adrenalin coming out of her ears since the house needs painting, the garden needs weeding, and here's me waging a full scale battle against the aeronautical intransigence of a historically proven natural flier.

So how come I'm presenting Avro as a plan for the whole of the world to build? Well, having been repaired, she now handles well and has even been successful in competition both for appearance and handling. At our club, we had a club contest to see who could perform the most take-offs and landings in five minutes (from a standing start each time) and me and my friend (the Avro!) won with ten complete take-off & landings. Next came a .40 powered pattern ship with 10 take-offs and 9 landings. Conditions included a 10 knot gusty breeze & a cow pasture strip!

I'll reveal my trimming secrets later, along with comprehensive flying notes, but now let's see how to build her. By the way, the house and garden are doing fine!

CONSTRUCTION

General:

The only tough parts on the slender box-girder fuselage are the landing gear and tail skid --- more about this later. The flat bottomed section wings use thick top spars to resist compressive bending loads in high-g maneuvers. At last I've discovered a method of getting inter-plane struts the exact length with minimum work, and the method of linking the quadruple ailerons is just a variation of what the ukie boys have been doing for years with their pushrods.

Fuselage:

Make the sides, including the 3/16" nose and lower wing seat sheeting. Add ply doublers, and then join the sides from F-1 back to the last F-2, taking care to get the down and side thrust angles correct. Join the tail end, then glue the cross braces, landing gear mount, skid front strut blocks, cabane mounts, top decking, cowl sheeting, stern sheeting and stringers. Whew! Check how the cabane struts define the wing incidence, before binding in place and soldering up. As regards to the cockpits, I decided at an early stage on the joy-ride version, but the military cockpits are shown as well.

Landing Gear:

The sprung gear is a worthwhile project and combines vertical springing and torsion bar action. The 1/8" wire is amply strong enough, since even crashes only happen slowly with this ship! You can leave the legs solid, but the sprung version goes together as follows: Make the 5/64" lower legs, not forgetting the axle bearing, and solder the two brass retainers in place. Then wind the spring about 1/4" too long, put the spring, stop, and 1/8" wire top leg in place and solder the stop to the 1/8" leg. Yes, it's that quick! Tin the edges of the retainers, bend and tin the oleo fairing and solder this in place. Use a hot iron quickly at this point, or

the whole assembly will disintegrate as the solder melts and the spring activates. After making the other leg, drill the landing gear mount, observing the slight off-set relationship between opposite holes, to ensure that the legs exit the sides truly opposite each other. Secure the legs to the fuselage with tin plate saddles, then solder the axle in place. You will see now that when you press each wheel independently, the little tube bearing plays its part in removing stress at the bottom joint.

By now you should be in the mood for wire bending, so make the rear skid, though don't glue the ply plate to the fuselage until just before painting. Leave the front skid assembly until you've made the bottom wing, and have the rear leg retaining spurs secured in the center section.

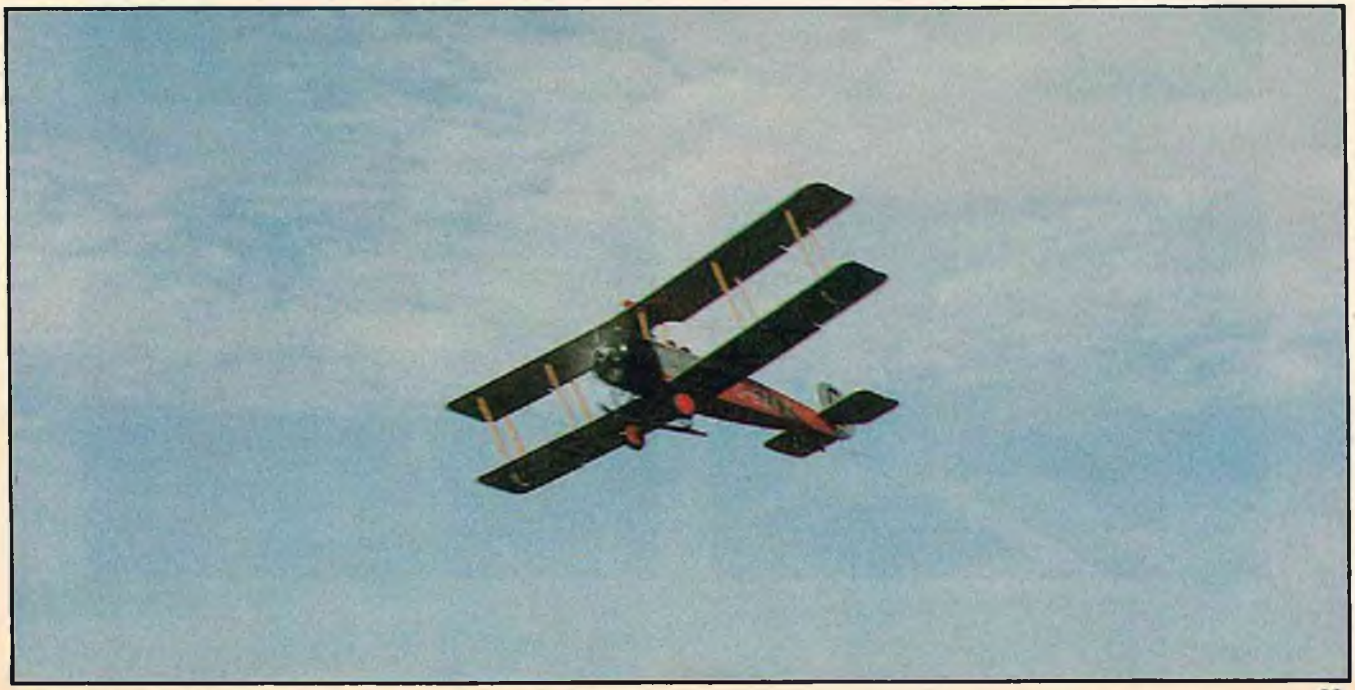
Stabilizer:

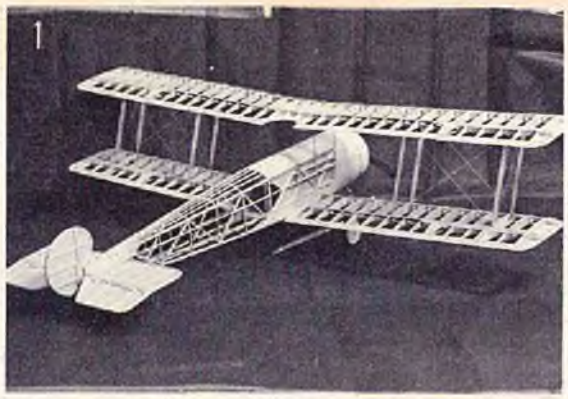
Join 1/32" balsa edgewise, and cut out the entire stab outline. Build the structures successively on each side, sand the edges round, then separate the elevators which are then joined and hinged. Choose light stiff sheet for the rudder. Use a Robart hinge point for the top rudder hinge, but any old pinned hinge will suffice for all the other hinge stations.

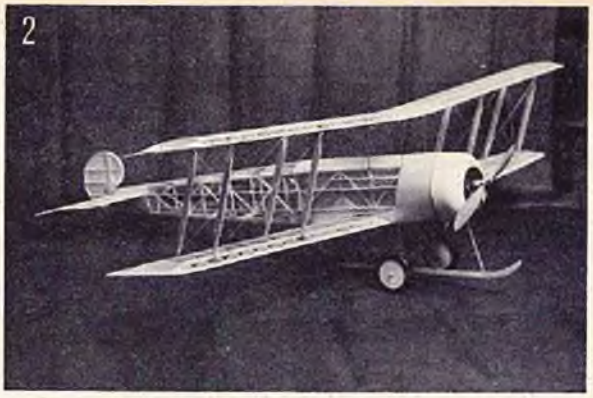
Wings:

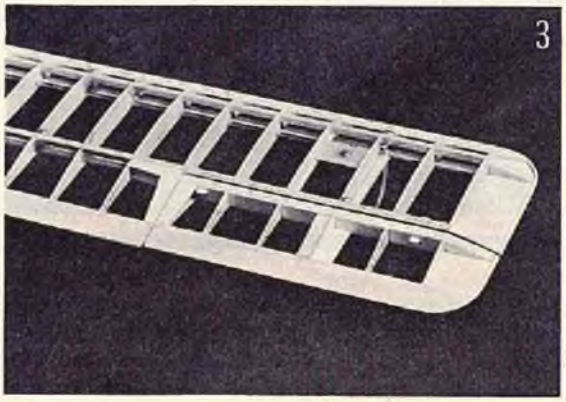
Only the center sections differ, both in shape and width. I used bolt-on wings and these look realistic, but the arrangement can be unforgiving in rough landings --- so you may choose to secure the wings with elastic bands. I cut the front cabane lugs from a large nylon horn, but aluminum or paxolin would be suitable. As usual, I built the ailerons integrally with the wing panels, and separated them when needed. When setting up the ailerons, you'll find the link wires sufficiently rigid as there are two per aileron, and the angled stubs retain them positively. Use a sharpened piece of 1/32" wire to drill the lugs, and open the holes slightly with a needle file. Make the wires slightly too long, and adjust them for final

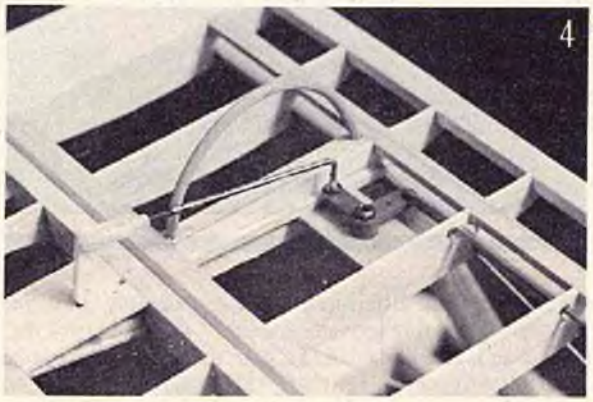
text to page 159

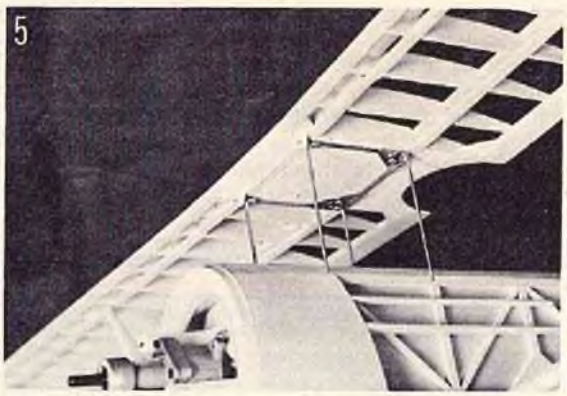


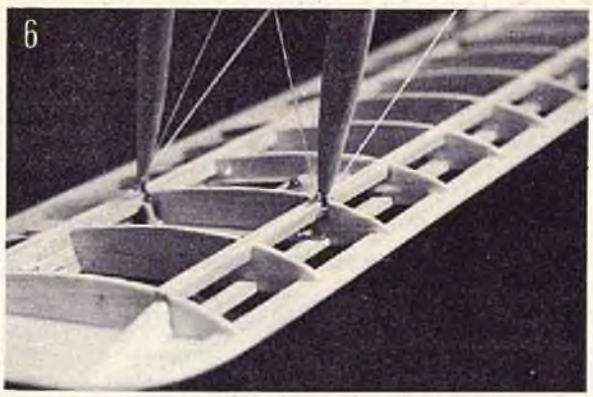


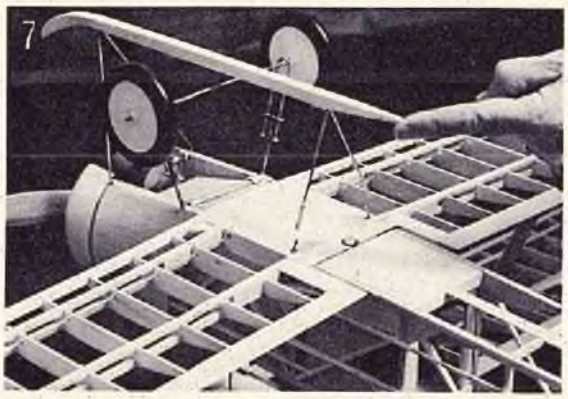






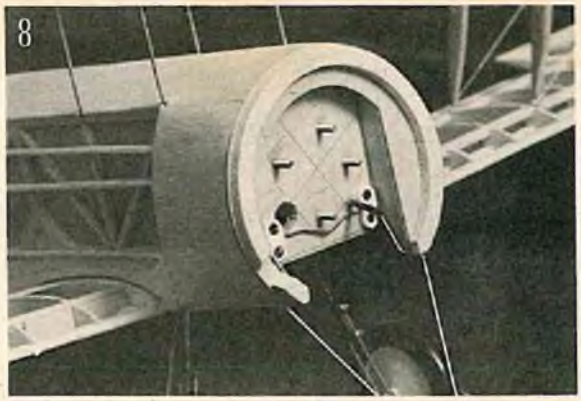


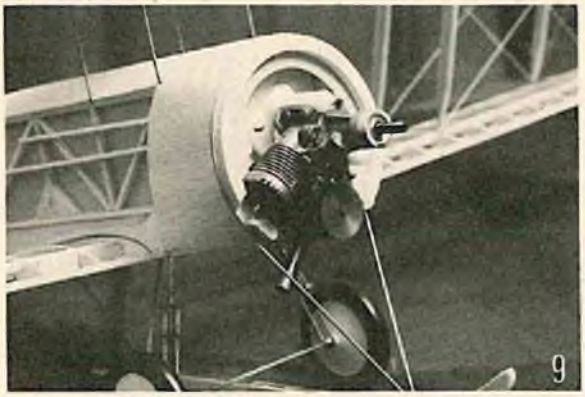


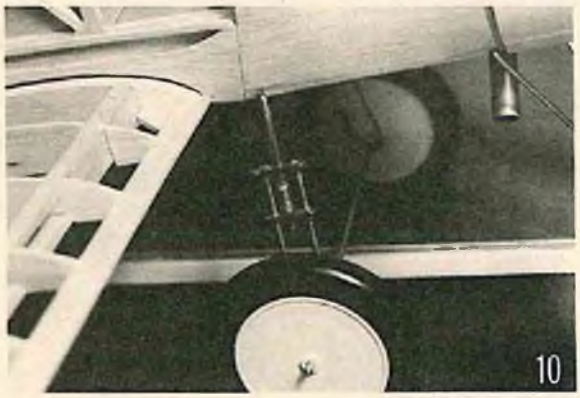


(1) Rear view of uncovered Avro. (2) Another view from the front. Skid keeps the nose-overs to a minimum. (3) Aileron detail viewed from the top. (4) Tip skid shown along with aileron set-up. This gives slight but not noticeable differential action. (5) Bolt-on center section arrangement on top wing. (6) Struts are retained on hooks by elastic thread which wraps around hook. (7) Rear skid struts engage on angled prongs projecting from lower wing center section.

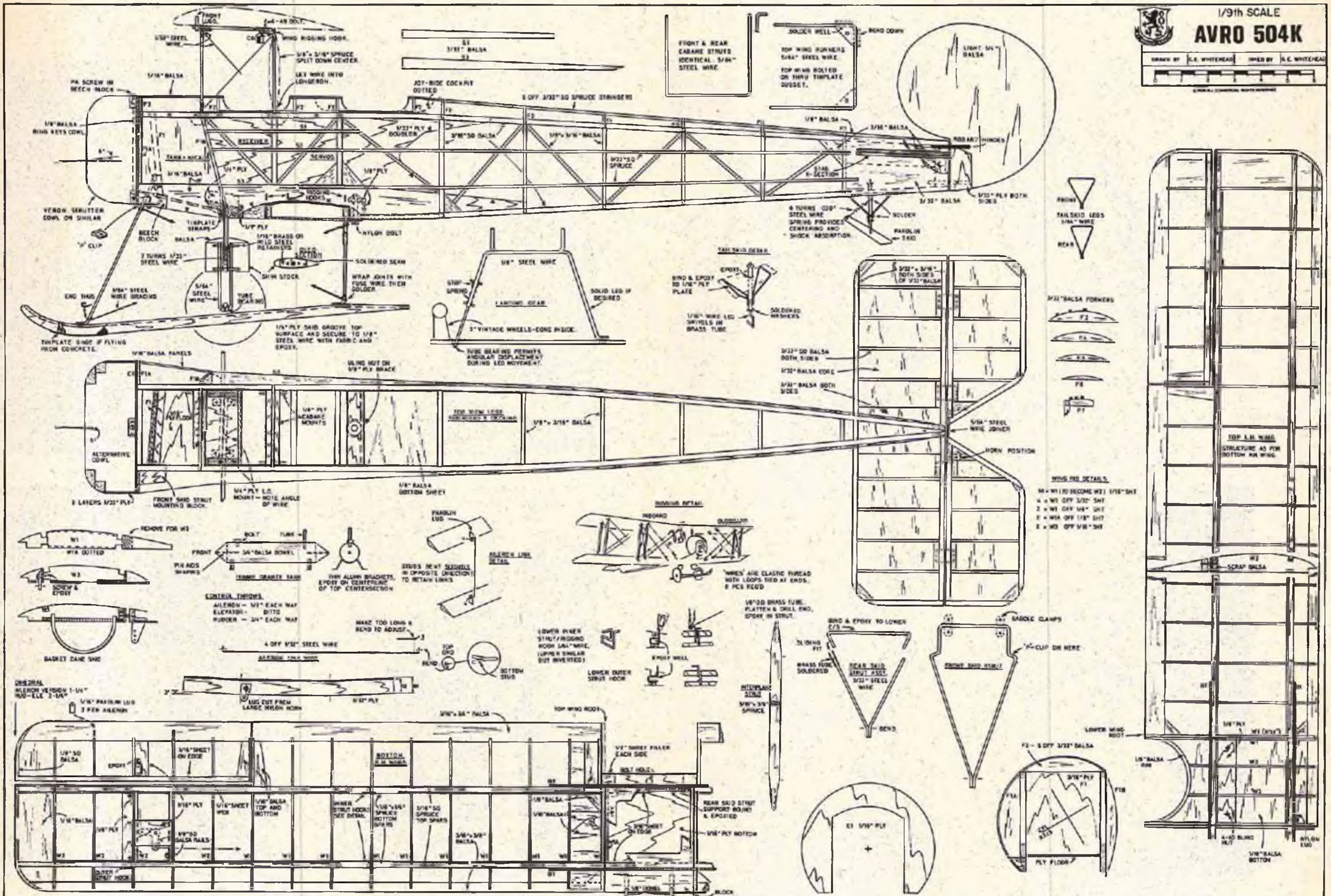
(8) This view shows front skid clamps. (9) Angled engine mounting. A car-type muffler was used. (10) Compressed main landing gear springs. (11) Tailskid assembly before epoxying in place. (12) The Avro 504K lifts gently into the air. (13) A low fly-by. Bright disc in center is sun's reflection on muffler. (14) The end of another perfect flight.







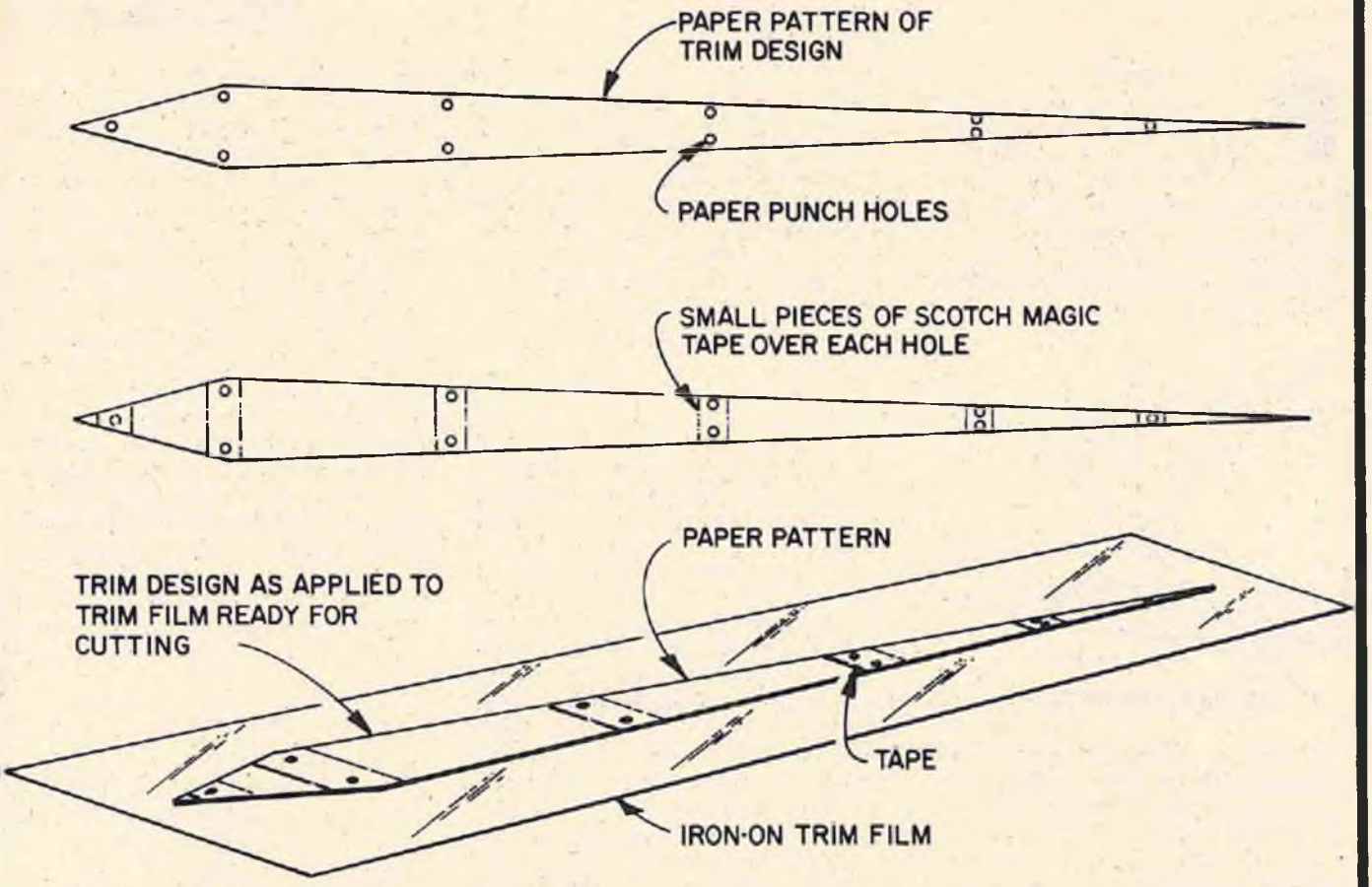
FULL SIZE PLANS AVAILABLE — SEE PAGE 190



HERE'S HOW

By Jerry Smith

TYPICAL APPLICATION OF FRANK GUNSAULLUS PATTERN HOLDING SUGGESTION



RIGHT/LEFT HAND DESIGNS CAN BE MADE WITH THE SAME PATTERN BY PLACING IT ON EITHER SIDE OF THE TRIM FILM. ASSURES EXCELLENT DUPLICATION.

One of the most difficult things to do, when you decide to apply film trim on your airplane, is to cut out a good clean design. It has been my experience that once the trim pattern has been cut out, holding it in place on the film is at best a nerve wracking experience. Trying to cut a good straight edge is difficult for a lot of us. Yes, just a simple straight edge. Most of the time we try to cut under somewhat less than ideal conditions and become quickly disappointed with the results. Ideally, a large, well lighted table with straight edge and sharp cutting tools will provide excellent results. But, all of us do not have these conditions.

Frank Gunsaullus of Lander, Wyoming, has a unique way of holding a particular design pattern on film trim. It provides a sure fire way of coming up with a clean, accurate trim. According to Frank, you must first lay out your particular design on a piece of paper. Any paper will do, however, delicate designs may prove easier to handle on a heavier paper. Once the pattern is cut out, use a paper punch to make holes along the perimeter and, if necessary, internally in the pattern. Lay the pattern on a clean flat surface and apply a small piece of Scotch Magic Tape over each hole. Transfer the pattern to the film trim and press firmly in place. Now proceed to cut out around the pattern. This, simply, is Here's How you do it. However, if one gets ambitious in his desire to come up with a super trim job, then it may take some special thought in placing the punch holes in his particular design.

Another benefit of Frank's suggestion is that you only need one pattern for right hand or left hand application. By simply placing the pattern on the top side or bottom side of the film you can cut out a pattern, for example, that will satisfy both wing panels. And, efficient cutting and duplication is assured everytime. Thanks Frank, a super idea!

Here is another simple suggestion that might help you. Many of you use R.S. Perfect Paint. I like it because it's odorless and it doesn't cure hard and brittle. Most of us buy a small can, use half of it, then set it on the shelf for storage. Next time we open it, the paint is skinned over — sometimes quite thick. To help avoid this, try storing the can up-side-down. Make sure the lid is on tight!

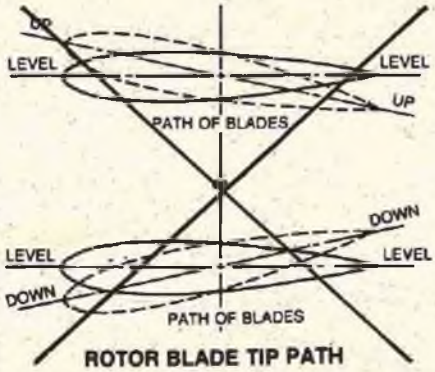
Here's one for Quarter Scale scratch-builders. A good wing leading edge can be realized from a piece of wooden outside corner molding. The front edge of the ribs will fit nicely into the inside surface while some carving and sanding may be necessary to make it match the airfoil configuration. Many are made of pine and lend themselves well to aircraft construction. □

GIVE IT A WHIRL

John Gorham

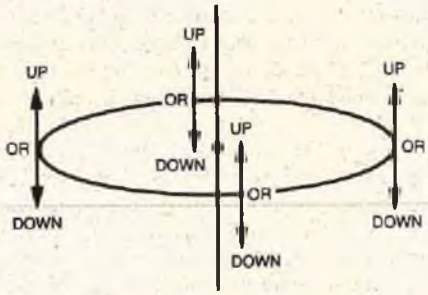
Correction

First we would like to correct an error in a diagram which was published in the December 1980 RCM "Give It A Whirl" column. The intent was to illustrate that the main rotor blades plane of rotation could be tilted at any angle from the horizontal. The diagram shown below was published to try and give you an idea of what was meant by this.



ROTOR BLADE TIP PATH

Unfortunately, somehow between the rough sketches and the final artist's rendering, the elipse showing the tip path of the blades became pear shaped so the diagram really didn't do much except confuse. Our apologies for that and below you will find the diagram as it should have been. We hope by now everybody has a thorough understanding that the rotor plane system of a helicopter can tilt (or apply forces causing the helicopter itself to tilt) from the horizontal in any direction. Well, enough of that.



ROTOR BLADE TIP PATH

Heli-Hints

Correspondence still flows in from R/C helicopter flyers from around the world who are sharing their experiences. I find these letters thoroughly enjoyable. We will, from time to time, publish some of these in this column. One which I feel you might enjoy this month is from John D. Krehbiel of Cincinnati, Ohio, which reads as follows:

Dear John,

I am so excited I can hardly write! After only one article I am an instant novice. Your suggestion in 'Give It A Whirl' to avoid lowering the CG with PVC landing gear has made my day. I threw away the gear which was suggested in my instruction book and put on the stock gear. I've practiced off and on for three years and that simple suggestion has improved my chopper 1000%. No more pendulum effect. Hooray!!!

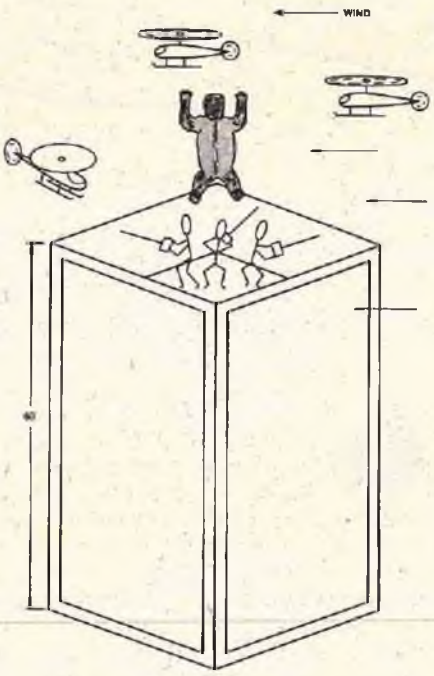
Yours truly,
John

Well, that letter gives you some idea of the good feelings that a columnist can have when he knows that what he is saying is reaching and benefiting his fellow modelers.

In an earlier column we quoted a letter by Ed Farabaugh, Jr., of Fleetwood, Pennsylvania (his phone number was included in the December 1980 issue). He makes one comment about the little 'stick' men who fly the R/C helicopters in some of the "Give It A Whirl" diagrams. Ed points out that the 'stick' man apparently doesn't know that it could be dangerous to point his transmitter antenna directly towards his helicopter. "I would suggest that you tell him about the radiation pattern of his transmitter. Otherwise you might have to draw a new picture of him eating a few 'after-crash mints'." Thanks, Ed, for the comment, and certainly you are right. The minimum (and sometimes insufficient) radio range can occur when the transmitter antenna is pointing directly towards the helicopter.

RC Helicopters In The Movies

For a change of pace this month we thought that you might enjoy hearing briefly about a little known use of R/C helicopters — making movies (the big kind that you see at the local cinema). Some of you must be aware that many of the spectacular crashes in the movies utilize R/C models, but perhaps you didn't realize that many times the people who do the building and the flying are part time modelers like ourselves. One such modeler who has been into R/C helicopters since the 'beginning' (1970) is Ernie Huber and he was responsible for all of the helicopter flying scenes in "The Towering Inferno" which used models. These scenes involved some extremely tricky flying maneuvers such as standing on a high platform at night, taking his helicopter off from the ground way below him, flying up to and around a building (losing sight of the helicopter at one point) and then returning to finally land back on the ground again. **Very** difficult. Yours truly was involved in the early shooting stages of "King Kong." During a rehearsal the director blandly told us that one scene would require standing on a 6' x 6' piece of plywood which was mounted 60' in the air on the corner of a 1/6 scale model of the 'World Trade Center' in New York. Three pilots were then required to fly three helicopters around a man-sized "King Kong" who was standing on the opposite corner (remember now the building was 1/6 scale so that the building, the helicopters and the gorilla were all the same scale). The shots involved "Kong" reaching up and out and grabbing airplanes and/or helicopters out of the air and it was to be shot **at night** in quite gusty winds. We decided to forego the doubtful pleasure of even attempting that scene and, in fact, it was finally shot with the model helicopters flying around "Kong" suspended by wires and controlled like marionetts on a string.



There have been numerous movies which have used R/C model helicopters (and, of course, R/C planes) and many times it can be one of the greatest tests of your flying skills. Film directors many times don't understand or even want to hear of, the limitations of the helicopter and the flyer and you are often asked to carry out some almost impossible tasks. Now, the use of R/C model helicopters in movies is most often times when it would be less expensive or less dangerous to use them in place of the full-sized machines. Sometimes, however,

John Gorham's 'Cricket' starring in Universals new movie, "All Night Long." Of course, Gene Hackman (flying Cricket) and Barbara Streisand are in the movie too! Movie to be released in early 1981. Photos courtesy of Universal City Studios, Inc.

the model helicopter in the movie is representing just a model. A very recent movie of this type is just being completed by Universal Studios. The name of the movie is "All Night Long" and it stars Gene Hackman, Barbra Streisand, and a small, .25 powered helicopter.

The background to this involvement was an approach by the studios to one of the local hobby stores to ask them who could fly a model airplane inside a drug store. When the director was told that it might be difficult to find an R/C plane which would maneuver well enough inside the confines of a drug store the requirement was changed to an R/C helicopter instead. For many reasons the size of the helicopter was important. It must be small, and that of course set the stage for "Cricket" to become a star. As usually seems to happen, the script was changed several times during the shooting of the helicopter scenes to increase the role of the model, mainly because of what we were able to do with it inside the store. Of course I can't tell you the story of the movie here since it won't be released until early next year, but I can tell you a bit about the way the shooting was carried out.

The set was not, as you might expect, a stage in one of the studios — it was a real, live drug store in Pasadena. The director was a very charming gentleman named Jean-Claude Tramont, the associate producer present was Fran Roy, and most of the scenes which involved the R/C helicopter were shot with Gene Hackman present. The first day was spent in waiting around since we didn't get to the helicopter scenes that day. We were able to practice a little at the end of the day — for the first time, by the way! The next day was exclusively helicopter shots and at the briefings I was told that the first scene involved the night guard attempting to fly an R/C helicopter which he had built, taking off from the divider top between the checkout stands (about one foot wide and three feet long). This with three actors standing within a foot or two of the helicopter's rapidly spinning blades! The task was to take off from there, hover for a short while just above the actor's heads and then fly forward slowly between the aisles of the drug store. Well, taking off was bad enough in such a restricted space and especially since I had to be out of camera range for obvious reasons. Catastrophe struck as I tried to fly slowly between the merchandised packed aisles since the helicopter suddenly became very 'slippery' in roll and wanted to fly towards whichever side of the aisle was nearest at the time. It seems that in a restricted space like this, the 'ground effect' of the helicopter made it unstable so that it would be almost impossible to shoot the scene that way. After a short discussion we decided that we would fly **above** the level of the display shelves, which then provided around 5' of air space between the top of the shelves and the ceiling to do all the flying. Well, each time "Cricket" did a scene as the director wanted it, the director seemed determined to explore the upper limits of the helicopter and pilot's capabilities and many experiments were tried out in this regard. One scene was to chase some crooks down the aisle with "Cricket" in a flight path such that the helicopter's main blades would cut the wires holding the directory signs up above the aisle shelf units. We soon figured out that this wasn't feasible since the rotor blades would probably break before the wires would! However, the director was determined to at least try the scene. A 'special effects' man rigged up a quick release on one of the suspension wires so the sign could be made to fall as the helicopter passed and it would look as though the blades were cutting the wire. So we again went through the now familiar routine: "John, start your engine — quiet! — Sound! — Action!" I duly took off and flew the helicopter towards the sign at a reasonably fast forward speed. The special effects man, who was hidden behind the "Kleenex" display pulled the release cord, the sign fell, and was left suspended by one wire. Perfect! — except that the fallen sign was now swinging exactly between the pilot and the helicopter. The result was one "bruised" "Cricket" (against the side of the drugstore wall), although we had it flying again later in the day. We then decided to eliminate **that** scene and, so that I won't give away any of the plot of the movie, all I will say is that it was the intention at one point to blow-up "Cricket" during one of the flying shots but this was cancelled and another scene substituted which involves no damage to "Cricket." This particular scene is really a great surprise so I hope you will enjoy it when you see the movie.

Gene Hackman was charming to us throughout the time we were filming and he

to page 158

SOARING

Al Doig

Want to know what color **not** to paint the fuselage of that new glider? Writing in "Carrier Wave," newsletter of the McDonnell Douglas R/C Club, Thermodynamicist John Britt gives us some guidance. Using the properties of white, black, and aluminum epoxy paints and a bit of scientific legerdemain, Mr. Britt calculated surface temperatures. On a 90 degree day and zero wind, white would yield 95-100 degrees F., black 125-130 degrees F., and aluminum a surprising 140-145 degrees F. I, of course, ran to my college heat transfer text book to check Mr. Britt's results. I found that I apparently went through a whole year of Brown and Marco without even slitting the stuck pages — so I gave that up in favor of Mr. Britt's results. He concludes: "Now just think what you've (been) subjecting your radio to! If you don't now, next time, use a light color (white, light blue, yellow, etc.) on the canopy or around the radio area. Transparent canopies aren't too great either due to the "green-house" effect we're all familiar with. If you live in a hot area of the country, stay away from dark and aluminum paints." Gee, here I always thought aluminum was a good reflective color.

★

Seems like all the new airplanes I see are 2 meter jobs. The accompanying photo shows Ken Raymond of Poway, California, and his new cowboy hat. He is also holding his latest 2 meter creation, Marriah. The airfoil is an Eppler 205, thinned to 10%. The wing has 596 sq. in. and a wing loading of 10.5 oz. All trailing edges are spruce, sanded to a knife edge. The stab area is 13% of the wing. The wing has quite large flaps extending out to the polyhedral break. Ken is pleased at the performance of both the glider and the hat.

Ken Raymond, Poway, CA, and new 2 Meter design.

★

Beating the gas shortage is Frank Hunter of San Diego. This kindly old gentleman just straps his Wanderer to the back of his motorbike and away he goes to the field. It's a little hard to carry a winch though.

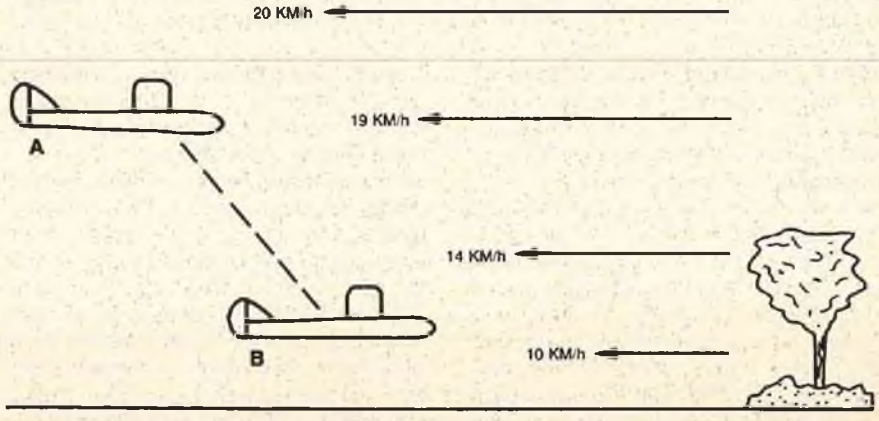
Frank Hunter rides again.

★

My request for soaring oriented newsletters brought response from down under. The Heathcote Soaring League, NSW, Australia, sent several newsletters published by Secretary Dave Burns, 10 Cassandra Crescent, Heathcote, NSW 2233, Australia. In the Sept./Oct., 1979 issue, I found a worthwhile piece, that I presume was written by Dave, which I'd like to share with you.

"Wind Gradient — and the Model Glider. How often have you seen, on windy days, a model aircraft making its final approach to the landing spot, suddenly lose height and land — or more usually crash — with one wing down, short of the spot? Living at the coast, strong wind is the usual weather and I've seen this happen often, but I have never heard anyone give the correct reason for the mishap. The excuse is always, 'downdraft, turbulence, finger trouble (pilot error),' or even 'radio failure.' Now, I have always believed that an aeroplane flies relative to the air around it, that is, in a wind, the ground speed and direction are of no concern. Thus you can't say that you turn a plane 'into the wind' because from the plane's point of view, it flies forward all the time. Why is it then, that all the effects relating to wind are so observed — even some experienced model pilots seem to be convinced that the wind is blowing their plane around. For example, a plane is put into a dive against the wind, and even with full up elevator it does not pull out of the dive — the reason given, after picking up the pieces and checking the radio, is that the 'wind kept the nose down.' But I repeat, 'the plane flies relative to the air.' The wind is just movement of the air relative to the ground. So what is the true answer? It is ***wind gradient!*** *Wind gradient is best described by the following diagram. One cm from the ground there is hardly any air movement; one metre from the ground there might be a fair breeze, and at 10 metres quite a strong wind. The height and severity of the wind gradient depends on the type of ground over which the wind blows, and, of course, the wind strength. Wind gradient will be most noticeable when there is rough ground or trees upwind of the flying area. The theory that a plane flies relative to the air, regardless of the ground speed is only partly true; it still has inertia, that is, it resists change in speed and direction with respect to the earth because, for our purposes, the earth can be said to be stationary. Now let us look at a plane descending in a wind gradient, for example, when making a landing approach. At A, the ground speed is say 5 km/h and the air speed is about 23 km/h. Then at B, if the ground speed is still 5 km/h, the air speed will only be about 14 km/h. Because of the reduced air speed there will be less lift, and this, in*

to page 152



WIND GRADIENT

By Bob Wallace

Compact Competition Caddy

The Compact Competition Caddy is shown loaded and ready to go to the starting line.

With this little Caddy, you can get to the starting line with just the equipment you need.

Over the years, an abundance of flite box designs have been presented for the R/C fraternity to consider. Magazine construction articles, assembly kits, and completely finished models, of all shapes and sizes have been provided. At this stage in the evolutionary development of R/C, one would surmise that a flite box to suit every modelers needs has been produced. With the lone exception of the competition oriented flyer I would certainly agree. The Compact Competition Caddy flite box, which is the subject of this article is aimed solely at that segment of the R/C modeling public. While it is designed primarily for use by the pylon racer, it should also prove useful to the competition pattern and scale flyer.

If you are a pylon racing competitor, you have, in all probability, toted a flite box back and forth on multiple trips to a distant flite line at every race that you have entered. That flite box is often rather heavy and cumbersome and generally contains a number of items that are invaluable at a contest but very rarely used or needed on the starting line. The Compact Competition Caddy is different in the sense that it contains only the absolute "starting line" necessities. It has provisions for a starter and battery, a glow driver, a tachometer, a spare glow plug, and essential tools only.

In pylon racing any starting line problem that may arise (other than a bad glow plug or loose prop and spinner) that requires additional equipment is unlikely to be diagnosed and corrected within the allotted 60 to 90 second starting period.

The cord and connector can't really be appreciated until you try it.

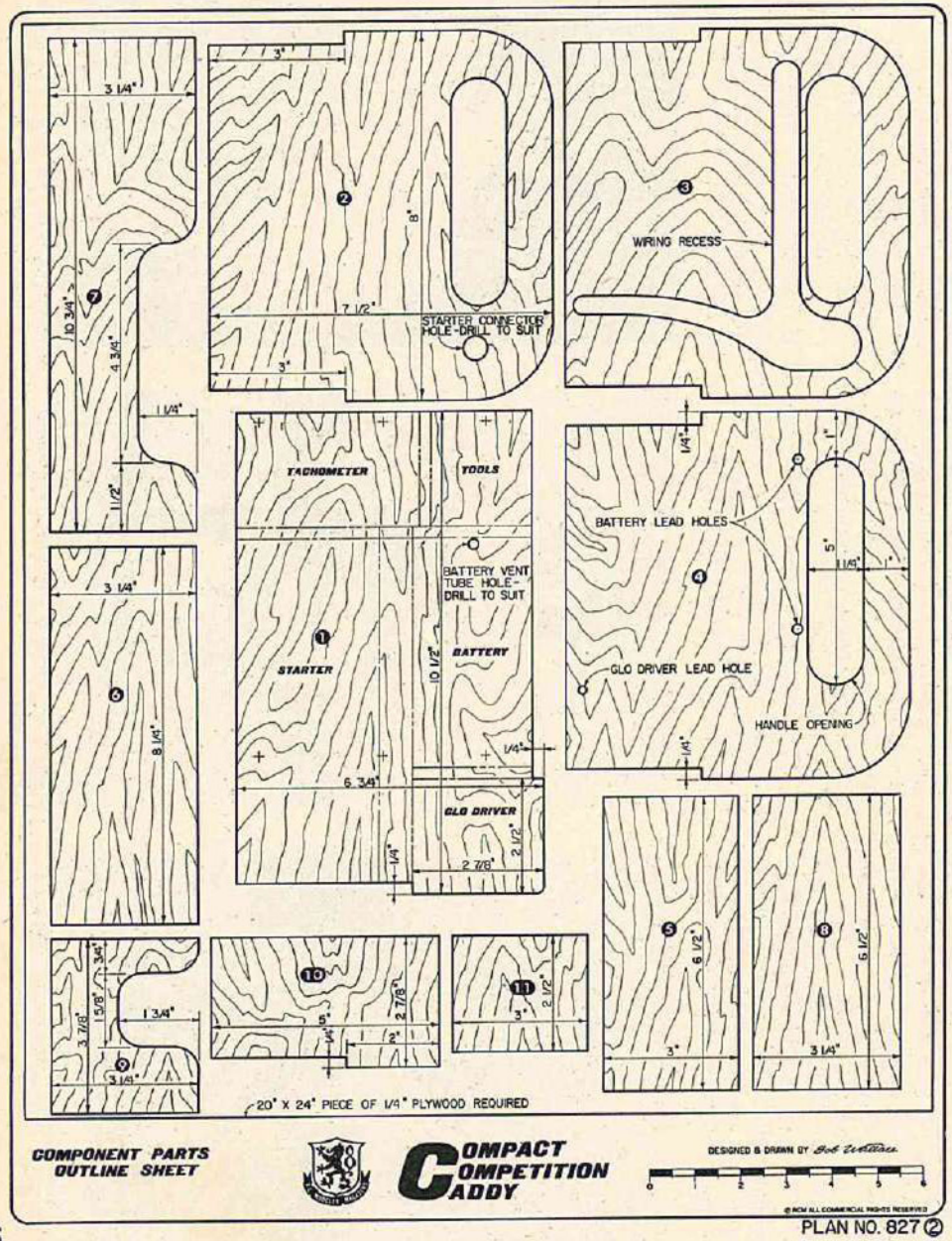
In most cases this would also apply in the pattern and scale events. Why, therefore, carry all those unneeded pieces of equipment, repeatedly back and forth to the starting line? Leave them in your regular flite box in the pit area.

The Compact Competition Caddy is constructed from readily available 1/4" plywood. A piece of plywood measuring 20" x 24" is more than ample. A piece of 1/4" thick birch plywood was used to construct the Caddy shown in this article, but there is no reason why any type of 1/4" plywood could not be used. If you have an old piece, or pieces, of scrap 1/4" thick paneling or fir plywood, this should serve equally as well. The slide-out transmitter

to page 150

The CCC was designed primarily for Formula I racing, but is suitable for starting line duty in any event.

This complement of equipment is used for 1/2A racing.

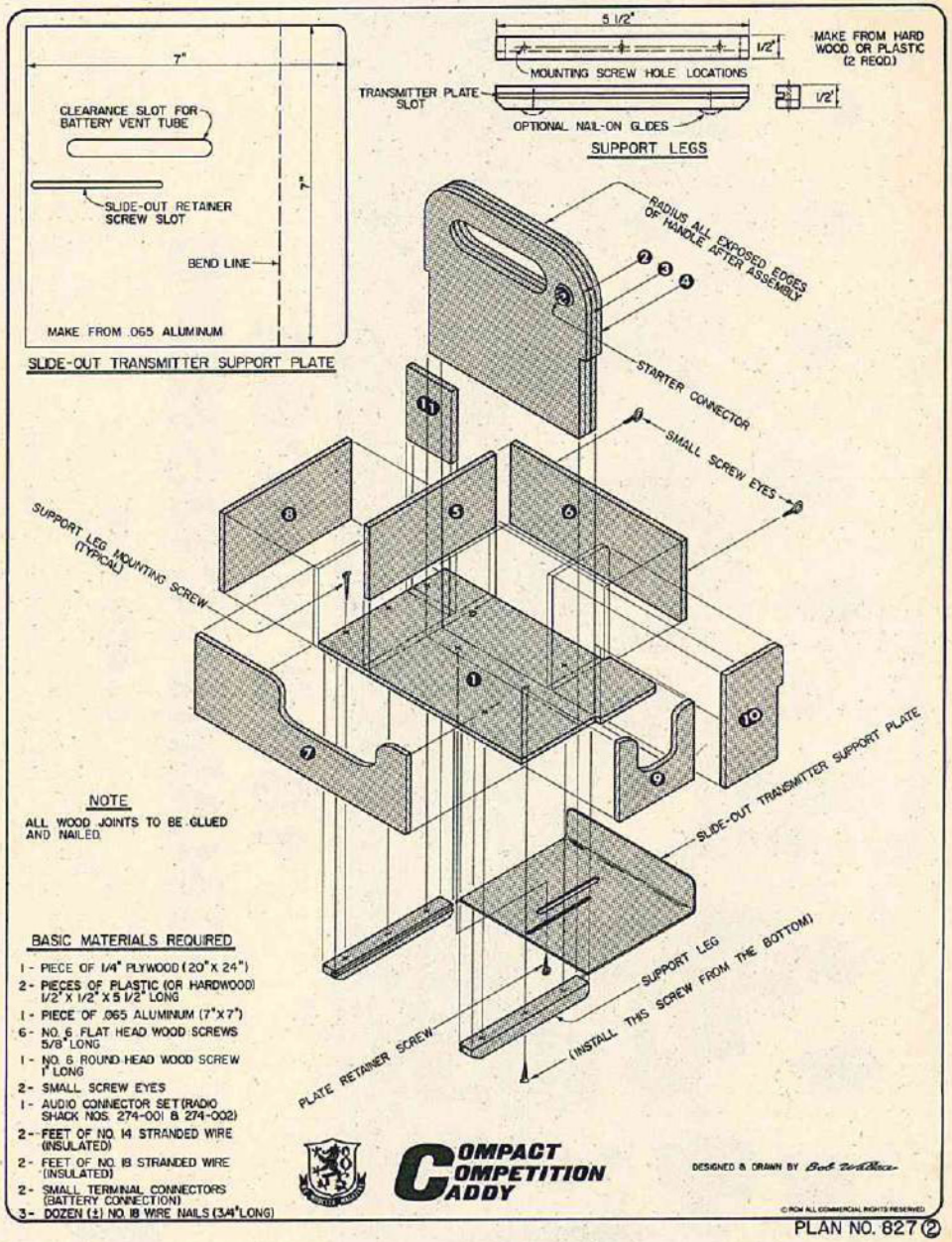


COMPONENT PARTS OUTLINE SHEET

COMPACT COMPETITION CADDY

DESIGNED & DRAWN BY Bob Zeltwanger

PLAN NO. 827 ②



NOTE

ALL WOOD JOINTS TO BE GLUED AND NAILED.

BASIC MATERIALS REQUIRED

- 1 - PIECE OF 1/4" PLYWOOD (20" X 24")
- 2 - PIECES OF PLASTIC (OR HARDWOOD) 1/2" X 1/2" X 5 1/2" LONG
- 1 - PIECE OF .065 ALUMINUM (7" X 7")
- 6 - NO. 6 FLAT HEAD WOOD SCREWS 5/8" LONG
- 1 - NO. 6 ROUND HEAD WOOD SCREW 1" LONG
- 2 - SMALL SCREW EYES
- 1 - AUDIO CONNECTOR SET (RADIO SHACK NOS. 274-001 & 274-002)
- 2 - FEET OF NO. 14 STRANDED WIRE (INSULATED)
- 2 - FEET OF NO. 18 STRANDED WIRE (INSULATED)
- 2 - SMALL TERMINAL CONNECTORS (BATTERY CONNECTION)
- 3 - DOZEN (±) NO. 18 WIRE NAILS (3/4" LONG)

COMPACT COMPETITION CADDY

DESIGNED & DRAWN BY Bob Zeltwanger

PLAN NO. 827 ②

The best pylon racers in the country do it at Titusville.

The Top Twenty Plus One.

1980 NMPRA CHAMPIONSHIPS

By RCM Staff

The 1980 NMPRA Formula One Championships is now history. The event took place October 25 and 26, and was hosted by the Moonport Modelers at Ti-Co Airport, Titusville, Florida.

This last big race of 1980 drew together 45 of the country's best, previously qualified under NMPRA's point system. Except for a borderline high wind Saturday which caused some anxious moments, the weather ordered by the Moonport Modelers was perfect, as was the organization and operation of the contest. Overall winner was California's Tom Christopher, an airline pilot by trade, the only flyer with a perfect all-fours score after two days of fast and furious racing.

The meet's fast time trophy went to another Californian, Dave Shadel, with a glued-to-the-course flight of 1:09:00, which qualifies also as a new NMPRA low time. This was not a surprise to anyone; Dave has been extremely fast all year, and was number one in the NMPRA standing with a total of 613.7 points.

When the last throttle was pulled back, the final results were announced and trophies were awarded as follows:

1. Tom Chirstopher, CA, 40 Points
2. Greg Doe, TN, 38 Points
3. Dave Shadel, CA, 37 Points
4. John McDermott, NC, 36 Points
5. Brian Richmond, FL, 35 Points
6. Dave Pierce, NC, 35 Points
7. Bill Grove, CA, 34 Points
8. Laird Owens, CA, 33 Points
9. Glen Sicotte, NY, 33 Points
10. Bob Wallace, CT, 30 Points
11. Bob Reuther, TN, 29 Points
12. Lew Hipkins, PA, 29 Points
13. Dave Latsha, PA, 28 Points
14. Robert Schuster, FL, 27 Points
15. Bill Hager, TX, 27 Points
16. Gary Hover, CA, 26 Points
17. Bill Preis, IL, 25 Points

Top Man, Tom Christopher takes it around number one, with some expert calling by Dave Latsha.

The twain did meet — California's 8th place Laird Owens and Florida's Valerie Williamson.

The fastest guy in town! Dave Shadel set a new NMPRA low time record at this Florida contest.

18. Kenneth Hulik, MI, 25 Points
19. Thomas Nay, AL, 25 Points
20. Gail Jacobson, GA, 23 Points

It is always interesting to see who shows up from where and with what at these national events. As to the where, the Californians were obviously the farthest away from home — there were 10 racers plus assorted friends there. There was also a good representation from the northeast and from as far in the midwest as Minnesota. As far as the airplanes are concerned, we did not get an accurate count, but the impression is about a fifty-fifty split between Tonis' and the Polecats, with a few miscellaneous. Radio-wise, and this is an accurate count, the country's top pylon fliers prefer Kraft by 47%, Proline by 27%, with ones and twos of EK, MRC, Futaba, Millcott, RS, Royal, Orbit, and Bob Wallace's Variant. Engine-wise, also an accurate count, the choice is 73% Super Tigres, with all the others being K & B's. The flyers themselves ranged in age from 18 to 56, with an average age of 34.

I heard only two complaints — John McDermott broke his crankshaft and claims that "they just don't make them like they used to." Other than that, we all had a great time, enjoyed the racing and the camaraderie and ate up that great Southern hospitality, courtesy of Prez Roy Johanson, Sali and Rod Gier, and all the members of the Moonport Modelers. Thanks guys, next time the cycle rolls around for another east coast NMPRA Championships, we hope to see you in Titusville.

□

The Samurai Racing Team took home their share of the bacon, though Manager Shinohara is not impressed.

Dennis O'Brien had two of the most colorful Polecats at the contest, and then there was one . . .

Dave Latsha placed 13th in the race, 1st in finish. He would have also won 1st for van paint contest.

The Californians traveled en masse to Titusville; 15 of us with assorted boxes descended upon Delta Airlines.

RCM's Bob Wallace smilingly accepts the 10th place trophy from Moonport Modelers Pres. Roy Johnson.

Our wide angle camera caught 17th placer Bill Preis and Roy Johanson sharing a laugh.

Aircraft Design Factors For The Midwest RK-20B Ducted Fan

Now — you too can be a jet jockey

By Rich Uravitch

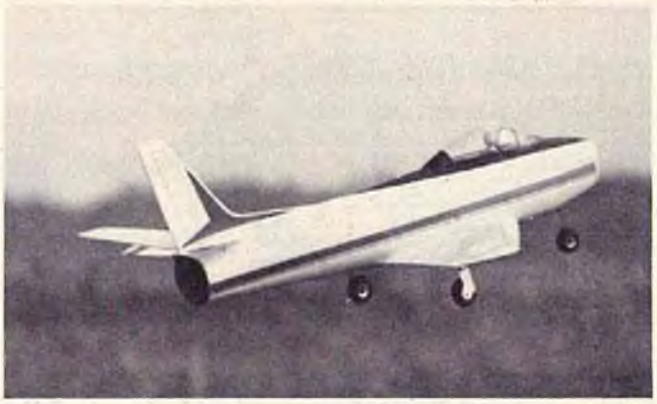
Ever since becoming involved with ducted fan R/C airplanes, I have believed that the only time this form of scale modeling would achieve any measure of success would be when the manufacturers could provide the modeler with an off-the-shelf fan/engine combination that he could operate and maintain in a fashion similar to conventional propellor driven sport models. With the introduction of the RK series fans by Midwest, specifically the RK-20B, and the 3.5 series K & B engine, it appears we now have a workable, reliable, and relatively uncomplicated ducted fan propulsion system.

Until this point in time, repeated success with this exciting form of propulsion was limited to a sprinkling of modelers who possessed the talent, patience, knowledge and resources to insure success. At the top of the list would have to be Bob Violett, Nick Ziroli, Dick Sarpolus and Larry Wolfe. Four really innovative and creative guys. Bob is one hell of an engine man with seasons of Formula I racing contributing to his knowledge of how to extract every last rpm from his engine. One wonders, when hearing his A-4 Skyhawk for the first time, how a piston can change directions so rapidly and still remain intact! Nick "The Polish Falcon" Ziroli has **designed** more successful airplanes than the average modeler will **build from kits** in his lifetime. His ducted fan experience goes back to early development work with Bob Kress, designer of the RK fans. Of course, Nick could probably fly an anchor given enough power and runway. Dick Sarpolus is kind of a grass roots modeler who appreciates what the sport flyer really wants. His Jetster 20 and 40, while maybe not the most esthetically appealing designs, are functional, simple, easy to build and most important, flyable. Dick realized, early on, that a 125 mph A-4 may not be ideally suited to everyone. Larry has directed his efforts toward higher performance, detailed scale machines with his Mirage and Cougar. These four gentlemen, and a host of others, have really put this fan thing within the reach of the average, fun seeking sport flyer.

The design of the F-86 came about as a result, among other things, of my geographical proximity to Bob Kress. Having had some, albiet limited, experience with ducted fans and being aware of the then forthcoming release of the RK-20B fan unit, I asked Bob for a set of dimensional drawings of the unit in order to size a model. Bob responded with a prototype unit, stressing that it was a "prototype" and not necessarily representative of the planned production item. I acquired a K & B 3.5 engine and started running some tests to familarize myself with the package. Satisfied with the results and deciding early on that even if I **could** install a radio on my static test stand, it probably wouldn't fly, I needed an airplane. Since there weren't any kits available, we started the subject search. Numerous aircraft were looked at, most discarded and then --- the light dawned! Why not scale up my 1/2A F-86? This little airplane weighed 28 oz., used the RK-049 with a TD .051 and flew pretty well on two channels. Furthermore, when displayed at Toledo in 1979, it drew enough questions to indicate above average interest. The advertised thrust (16 oz.) provided a little better than a 1:2 thrust to weight ratio, less than ideal, but, except for a long take-off run, provided reasonably good results. Figuring the closer I could get to a 1:1 thrust to weight for the new airplane, I planted a

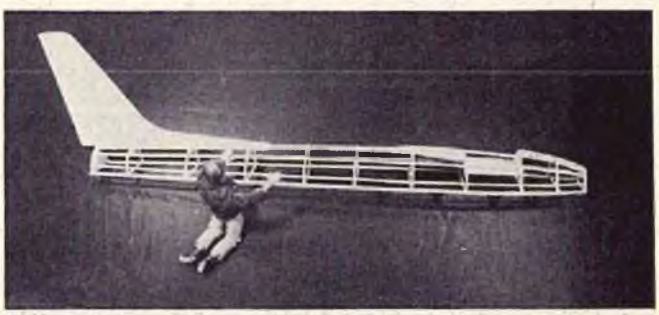
to page 140

Rich Uravitch with two of his ducted fan development models.



F-86 has a respectable climb-out after take-off.

Large pieces of sheeting simplifies covering and minimizes weight.



Note small number of parts required to achieve correct shape.

FIRST LANDING PANIC

By Tom Kempf

Most experienced R/C pilots have, at one time or another, been flight instructors. They've helped newcomers earn their wings. What one thing strikes the most fear into a student's heart? The first landing, of course.

I've discovered a devious, underhanded way to get past that hurdle, and my students thank me for it. I now **avoid** what happens in the following scene, an event that may sound familiar to both instructors and students.

"This time around," says the instructor, "you're going to put that turkey on the ground."

"You mean, **land**?!" says the student, almost dropping his transmitter. "Really **land**?!" His knees start shaking.

"You got it. Just make your approach like the last one and you'll grease her in. No sweat."

The student notices his thumbs are sweating. "My thumbs never sweat before," he mumbles as he makes a wobbly turn onto final approach.

"Throttle back some more," says the instructor. "No, too much. Up a little, throw in some up trim. You're too low. Add some throttle. A little left. Not right, left! Watch that tree!"

Crunch! Across the field drifts the sound of MonoKote and tree branches trying to occupy the same space at the same time. The result? We now have an airplane and a student pilot, both in need of repairs.

Not too long ago, I was the instructor in that scene. But the next time I worked with a student pilot toward that first landing, a flashbulb went off in my head. I decided to be daring, to try something unheard of. I wouldn't tell him he was going to land!

But that's crazy, I thought. How can he land if he doesn't know he's going to land? I reasoned it this way: A student's anxiety increases geometrically with the proximity of his aircraft to the ground. I had to get his attention off the hard stuff he thinks will reach up and smash his airplane. I had noticed that every student goes to pieces when he's told that for the first time he will singlehandedly arrange a controlled meeting between his airplane and the dreaded ground: He suddenly forgets the plane and starts worrying about the landing. So I don't tell him.

It's easy. Sneaky, but easy, and it works. Before take-off, I lay out the flight plan like I always do. "We're going to fly the pattern and make some practice approaches at altitude," I say. I'm lying, because I know he'll make that first landing today.

Up goes the airplane, under his control. He does a couple of horizontal eights to get into the swing of things, and enters the pattern on the downwind leg. Altitude about 150 feet. I decide to test his trust in good old me.

Let me digress, on the downwind leg, to talk about trust. It's a necessary ingredient in the "don't-tell-him" system of first landings. The student must trust the instructor 1000% or it won't work. When the instructor says, "Left," the student must immediately react with left --- not right, not up elevator, but left. He must believe that what the instructor says to do is the only possible thing to do. Most of my students have that kind of trust, but I don't take it for granted. I test it before I don't tell him to land --- and then make him do it.

Back to the downwind leg. Oops, he's on the crosswind leg. "Throttle back a little," I say, "and let it sink a bit." He reacts immediately and correctly, total concentration on the airplane.

He turns on final, about 75 feet off the deck. "Correct left," I say. He corrects a bit too much, and the approach can't be salvaged. "Okay," I say, go around again."

He throttles up and flies past. The next two practice runs are similar, with something going wrong somewhere. I'm waiting for the one that looks like a winner.

The fourth time around, he's steady as a rock and trusting me completely with automatic reactions. When he turns on final, about 300 feet from the end of the runway, he's lined up perfectly. I decide not to tell him he's going to land.

"Really nice," I say. "Just keep her straight." By now I see he's got plenty of altitude to make the runway. "Throttle down to idle," I say. He does it right away, still concentrating on the airplane. He knows he's getting close to the ground, but he's expecting to go around again. He also knows he's in solid control of the airplane.

The plane is now over the end of the runway, 10 feet high. "Keep her steady," I say, "and begin feeding in some up elevator. Easy does it." The plane is only 3 feet above the grass as it passes us. He's still expecting to go around for another practice approach. This is working so well I almost feel guilty.

"A little more up," I say as the plane's wheels begin to brush the grass. The plane settles gently on the runway and rolls to a stop, engine idling quietly. There is dead silence between us.

He turns to look at me, puzzled. "What happened?" he asks.

"You just made your first landing."

"I did?" Realization dawns. "I did!"

I hold out my hand. "Congratulations."

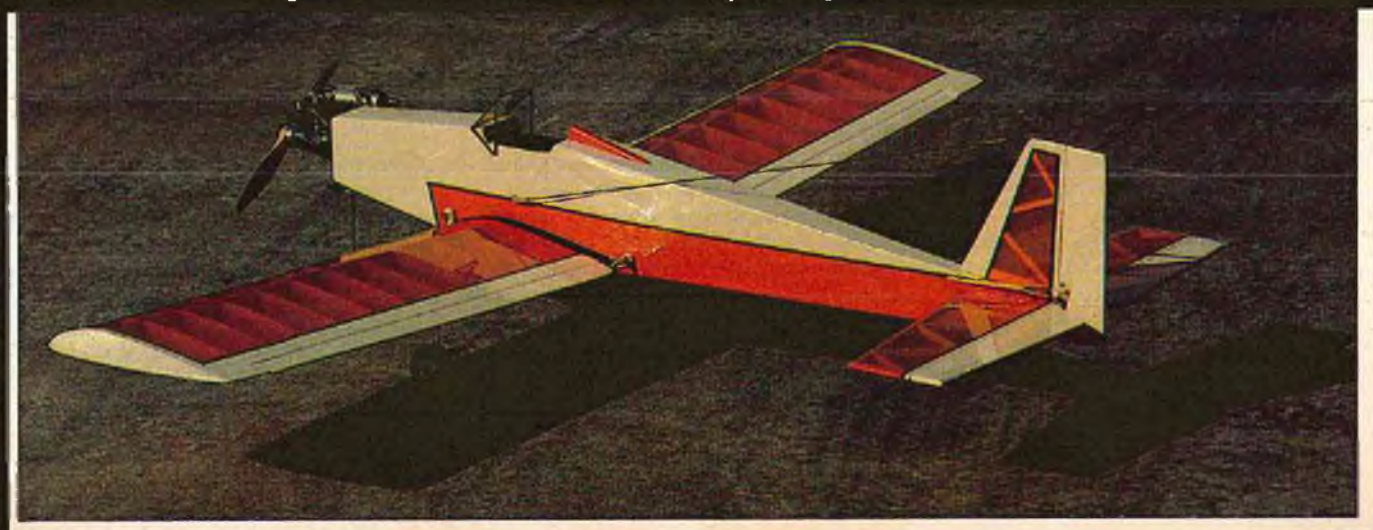
Now he gets excited and starts to babble. "I really did it! All by myself. I can't believe it. But how? I wasn't planning to land. I wasn't even nervous." And he goes on for five minutes or so.

This isn't the end of his basic training, however. Just as in full scale aircraft, he needs some landing practice with an instructor before he can set out on his own. But the toughest part is over, that first landing.

Skeptics might say, "That's trickery. It didn't help." But I say it helped a lot. He now knows he **can** land that plane all by himself. He learned to go around when the approach isn't right. He knows how to handle the plane close to the ground. Most important, however, he'll never have to panic about his first landing. It's over. □

HOMER

Designed to help the beginner, the Homer is for anyone. The simulated open cockpit sport trainer will handle engines from .10 to .20 cu. in. Pick your engine and give yourself a treat.



By L.F. Randolph

Homer is suppose to look something like a home-built airplane, just a little mind you; to convey the idea. Some years ago I built, or almost built, a Flybaby (I sold it just before it was finished because it was just too small for my new wife and me at the same time — I still have the wife and she is a lot more fun than any airplane) and ever since I have had a warm place in my heart for open cockpit airplanes. Models with open cockpits have clean up problems so, to correct that, Homer has a closed open cockpit that retains the flavor without the mess. Homer is easy to build and although it is a generous size for a .15 engine it is light and the performance is just what it should be for a solid Sunday flying airplane.

From a full throttle pass, Homer will climb straight up for a good two hundred feet before pausing to catch its breath, and at a climb angle of 60 degrees it will go out of sight. Although the airfoil is not designed for it, Homer is comfortable inverted and will do almost any of the outside stuff other than snaps. Spin recovery, both inside and out, is almost instantaneous with the relaxation of rudder and elevator. Slow flight is just great; in fact, I spend most of my time at one-half throttle or less doing lazy loops and rolls in close where they are easy to see and enjoy. I honestly believe the landings are so easy that a dedicated effort has to be made to foul them up. The touch down is nose high and the airplane almost tip-toes down the runway, no tendency for a wing to drop at the last minute, and complete aileron control till roll out. Knife edge is not good because of the power available, but slips all the way to touch down are easy and recovery is rapid with no inkling of a snap. I would recommend Homer to anyone from a beginner on.

A word about construction --- build light. Homer is strong without any changes; in fact, during one of the test flights it did a full throttle split-S into a concrete runway and lived to fly again. Any R/C aircraft structure should be built to fly --- never to crash --- but, should that happen, the lighter they are the softer they fall!

CONSTRUCTION

Wing:

Cut out all the parts before starting the assembly and everything seems to go easier. The ribs can be traced on sheets of 1/16" balsa and cut out as individuals, or they can be stacked up and sawed at the same time. The template-tracing method uses less wood but either way is fine. Select four of the ribs and trim 1/16" from the top and bottom of each and trim the main spar notches 1/16" wider on each side; label these RC. Select four more and glue the 1/16" plywood landing gear mount braces to them at the main spar notches and trim them for the landing gear mount; label these RL. Note, there are two left and two right.

Strip the spars from good firm, not hard, 3/16" sheet balsa; be sure the grain is straight down each spar. Slice the trailing edge sheeting from medium 1/16" sheet and the trailing edge from firm 1/8" stock. The leading edge is 1/4" sq. balsa. The strip stock can, of course, be purchased from your local hobby shop rather than being stripped. Use a straight-edge and a good sharp knife to cut the dihedral braces from 1/16" plywood. While you are at it, cut the stab spar doublers from 1/32" plywood. Cut the spar and trailing edge webs from medium 1/16" balsa with the grain running vertical to the longest side.

Pin the plans to a good flat building board and cover them with waxpaper or plastic wrap. Pin the trailing edge sheeting and the bottom main spar in place over the plan. If the main spar is cut a little longer than the plan length it can be pinned at each end right through the spar and into the work board without damage because that part of the spar will be trimmed away later. Start gluing ribs to the bottom spar and the trailing edge sheet with the second RC. The sequence goes like this. Glue in the spar and trailing edge webs at the center section followed by the second RC, more webs, the first RL, webs, the second RL, more webs, the next rib, etc., on out to the tip. Installing the webs as you go along keeps the ribs vertical to the spars as well as equally spaced. When all the ribs are in place, add the top main spar and the top front spar as well as the leading edge and the

text to page 114

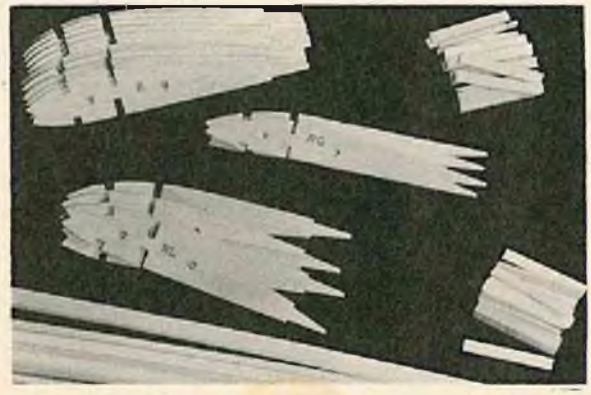
HOMER

Designed By: L.F. Randolph

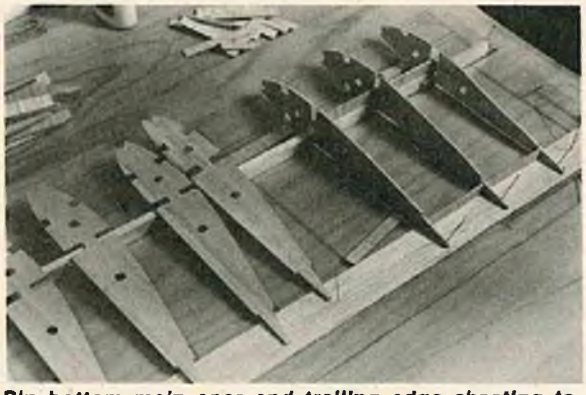
TYPE AIRCRAFT
Sport-Trainer
WINGSPAN
49½ Inches
WING CHORD
7¾ Inches
TOTAL WING AREA
380 Sq. In.
WING LOCATION
Low Wing
AIRFOIL
NACA 4312 (Mod.)
WING PLANFORM
Constant Chord
DIHEDRAL EACH TIP
1 Inch
O.A. FUSELAGE LENGTH
32¼ Inches
RADIO COMPARTMENT AREA
(L) 9" x (W) 2¼" x (H) 2½"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
4½" (Avg.)
STABILIZER AREA
87 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Mid-Fuselage
VERTICAL FIN HEIGHT
5½ Inches
VERTICAL FIN WIDTH (incl. rudder)
4½" (Avg.)
REC. ENGINE SIZE
.10-.15 Cu. In.
FUEL TANK SIZE
4 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Throt., & Ail.

BASIC MATERIALS USED IN CONSTRUCTION

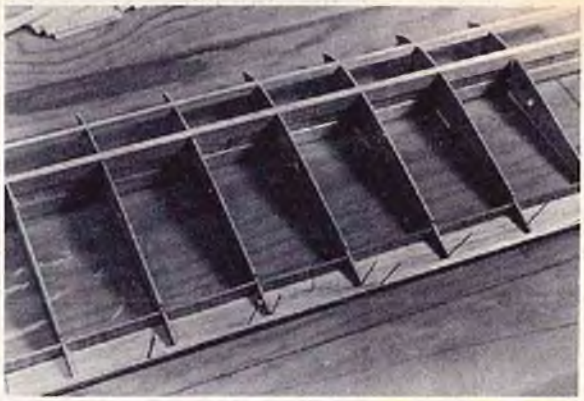
Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa and Ply
Wt. Ready To Fly	**35 Oz.**
Wing Loading	**13.25 Oz./Sq. Ft.**



Wing kit, spars, ribs and webs. RL's and RC's are all made from regular ribs.

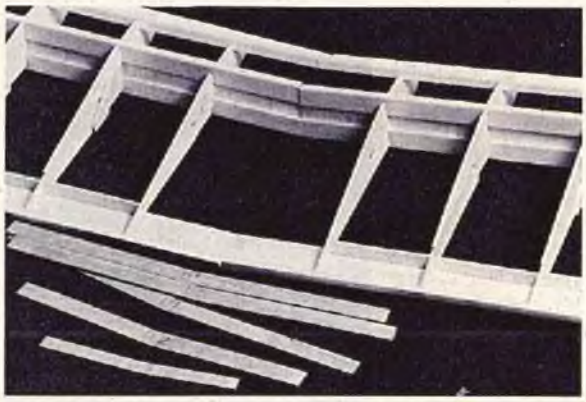


Pin bottom main spar and trailing edge sheeting to building board and assemble wing by adding ribs and webs from the center out to the tip.

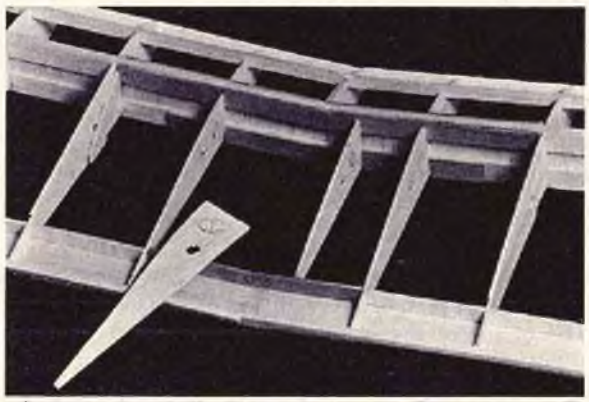


Partially completed wing half still on building board, leading edge and bottom front spar will be added when wing is removed from board.

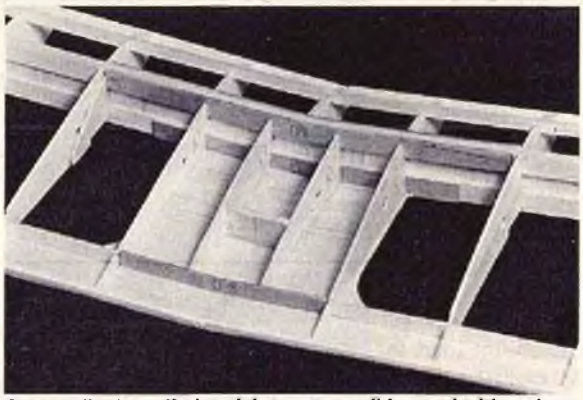
Use fine sandpaper and a block to sand bevel in trailing edge to prepare it for top trailing edge sheet.



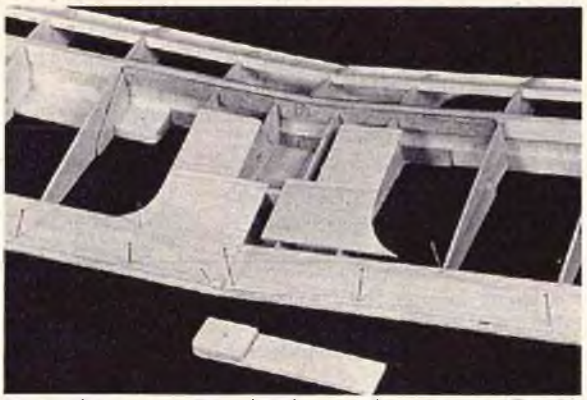
Spars, leading edge and trailing edge have been beveled to fit the dihedral angle and are ready for dihedral braces and joining.



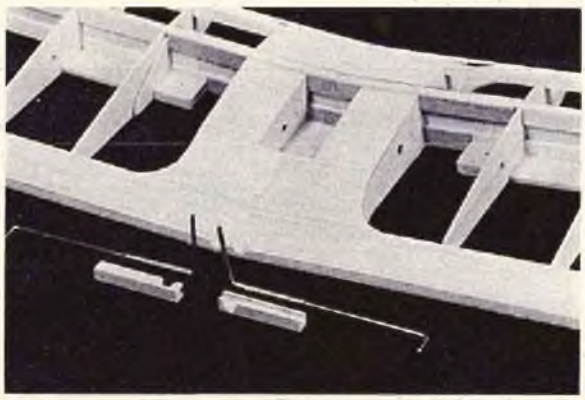
After wings are joined, the two center ribs are cut to fit between the spar and trailing edge and the spar and leading edge.



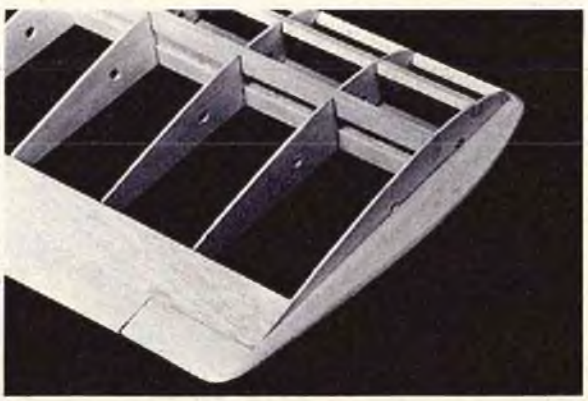
Center ribs installed and the servo well formed with a piece of scrap balsa trimmed to fit between the ribs, bottom sheeting in place.



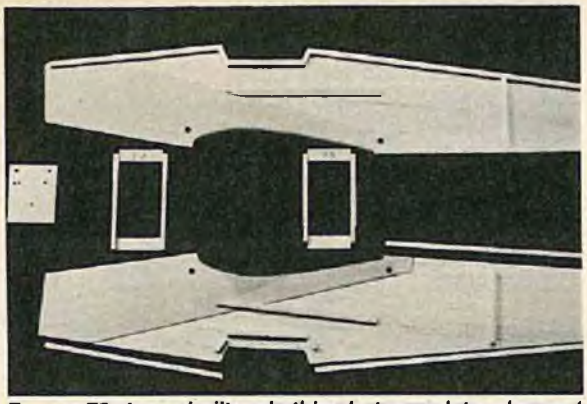
Top trailing edge sheet in place and center sheeting in progress, landing gear mounts shown assembled and installed.



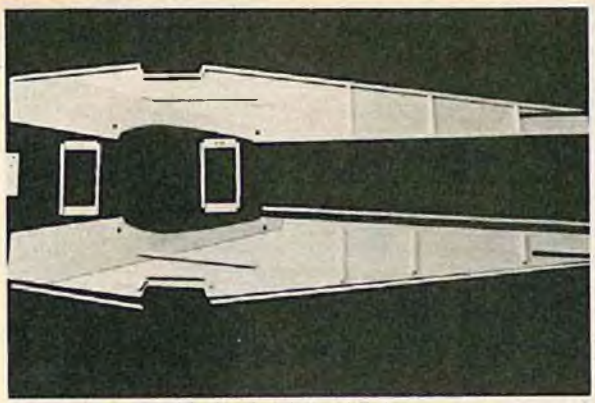
Aileron torque rods are 3/32" wire through 1/8" brass tube. Brass tube is epoxied to the trailing edge and covered with the fairing made from 1/4" sq. balsa. Note relief notches trimmed in trailing edge.



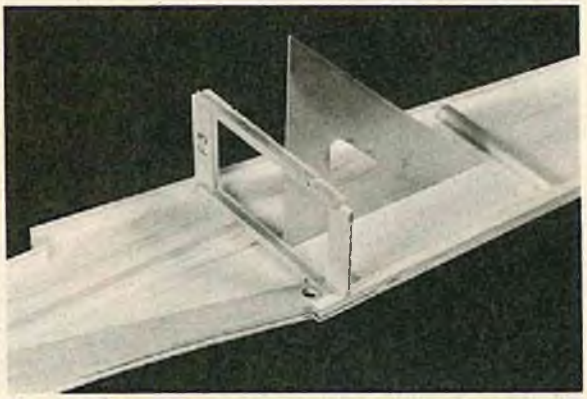
Last 2" of aileron is cut off and glued to the trailing edge at the tip. Holes in ribs allow plastic film to breath when shrunk with a heat gun.



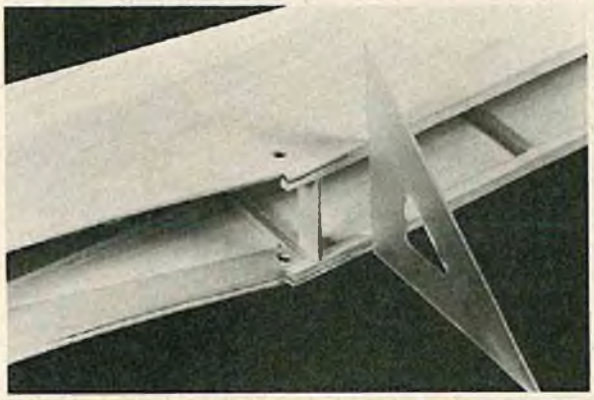
Former F2 shown built up in this photo was later changed to plywood as shown on plans.



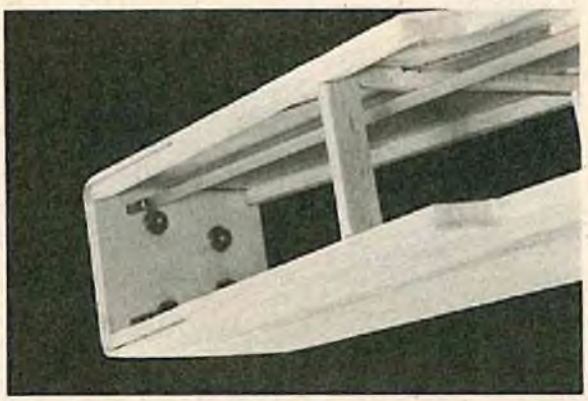
Fuselage assembly is simple and light.



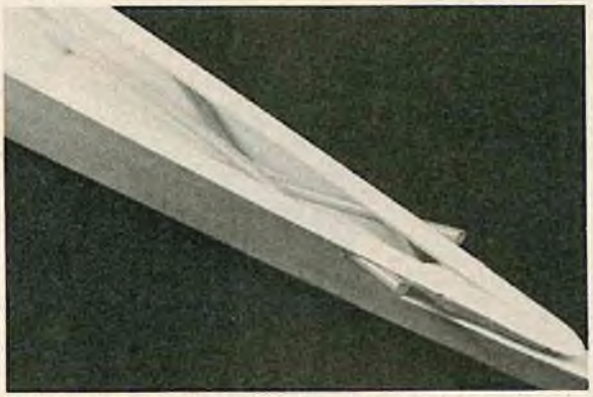
Glue formers to one side of fuselage and use a square to hold them in place, Hot Stuff works great here.



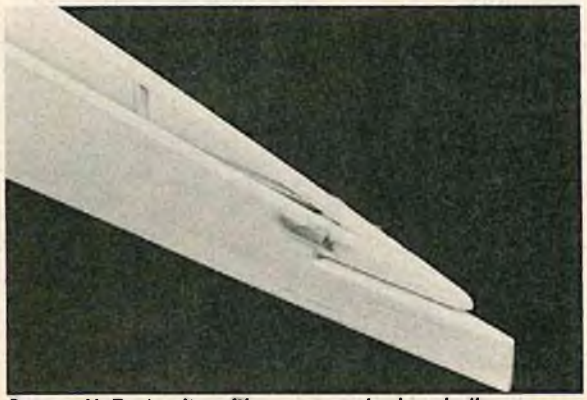
Glue the second side on the formers right over the first, use a square to align both sides.



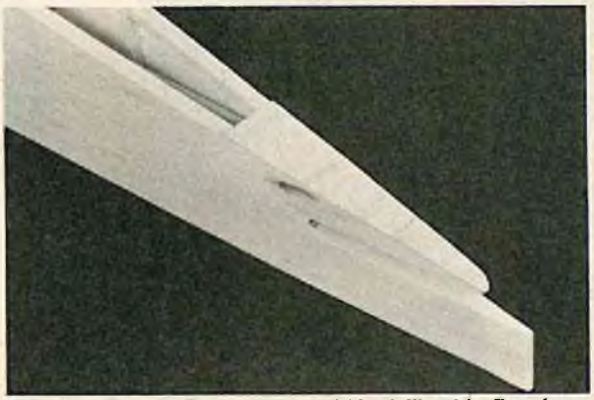
Firewall with blind nuts, fuel and overflow lines as well as throttle line installed.



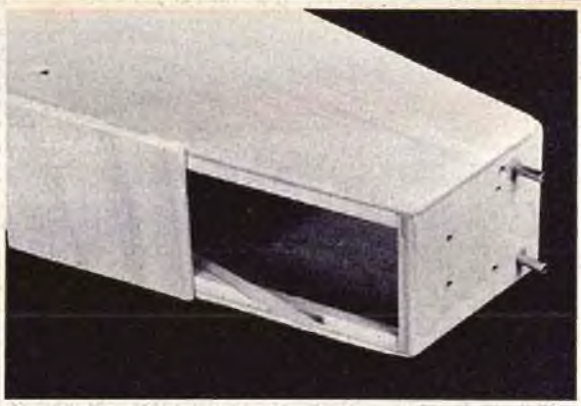
Outer NyRods are installed in fuselage before top sheeting is in place.



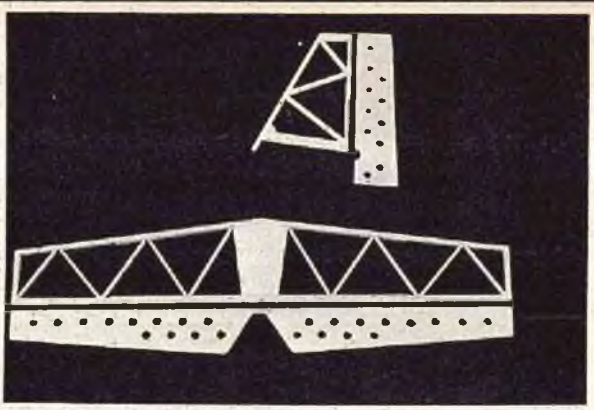
Secure NyRod exits with epoxy and micro-balloons.



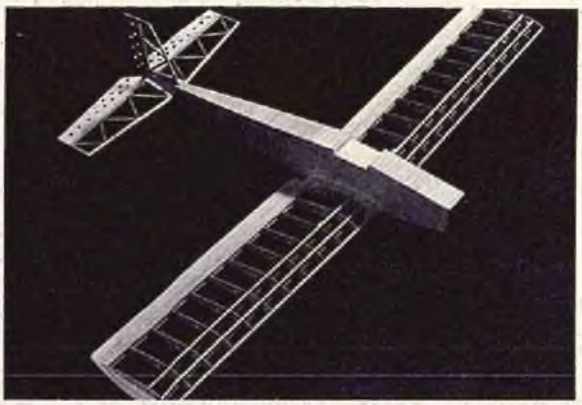
After sanding, NyRod exits should look like this. Fuselage top sheeting can now be completed.



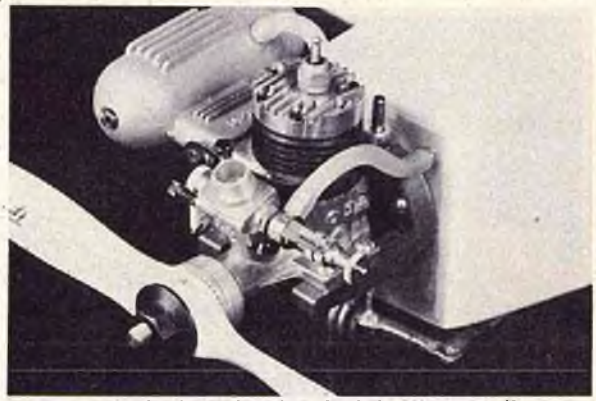
Nyrod to nose gear steering is fitted in slot thru bottom longeron prior to addition of bottom sheeting. Brass fuel & overflow lines ready for installation.



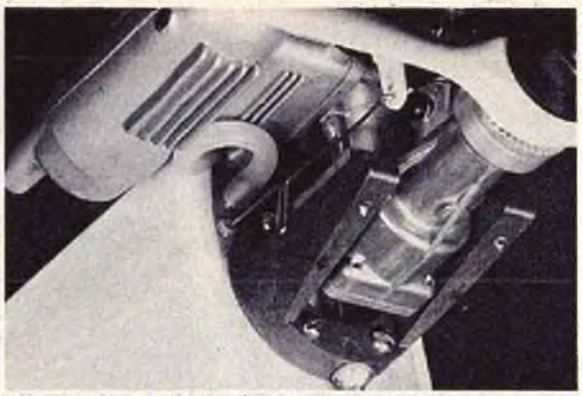
Completed fin-rudder and stab-elevator assemblies ready for cover. The lightening holes in rudder and elevator are not necessary if soft stock is used.



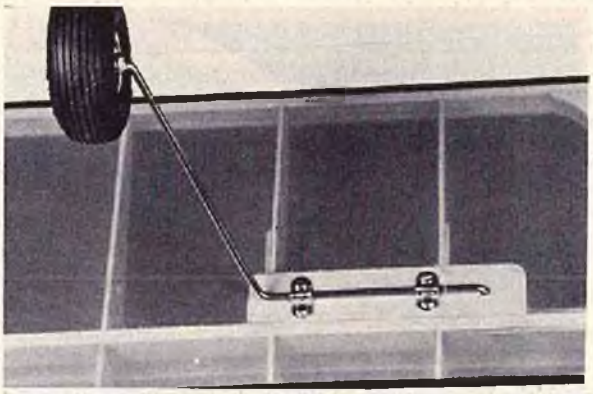
All structure is complete and Homer is ready for cover. Wing should be fitted to saddle at this time.



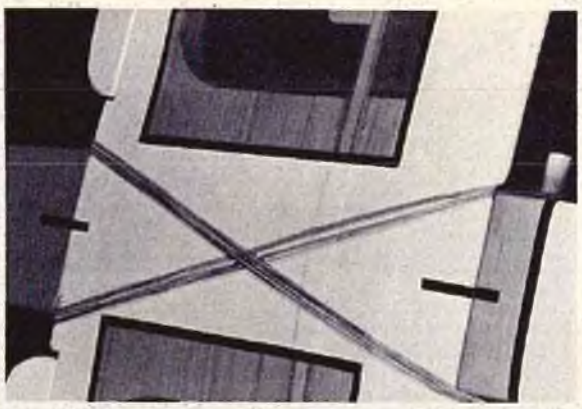
Engine installation showing fuel & pressure lines to engine & muffler, as well as detail of nose gear steering arm. Plans show Goldberg nose gear steering arm.



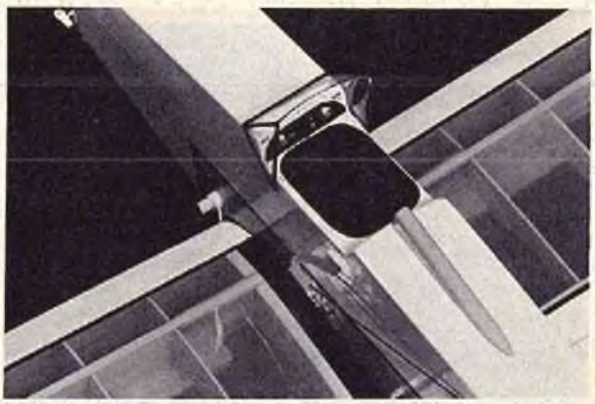
Close-up of throttle linkage which provides method of adjustment as well as override protection for servo.



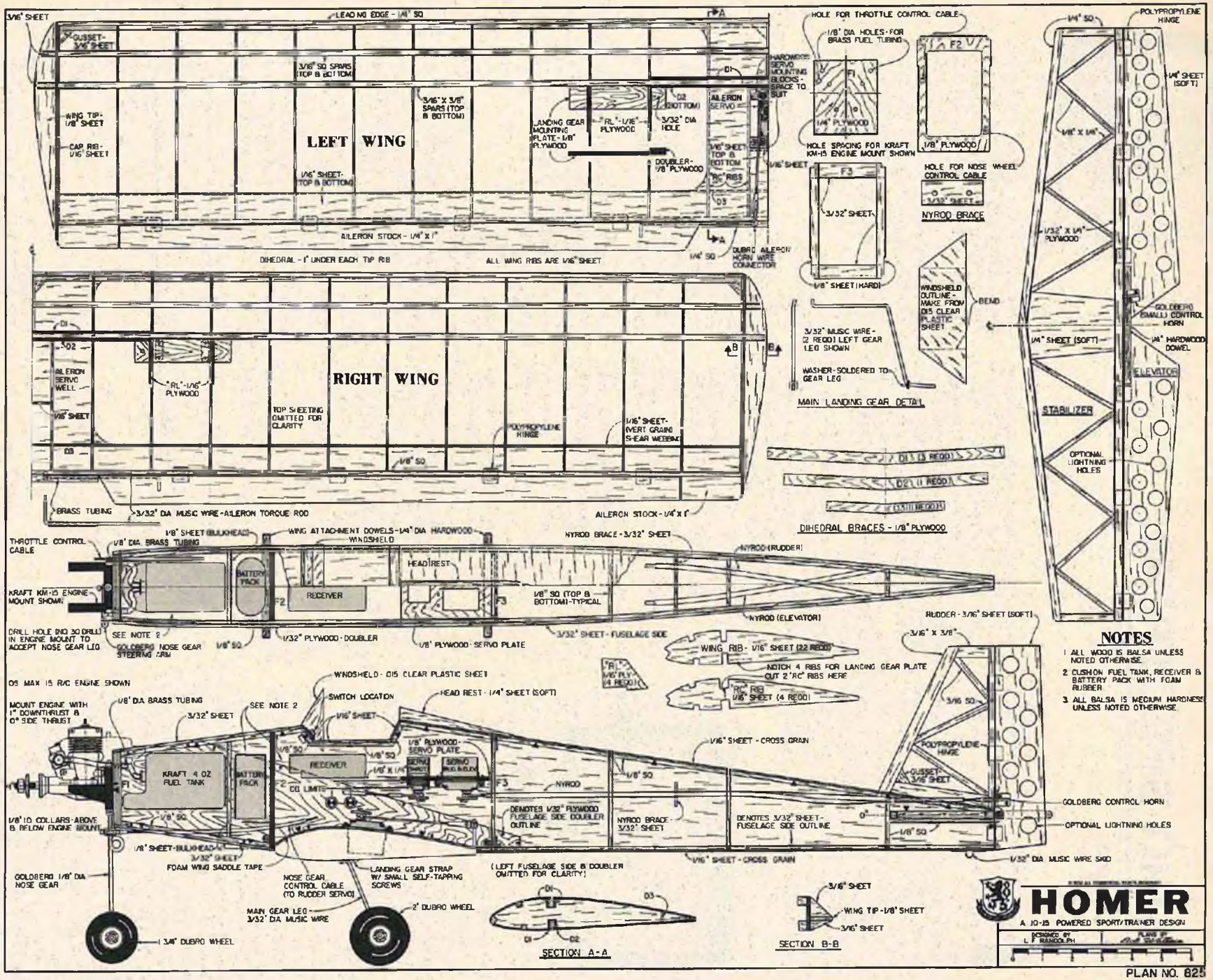
Main landing gear is held in place on the gear mounts with brackets and small wood screws.



Small strips of pin-striping is used for alignment marks on the fuselage and wing.



Switch is mounted on inst. panel, black MonoKote simulates cockpit. Windshield is cut from a piece of florist box and pinstriped.



FULL SIZE PLANS AVAILABLE — SEE PAGE 190

RADIO SPECTRUM

Jim Oddino

I sat down to start writing this month's column about an hour and a half ago and all I've done so far is answer eight letters. All good questions but probably not of general interest to our readers. Unless you fly control line and want to add functions by using an R/C encoder and decoder and use the control line instead of an RF link; or you want to add a fifth channel to your 4 channel Heathkit or switch out the exponential on your Omega transmitter, etc., etc. Anyway I've decided to get through this month by just answering letters so let's go.

Chromatronics Fail Safe

I received a letter that was addressed to Dick Kidd from a gentleman named David S. Coles. Way back in May, he sent RCM a fail safe unit he is importing from England. I had tested it and then forgot all about it. When he didn't hear from us he wrote again but was very patient. Therefore, I think we owe him a few lines. The unit is a small box the size of a receiver that plugs in-between your receiver and servos.

The unit we received was set up for four servos so it has four inputs and four outputs. It does not come with connections so you would have to make arrangements for these first of all. It is designed for three wire systems with positive pulses of one to two milliseconds. This includes almost all of the popular systems. Under normal conditions the unit simply passes the signals from the receiver to the servos. Should something happen to disrupt operation such as loss of RF to the receiver, the unit sends pre-set signals to the servos to the so called "safe" positions. You might adjust for a gentle turn and low throttle for instance.

The unit does its thing if the pulses it receives from the receiver are not between two pre-set thresholds that you can adjust. Nominally these are 1.0 and 2.0 milliseconds. However, some systems work between .9 and 1.9 msec and these are easily accepted. Some of the times that a fail safe could save you are as follows: Transmitter failure, receiver failure, out of range, and in interference. If the interference is from another R/C transmitter and it "takes over," the fail safe won't help but this is unlikely. Usually the two transmitters beat against each other and the resulting pulses are all screwed up and the fail safe would help you. A good example is sitting on the start line of a race with two guys on the same frequency.

The unit is well built and looks like it should last forever. However, if you would have trouble, you'd have to send it back to England because they very cleverly ground off the numbers on the integrated circuits.

Before we leave this subject, I must report that fail safe circuits were built into the first digital R/C systems but were soon discarded. Too many times, the system went into fail safe and the plane proceeded to crash. These were pattern planes which are not inherently stable. The guys soon decided some control is better than none when you have interference and the fail safe circuits were discarded. However, in a scale job, or big stable Quarter Scale model or old timer, I'm sure the fail safe might work. How about someone out there giving it a try? Go up and turn off your transmitter, and see if the plane will come down free-flight style. Actually if the unit just gives you a chance to change something such as antenna position or lets the airplane spiral down to where you can get control again, it is probably worth its price which I believe is under $50. So for those of you looking for a four channel fail safe black box, write to: Sporting Goods, Ltd., 491 McNicoll Ave. Willowdale, Ont., Canada M2H 2C9.

Battery Life

Dear Mr. Oddino,

I would like to prolong the life of the nicad airborne batteries as much as possible. We know, that during the idle winter season, the batteries should be periodically recharged, because of the ever present leakage. Can we keep them in the refrigerator all that time and reduce the leakage considerably? The corrosion activity and chemical migration is also reduced, so it should be beneficial to the battery. I would appreciate your opinion.

Sincerely yours,
George Korbell
Mentor, Ohio

If you believe what the battery manufacturers say about charge retention you will put them in the refrigerator. The published curves (See Figure 1) indicate you can expect the batteries to lose all of its charge in about four months when stored at ambient (20°C) whereas it never loses more than 10% of its charge if stored at freezing (0°C).

I won't swear to the accuracy of this data but I do know that colder is better based on some tests we ran for the Army. One caution, be sure and warm the battery up before recharging.

Jim Oddino,

Try this one on.

While cycling my batteries, I let my transmitter and receiver sit while turned on. It was quiet in the shop, while the glue was setting, when the servos in the airplane made a small crack, then another. The servos were beginning to run! Before I got over to it, the servos were full throw. I shut everything down but noticed the transmitter meter was about half scale.

The servos were in full down elevator and low motor. The transmitter had driven the servos off range. Checking the transmitter,

to page 100

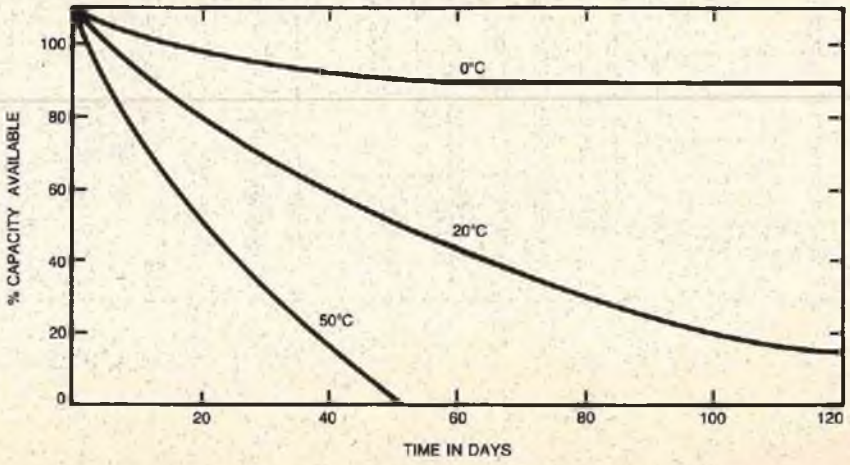


FIGURE 1

PIT STOP

Gene Husting

Vehle Raceway in Pomona, California, was the scene of the 1980 Western Regional Championships for 1/12 scale electric cars. 242 entries broke all records for participation. Electrics are growing!

Mike Lavacot was the big winner of the weekend. Mike was a ROAR National Champion in 1979 and 1980. Now he has added wins in both Stock and Modified Classes at the 1980 Regionals to his long list of wins.

Kent Clausen dominated the California Championship Series winning both the Stock and Modified Classes. Kent was also a ROAR National Champion in 1979 and 1980.

Western Regionals
242 Entries

The 3rd Annual Western Regionals race was again held in Pomona, California. The first two races were held at Thorp Raceway and this race was held at the same location, but now it's Vehle Raceway. John Thorp sold his track to Charlie Vehle. Charlie does not do any manufacturing and so is able to devote all his time to the raceway. This, in turn, has shown an increase in racing activities at the track.

The first two Regionals were limited to 200 entries each, but by following a tight schedule, the Race Directors, consisting of ROAR President Mike Reedy, Steve Hurley, Mike Howe and Frank Killam were able to allow 242 entries to compete this year. There are many who rightfully believe this annual 1/12 electric race is rivaling the ROAR Nationals for importance, although the Nationals is **the** Nationals.

The 1980 Western Regionals race was doubly important. Not only was it the largest 1/12 race of the year, but it was also the 4th points race of a 4 race series between Northern and Southern California, known as The California Championship Series. The racing fun was not limited to California drivers though, as Gary Kyes, #1 driver of the MRP Team came down from Washington, Chuck Phelps came from Phoenix, and Bob Bernhard made the trip from New Jersey just to join in on the fun.

The race schedule showed Saturday for Stock Class events and Sunday for Modified Class events. A history of the Regionals shows me winning the first Regionals Modified race, and Bill Jianas winning the 2nd Regionals with a track record of 23 laps in 8 minutes and 6 seconds. At the last club race here 3 weeks ago, I won with a qualifying time of 23 laps 8 minutes and 8 seconds and my son Curtis was right behind with 23 laps 8 minutes 10 seconds, so it looked like Jianas's record would be in jeopardy.

We went to the track Friday to practice and it looked as if half the entrants were also there practicing. Some of the guys going very fast were Mike Lavacot, Curtis Husting and Gary Kyes. I was quite happy with the way my car was running and didn't plan any major changes. Jim Aguirre looked like he was turning some laps as fast as anyone. A big surprise was John Thorp running a new prototype Thorp 1/12 electric car, and would you believe it didn't have a belt? We were told John was at the track every day for 2 weeks getting his car ready and he was beginning to go quite fast. The track was very clean and the traction was fairly good and a lot of guys were able to run without wings, although most of the Amateur and Novice class drivers still required wings.

Saturday morning everyone had to be there bright and early at 7:00 a.m. to tech inspect their cars and get their stock motors from the Race Directors. Everyone picked a stock motor out of a box. These motors were color coded, numbered and recorded by the Race Directors so no motor swapping was allowed. After practicing with the modified motors on Friday, these stock motors seemed a lot slower and I noticed a lot more

Derek Coopersmith is the hottest Amateur driver in Calif. Derek won the Modified Class, 2nd in Stock Class.

Gary Keyes, ROAR National Champion was Top Qualifier in Stock Class.

Andy Jacobson won Concours with this beautiful Kroells car.

wings being removed.

I was in the first qualifying heat and just barely won it, beating Tim Neja by just 1 second. I thought I had the slowest stock motor ever and so I bought another one from the Race Director for my 2nd round. Butch Berney edged Jerry Case by 4 seconds to win the 2nd heat. But the Top Qualifier came out of the 3rd heat. Gary Kyes got a great start and lead the field through turn one. Meanwhile, Mike Lavacot got off the line with Gary, but as Mike said, brain fade took over, and instead of going around turn one, Mike went straight towards turn four, which is the way the club races are run here. Well, Mike got to turn four first. Matter of fact he was wondering how he was so lucky to get there so far ahead of everyone else, so he looked to see where the rest of the cars were, and they were just coming out of turn two. Realizing his mistake, Mike then headed for turn one to play catch up. Meanwhile Gary Kyes was flying around the track, driving perfectly as he always does. Mike started passing cars and was getting closer and closer to Gary, but Gary was Top Qualifier in this round with 22 laps

Chris Chan finished a close 2nd in Concours with this equally beautiful Lotus F1 car.

in 8 minutes 21 seconds. Mike missed 22 laps by one second turning 21 laps in 8 minutes 1 second. Gary bettered his time in the 2nd round turning 22 laps in 8 minutes 20 seconds, about as consistent as you can get. Lavacot lost a servo and didn't complete his run, but remained in 2nd spot. Curtis Husting was 3rd with 21 laps in 8 minutes 6 seconds, and I was 4th with 21 laps 8 minutes and 8 seconds. The qualifying was so close that 4 of the "B" Main drivers also had 21 laps.

The drivers were separated into 3 classes, Novice, Amateur and Expert, and all the drivers were trying especially hard because this race also had points toward the California Championships standings.

Novice Stock "A" Main — Rich Douglas dominated the stock "A" Main, but not without a close battle from Joel Mayer in 2nd, Jeff Bates in 3rd and Wayne Campbell finishing 4th. This also gave Rich enough points that he won this class in the series as well.

Amateur Stock "A" Main — Derek Coopersmith and Joel Johnson have been having a neck and neck battle in the series, but today's race belonged to Ed Janis. Ed drove a great race to win with Derek sitting right on his tail to take 2nd, with Rob Adair 3rd and Greg Bergman from Phoenix 4th. Derek got enough points to win the series with Joel taking 2nd, Steve Hurley 3rd and Rick Fox 4th.

Expert Stock "B" Main — All the Experts in this Main were evenly matched, so Tim Neja really had to do a perfect

to page 80

1980 WESTERN REGIONAL CHAMPIONSHIPS — RESULTS

EXPERT STOCK CLASS

1	Mike Lavacot	Associated
2	Gary Kyes	MRP
3	Gene Husting	Associated
4	John Thorp	Thorp
5	Curtis Husting	Associated
6	Jim Aguirre	Associated
7	Kent Clausen	Associated
8	Butch Berney	Associated
9	Mike Reedy	Associated

AMATEUR STOCK

1	Ed Janis
2	Derek Coopersmith
3	Rob Adair
4	Greg Bergman
5	Sean Plummer
6	Joel Johnson
7	Larry Harrison
8	Mike Howe
9	Doug Kott

NOVICE STOCK CLASS

1	Rich Douglas
2	Joel Mayer
3	Jeff Bates
4	Wayne Campbell
5	Peter Fokos
6	Ken Jones
7	Mike Toland
8	Huw Powell
9	Brooks Cummings

EXPERT MODIFIED CLASS

1	Mike Lavacot	Assoc-Reedy
2	Curtis Husting	Assoc-Reedy
3	Jim Aguirre	Assoc-Reedy
4	John Thorp	Thorp-Thorp
5	Frank Killam	Scratch-Checkpoint
6	Phil Goodwine	Assoc-Reedy
7	Chuck Phelps	Assoc-Reedy
8	Gary Kyes	MRP-?
9	Tim Neja	Assoc-Reedy

AMATEUR MODIFIED CLASS

1	Derek Coopersmith
2	Ed Janis
3	Rene Cortez
4	Joel Johnson
5	Brad Franks
6	Steve Hurley
7	Steve Hickman
8	Rob Adair
9	Mike Hickman

NOVICE MODIFIED CLASS

1	Joel Mayer
2	Peter Fokos
3	Paul Devos
4	Ken Stephenson
5	Ken Jones
6	Rich Douglas
7	Wayne Campbell
8	Ron Conway
9	Jim Greenemeyer

1980 CALIFORNIA CHAMPIONSHIP SERIES

EXPERT STOCK CLASS

1	Kent Clausen	Associated 123 pts.
2	Gene Husting	Associated 120 pts.
3	Mike Lavacot	Associated 120 pts.
4	Jim Aguirre	Associated 114 pts.
5	Butch Berney	Associated 114 pts.
6	Jerry Case	Associated 113 pts.
7	Curtis Husting	Associated 113 pts.
8	Steve Betts	Leisure 110 pts.
9	Tim Neja	Associated 110 pts.

AMATEUR STOCK

1	Derek Coopersmith	116
2	Joel Johnson	113
3	Steve Hurley	99
4	Rick Fox	99
5	Steve Hickman	98
6	D.D. Coopersmith	98
7	Mike Hickman	97
8	Mike Petruzzi	94
9	Bob Petruzzi	93

NOVICE STOCK

1	Rich Douglas	119
2	Ken Stephenson	111
3	Ken Jones	109
4	Huw Powell	103
5	Mike Toland	102
6	Jerry Whitney	102
7	Wayne Campbell	98
8	Robert Fujioka	96
9	Jack Woodside	96

EXPERT MODIFIED

1	Kent Clausen	Associated 129
2	Butch Berney	Associated 124
3	Mike Lavacot	Associated 121
4	Tim Neja	Associated 120
5	Gene Husting	Associated 119
6	Curtis Husting	Associated 114
7	Steve Betts	Leisure 113
8	Jim Aguirre	Associated 111
9	Jerry Case	Associated 111

AMATEUR MODIFIED

1	Derek Coopersmith	128
2	Joel Johnson	124
3	Ed Janis	114
4	Steve Hickman	99
5	Steve Hurley	99
6	D.D. Coopersmith	99
7	Mike Howe	98
8	Brad Franks	98
9	Randy Tentschert	93

NOVICE MODIFIED

1	Jerry Whitney	116
2	Rich Douglas	111
3	Ken Jones	108
4	Mike Toland	99
5	Ken Stephenson	99
6	Ricky Petruzzi	97
7	Dan Debella	96
8	Robert Fujioka	95
9	Wayne Campbell	94

BIG IS BEAUTIFUL

Dick Phillips

Cessna 172 Skyhawk kit (see text) by Chris Sweatman of South Africa. Now that's a real treat for the eyeballs on opening a kit box. Very complete and very well done.

Every once in a while a kit comes along that is a real jewel. They are usually a bit more expensive than the run-of-the-mill kits and they are, more often than not, so good that it is difficult to do them justice in mere words. The accompanying picture will help a bit.

The kit is for a Cessna 172G Skyhawk and was designed by Chris Sweatman of South Africa. Extensive use of a Rhodesian wood called Mugongo is made which produces a very strong, but very light model. Formers, wing & tail ribs are Mugongo, fuselage is skinned w/balsa.

Specifications are: wingspan, 108"; length, 71"; weight, 13 to 18 pounds; and motor required is .61 to .91 glow. The prototype was flown at 5500' on a Webra Speed .61 at a weight of 14 pounds, with good success.

The kit box contains, in addition to the things you'd expect, a molded windshield, Oleo sprung nose wheel, pre-formed aluminum sheets for the flaps, elevator and rudder, silver soldered main undercarriage, fibreglass wheel pants, aluminum wing struts, scale operating flap mechanism, nearly 200 pre-cut Mugongo and balsa parts, wheels, fuel tank and hardware, plus large rolled plans and proof of scale materials.

The kit is available from Brooke Model Products (3431 S. 194th St., Seattle, Washington 98188), and while not a cheapie at $395.95, it is the kind of kit a guy should treat himself to, once in a while. Ralph Brooke has the kit in stock and will be able to supply from 'on hand' kits.

I made a grievous tactical error late in the fall. I made the mistake of flying my Mr. Mulligan near a 500,000 volt power line. I hasten to add that this was done from a properly set-up field which is used regularly by a club near me. The Mulligan was flown too close to the line and the radio went completely ape. The result was that the Mulligan flew into the line, completely out of control. The impact didn't even shake the line it hit, but it ripped a wing off the model and then went straight into the ground, completely ruining my whole day. The moral to the story is: stay away from high voltage lines. The electrical field built up around one of these high tension lines is such that it will kill the signal to your receiver, or drive it up the wall and you'll have no control. I subsequently found that personnel working on these lines are not permitted within 15 feet of a hot line for their own safety and the electrical field built up around these lines can be measured at 150' from the line. Too bad I didn't check that out **before** I flew there. I should have known better as I have seen this sort of thing happen before. Luckily, no damage was done to the line and no fire resulted in the model, but that's small consolation when it destroyed a model that has been flown for about three years with little or no trouble. Being dumb can also be expensive!

I don't generally talk about something I have not seen or used, but feel I can safely make an exception. Several people have written to tell me about their Balsa USA Sopwith Pups. I am told the kit is an excellent kit and very complete. Tom Cimino of Memphis, Tennessee, wrote recently to say that he had recently completed his kit. His comments were as follows " . . . an extremely fine kit, good wood, good plans . . . Walt Moucha did himself proud on this project." He goes on to say that it is very difficult to describe the flying characteristics of the kit, but guesses the best adjectives are, "beautiful and docile . . . it sure looks like the real thing in the air."

Tom's comments reflect a few others I have heard and, while I have not seen the kit, I have seen Walt's model fly and it is about the most realistic thing you could imagine. Looks great in the air and flies very well. As Tom suggests, Walt has done himself proud on this one.

★★

I sometimes forget that not everyone has been reading this column since it started and that it doesn't hurt to repeat things once in a while. Especially important things. Here's one that I mentioned some time ago and Joe Althause of Magalia, California, brought it to mind when he wrote suggesting that I should contact Quadra about a problem which destroyed a couple of Quadra engines in his area not too long ago. Seems the engines 'swallowed the butterfly' and came up with a severe case of mechanical indigestion. Regular readers may recall that I mentioned a while back that Quadra had advised me to suggest that you all inspect your engines to see if the screw that holds the butterfly in the carburetor throat onto the throttle shaft was still tight. There have been a few cases reported to Quadra of this screw coming loose, falling into the throat and being ingested by the engine. The results are serious damage to the engine, of course. The cure is to assure that the screw is tight and then use Loctite, or some such material to assure that it stays that way. The old original engines had the screw head facing downward into the throat and were not secured any other way but by tightening them in place. The more recent engines have had Loctite applied and the screw will not come loose on its own. Check your engine to be sure it is secure and apply the necessary cure if it isn't.

★★

I don't really know how my incoming mail compares with that of other columnists. It seems to be on the increase since there is never quite enough time to answer all the letters, spend some time at the field and some at the building board, and still earn a living. However, the time spent here at the keyboard has not yet become a chore and I try to answer all letters received. I don't use many of them in the column, as you have noticed, except to mention who reminded me of what to pass along to you. Your letters are appreciated and much of what I have learned about building **big** has come from those of you who are the 'regular reader' I mention from time to time. If there was any doubt about modelers being a great group who want to share their experience and their short cuts with others, reading my mail would dispel that doubt. To those of you who do write and share your ideas with

me and with my other 'regular readers' my sincere thanks, you make what could easily become a chore, a real pleasure.

Joe Althause also mentioned that he thought I was going to run an engine review on some of the engines we use. Much as I would like to do so, I don't have the engineering background nor the equipment to do a proper evaluation of all the engines that are now on the market. From time to time I will mention an engine and my experiences with it and have just received a Kioritz which I will comment on as soon as I have had a chance to run it on the bench and (later) fly it. I mentioned the smaller Kioritz some time ago; it is currently marketed under the name Mag Aero and their advertisements here and elsewhere will give you there address.

In addition, I have on order a Stihl engine which has been adapted for model use and I will have additional information on it when it arrives. The engine work is being done in New Zealand and I am informed that it gives a reliable idle at 1000 rpm which it can sustain for a long period with no missing or erratic operation. This engine also incorporates a spark advance coupled to throttle and I feel sure this modification will provide a very smooth transition from low to high throttle without the 'flat spot' we experience with engines which do not have a spark advance. I would not be surprised if the top end might not be a bit better as well.

The Stihl engine is highly respected here as we cut a lot of timber with chain saws and the Stihl has a good reputation for quality and reliability. The modified engine will soon be available in North America and as soon as I have run mine, I'll have some additional information for you on it. Cost is bound to be a bit higher than we are used to but, if it does as advertised, it may well be worth a few extra dollars. More on it later.

★★

Allan Kass of Big Sky, Montana, wrote me recently and enclosed some pictures of his Fleet. As you can see from the photo, Allan is a good builder. He is also a pilot of full scale aircraft and took exception to my saying that those of us building large models are a bit nuts. His comments about model building are too good not to share.

"I think it's just that we love airplanes. It's got something to do with aesthetics and machines, form and function. I was a military pilot in WW II and went the route from Stearmans to Liberators and also had a Stits Playboy for a while after being bored to tears with a Cessna 182 and I think a lot about the merits of owning a 'real' one again or building models. With the models I can have any plane I've ever dreamed of, especially the bipes of the 'Golden Age' and I have them right here in the house where I can fuss with them year 'round. They're not sitting at an airport 50 miles away eating hanger rent and maintenance, useful for just a few months of the year. There's none of the 'go, no go' situation gnawing at you, especially if your family is along, and you are not stranded at flea ridden airports with no car, waiting for a front to pass. I've been

Allan Kass' version of the Fleet Bipe, Quadra power and nicely finished. Allan's comments on building models as opposed to owning a full-scale aircraft in text.

that whole route and I'll take my model world, partly due to circumstances, but mainly because it fulfills more completely my love of airplanes."

I don't think I have ever heard it put so well, Allan Kass speaks for a lot of us, I'm sure. He certainly hit the nail on the head as far as I am concerned!

To add further to what Allan says, the interest in modeling Golden Age, Classic and Vintage aircraft contributes to the knowledge of such aircraft and preserves an era of aviation history which might otherwise be lost. The research done by a modeler authenticating his creation is often a collection of material gathered from many sources and which may not exist anywhere but in that modelers files. I doubt there are many of us who have not gathered a file of information on our particular favorite airplane with the idea of eventually building that super detailed model we all dream of. There must be thousands of such files scattered around the world, many with material gathered over many years, and most of them quite comprehensive.

We are all collectors of one sort or another, magazines, plans, historic records of specific aircraft, and all sorts of aviation information. I am sure a great deal of such material is destroyed for one reason or another; if not by neglect, then by simple disposal when a modeler leaves the hobby. How much better it would be if all such material could be preserved for the use of others interested in a subject.

While I do not know of a formal storage of such materials presently, would it not be a good idea if there were a sort of AAHS for model material? In fact, much of what is presently in modelers collections might well be a welcome addition to the material in the files of the American Aviation Historical Society (AAHS). If you have such a collection of material, why not make sure that it goes somewhere useful when you leave the hobby? (Address for AAHS is; P.O. Box 99, Garden Grove, California 92642.) Material from AAHS's comprehensive negative library is available to members and a quarterly journal and quarterly newsletter is mailed to all members. Membership fee is $15.00 per year for both U.S.A. and Canada.

★★

Doug McBrien, who designed the Druine Turbulent mentioned here recently, has re-designed the landing gear arrangement on the model. If you have Doug's plan with the old gear, drop him a note for the re-engineered version. I've had some good comments on the flying qualities of the Druine lately, and it comes highly recommended for the scratch-builder.

T & D Fibreglass Specialties' cowls for the 1/3 Pitts, 1/4 Super Cub and Gee Bee Model Y. Good looking and easier than building your own!

The guys at T & D Fibreglass Specialties have not been idle this summer, judging by the new products they have been releasing. Most recent additions to their line-up have been cowls for the following models.

(1) 1/3 Scale Pitts S-1, airscoop, oil cooler and panel lines molded in, and this will fit the Byron or Sheber Pitts. $28.95 PP.

(2) 1/4 Scale Super Cub cowl with airscoop molded in place. Oil cooler can differ on various models of the Super Cub and this has been left to the modeler. Retail is $21.95 PP.

(3) 1/4 Scale cowl for Gee Bee Sportster Model Y. Also fits Boeing P-26 (pea shooter) and the F4-B4 and any other aircraft using the same engine and narrow cowl. No price mentioned for this one.

Drop them a line at 30925 Block, Garden City, Michigan 48135, for a complete listing of all their cowls and accessories.

★★

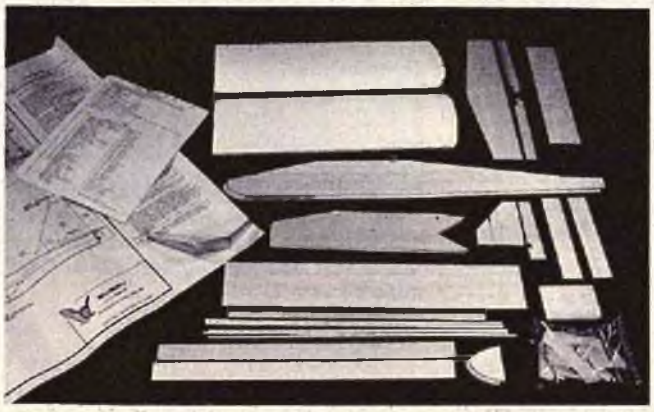
PT-19 by Paul Weigand of Rochester, New York weighs 35 pounds and flies on a Quadra. Weight is a bit much for the engine and Paul plans to install Kioritz engine. (STARS Rally photos courtesy Lou Eltscher, STARS member and good friend.)

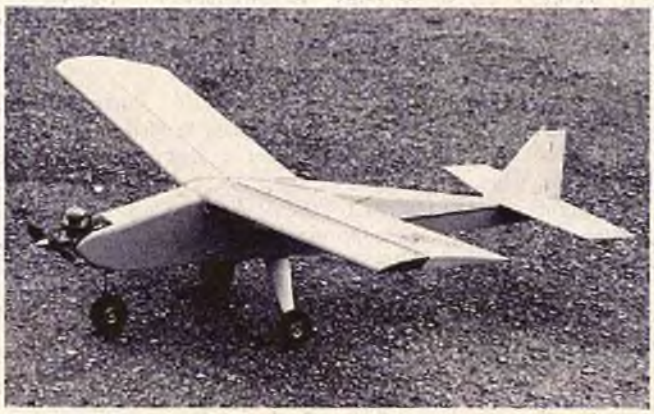
"Chicken Charlie" Nellis, the barbecue king props his scratch-built Volksplane at STARS Rally, Jim Messer doing the holding.

to page 79

RCM PRODUCT REVIEW

Hoo, Inc. SURRY





SPECIFICATIONS

Name	SURRY
Aircraft Type	1/2A Sport Trainer
Manufactured By	Hoo, Inc. 12 Mac Alva Drive Hampton, Virginia 23669
Mfg. Suggested Retail Price	$29.95
Available From	not given
Wing Span	34 Inches
Wing Chord	6.25 Inches
Total Wing Area	212.5 Square Inches
Fuselage Length	26.25 Inches
Stabilizer Span	13 Inches
Total Stab Area	42.25 Square Inches
Mfg. Rec. Engine Range	.049-.051
Recommended Fuel Tank Size	Cox Tank Mount
Recommended No. of Channels	2 or 3
Rec. Control Functions	Rud., Elev., Throt.
Basic Materials Used In Construction:	
Fuselage	Balsa and Ply
Wing	Foam, Balsa, Spruce and Ply
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	Yes
Instruction Manual	No
Construction Photos	No

RCM PROTOTYPE

Radio Used	RS 5 channel
Engine Make & Displacement	Cox QRC .049
Tank Size Used	Stock Cox Tank Mount
Weight, Ready to Fly	27 Ounces
Wing Loading	18.2 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

Ease of construction, quality of machine cut wood, parts, easy handling, positive flying.

WE DIDN'T LIKE THE:

Too many small hardware items are required which could be included, even with a proper upward adjustment in price. Would save time.

What this country needs more than even a good five cent cigar is an inexpensive, easy to build and fly R/C airplane that is also easy to transport and which will fly in moderate winds. The "Surry" from Hoo, Inc., fills all of these requirements admirably.

CONSTRUCTION

The construction throughout is basic and straightforward. The balsa and hardwood fuselage goes together rapidly; the step-by-step instructions and full size plans greatly speed up the process. Though epoxy is recommended in the instructions, using cyanoacrylate will speed things up even more, including the use of one of the thicker types for the ply and hardwood joints. Contact cement or Sonic-Tronics Crazy Tape should be used for attaching the forward fuselage laminations to the sides. The tricycle landing gear mounts are added at this time. Blind nuts for the engine and main gear should also be installed during the fuselage building.

The tail assembly is pre-cut and requires only shaping the leading and trailing edges, and the hinge slots to be made. We used and recommend the use of the smaller pinned hinges such as available from Goldberg and DuBro.

The foam wing requires little work, only the installation of some 1/8" spars, and joining them together. Use epoxy or aliphatic glues for the wing construction, and test the epoxy on a piece of scrap foam first, as some if it will attack foam. Don't forget the nylon reinforcement tape in the center. We used Solarfilm to cover ours; Econocote is also acceptable. Do not use the films that require high temperatures as the foam does not like it too well.

Radio:

The radio installation instructions are rather meager, but since there are so many different systems around, possibly this only saves confusion. By all means, follow the instructions that came with **your** system. We like to see the use of servo trays with their vibration dampening mounts, even in small aircraft like these. However, weight is a factor, and the use of good double-sided tape is warranted.

Flying:

The instructions recommend the use of 3/16" control throw on all of the surfaces, which we found adequate for testing and general flying, though you hotrocks might put in a little bit more for greater maneuverability. The C.G. is plainly marked on the plans, and was easy to achieve with proper placement of the radio components. The plans show, and we used, a 500 mil airborne battery, which results in a longer flight time capability than most of us need or want. We recommend the use of a smaller 225 or 250 mil unit, which should give ample flying time, yet save a couple of ounces that will give us a bit more pep in the air.

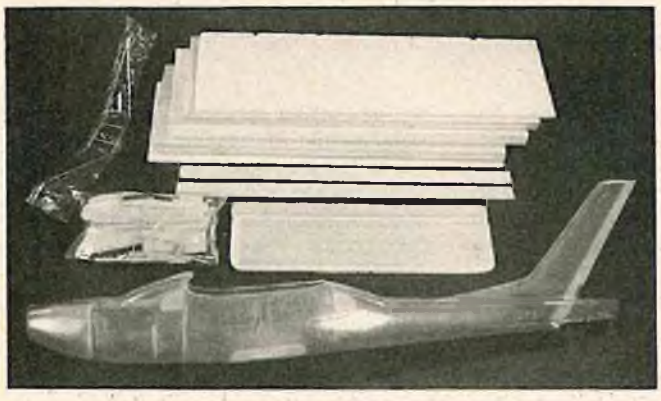
The Surry has no tricky tendencies in the air and is fun to fly with its only limitation being its small size — keep it close and don't let it get out of eyeball range. Take-offs can be ROG, or hand-launched.

Conclusion:

This was an outstanding kit in the parts fit and quality of material. We feel that it falls into the category for beginners and sport flyers. If you are a beginner, be sure and get some experienced pilot to get you off to a good and safe start. □

RCM PRODUCT REVIEW

Consumers Hobby Corp. CESSNA CARDINAL



SPECIFICATIONS

Name	CHC CESSNA CARDINAL
Aircraft Type	Stand-Off Scale
Manufactured By	Consumers Hobby Corporation P.O. Box C-617, Gravesend Station Brooklin, New York 11223
Mfg. Suggested Retail Price	$84.95 (special price) ($140.95 list price)
Available From	Direct from Mfg.
Wing Span	56 Inches
Wing Chord	9¾ Inches
Total Wing Area	545 Square Inches
Fuselage Length	44 Inches
Stabilizer Span	19 Inches
Total Stab Area	109 Square Inches
Mfg. Rec. Engine Range	.35-.45
Recommended Fuel Tank Size	not given
Recommended No. of Channels	3 or 4
Rec. Control Functions	Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:	
Fuselage	Fiberglass and Ply
Wing	Foam and Balsa
Tail Surfaces	Balsa
Building Instructions on Plan Sheets	No (no plan sheet)
Instruction Manual	Yes (1½ pages)
Construction Photos	No

RCM PROTOTYPE

Radio Used	Westport International Variant
Engine Make & Displacement	K & B .40 R/C
Tank Size Used	8 Ounce
Weight, Ready to Fly	84 Ounces
Wing Loading	22.2 Oz./Sq. Ft.

The Cessna Cardinal is distributed by Consumers Hobby Corporation, P.O. Box C617 Gravesend Station, Brooklyn, New York. It is available direct only at a special price of $84.95, although the indicated list price is $140.95. The Cardinal is advertised as an ARF (almost ready to fly), Stand-Off Scale aircraft, designed for engines of .35 to .45 cubic inches of displacement. It is shipped in a large (43"L x 15" W x 6" H) corrugated box with no label to identify its contents.

As mentioned, the Cardinal is advertised as being an ARF, Stand-Off Scale aircraft. In this reviewer's eyes — it is neither! While the term ARF can be defined in several ways, it is generally accepted to mean that the aircraft can be "ready to fly" with minimal construction and finishing effort being required. The CHC Cessna Cardinal is highly prefabricated, but labeling it an ARF is a misnomer. Equally misleading is its Stand-Off Scale designation, as the Cardinal's fidelity to scale is very low. Any modeler who purchases this kit, with intentions of using it for competitive Stand-Off Scale purposes, will be keenly disappointed. The CHC Cardinal is, however, a nice looking aircraft, that bears a resemblance to the full size Cessna Cardinal.

It is the obligation of any responsible reviewer to conduct that review in an open minded, unbiased, and objective manner. An honest assessment should be his goal and that is certainly intended with this review. The CHC Cessna Cardinal is a kit of contrasts, as it has several glaring deficiencies and on the positive side, some very nice features. We will attempt to outline each in an honest objective manner.

The Cardinal kit is very unique in that no plan sheet is included. This is especially surprising for a kit that is advertised as a Stand-Off Scale design. The entire assembly instructions consist of 1½ pages (8½" x 11") of typed information which are at best, rather vague.

Construction:

The fuselage is molded fiberglass with all of its plywood formers, engine and landing gear mounting plates already installed. The vertical fin is molded in as part of the fuselage. A nice feature is the molding-in of the cabin window and door outlines. The molding quality is excellent but the seam which joins the two fuselage halves is rather sloppy and a considerable amount of epoxy and micro-balloons was required in order to obtain a smooth, even surface. The fiberglass fuselage as it comes in the kit is either a rugged or heavy unit, dependent upon your point of view. This reviewer would rate it as being unnecessarily heavy, especially in the tail section. The most disturbing aspect was the fact that the molded-in vertical fin was not square to the wing and horizontal stabilizer saddles. This defect was visually apparent.

The wing is a semi-symmetrical design of foam and balsa sheet construction. Both wing panels come pre-sheeted with balsa and the leading and trailing edges are also glued in place. Wood quality and workmanship are excellent. The two wing halves are joined together using the pre-cut plywood dihedral brace as a guide. Each wing panel comes with the proper dihedral angle pre-sanded off of the center section. The plywood dihedral brace groove and aileron servo well are also pre-cut from each wing half. The strip type ailerons are pre-shaped balsa. The wing tip blocks are also balsa.

to page 79

SUMMARY

WE LIKED THE:

Pre-sheeted foam wing, formed wire main landing gear.

WE DIDN'T LIKE THE:

Sloppy seam on fiberglass fuselage, fuselage excessively heavy, no plan sheet, very vague assembly instructions, lack of adequate hardware package, misaligned vertical tail fin, scale fidelity very poor.

DO IT YOURSELF AIRFOIL DESIGN

FROM THE EPPLER SERIES

By Eric Lister

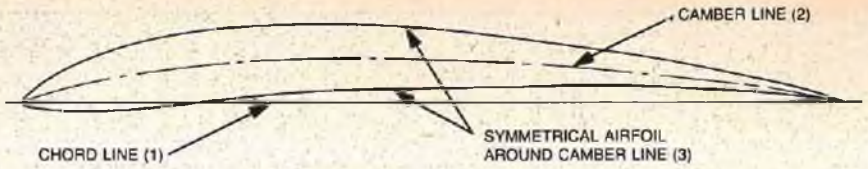


FIGURE 1
AIRFOIL CONSTRUCTION TECHNIQUE, 3 EASY STEPS

The purpose of this article is to give you some new high performance airfoils derived from the Eppler series for all kinds of R/C flying plus show you how to do it yourself so you can tailor-make a brand new Eppler-like airfoil for your own type of flying. The reason for selecting the Eppler series is that they have been designed for low drag (which means better performance) in the Reynold's number range of modelers. The problem with the Eppler series is that it is not particularly easy to acquire the coordinates of these sections, plus there isn't a lot of easily accessible information that explains which section goes with which application. The intent of this article is to get this information on the street in one lump and show you, the modeler, how to use it. If you've got the interest and 7th grade math skills, you can walk out of this article as an honest to goodness airfoil designer. Hang in there because it's not hard. The only tool you'll need (besides your trusty copy of RCM) is a small hand calculator with simple add, subtract, multiply and divide functions. The reward can be a brand-new "Eppler" airfoil for your next ship that's low in risk, high in performance, and different from any other known section because it was designed by you for you. Okay, let's go do it.

There are two ways you can get the

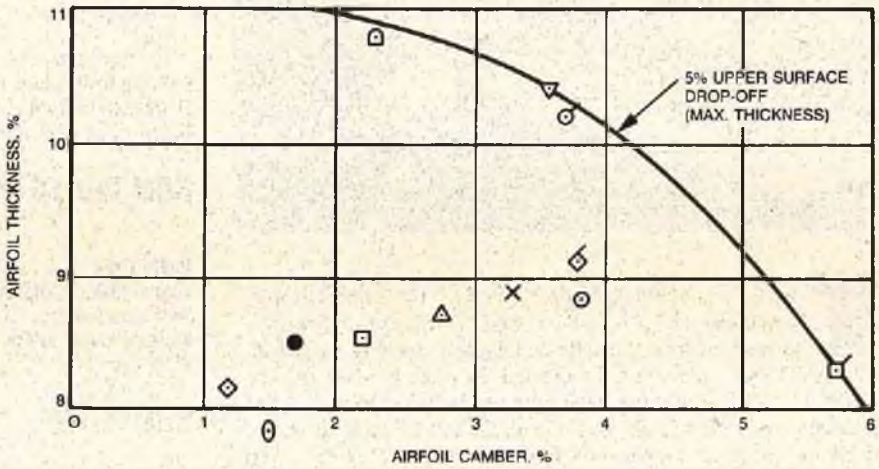


FIGURE 2
CAMBER AND THICKNESS SCHEDULE OF EPPLER AIRFOILS

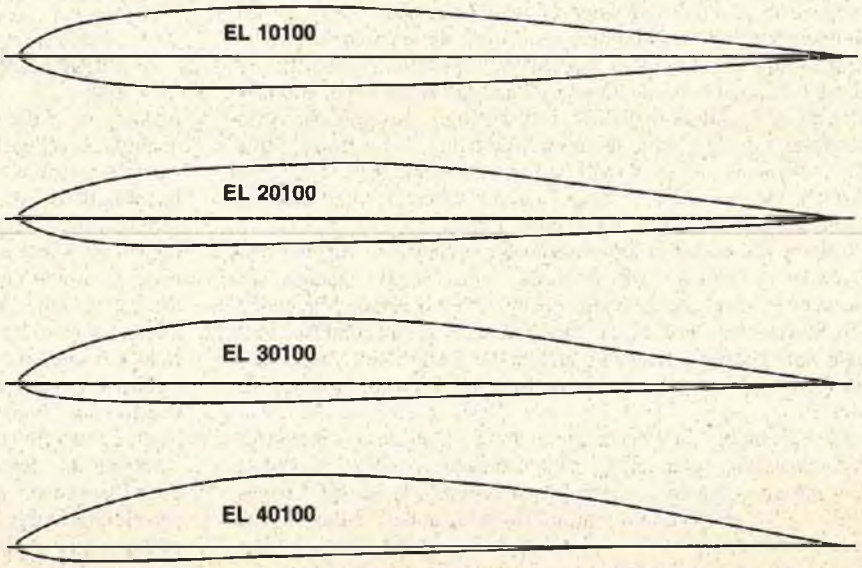


FIGURE 3
4 NEW AIRFOILS DERIVED FROM THE EPPLER SERIES

TABLE 1
EPPLER CAMBER LINE COORDINATES

x/c	y/c										
0	0	0	0	0	0	0	0	0	0	0	0
1.25	0.07	0.11	0.14	0.17	0.20	0.24	0.27	0.31	0.34	0.37	0.41
2.50	0.16	0.23	0.31	0.39	0.47	0.55	0.62	0.70	0.78	0.86	0.94
5.0	0.23	0.35	0.46	0.58	0.69	0.81	0.92	1.04	1.15	1.46	1.60
7.5	0.36	0.54	0.72	0.90	1.07	1.25	1.43	1.61	1.79	1.97	2.15
10	0.47	0.71	0.94	1.18	1.42	1.65	1.89	2.12	2.36	2.60	2.83
15	0.62	0.93	1.24	1.55	1.86	2.17	2.48	2.79	3.10	3.41	3.72
20	0.76	1.14	1.52	1.91	2.29	2.67	3.05	3.42	3.81	4.19	4.57
25	0.87	1.30	1.73	2.16	2.59	3.02	3.46	3.89	4.32	4.75	5.18
30	0.95	1.42	1.89	2.34	2.80	3.27	3.73	4.20	4.67	5.14	5.60
40	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
50	0.93	1.40	1.86	2.34	2.82	3.36	3.86	4.37	4.90	5.41	5.98
60	0.74	1.11	1.48	1.90	2.37	2.87	3.36	3.87	4.45	4.95	5.52
70	0.53	0.80	1.06	1.41	1.80	2.28	2.72	3.20	3.75	4.18	4.92
80	0.34	0.51	0.68	0.94	1.23	1.58	1.92	2.30	2.75	3.19	3.72
90	0.16	0.24	0.32	0.48	0.66	0.88	1.12	1.35	1.65	1.96	2.28
95	0.09	0.14	0.18	0.25	0.35	0.48	0.60	0.72	0.85	1.05	1.20
100	0	0	0	0	0	0	0	0	0	0	0
% Camber	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00

NOTE: ALL COORDINATES ARE GIVEN IN % OF CHORD LENGTH

TABLE 2
EPPLER SYMMETRICAL THICKNESS DISTRIBUTIONS

x/c	± y/c				
0	0	0	0	0	0
1.25	0.99	1.08	1.15	1.21	1.26
2.50	1.51	1.66	1.80	1.86	1.87
5.00	2.15	2.34	2.50	2.62	2.73
7.50	2.60	2.83	3.00	3.18	3.32
10	2.91	3.22	3.35	3.60	3.83
15	3.28	3.61	3.90	4.21	4.49
20	3.44	3.86	4.25	4.59	4.89
25	3.48	3.96	4.45	4.86	5.24
30	3.50	4.00	4.50	5.00	5.38
40	3.48	3.96	4.40	4.94	5.50
50	3.03	3.47	3.90	4.48	5.05
60	2.43	2.78	3.10	3.70	4.34
70	1.75	2.00	2.50	2.96	3.43
80	1.07	1.22	1.75	2.02	2.32
90	0.47	0.53	0.95	1.08	1.21
95	0.19	0.24	0.30	0.47	0.66
100	0	0	0	0	0
% Thick	7	8	9	10	11

NOTE: ALL COORDINATES ARE GIVEN IN % OF CHORD LENGTH

TABLE 3
EPPLER AIRFOILS CHARACTERISTICS

Eppler Title	% Camber	% Thickness	EL Equivalent
E-176	3.3	8.9	EL 33089
E-174	3.8	8.8	EL 38088
E-180	2.2	8.5	EL 22085
E-178	2.8	8.7	EL 28087
E-182	1.7	8.5	EL 17085
E-183	1.5	7.8	EL 15078
E-184	1.2	8.2	EL 12082
E-374	2.4	10.8	EL 24108
E-392	3.6	10.4	EL 36104
E-193	3.7	10.2	EL 37102
E-385	5.7	8.3	EL 57083
E-387	3.8	9.1	EL 38091

coordinates for an airfoil. The first is somebody provides them to you and, if all else fails, at the end of this article will be a few new sections to satisfy this need for folks who are willing to try something new but don't want the pain of learning a new skill. The second way is to understand how those coordinates were arrived at in the first place and to make up your own. This article will do both. Let's take the second route first with the first method being the fall back position.

If you want to come up with your own coordinates for the upper and lower airfoil surface as percentages of chord length, the first thing that you should understand is that any airfoil, and I mean **any** airfoil, can be broken out into three physical characteristics that are used to describe its makeup. These are the chord line, the camber line and the symmetrical distribution of the airfoil thickness around the camber line. Each of those three characteristics are illustrated in Figure 1. The chord line is simply a straight line that goes from the middle of the airfoil nose to the center of the trailing edge. The chord line is the reference line from which all measurements to describe the airfoil profile are made. The chord line is the first thing you draw when laying out any airfoil. The camber line is the line that is slightly curved and passes exactly through the center of the structure that represents the airfoil. The camber line is what describes the angle of attack-lift characteristic of the airfoil. The more the high spot on the camber line is raised, the more lift you can get for any given angle of attack. The only practical limit to how far you can raise the camber line is the onset of flow separation (high drag) and eventually stall.

In both theory and in fact, you can have a wing that is essentially a sheet with the curve of the sheet reproducing the camber line and the ship will fly very well. The reason that method of wing construction isn't more popular than it is, is that such wings are very weak. For reasonable wing strength, a perfectly symmetrical airfoil is wrapped around the camber line so you can build in a wing structure for support lift loads. This is actually how an airfoil is made up. The final airfoil shape is simply the result of which camber line and which symmetrical thickness distribution is used in its makeup. Where the camber line described the lift characteristics, it's the combination of camber and thickness that usually describe the drag characteristics.

That method of describing an airfoil's makeup isn't attributed to me. It was a method of the old venerable NACA back in the 30's when they were trying to come up with low drag airfoils and they needed a way of describing the basic airfoil properties in some systematic way. The alternative is to start cataloging upper and lower surface shapes and what they do to lift and drag. That's not necessarily an impossible task but it is beyond normal human and even computer capabilities but, yet, how many guys have you known who talk about "their favorite airfoil" in terms of the upper or lower surface shape? While there are exceptions, which we'll get into because they have their place, at the risk of stepping on the toes of some sacred cows, anybody who limits his discussion of airfoil performance characteristics to upper and lower surface shape trends, frankly doesn't know what the hell he's talking about. That doesn't make what I'm going to say about camber and thickness effects on lift and drag either right or wrong, it just gives us a basis for describing the estimated performance characteristics and winding up with a final airfoil shape that goes with those properties.

If you're going to either select an airfoil or design one yourself, the first thing you need to determine is how much camber is required. This is usually determined by your wing loading and the speed range over which you would like to get the lowest possible drag from the airfoil. No one airfoil is going to cover the whole range. To help you in the selection process, the following are the applications for various cambers.

Thermal soaring sailplanes: For very calm weather where wind penetration is not required and your game plan is to add weight for windy days or higher speeds — use up to a 6% camber and as low as 5%. The more camber you use, the slower she flies and your chances increase for getting a flat glide slope.

All weather sailplanes with reasonable speed and soaring capability: This is the ship that goes from contest to contest in the back of your car and flies well in both windy and calm weather. You'll add weight and use some down trim for windy days. This ship would use anything in the 3.5% to 4.5% camber range. A good compromise would be 4%. Trainers would use this.

High speed capable sailplane: This is strictly a speed or slope soaring machine. It is capable of dashes through the speed traps, loops, rolls and inverted flight. It rides ridge

to page 78

TABLE 4
COORDINATES OF 4 NEW EPPLER LIKE AIRFOILS

x/c	EL 10100		EL20100		EL30100		EL40100	
	u	l	u	l	u	l	u	l
0	0	0	0	0	0	0	0	0
1.25	1.28	-1.14	1.35	-1.07	1.41	-1.01	1.48	-0.94
2.50	2.02	-1.70	2.17	-1.55	2.33	-1.39	2.48	-1.24
5.00	2.85	-2.39	3.08	-2.16	3.31	-1.93	3.54	-1.70
7.50	3.54	-2.82	3.90	-2.46	4.25	-2.11	4.61	-1.75
10.0	4.07	-3.13	4.54	-2.66	5.02	-2.18	5.49	-1.71
15.0	4.83	-3.59	5.45	-2.97	6.06	-2.36	6.69	-1.73
20.0	5.35	-3.83	6.11	-3.07	6.88	-2.30	7.64	-1.54
25.0	5.73	-3.99	6.59	-3.13	7.45	-2.27	8.32	-1.40
30.0	5.95	-4.05	6.89	-3.11	7.80	-2.20	8.73	-1.27
40.0	5.94	-3.94	6.94	-2.94	7.94	-1.94	8.94	-0.94
50.0	5.41	-3.55	6.34	-2.62	7.30	-1.66	8.34	-0.62
60.0	4.44	-2.96	5.18	-2.22	6.07	-1.33	7.06	-0.34
70.0	3.49	-2.43	4.02	-1.90	4.76	-1.16	5.68	-0.24
80.0	2.36	-1.68	2.70	-1.34	3.25	-0.79	3.94	-0.10
90.0	1.24	-0.92	1.40	-0.76	1.74	-0.42	2.20	0.04
95.0	0.56	-0.36	0.65	-0.29	0.82	-0.12	1.07	0.13
100.0	0	0	0	0	0	0	0	0

BUILD IT TO BE BROKEN

By
Dario
Brisighella, Sr.

I hope the title caught your eye, it is important. There are some things, simple things, which should be given your consideration and efforts in designing and/or construction which you want to break at a specific time. The simple item I speak of is, in this case, a nylon bolt. I will cover the "nylon bolt thing" as it applies to wing attachment in this article, but it also will apply to any number of other applications within our R/C models.

Ask most any modeler why he uses nylon bolts to secure the wing(s) to the fuselage on his model. For an example, and in nine chances out of ten, he will respond, "So the bolts will break on impact (unscheduled), allowing the wing(s) to separate from the fuselage to minimize the structural damage to either component."

Aside from holding the wing securely in position, this has to be the real intent of using nylon bolts at all. Originally most of us used the old rubberbands for the same basic reasons. **Right?** Well for most of us it did not take too long to learn that if we used too many rubberbands, and our model did a cartwheel or two, the wing did not separate and it would get damaged, and the fuselage suffered as well. Now, no one knew just how many bands or what sizes it took to serve both functions properly. Now, trust me, it was all guesswork. You bet.

Like most of you, I have seen dozens of bad landings, cartwheels and the like, where if the nylon wing bolts would have broken off (as intended), the overall damage would have been very minimal. Instead, they did not break and the model turned into a basket case. Did it ever happen to you?

Now, if you are expecting me to stick my neck out and tell you that for this or that size, weight, span, or power loading, etc., you should use this X-size nylon bolt, forget it . . . ! I have been around too long for that and I have grown smarter (or dumber), than that. That could be a "whole can of worms" in itself. What is intended here is to sort of touch bases on some installations, and here I will let the drawings do most of the work for me.

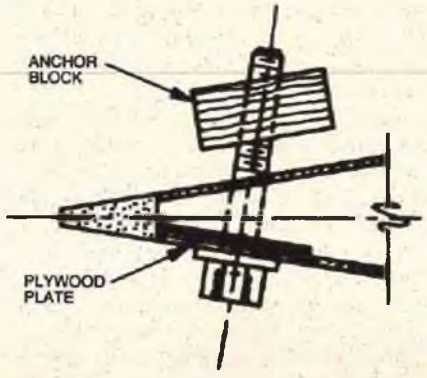


FIGURE A

Figure A: This detail is almost classic. The majority of installations being made by, I would guess, some eighty-five percent of the R/C builders. This is a standard today even if it is totally wrong! That is correct, it is wrong! Remember the idea is for the bolt to break off during a mishap, like a cartwheel. Well, really look at the drawing. As shown, the bolt has a lot of freedom to bend before it would break. And bend it will, as it is unsupported between the plywood plate at the bottom of the wing and the hardwood anchor block cemented to the fuselage side. This standard design is poor at best.

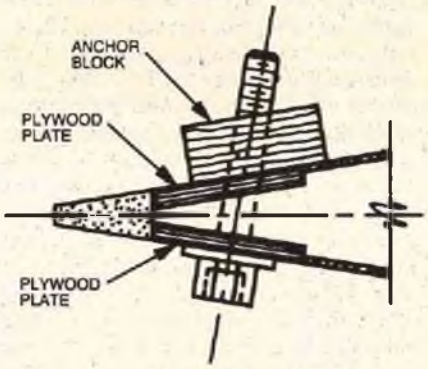


FIGURE B

Figure B: This offers a much improved installation verses that of Figure A. Now the anchor block and the added plywood plate at the top surface of the wing are in contact forming a plane of shear. Whenever these two surfaces move in opposite directions they can shear the bolt off as intended. This design is still not without fault. Notice that the shear-plane is not at a right angle to the bolt itself and, therefore, the shear-plane is not across the smallest cross-section of the bolt. Also the anchor block is small in surface area and cannot spread any shock-loading equally to both sides of the fuselage. The anchor blocks are more apt to part from the fuselage long before they could shear-off the bolts. A lot of 1/4-20 size nylon bolts are sold and employed for wing attachment purposes and to learn just how strong these little gems are, try breaking one or two . . . !

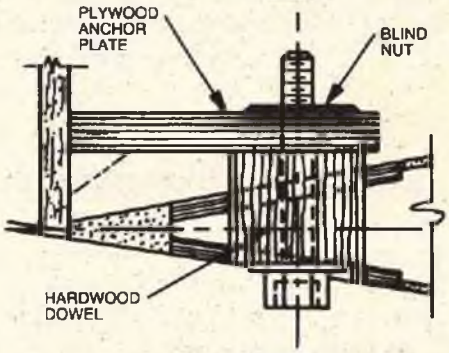


FIGURE C

Figure C: Now this may not be the last word in designing a good shear-type action for those wing bolts but it has a lot to offer over the others detailed. Please note that now a section of hardwood dowel has been added to the wing structure. It spreads its load to the plywood plates in the surfaces of the wing. The shear-plane is now perpendicular to the long axis of the bolt and is across the smallest cross-section of the bolt. The anchor plate within the fuselage is now plywood and it spans across the fuselage so it can be secured to both sides of the fuselage and the former at the rear of the wing saddle opening. The plywood anchor plate is also fitted with blind nuts or T-nuts (available at hardware stores in all sorts of sizes), to engage the wing bolts. The blind nuts can be omitted if the hole is saturated with cyanoacrylate before and again after it is threaded with a bolt-tap. There can of course be dozens of variants to this detail that may work better for your particular installation. It is intended to offer some better ideas on shear-action.

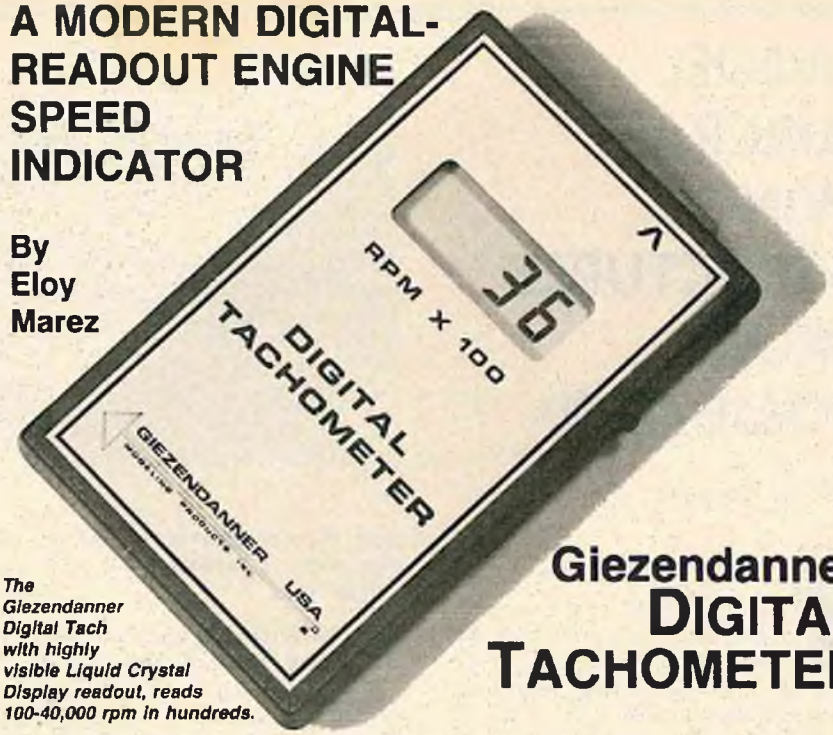
Over the years now, I have been known to even drill a hole right through the length of the nylon bolts I use in order to reduce the forces required to shear these bolts. The 1/4-20 size nylon bolts have almost become a standard for wing attachment, but there are other sizes available also. My own favorites include: 6-32, 8-32 and 10-32. In some applications I also drill these sizes out.

Simple stated, it boils down to, "if you want the bolts to break in the event of an accident or mishap, provide a shear-plane to do the job." The small amount of effort required during construction may just save you a lot of repair work when the unexpected comes along. □

RCM PRODUCT TEST

A MODERN DIGITAL-READOUT ENGINE SPEED INDICATOR

By Eloy Marez



The Giezendanner Digital Tach with highly visible Liquid Crystal Display readout, reads 100-40,000 rpm in hundreds.

Giezendanner DIGITAL TACHOMETER

Digital rpm readings have arrived in the form of the Giezendanner Digital Tachometer. Right, the same Bruno Giezendanner from Switzerland who has had some success, if you can call two World Championships and numerous other championships as "some success" in R/C pattern competition. What might not generally be known is that Mr. Giezendanner is also a master designer /machinist who has been producing model products for some years.

The latest is his Digital Tachometer which, like all other products of the same name, is available in this country from Giezendanner USA, P.O. Box 118, Pottstown, Pennsylvania 19464. It is similar to most other available tachs in that it is an optical pick-up instrument, i.e., it does not require a direct connection to the engine. It is pointed at the revolving propeller, and counts (and divides by two) the light reflections off the propeller. It then displays the times per minute of a 1/2" high Liquid Crystal Display that is easily read in direct sunlight. This type of display is unlike the more familiar Light Emitting Diode readouts commonly seen on calculators and such, which glow green or red. This LCD makes black characters on a satin silver background, and works extremely well for this application.

The tach is 5⅝" x 3⅝" x 1⅛", at an inconsequential weight of 6½ ounces. It has a range of 100 to 40,000 rpm, readable in steps of 100, and the claimed accuracy is plus or minus 50 rpm throughout the entire range. The update interval is .6 second.

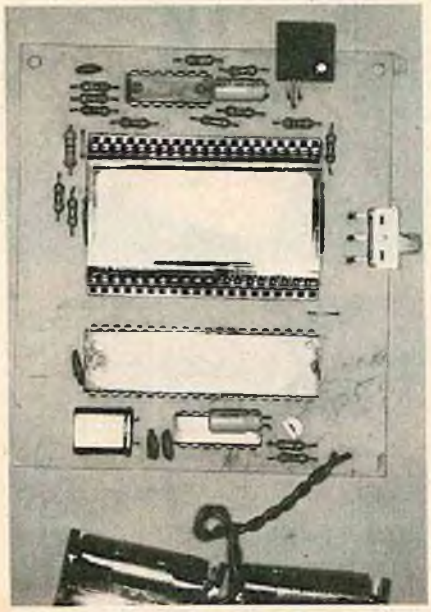
For power, the Digital Tachometer uses 6 volts, derived from 4 size "N" dry cells, NEDA Type 910F. Some such types are Eveready No. 904; Ray-O-Vac No. 716-4; and Mallory 910F. These are little cells, measuring 1.18" x .455" each, and are held in plastic clip-in holders. The tachometer manufacturers list the battery life at over 50 hours. The batteries are located in the lower part of the case, and are accessible by removing the four screws that hold it together. A set of batteries are provided, and installed; replacements are available from Radio Shack, at two for 49¢.

Electronically, the tachometer is fully solid state, mostly integrated circuits with a few discrete components thrown in. The reliability of such a circuit should be excellent. Physically, the tachometer is well made, on a thick epoxy base printed circuit board, and a rugged thick walled fuel resistant case.

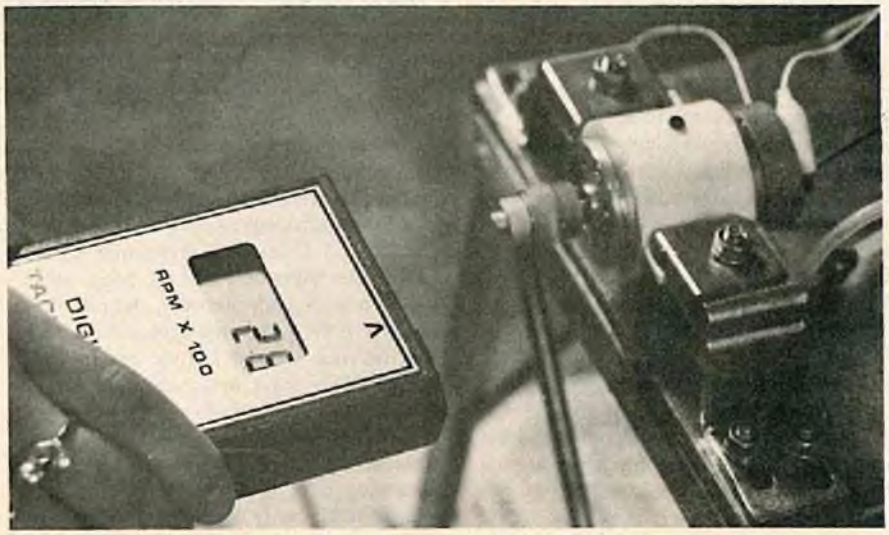
To test the tach, simply aim it at the nearest electric light, preferably of the single bulb type. I won't bother you with the theory and arithmetic — the tach will indicate 3600 rpm, or 36 in hundreds. Sometimes, some of the two lamp fixtures that apparently are not running synchronized to each other will indicate 7200, or 72. If you have four lamp fixtures only in your shop, forget it, the possibilities are too confusing, go check it in the bathroom with its simpler light fixture.

Now, to use the tach, simply switch it "ON" and aim it at the prop. There is an arrow on the top of the front panel, at a point right over the upper right of the display opening. This indicates the optical pick-up location, and is the aiming point. The best

to page 77



All solid state design, with all components mounted on one single heavy epoxy base printed circuit board. High reliability expected.



Shown here reading rpm of Astro Flight electric motor; readings from as far as 3' can be made in bright sunlight.

MODEL AIRCRAFT WING STRUCTURES FROM FOME-COR®

By Bill Harvey

The Archaeopteryx Laminate Bending Process, intended for airframe mass production, can be used with little or no tooling to produce flying structures at home.

The purpose of this article is to acquaint the modeler with the process and the basic steps required to produce a raw wing panel. The modeler, already a craftsman by necessity, should be able to adapt the process to other aircraft component structures as well. With a little practice you should be able to make a stack of wing panels in just a few evenings.

Construction of model aircraft using Monsanto's Fome-Cor® in the flat, planar state has been utilized for some time. However, not until the material is formed is the true strength potential realized. In addition, a 30% weight reduction is realized after the material has been stripped properly.

My patents, 52 claims in all, deal with a bending process that maintains skin integrity on the inside surfce yielding a composite structure of a sandwich /monocoque nature. It should be understood that marketing of products using the process without a license would constitute an infringement. However, utilization of the process by individual hobbyists for their own use would not be subject to litigation. Enough said on that matter.

Now, we get to the part that concerns the modeler. The following method of Fome-Cor® construction requires no special tooling and can produce inexpensive, strong, high quality airframe structures relatively quickly in your basement or kitchen.

The first thing you should know, contrary to what you may have read, is that Fome-Cor® (as manufactured by Monsanto) comes only with the paper adhered to both sides of the material. In addition, the material has a definite grain and a preferred orientation as well. Fome-Cor® is available in 1/4'' and 3/16'' thicknesses and is laminated with either white or brown Kraft paper, the white paper being either plain or clay coated. The process will work well with all types.

STEP ONE: Determining Direction And Orientation Of The Grain.

The grain direction can be seen by holding the material in a good light and sighting down it for faint extrusion lines

acquired during the manufacturing process. A 2'' wide sample cut along the grain will suffice for orientation testing purposes. You should sacrifice a piece of the material for a cutting pad. Using an X-Acto knife, cut just below the paper and pull the paper away. Wrap it around a broomstick and roll off as shown. If the paper strips completely away the direction is correct; if the paper fails to strip off or tears away the direction is incorrect. Once determined, be sure to mark your material. At Archaeopteryx we found that all the sheets were placed on the shipping skid in the same orientation; consequently, only the topmost sheet had to be tested. Some experimentation with this step will help you become familiar with stripping properties.

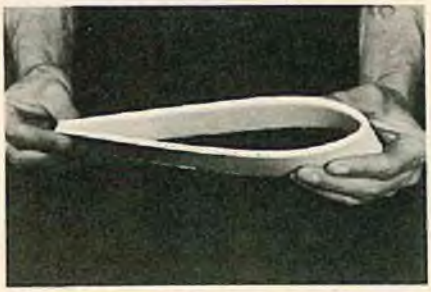
STEP TWO: Stripping The Inside Layer.

Soaking the surface with warm water will help prevent bald spots. Using a sponge, wipe on as much water as possible. When it starts to soak in, repeat once more and then wait about five minutes. Now, in the same manner used and in the direction determined on the sample strip, slit and roll the surface paper off. A well stripped panel will have no bald spots and will appear uniform when held up to a light so it shines through. The thin fibrous layer of paper on the inside surface is essential to the process.

STEP THREE: Sizing The Panel.

Cut a 2'' strip across the grain and wet the inside and mark the center. Using a

broomstick as shown, work a radius of curvature into the strip, pulling up on the material as you roll the broomstick. Fold the strip into a wing shape selecting the chord and thickness you desire. This sample then can be unfolded to determine the wing blank size. Be sure that the grain runs span-wise.



STEP FOUR: Forming The Wing Panel.

When bending by hand, care must be taken to avoid breaking the inner stripped layer. Carefully, so as not to break the inner surface, mark the inside centerline of the leading edge on the panel. Sponge warm water on the middle (span-wise) two-thirds of the panel. Using a broomstick as in Step Three, carefully work a radius into the wing as shown. Holding the broomstick firmly over the marked centerline, fold the wing

around it, working as close to the broomstick as possible so as not to break the inner layer --- until you can touch the trailing edges. Take the wing panel from the outside; working from one end to the other gently squeeze the leading edge until you achieve the desired radius. This process can be simplified by creasing with a sharp pencil point the inside centerline; however, this may result in a sharper leading edge than you desire. Once folded into a wing shape, place paperback books on the wing to hold the shape until dry. You can use a hair dryer to dry it if you are in a hurry.

STEP FIVE: Installing The Main Spar.

Depending on the size and power of the desired aircraft, use foam, balsa or plywood spars. For a .40 size aircraft, a single 1/8" plywood (3 ply) spar is usually adequate. Cut and trial fit the spar prior to gluing. Mark top and bottom attachment points at both ends of the wing. Apply epoxy or white glue to both edges of the spar and re-insert into the wing --- take care that the spar is not bent by sliding a yardstick into the wing alongside the spar if necessary. Place a larger stack of books on the wing, concentrating the weight over the spar, until dry.

STEP SIX: Joining The Trailing Edge.

Trial fit by hand, compensating for any misalignment, so that the wing is either straight or has the desired amount of washout. Apply epoxy or white glue and, again, use books or a piece of 2 x 4 to clamp until set.

STEP SEVEN: Trimming The Wing Panel.

Using a straight-edge and X-Acto knife, trim excess material from trailing edge. The trimmed edge, as well as the root and tip, may be squared using medium paper on a sanding block.

I hope I have given you enough information to get started. If you have additional questions send me a stamped, self-addressed envelope and I will try to answer them. The address is P.O. Box 574, Olney, Maryland 20832.

Happy flying. □

Challenger for 1980, now Defender 1983, John Cleave of London, England, winner of Mini-America's Cup.

Chris Jensen (L) Winner of Newport Mayor's Mini-Cup Race gets trophy and congratulations from Mayor Donnelly (R).

MINI-AMERICA'S CUP 1980

Mini-America's Cup goes to John Cleave of Great Britain. Chris Jensen, Itasca, Illinois --- First Newport Mayor's Mini-Cup Champion.

By Richard H. Palmer

A dramatic Mini-America's Cup racing series took place in Newport, Rhode Island, the week of September 10-14, 1980. Model sailing was at its very best, as John Cleave became the first person to turn the challenger title into that of "defender."

Carter Cain of Hilton Head, South Carolina, battled Chris Jensen of Itasca, Illinois, in a best 4 out of 7 series to determine the defender title for the U.S. This event took place Saturday morning, following the tie situation which occurred between these two skippers after 100 races during the week.

Carter Cain was able to overcome being behind on three occasions to finally take 4 out of 7 races when Chris Jensen went for the works and fouled on the starting line. A protest was lodged, which was upheld by the race committee, giving Carter Cain the defender title. Cain then proceeded to dual it out with John Cleave of England and immediately found himself down 3 races to 1.

Sunday afternoon was filled with tension, as Carter Cain won the next two races to tie the series. In the 7th and final race, Cain found himself 3 boat lengths behind and had to gamble on the final mark. The gamble failed, when his attempt to round the mark on a very close tack found him coming about too soon, which then led to a foul of Cleave's boat. It was all over and John Cleave became the first foreign skipper to hold the title of Mini-America's Cup champion.

It has been tentatively decided that John Cleave will defend his title in Newport at the next "America's Cup" race series to be held in that port. Mayor Humphrey Donnelly III was on hand to award to Chris Jensen the official "Mayor's Mini-Cup" award at the first running of this race in Newport, Rhode Island.

The event spread out over two days and saw each skipper participate in 12 races to establish the winner of this event.

Chris Jensen from Itasca, Illinois, exercised extreme sailing ability, as he went undefeated throughout the entire event. Chris' closest race throughout the series was his one with Max Lewis of Australia, who knuckled down and battled Chris right to the wire.

The Mayor's Mini-Cup Race will be an annual "invitational" meet to be held in Newport each fall, and then tied into all Mini-America's cup races during the years the international event takes place. Those who qualified for the Mayor's Cup program were the top skippers who failed to make the Mini-America's Cup event.

The balance of skippers on hand, who did not participate in either of the other events, treated the crowd to some multi-sailboat races, demonstrating how model regattas take place when more than two boats are in the water. □

1980 Mini-America's Cup Participants

DEFENDERS

Don Biggins	Dunedin, FL
Hank Bouchard	Warwick, R.I.
Larry Breault	Fairless Hills, PA
Carter Cain	Hilton Head, S.C.
Manny Costa	Cumberland, R.I.
John Decker	Concord, MA
Richard Finlay	Miami Lakes, FL
Chris Jensen	Itasca, IL
Floyd Kenny	Orlando, FL
George Laird, Jr.	Wellsville, PA
Joe Schoonover	Annandale, VA
Stanley Tyler	Nashua, N.H.

CHALLENGERS

John Cleave	London, England
Max Lewis	Brighton-Le-Sands N.S.W. Australia

Mayor's Mini-Cup Race Standings

	Wins	Losses
Chris Jensen	12	0
Joe Schoonover	9	3
Manny Costa	6	6
Dick Finlay	5	7
Don Biggins	4	8
John Decker	3	9
Max Lewis (Aus.)	3	9

The Great AT-6 Pylon Race

By Joan Alyea

Top winner in Independence Day AT-6 Pylon Race was Bill Pachak, (Right), aided and abetted by caller Harold Shaver (Left).

It was a great idea--- while it lasted!

"Hey, guys," a cheerful, enthusiastic voice rang out in the hobby shop one spring day. "let's have a **pylon race** on the 4th of July!"

So what else is new?

But the contest was carefully planned and the rules announced: **only** Jemco AT-6 Texan kits allowed, with **stock** non-Schnuerle .40's right out of the box!

Great. No one **had** an AT-6.

This situation soon changed. A score of "eager" modelers (some coercion was reported!) disappeared into the depth of their workshops, armed with new AT-6 kits, glue, dope and the etceteras.

No one saw them again. Bosses received "sick" calls; wives celebrated wedding anniversaries at the local hamburger heaven with the kids for company; lawns degenerated into rank masses of tropical vegetation or became arid deserts.

Occasionally one or another modeler would creep out in the dark of night and high-tail it down to the hobby shop, where the hobby shop owner's wife would sell them the necessities of modeling life. (The hobby shop owner was never there --- he was home building an AT-6, too!)

Mysterious phone calls --- "How're you coming on yours?" "Great --- no problem!" Packs of lies. Packs of problems to lie about.

No one had scale pilots the right size: one modeler worked so fast he never found the back of the instruction sheet where the color schemes were given until he finished painting his bird!

July 1, 1980. Bleary-eyed modelers emerged unwashed, unshaven, blinking in the sunlight. Six of them had completed AT-6's. The rest had completed **excuses** --- "no radio back yet," "have to go to Texas anyway," "I don't build scale," "my wife won't let me."

Three "intrepid aviators" decided to risk test flights. The planes flew. Great, in fact. So great that no one would speak to the guy who had to buy a **new** .40 because he had no **old** one. Flew **too** great!

July 4, 1980, 9 a.m. at Sky Corral R/C Field, Pueblo, Colorado. Wind --- mild, with gusts up to hurricane force. Temperature heading for **another** 100+ day. Six planes on the line.

Cameras clicked. Broad grins. Hey --- only **five** planes on the line? Plane minus radio innards was sent back to nest in truck.

Brave Soul decided to make a practice flight for luck. He really needed the practice --- his AT-6 made a funny landing on topside of fuselage. Brave Soul spent the next half hour gluing the pieces back. Then Brave Soul made a **second** test flight, hoping his luck would change. It sure did --- it got worse! Brave Soul's AT-6 entered its disintegration phase; so much for being intrepid! Good enough for fifth place, though.

Four planes were on the line. Two guys had the **same** frequency: the mathematics involved here sent the C.D. heading for the relative calm of the sanitary facilities, where he tried to forget all about pylon racing.

The race itself ran smoothly, with a minimum of efficiency and a maximum of pilot complaints. "I just flew," the contestants whined.

"Howcum I gotta fly **again** right away?"

Gee, fellas, there's only four of you!

Tempers began to match air temperature.

One entrant cut pylons like there was no tomorrow --- he was listening to the other feller's caller.

Lone entrant had to fly solo because of frequency conflict --- piece of cake, all alone in the big blue sky, flying the clock. His AT-6 rolled down the runway --- and rolled --- and rolled--- floated off into the air, stalled a wing and completed inverted post-hole digging project. Good enough for fourth place, though!

Race over, the sunburned helpers staggered in, and the crowd gathered to receive trophies --- all **five** places. Only four planes? Okay, if the engine started, give the guy a little trophy and a big hand!

"Hey, guys," a cheerful, enthusiastic voice rang out. "Let's do this **again** --- everybody build B-17's!"

Out at Pueblo's Sky Corral Field, they are **still** chasing that guy! He was the one who didn't even **start** to build an AT-6! □

Lineup of Jemco AT-6 Scale pylon planes at Sky Corral Field, Pueblo, Colorado. Race was flown under Quarter-Midget rules.

Pylon race winners at Pueblo, Colorado, display AT-6 trophies. (Left to right): 5th Place, Jerry Bible; 4th Place, Dale Alyea; 3rd Place, Larry Osborn; 2nd Place, Sam Pisciotta; and 1st Place, Bill Pachak. Pisciotta had high time of 2:33:56.

BIG IS BEAUTIFUL

IN SOARING TOO!

By Ray Burns

An ad in the July issue of RCM caught my eye. There, if tired eyes were not deceiving, was the largest R/C sailplane I had ever seen about to be launched. Reading on quickened my pulse even more. The specs were relatively simple: model LS-1C, wingspan 5 meters (zounds, that's almost 200"), all fiberglass and 1/3 Scale — yep, 1/3 Scale right down to the Wortmann airfoils. Lastly, the manufacturer, Richair Ltd., Ruemlang, Switzerland (near Zurich), advertised production models of the Jantar and PIK-20D as also available.

Since I had intended to be in Switzerland during the month of August the idea of piloting a super European glass bird became uppermost in mind. A quick call to RCM offices ilicited the name and address of Mr. Richard Studer, President of Richair Ltd. An airgram was immediately dispatched to Switzerland announcing my arrival and expressing hopes of joining him for a flying session at his convenience.

A week after arrival, Herr Studer and Karl Wickli (his production V.P.) appeared at our apartment on Lake Thun. The stationwagon parked in front had two huge cylindrical containers strapped to the luggage rack. After brief introductions and idle weather talk (lousy flying day), I proposed that we assemble the very model that I had seen in the RCM advertisement. With the fireplace burning and the wine flowing, we proceeded to assemble the LS-1C inside the living room — but just barely. The wingspread spanned the entire living room and into the kitchen and dining area just clearing the walls (remember 1/3 Scale). I have never seen such a huge model before, let alone one whose scale authenticity was so accurately reproduced. Now I wondered if this 22 pound biggie would really fly as well as I had heard.

The fire dimmed and the wine ran out some four hours later, but not before we had set a time for flying at the Hahnenmoos which is the local slope site above the town of Adelboden. There, I was told, the sailplanes in their containers are transported by ski lift to the top of the mountain (7000 ft. ASL) where they are assembled for flying.

The chief pilot for our day was to be Marc Snyder, Chief of Homologation of all sailplane activities (full scale and model), for the Aero Club of Switzerland. Your's truly was to be the weak kneed backup pilot (thankfully).

Happily when we arrived at the terminal station of the ski lift, some eight other fiberglass giants were lined up on the lee side of the slope. In addition, two sniffer

SPECS	PIK-20D FIN	JANTAR POL	LS-1C GDR
Wing span	137.8"	177.9"	196.8"
Wing area	821.5 sq. in.	1333 Sq. In.	1559.3 sq. in.
Root chord	7.87"	9.05"	11.0"
Tip chord	2.95"	4.33"	4.5"
Airfoil	Wortmann FX-61-140, FX-140 mod	Wortmann	Wortmann FX-66-5196, FX-64-184
Fuselage length	50.4"	64.17"	92.1"
Aspect ratio	23:1	26:1	24:1
Flying Wt. (approx.)	7.04 lbs.	11.1 lbs.	17.6 lbs.

The author, on the left, with some of his newfound Swiss friends and one of the giant sailplanes discussed in the text.

A lineup of the all-fiberglass biggies, (L to R) the LS-1C at 200", Jantar at 178", and the PIK-20D which spans 140".

Ray was put to work before being allowed to fly one — here he heaves off the PIK-20D. Notice the almost straight-out windsock.

In addition to the sailplanes, the scenery is also king-sized, and is reached by a conveniently located ski-lift.

The middle-sized Jantar, being held by one of the Swiss flyers. The machines pose some transportation problems, but assemble easily.

The fuselage is described as "large enough to carry a watermelon," a fact easily seen here as the LS-1C is carried to launch.

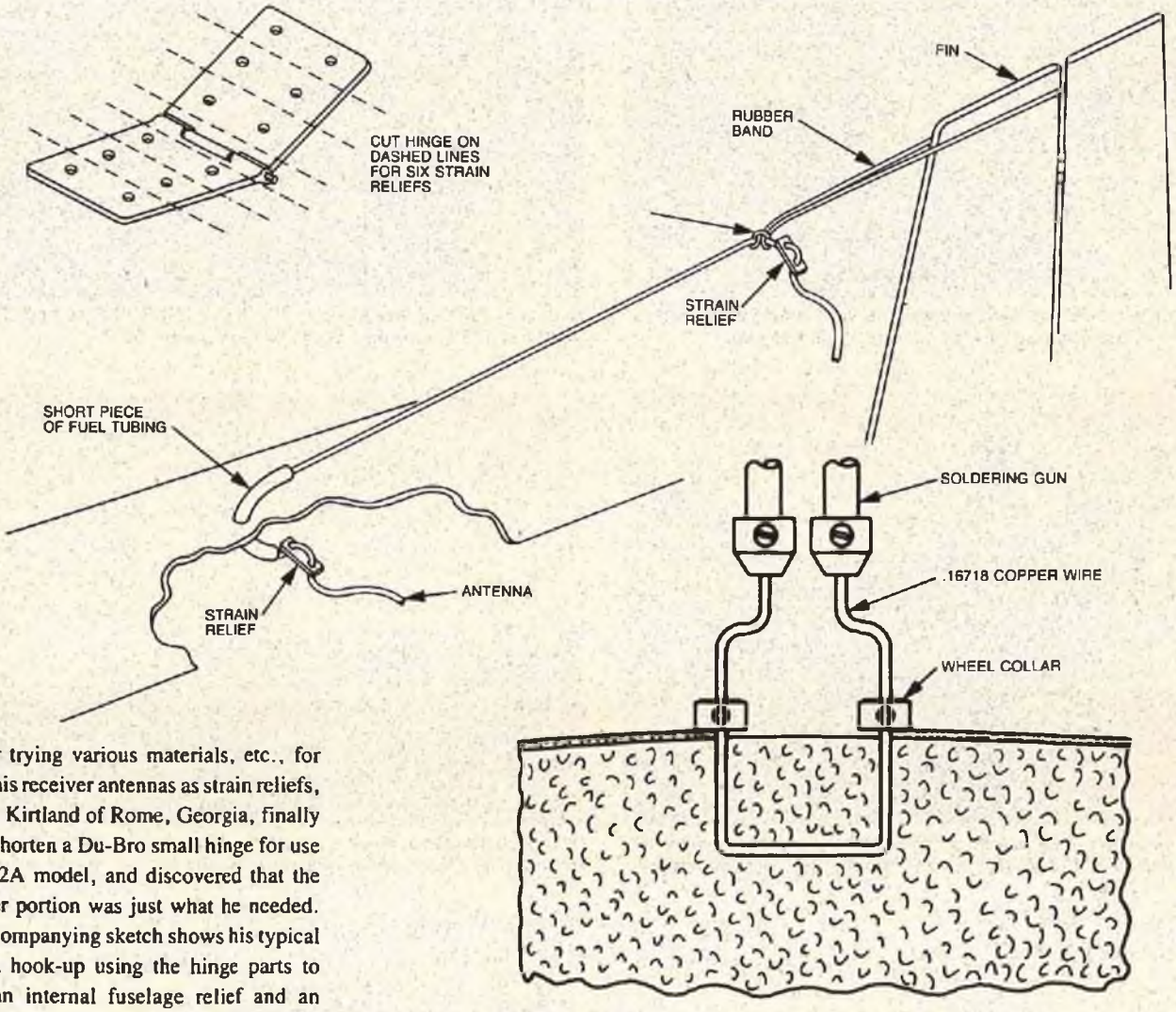
planes were available to ascertain lift conditions as well as an assortment of Jantars, LS-1C's, PIK-20's and an SG-100 all awaiting their launch turn. The windsock gave us promise for later in the day.

Assembly was not difficult since the main spar tongue is channeled into the fuselage and secured by two wing nut and bolts. The spoiler and aileron pop-off linkages easily attach inside the fuselage where there is more than ample room to maneuver (the cockpit can hold a watermelon it's so big). Rudder and all-flying stab are cable operated from a servo driven wheel (LS-1C-Jantar & PIK-20 pushrods) and all controls functions internal making an extremely clean ship. After extensive control and radio checkout, clearance of the launch site and landing zone, Marc gave the okay for launch.

In order to quickly achieve flying speed, you must throw these biggies definitely in a downward direction. Once flying speed was attained and the control response effective, I was amazed at the handling characteristics as being similar to flying full scale

to page 77

FOR WHAT IT'S WORTH

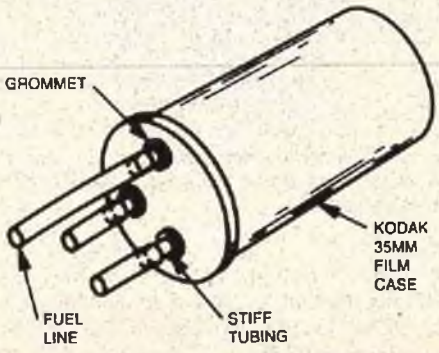


After trying various materials, etc., for use on his receiver antennas as strain reliefs, Charles Kirtland of Rome, Georgia, finally had to shorten a Du-Bro small hinge for use on a 1/2A model, and discovered that the left over portion was just what he needed. The accompanying sketch shows his typical antenna hook-up using the hinge parts to make an internal fuselage relief and an external attachment to keep the rubberband slip knot from sliding off the antenna end.

Vic Leerhoff of Minneapolis, Minnesota, has eliminated all problems caused by the brass tubing that comes with most gas tanks. He has replaced all the tubing with a plastic type that comes with most "Air-Ride" types of shock absorbrs. This tubing is flexible, and can be bent by the application of heat while held in a curved position. The tubing withstands 150 lbs. of pressure, and is absolutely fuel proof and a perfect 1/8" coil, as furnished by Monroe in their air shock packages. Look for it at most auto supply stores.

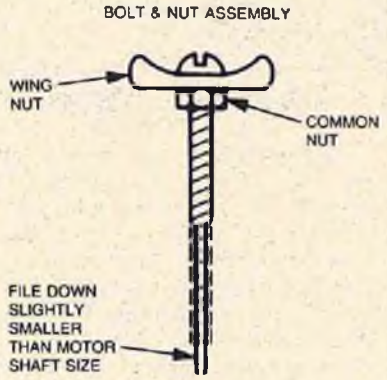
Frank Hart of St Johns, Michigan, wrote to tell us of his method of controlling the depth when making landing gear block or aileron linkage cut-outs in foam wing cores with a hot wire. He uses two wheel collars clamped on the #18 copper wire tool at the desired level. The wheel collars will ride smoothly along the wing skin or, if the core is not yet skinned, wood guide strips can be taped to the core. The sketch shows the required shape of the tool, and the adjustment capabilities.

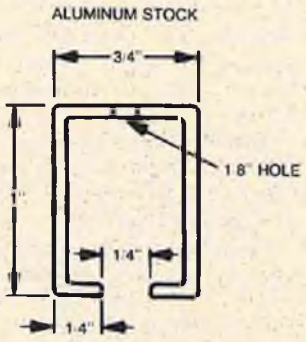
Do you need a one ounce fuel tank? Try this approach suggested by Nicholas V. Kroeze, who resides way down in Tlacolula, Oaxaca, Mexico. Using the film case from Kodak 35mm film, Nicholas heated a nail and punched three holes in the container lid. Small servo grommets were put in the holes to form a seal. Three pieces of stiff tubing were cut from a discarded ink cartridge and then pushed half way through the grommets. This formed a real tight seal which prevented leaking and the tube from slipping out under vibration. The appropriate fuel line was then connected to the tubing. When the fuel tank was finished the lid was sealed on with cyanoacrylate. See accompanying sketches. Nick reports using this type of tank in three different models, with complete success on each one.



Jerry Terpening of Artesia, New Mexico, submitted his idea for a homemade puller for taking pinion gears off motor shafts for

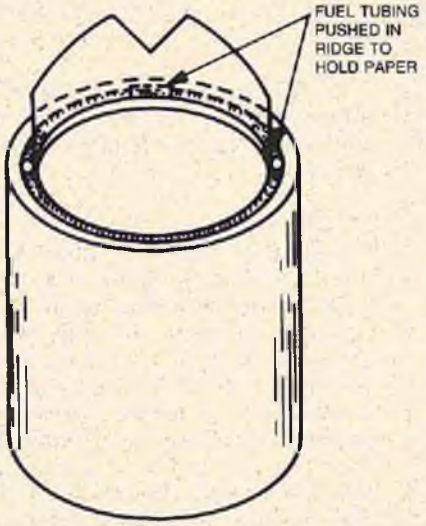
electric cars. As seen from the sketch, he uses an almost closed square loop made of 1/4" x 3/8" aluminum stock, a 5-32 or 6-32 screw, wing nut, and plain nut. The aluminum bar, 3½" long, is first drilled with the appropriate size hole for tapping in the center, and then bent as shown. The screw is modified by chucking in an electric drill, and filing the end to a diameter slightly smaller than the motor shaft. Screw the wing nut onto the bolt, tighten as securely as possible, and lock it in place with a common nut. Now thread the hole in the aluminum bar, with a tap if one is available, or using the bolt if one isn't. Regular glow fuel will make a good lubricant for this operation if nothing else is handy. To use, place the open end of the aluminum piece over the gear, and the end of the screw on the motor shaft. As the screw is turned, the gear will be pulled off.

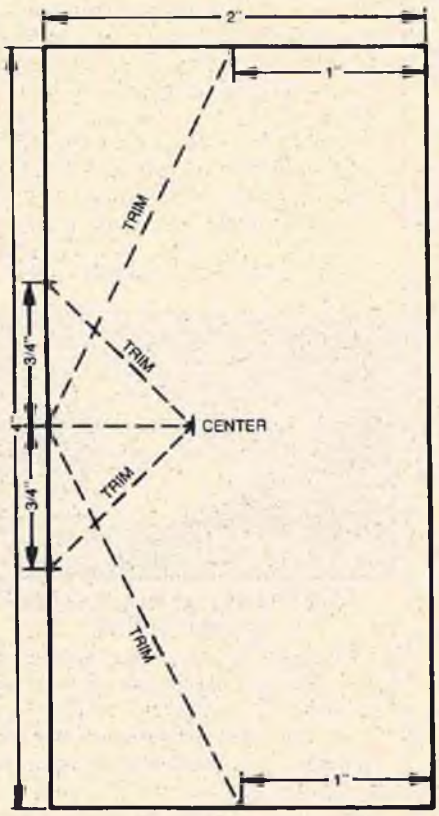




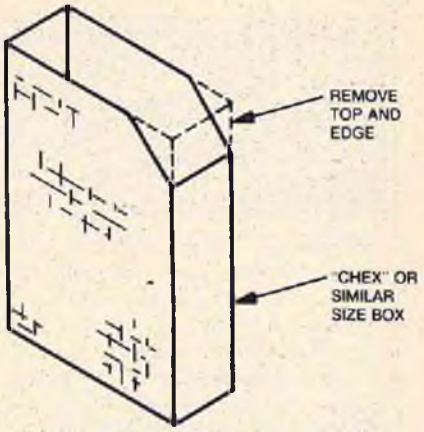
When attaching wings with 1/4 x 20 nylon bolts, in order to get a perfect fit for the bolts where they go through the wings, first drill a 3/16" hole, and then enlarge it with your Fox prop reamer. High speed drills are a little to hard to control, and the reamer will give you a perfect fit the first time and all the time. A hint from Jorge Casanova of Greensboro, North Carolina.

That everlasting problem of how to pour paint neatly out of a can has been solved cleanly by Richard S. Hade of San Jose, California. He cuts a piece of folder paper according to the sketch shown, inserts it around the lip of the can, and holds it in place with a length of fuel tubing.



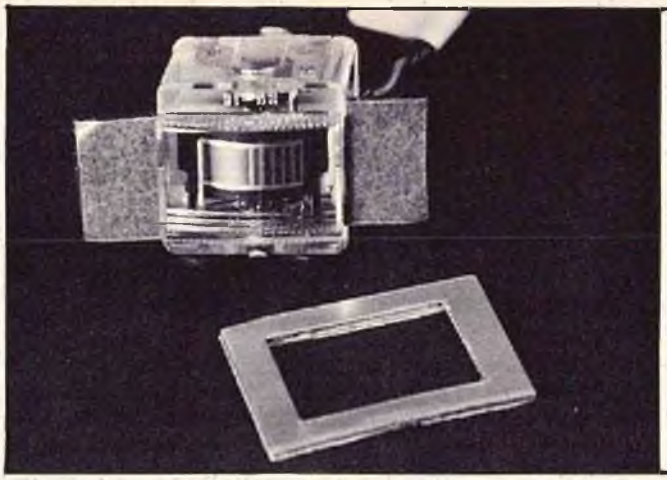


Until you get around to ordering your RCM Binders, you can store them temporarily in holders made from "Chex," or similarly sized, cereal boxes. Trim them according to the sketch, along the top and one end, on one side only. The magazines fit nicely in the modified box, and can be stood on end thus saving shelf space. This idea was submitted by Le Cong Danh of Norcross, Georgia.



Fred E. Williams, Evansville, Indiana, submitted a helpful construction technique. It concerns the use of laminated wing tips, stab and elevator tips, and fin/rudder outlines. Some kits out now use them; Fred's is the Sig Liberty Sport. To obtain a scale outline they use four laminations of 1/16" x 1/4" balsa to keep the outline fairly thin. They are soaked in hot water then bent around a series of pins conforming to the outline of the tip, etc. The problem arises when the balsa tends to crush while being bent against the pins. Each succeeding piece is glued to the next with thinned Titebond or similar glue. The outside one isn't as bad as the inside naturally, but still is noticeable. Fred substituted the inside lamination and the outside one with 1/32" plywood, leaving three laminations of the original balsa intact. The substitution leaves the overall thickness the same. The plywood is soaked the same as the balsa and bends beautifully, but does not dent or crush against the pins. It also makes a much tougher outer edge. This is a plus for most modelers, to prevent damage here and there, hitting doorways, etc., during the building process, not to mention the carrying in and out going to and from the flying field. The plywood keeps the dings to a minimum. It turned out very well for Fred's Liberty Sport.

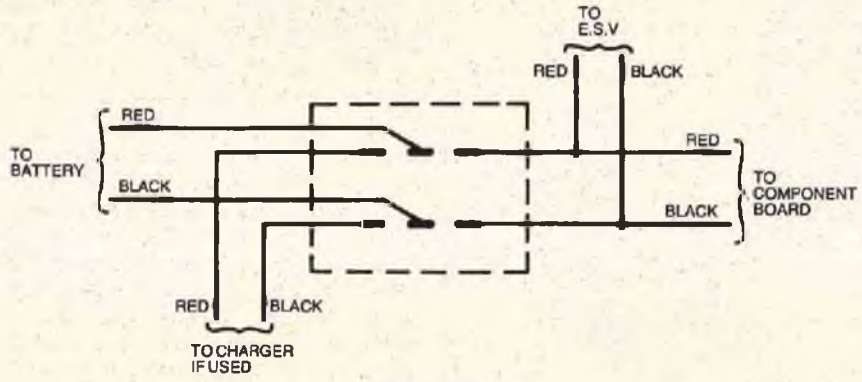
Send your hints & kinks to RC Modeler, P.O. Box 487, Sierra Madre, Ca. 91024 & win a free book from RCM's Anthology Library Series if your idea is used.



A BATTERY CONDITION METER FOR METER-LESS TRANSMITTERS

By the RCM Staff

The meter and bezel, small enough to fit comfortably into the current two and three channel transmitters.



Installing And Using The Ace R/C Mini-ESV

In general, the under-$100 two and three channel R/C systems now available from so many manufacturers are excellent buys. The transmitters and receivers are usually time proven circuits, with servos often using the latest IC amplifiers and high quality mechanics. The actual reason for their lower prices is that they are made in large quantities, and that the luxuries have been left out.

The meter we are used to seeing and checking upon turning on the transmitter actually does provide some useful information, thus we started off to install one in our new three channel transmitter that comes without one.

Since this is a dry cell powered transmitter, we opted for a voltmeter that would give us an idea of how much life was left in the present battery.

Browsing through Ace R/C's catalog, we came across their transmitter Mini-ESV (Expanded Scale Voltmeter) kit, Stock No. 22K10 for 9 volt dry battery transmitters, and 22K11 for those using 9.6 volt ni-cd power. The cost of the meter, complete with components installed that transform it from a common meter into an expanded scale variety, is only $5.95.

Expanded Scale? Just what are we talking about? Simply, this means that we have limited the range over which the meter will operate, so that a small amount of change in the applied voltage will cause a large meter deflection, making it easier to interpret whatever information is given to us.

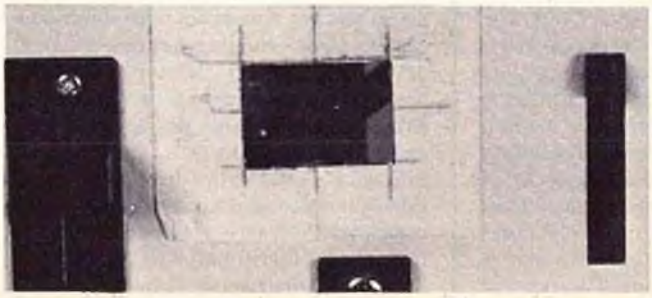
In the case of the Ace transmitter ESV, they are small meters, merely 1/2" x 3/4", a good size for small transmitters such as most two and three channel models are. It has a two-colored face, solid red on the left half, and a series of narrow green markings on the right half. As received, the ni-cd model is calibrated so that the meter will read "in the green" as long as the voltage is above 9.4 volts, considered to be a safe value. As the needle drops into the red segment, it indicates that a critical level has been reached, and charging is required.

On the 9 volt dry cell model, movement into the read area takes place at 7 volts, indicating that a battery replacement is in order.

Installation of the meter is simplicity itself. A complete instruction sheet is included, which tells you everything you'll need to know. We especially liked the meter cut-out template furnished which makes it easy to cut the proper hole without over-doing it. We also liked the brushed aluminum bezel furnished, which can be used to dress up the installation hole if you get "outside the lines."

The first step is to determine where the meter will go, bearing in mind that it will need some space in the back, inside the transmitter case. It measures 3/4" square by 7/8" high. When you are sure that there is nothing inside the case that the meter will interfere with, or vise versa, either tape the cut-out template to the transmitter case, or cover the area with masking tape, and transfer the template to it with a sharp pen or pencil.

Ace recommends that you drill two 7/16", or six 1/4" holes and file out the insides to the dimensions indicated. Unless



Meter cut-out hole is made by drilling a couple of holes and some careful filing. Tape protects the area around the hole.

Meter with bezel installed, a nice feature if the hole is inadvertantly made over-size or with a jagged appearance.

you have a drill press, and some way to secure the transmitter from wandering while drilling, we do not recommend making the larger holes. During all filing and drilling operations, have the transmitter exactly face up on your work bench, and arrange for all the metal filings to fall some place other than into any of the transmitter components.

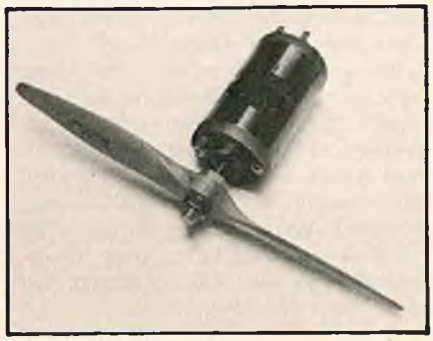
Blow or brush the inside of the case in the area of the hole to clear out all aluminum filings. The meter installs from the inside, and several trial fittings will probably be necessary for a just-right fit. The bezel furnished will take care of any sloppiness or an oversize hole. The meter is held in place with two pieces of double sided tape, which come already applied to its mounting ears. When the hole is complete and dressed to your satisfaction, remove the protective paper from this tape, and press the meter in place. The bezel is also adhesive backed, and if you have opted to use it, remove its protective covering and permanently install it around the meter face.

There are just two wires to attach to the switch terminals which also contain the wires coming from the transmitter component board. The accompanying diagram is for a normal installation; the only thing that might differ in your particular transmitter is that the switch might be only a single pole type that will not have the additional contacts to which the charger connections are made. Follow the polarity as indicated by the color codes on the wires; red for positive and black for negative. If yours is a dry battery transmitter, disconnect the battery while you are making your connections, removing any danger of shorts. If you have built-in ni-cds, which are more difficult to disable, just remember that you are working on a live circuit, and don't allow anything metallic to fall across the battery contacts on the switch.

We believe the Ace R/C Mini-ESV is an important addition to the meter-less transmitter, and worth many times the cost, in assurance if nothing else. □

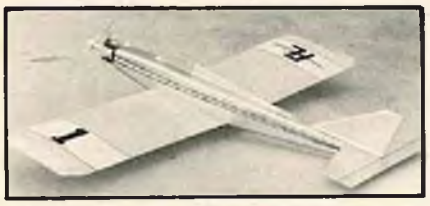
SHOWCASE '81

from page 75/74



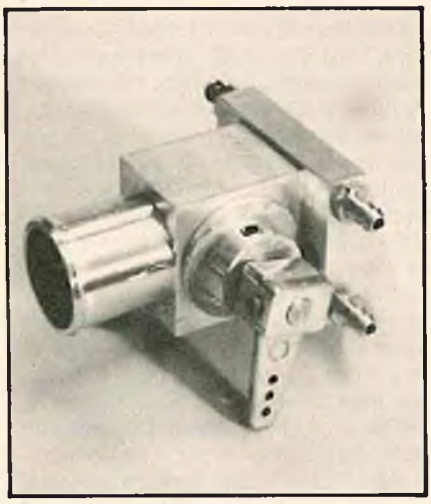
ASTRO 40 ELECTRIC MOTOR

A new and powerful 40 size electric motor for racing planes and boats, and for aerobatic models is now available from the developers of electric power for model propulsion, Astro Flight Inc., 13377 Beach Ave., Venice California 90261. This new motor develops approximately 3/4 h.p.; turns an 11/6 prop at 10,500 rpm, a 10/6 at 11/500, and a 9/6 at 13,000. It is 3.5" in length, 2" in diameter, and weighs 17 ounces. It features twin ball bearings, high energy magnets, and twin commutators for maximum power and reliability. It needs from 16 to 20 sub-C Ni-cd cells for power. Look for it now at your local hobby shop, or inquire from Astro Flight.



FLITE LINE PRODUCTS SCAT CAT 500

Already established as a winner in Quickie 500 circles, the new Scat Cat 500 kit is now available. It features machine shaped parts of the finest balsa, plywood, and hardwood; one piece matched fuselage sides, precision cut foam wing; 1/16" balsa wing covering, and full size plans. Look for it at your dealers. Further information from Flight Line Products, 3207 34th St., Lubbock, Texas 79410.



PRATHER PRODUCTS EXHAUST THROTTLE

A high quality exhaust throttle for marine engines, an absolute requirement for successful sport and competition boating, is now available from Prather Products, the designers of many successful accessories and kits. This exhaust throttle incorporates the latest in throttle technology, features water cooling, internal high temperature O-rings, and a round exhaust for maximum performance. It is available in 12 and 20 degree mounting angles, for the K & B 3.5 and 7.5 cc marine engines. Look for this and other Prather Products' marine accessories at your nearest boat shop, or write directly to them at: 1660 Ravenna Ave., Wilmington, California 90744.

BIG IS BEAUTIFUL IN SOARING TOO!

from page 71/70

sailplanes. The LS-1C and Jantar were equally docile in most respects except a slower roll rate on the LS-1C. The PIK-20D was a faster ship (as if the others were slow!) and was quick to detect pilot error (undoubtedly due to higher wing loading).

After gaining sufficient altitude off the slope we penetrated (no problem here) over the valley in search of developing thermals. Once detected, the thermal centuring process is similar to full scale flying, however, differs greatly from our balsa/MonoKote floaters. The size of the flying circle is much larger (i.e., you need a bigger thermal) and it is easier to core using aileron controls. I once let flying speed drop off while thermalling to a near stall condition and ate up about 150 ft. of altitude before I recovered.

A brief lecture by Marc Snyder on the maintenance of airspeed convinced me that this is the one essential element for models of this size and weight. They must be flown at all times and by an experienced pilot.

Landing --- well that's another matter altogether. After fooling around in the sky for some time, the ticklish job of a safe landing seemed remote. Marc explained the process which was, again, just like full scale flying, of a downwind, base and final approach to the landing zone (spectators clear out of this area quickly). Speed and attitude are controlled by spoilers to touch-down. Forget the 2-minute precision landing drills we are accustomed to here in the U.S. --- just get that monster down and in one piece was my only thought.

Well, land them we did --- the LS-1C, Jantar and the PIK-20 --- when the lift became marginal and then we headed back to the ski lift for descent into the valley below.

The scenery, the sailplanes, the wine and the people all combined to make this the most memorable flying day of my life. Big is beautiful --- and in soaring too! □

GIEZENDANNER DIGITAL TACH

from page 65

place is about half-way out on the prop blade.

The Digital Tachometer, and any other tach that can be read accurately, can be used for a variety of things. For one, you can readily, and without doubt, determine if one plug or fuel, or any such combination, is better in your particular engine than another simply by making comparison readings.

You may find that you don't really need that more expensive higher-nitro fuel after all.

You can compare your engine's performance to itself, or to others of its type. Keep track of its rpm with a certain prop, plug and fuel combination, and test it under those conditions any time you feel it's not putting out like it used to.

Obviously, the exact engine rpm is also of interest to the ducted fan, helicopter, boat, and car R/C'er. In either case, you can read the engine rpm off a flywheel, starter cone, or shaft, simply by painting or taping on two light colored bars opposite each other to reflect the light such as a prop would.

In the case of a digital tachometer, its greatest value is its accuracy and easy readability at those times when the exact rpm is important. The Giezendanner Digital Tachometer meets that criteria.

Price and availability. The Giezendanner Digital Tachometer is available only from the company's Pennsylvania facility, and is priced at $129.95 plus postage. If you are a Pennsylvania resident, tax should be included with your order.

In conclusion we are happy to report that this product is of excellent design and construction and fully complies with the manufacturer's claims. □

AIRFOIL DESIGN

from page 63/62

air very well and loves the slopes. It is a fast ship and not for the novice pilot. Guys who like pattern but can't keep up with the cost of nitromethane would like this ship. It uses a 2.0% to 3.0% camber airfoil.

Very gentle power, like a trainer: Airfoils for this class would be picked for their good middle of the road characteristics. They would have low stall speeds and no particular capability to allow the ship to go fast. They would be tolerant of a lot of things but wouldn't fly inverted very well. This would be a 3% to 4% cambered section.

Slightly zippy power ship but not quite a pattern job: This ship would fly okay inverted and have reasonable dash speed capability. She would roll and loop but the rolls would be slightly sloppy as it transitioned from right side up to inverted flight. The camber would be 2.0% to 2.5%.

Full blown pattern ship: This is a camber of 0% to 1.5%. This is a high speed capable machine. Its take-off speed is slightly high but it flies upside down as well as right side up. It does loops, rolls, etc., with no drag change as you transition from right side up to upside down flight. This is a pilot's ship.

So much for camber. What about thickness? The only big limitation on thickness is drag. Specifically, if the airfoil gets too thick the curvature on the later portion of the upper surface gets too severe and the flow has difficulty in staying with the shape. When this happens, drag goes up very quickly. If the airfoil is too thin, the wing can easily break. The obvious question is what range of thicknesses go with each camber to try to hold low drag and yet keep reasonable strength? One of the things I found by examining not just the Eppler sections but also many very old airfoils used in modeling in the old days was that the upper surface drag problem apparently was recognized. There was a general characteristic on nearly the entire Eppler family and these older sections. The high camber sections were thinner than the low cambered ones and the combination of camber and thickness was such that the upper surface drop-off from the 40% to the 80% chord location never exceeded 5% of chord length. If you look at Figure 2, it shows this apparent schedule for the Eppler sections.

Eppler also used an apparent lower thickness limit schedule but I'm not aware of its significance, unless it perhaps has something to do with avoiding increases in drag from the lower surface at large negative angles of attack. At any rate, the figure shows the schedule. One thing I can tell you for sure is that for the same materials if you thin out a wing by 10% you weaken it by 10%. High thickness sections are very useful at the root and out to the 1/4 span but beyond that they really aren't needed for in-flight strength. One quick calculation I ran off recently said that if you gradually reduced the percentage thickness as you went from 1/2 span to tip on a sailplane, you'd reduce wing profile drag by 8.4% and improve the overall glide slope by 5%. The root was 10%, the 1/4 span 10%, mid-span 8% and tip 6% thick.

Another thing you should notice on Figure 2 is that there are about a dozen Eppler sections plotted on there. Most of these sections came from a book I got last year from a modeler in Czechoslovakia, published in 1978 in Prague. This brings up one of the problems with the Eppler series — their data is a little harder to get your hands on than Ford parts. The other problem is that there is currently no titling system on the Epplers that gives you any useful technical information on their characteristics. The next section solves both problems.

Using the camber discussion given earlier and the camber-thickness ranges of Figure 2, if you had the Eppler camber and thickness values you could make up your own airfoil, or even reproduce one of Eppler's existing sections. To do this, all you'd have to do is take the proper camber line values for height and first add and then subtract the values of the symmetrical thickness distribution to those of the camber line and you'd have your upper and lower surface coordinates for that chord location. To help you do this, Tables 1 and 2 are provided. I obtained these tables by breaking apart a lot of Eppler sections into a camber and a thickness distribution. As it turns out, they weren't arbitrarily selected, they were all systematically generated. At any rate, now that the code has been broken, you can use them to make up any airfoil section of your own choosing that you wish. The usefulness of this is that now there is an infinite variety of new sections that can be made up to your choosing, simply by putting together a camber and a thickness distribution you pick out.

Now, what about the titling problem? I'm going to give a titling system to the airfoils by using a system somewhat like the NACA used. In the new system you will see and EL followed by a five digit number. The EL stands for "Eppler Like." The first two digits stands for the camber and the last three stand for the thickness. The existing Eppler sections can also be identified this way. For example, the E-193 has a 3.7% camber and is 10.2% thick. This would be called an EL 37102. It would be made up from a camber line 3.7% high and then adding and subtracting the coordinates for a 10.2% thick symmetrical section to those of the camber line. To get these off-beat cambers and thicknesses from the tables you have to interpolate linearly between the columns. This should be no big deal to anybody who has ever had to use this technique in using log tables. It's a grammer school trick.

Interestingly enough, I had never heard of nor seen an E-193 or any of those on the lower line of Figure 2 until three years after I had made up the general Eppler tables (1 and 2). Once I had gotten the camber and thickness of this one and several others (like the E-180) from the Czech book, I used the method being preached in this article to generate the airfoil shape and came within .01" worst error on a 10" chord. That's close!

In case you want to make your Eppler sections without having the coordinates to start with, Table 3 gives you the EL Equivalent of 12 of the Eppler airfoils.

What about some new sections? How about four new ones within the range of Figure 2, but all with 10% thickness and varying camber? If we pick 1%, 2%, 3% and 4% camber they would be the EL10100, EL20100, EL30100 and the EL40100. The applications would be pattern; slightly zippy power ship; power trainer or high speed sailplane; and all weather sailplane respectively. The coordinates for these new sections are given in Table 4 and they are drawn up in Figure 3. These sections are all brand new but low risk because they come from a known base where drag has been minimized. You can easily do worse but you'll have a hard time doing better. Remember, as you walk away from this article, that a ship which has had its airfoil properly selected to match the type of flying you intend to do will fly smoother, have fewer unpleasant surprises and, in general, make you happier with your ship. The choice is yours. Think about it. □

CESSNA CARDINAL

from page 61

. . . . The written instruction pertaining to wing reinforcement is as follows: "using epoxy, apply fiberglass cloth or equivalent to the bottom of the wing." No instructions relative to what weight fiberglass cloth should be used or how much of the wing should be covered. The experienced builder will naturally assume that a 3" or 4" wide band of 6 ounce cloth should be applied to the wing center section. This was applied to our test aircraft. We wince at the thought of how a beginner or relative novice may interpret this assembly step. As we mentioned: the assembly instructions are very vague and confusing. The step which we just quoted, serves as a typical example! The instructions call for the aileron servo compartment bottom to be built up with balsa. Since no surplus balsa is included with the kit the builder will have to have scrap balsa on hand or purchase it. The builder will also have to purchase all hinges, aileron horns and connectors, control horns, nose gear steering arm, etc., as the enclosed hardware package consists of one washer and a wood screw, which are used in mounting the horizontal stabilizer onto the fuselage; and two small 1/16" aluminum plates (1/2" wide x 2⅛" long) which are not explained in the instructions. Obviously we would rate the hardware package as being extremely poor! The formed wire main landing gear is a pre-soldered unit that is very nicely done. The axle ends are threaded and spacer washers and acorn type retainer nuts are attached. With no plan sheet, the builder will simply have to guess, in regard to which way to mount this unit to the fuselage as the wire legs taper, (similar to a conventional sheet aluminum landing gear) out to the axle points. The nose gear is the conventional type; pre-bent with a coil type shock loop.

The horizontal stabilizer is pre-assembled, from sheet and strip balsa. The elevator and rudder are pre-shaped solid balsa. The wood quality and workmanship are excellent. The builder is responsible for finish sanding and the installation of all hinges and control horns in order to complete the empennage.

Hardwood dowels are included in the kit for mounting the wing and main landing gear to the fuselage via the conventional rubber band/dowel method. We elected to use nylon bolts and an internal leading edge dowel to mount the wing and utilize bolt-on type retainer straps to hold the main landing gear in place. Both of these modifications were made in an effort to improve the overall appearance of our test aircraft. They were personal preference changes, rather than criticism of the manufacturer's suggested methods.

We did not experience any difficulty in assembling our Cardinal in spite of the poor instructions and lack of plan sheet. These deficiencies will, however, generate many pitfalls for a beginner or relative newcomer to the world of R/C aircraft. In addition to the two small unexplained aluminum plates, we also had two small (also unexplained) grooved balsa strips left over. We surmised that these pieces were perhaps bearing strips for the aileron horns but since there were not any horns included in the kit or instructions, we installed aileron horns with nylon attachment bearings.

Custom Model Products Quick Cure five minute epoxy and Fast Bond cyanoacrylate glues were used for all construction steps. These fine adhesives greatly hastened the assembly process. Custom Model Products micro-balloons were also utilized for filling and leveling all fuselage center seam imperfections.

Finishing:

The wing of our Cardinal was covered with EconoKote heat shrinkable type covering. The fuselage and tail surfaces were finished with K & B Super Poxy primer and gloss enamel.

Engine:

An old, but reliable K & B .40 R/C engine with a Kavan muffler was used for power. The pre-installed plywood engine mounting plate is canted at an angle (roughly 30°) so that the muffler is positioned close to the fuselage; which has a molded-in muffler depression. This is a nice feature that enhances the aircraft's overall appearance. An Sullivan 8 ounce fuel tank was installed.

Radio:

The radio equipment utilized for guidance was a Westport International Variant system. The radio equipment compartment is large enough to accept any type of radio system with ease. While the Consumer Hobby Corporation advertisements state that the Cardinal may be built and flown with either 3 or 4 channels; the kit is completely devoid of any information relative to a 3 channel installation. Our test aircraft was built in the standard (rudder, elevator, aileron, throttle) configuration.

Flying:

The instructions call for the C.G. to be located 1/3 of the chord, aft of the wing leading edge. This is exactly where we located the C.G. on our test model. It was necessary to position all of the radio system components as far forward as possible to accomplish this. The instructions call for the use of 1½" diameter wheels, on the Cardinal. Since all of our test flying was to be conducted from grass fields, we felt that 1½" wheels were a bit small for an aircraft of this size. Therefore 2¼" wheels were used on our aircraft. The Cardinal proved to be a good flying aircraft with equally fine ground handling characteristics. No bad traits were encountered and only minor trim changes were required for hands off straight and level flight. The Cardinal does fly a bit faster than other sport scale type aircraft. We attributed this to its clean lines and 84 ounce (dry) weight.

Conclusion:

In summary, the CHC Cessna Cardinal is a nice looking sport aircraft which resembles the full sized Cardinal. It is highly prefabricated, but in this reviewer's opinion it is not an ARF kit, nor is it very close to scale. The lack of a plan sheet and its extremely poor assembly instructions render it a very poor choice for the fledgling RC'er. The almost non-existent hardware package is another glaring shortcoming. The Cardinal's highest appeal should be found amongst sport flyers, who want an aircraft that looks like a full size airplane and one that can be assembled fairly rapidly. □

BIG IS BEAUTIFUL

from page 59/58

Dick Hershey of Lakeport, California, and his Grumman Goose finished in Coast Guard colors. Not yet flown, estimated final weight, 100 pounds and twin Quadras.

George Wacker's PT-19, Hustler powered and flies in a very realistic and docile manner. Now that's BIG!

As predicted here several times in the past couple of years, the non-competitive 'rally' type flying meet is becoming more and more popular. It seems that those of us interested in larger models enjoy getting together to exchange ideas and to fly our **big** models together without the hassle and pressure of competition. I have become aware of several such fly-ins around the country this past season, usually too late to mention them here in the column. If you are planning such an event for next season, please let me know about it well in advance (at least three months, four if you can) and I'll see that the word gets out to others in your area who might be interested in attending. Some pictures taken at The STARS rally in Olean, New York, accompany this column and I'm told it was a rousing success. Thistledown Flyers of Napoleon, Ohio, had one as well and I am hoping to have some pictures of it in a future issue. QSAA started the ball rolling several years ago under the guidence

of Ed Morgan and he surely started something **big**! Judging by the interest and attention given to such gatherings in 1980, we will see more and more of this sort of meet taking place in the future. Let me know about yours in plenty of time to get the word out to others.

That's it for this month, more next time, see you then.

Willard Deedles, Kitchner, Ontario, flew his Twin Otter at STARS Rally. Two sixties provided the power in this impressive model.

Jim Crawford of Hamilton Canada, taxies his Baby Ace to the flight line at the STARS Rally in Olean, New York. Great weather, good flying and good food all combined to make a rousing success of the event.

Lou Moyers, Conneaut, Ohio, flew this Ziroli Corsair in racing colors. Kioritz powered model put in impressive performance.

□

PIT STOP

from page 56/55

driving job to win, with Jerry Case finishing close behind to take 2nd, with Matt Azzara 3rd and Phil Goodwine 4th in a brand new car his first time out.

Expert Stock "A" Main — This was the big race of the day. The cars were brought to the line for a visual tech. After the race, the cars would be impounded to be checked for motor legality. The cars were lined up, the flagman raised the flag and the race was underway. Gary Kyes got one of his incredibly fast starts and took the lead, John Thorp was in 2nd and I felt lucky to be in 3rd with Mike Lavacot a little farther behind in 4th. Kyes started pulling away from Thorp. I was right on Thorp's tail, but with identical stock motor power, I couldn't pass him on a straightaway, it would have to be in a

to page 94

from page 80/55

corner. I sat behind John for 3 laps waiting for him to go wide in a corner, but he was right on line. I didn't want to just drive through him, but then on the 4th lap, he went a little wide and I got by. Kyes now had about a 50 foot lead. Lavacot came up behind Thorp and passed him on the 5th lap and on the 6th lap Lavacot came up behind me. I just moved over and let him go by. Lavacot then took out after Kyes. It took Lavacot 10 laps to catch Kyes and I could hear the crowd yelling. Kyes was cutting the corners perfectly, leaving no room for Lavacot to pass, except on the outside, which is the long way around. Then at the end of the straightaway, Kyes left a scant 10 inches between his car and the corner dot, which was all Lavacot needed to squeeze by and take the lead. Once Lavacot had the lead he started pulling away from Kyes. In the meantime, I had about a 30 foot lead over Thorp, which is not very much. One little mistake and you can lose 2 or 3 places fast. Lavacot continued his lead, but on the last lap Kyes started to slow down, which generally doesn't happen in an 8 minute race with stock motors. But Gary had geared extra high in an effort to get all the power out of his motor as possible, and now his batteries were going dead. I was closing on Gary at an extremely fast rate. Lavacot took the checkered flag for 1st. With one corner to go, I was 5 feet behind Gary, but Gary held on to take 2nd, while I was 3 feet back in 3rd, with Thorp another 30 feet back in 4th.

In the series standings, Kent Clausen finished 1st with 123 points, I was second with 120 and Mike Lavacot with an identical 120 points, but a slower backup time was 3rd.

MODIFIED CLASS

The stock motors came out and the horsepower went in for Sunday. Most drivers picked up 1 to 2 laps in qualifying. But with the added horsepower other problems can come up for some drivers. The Top Qualifier spot came out of the 3rd Expert heat. Going down the straightaway, on the 1st lap, Mike Lavacot, Gary Kyes and myself were side by side. Somehow or another we all made it around the corner at the end of the straightaway without hitting one another. Not only that, but the next 3 laps we all three were running door handle to door handle with no nerfing going on. It was some of the most exciting racing I've had in a long time. Lavacot finally took the lead. I held on to 2nd until my batteries dumped with 2 laps to go. Kyes' batteries also dumped. Lavacot turned 23 laps in 8 min. 10 sec. for Top Qualifier spot. It didn't break the track record, but this time we were running without glue.

In the 2nd round I changed to another set of Sanyo batteries, because I figured my

to page 96

from page 94/55

first set must have vented. But I used a set that was in my wife Midge's car, and one of her crashes earlier, unknowingly, had broken a wire and I never got off the line in my 2nd qualifying round. Which brings us to the question, which batteries are better — GE or Sanyo? They are both better, but in different ways. I'm not evading the question. There is just no simple answer. Let me give you some example situations, and you can tell me which is best. Most Experts use Sanyo's. Not necessarily because they're better, but they feel they have to, to have a chance to win. Some Sanyo batteries are better than GE batteries in that they will have more voltage over a longer period of time, which is exactly what we want. However, most Sanyos will vent, normally, but not necessarily, from overcharging, much, much easier and faster than G.E.'s. So, the G.E. batteries are more rugged, more reliable, more consistent — one battery to the next, and can tolerate more of an overcharge condition — although this is to be avoided at all costs. Some Sanyos are better in performance, but their lack of reliability can fail you in the middle of a race. You tell me which batteries are best. Many a story is made in Modified Class racing due to batteries. Good and bad. On with the racing.

Novice Modified Class — Joel Mayer drove to a 1st place finish in the "A" Main followed closely by Peter Fokos in 2nd and Paul Devos in 3rd. In the Series, Jerry Whitney took 1st with Rich Douglas 2nd and Ken Jones 3rd.

Amateur Modified Class — Derek Coopersmith won this class, but it wasn't easy. Derek had to drive a perfect race, because Ed Janis was right behind to take 2nd. Rene Cortez had so many problems on Saturday, he was debating on whether or not to race on Sunday. But race he did, to finish in a well deserved 3rd place. Derek Coopersmith made it a sweep by winning both the Stock Modified Classes in the Series. Joel Johnson added another 2nd

to page 98

PIT STOP

from page 96/55

place in the Modified Class with Ed Janis taking 3rd.

A funny thing happened during the race preparations. Everyone naturally wants a fast modified motor. But some motors will not run a full 8 minutes on a battery charge. The Reedy Modified motors not only have a reputation for being fast, having won the 1978, 1979 and 1980 ROAR Nationals, but they also run the full 8 minutes. So one well-known team from the Northwest was observed removing the Reedy labels from their Reedy motors which they had purchased, and were putting their own labels on the motors. At least they know a good thing when they see it.

Expert "B" Main — I ended up in the "B" Main due to my battery problems, but I had some fast company in the way of Kent Clausen and Butch Berney, who had both won one of the earlier series races. But I guess this was meant to be my race. I had no problems and lapped the entire field until my batteries dumped on the last lap, but I had a large enough lead to win with Jerry Case in 2nd and Butch Berney 3rd.

Expert "A" Main — This was **the** Main of the weekend. The cars were lined up, the starter raised the green flag and the Main was underway. Two cars took an early lead. Jim Aguirre had the lead with Curtis Husting right on his bumper. Jim was really flying, but Curtis was staying right with him. After 3 laps Jim and Curtis were pulling away from the field. At 5 laps Jim went just a little wide, and Curtis jumped into the lead. Curtis began opening up his lead over Jim. Mike Lavacot didn't get too good of a start, but one by one he was moving up through the field and now he was right behind Jim Aguirre. It took him a couple of laps, but he finally passed Jim to take over 2nd. Curtis was now about 50 feet in the lead with about 5 laps to go. Lavacot was gradually closing the gap, but it didn't

to page 100

PIT STOP

from page 98/55

look like he was going to catch Curtis. Then on the last lap, Curtis' batteries dumped and Lavacot went by to take the lead and the win with Curtis Husting in 2nd and Jim Aguirre finishing 3rd. Lavacot made a clean sweep winning both Stock and Modified Classes.

In the Series points it was Kent Clausen adding another 1st place in Modified Class to his long list of wins. 2nd was Butch Berney, with Mike Lavacot 3rd and Tim Neja 4th.

The Southern California Auto Racers Club would like to thank the following manufacturers for their prize donations. Associated Electrics, Bo-Link, Frank Killam, Leisure Electronics, MRP, Novak Electronics. As well as, Orange Coast Hobbies and Earle's Hobbies. I would like to thank the club for not only putting on one of the greatest 1/12 races ever, but also for presenting some of the best trophies I've ever seen. □

RADIO SPRCTRUM

from page 54

one of the cells was dead, but seven were good, so the RF output was there but the pulse circuit was affected. The circuits tap from the battery. A built in crash wouldn't you say? The meter on the transmitter doesn't tell you everything.

Fred Meichner
Huntington, New York

I agree, but you have an unusual case. Most **good** radios are designed to work if one or two cells are dead in the transmitter. For a while quite a few manufacturers were building encoders that ran off a five volt tap in the transmitter. I never liked this because you can see the bottom four cells will always be run down faster than the top four. I don't know what to say, but don't buy a system with a tapped battery and if you have one, you better buy a voltmeter and keep an eye on it.

to page 110

RADIO SPECTRUM

from page 100/54

Machine Guns

Dear Mr. Oddino,

Sometime last winter in your column you described the Radio Shack SN76477 sound generator linear I^2L device, and how it could be hooked up (schematic) to create gunshot sounds for use in R/C planes. What I would like to know, is there any company or anyone who makes the P/C board or a complete unit of this type? If this P/C board is not available do you have a full size layout drawing that I could obtain? Also would you tell me what issue of RCM your article about this "Sound Generator" appeared in.

Yours truly,
Justin Maas
Birmingham, Michigan

First, I must give credit to Harry Apoian and Hank Lopez for the machine gun circuit. I'd also like to give them hell for not specifying the part numbers and source for the audio amplifiers. I think half the mail I get (slight exageration) asks this question.

In the June 1980 column we mentioned that you could get the SN76477 from Radio Shack, Part Number 276-1765, or from Bullet Electronics in Garland, Texas, with an experimental circuit board. We also mentioned the audio amp kit is available from Formula International, Inc., 12603 Crenshaw Blvd., Hawthorne, California 90250. Also, you must remove the 10µf cap on the emitter of Q1. What we have not told you yet is this:

The pulses (+) shown on pins 27 and 28 should be supplied with +5 volt power. The +5 is available from pin 15 on the SN76477. This info was sent in by Dick Kolodziej of Van Nuys, California, and I hope it is in time to prevent anyone from blowing an IC. If you try to build anything like this, I suggest you always get a data sheet before you proceed. If you had the data sheet on the SN76477 it would have made it clear because the machine gun circuit is shown as a typical application.

This better be the end of the machine gun letters, Harry.

Expanded Scale Voltmeter

Dear Mr. Oddino,

Perhaps you may or may not remember me. I believe I gave you somewhat of a difficult time when I was living in England. I purchased one of your E.S.V. meters which was very satisfactorily resolved.

At any rate, I'm writing to you now for something a bit related to meters. While living in England, I acquired two meters which are used on two different English Tx's I would like to use these meters on expanded scale voltmeters on two Tx's I'm building. One is the Ace Silver Seven and the other Tx is the Cannon. Can you give me a definative answer as to how I can accomplish this. The two meters I have are different.

I would like the needle to start registering at about 9.3 or 9.4 volts. I know nothing of electronics, so I would have to accomplish this "by the numbers" so to speak. Any help you can give me would be greatly appreciated. If there is anything about the

to page 112

from page 110/54

meters which you must have information about, please let me know.

Again, many, many thanks.

Sincerely,
Jordon Flakser
Silverton, Oregon

The Ace ESV is a fairly simple circuit. Figure 2 shows the schematic for a 9 volt model. They use a 1 ma meter and a 6.8 V Zener diode. The meter reads full scale at 9 volts and zero at 7.3 volts. If you want a higher turn on voltage you should try a higher voltage Zener. This circuit will draw about 18 ma which is significant at full charge.

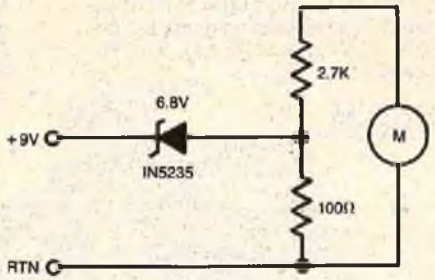


FIGURE 2

Fast Charging

Dear Jim

I'm not much of a brain when it comes to radio, but I do love to build R/C!

I am writing you in hopes of getting some info in regards to nicad charging, etc.

I am at present trying to come up with some method of quick charging my radios in the field. I have 2 Kraft KP6A Sport Series, 1 Cox 4 channel & 3 Kraft KP5-C radios.

I would like to know how to go about field charging any of these units and if the nicads will stand it. I have been led to believe some batteries won't take the fast charge and if so, how do you identify them?

Would you please let me know what method would be best suited for that and what charger I should buy?

I had planned on using the M.E.N C 50/4 charger if it would be suitable to all systems.

I am going to use 1800 ma battery packs for my flight packs in a couple of my larger planes. I have puchased one from CHC but haven't used them yet.

I will appreciate any help you can give me.

Thanks,
C.W. Smith
Red Bluff, California

I don't know of any charger on the market that will do what you want but you can build one. We covered this in detail back in the June 1975 issue and I suggest you get a copy of that article. (June 1975 issue is no longer available through RCM, but you can get a photocopy of the article by sending in $1.00 to R/C Modeler.) If there is enough interest from newcomers, maybe we can update that topic in a future issue. □

HOMER

from page 49/48

1/8" sq. trailing edge. Do not add the top trailing edge sheet at this time. Remove the wing half from the board and add the front bottom spar. The other half is built in the same manner.

Join the two wing halves at the center with the four dihedral braces at the main spar and the single brace at the trailing edge.

to page 118

from page 114/48

The short main spar brace goes on the aft side of the bottom main spar. Use a good aliphatic resin glue and hold everything in place with clothespins until it sets up. When everything is dry, slice the two remaining RC's at the main spar notches and fit them in place at the center section. Trim the trailing edges of each to fit against and behind the trailing edge dihedral brace. Bevel the 1/8" sq. trailing edge and add the top trailing edge sheeting. Cut and install the 3/16" gussets on each side of the center rib at the leading edge and sheet the center section with 1/16" balsa top and bottom except for the top of the servo well.

Slip the 1/8" brass tube, cut as shown, over some 3/32" music wire and bend the two aileron torque rods, one left and one right. Epoxy the torque rod bearings (the brass tubes) to the trailing edge as shown and add the 1/4" balsa fairings. Trim the 1/4" aileron stock to fit from the torque rod bearings all the way to the wing tip and cut off and glue the last 2" of each to the trailing edge at the wing tips. Notch the root end of each aileron to accept the torque rod ends and then lay it aside. The ailerons will be installed when the wing is covered. Cut the wing tips from soft 1/8" balsa and glue them in place with the soft balsa gussets as shown. Install the landing gear mounts and sand the completed wing.

Tail Section:

The stab and rudder are built just like the wing, over the plan. Be sure to add the 1/32" ply spar doublers to the leading and trailing edge of the stab; they add very little weight and a lot of strength. Note the stab is made from 1/4" balsa and the rudder from 3/16". The leading edge of the fin should be hard balsa and the rest medium soft — be conscious of weight in this area. The elevator and rudder are cut from the corresponding sizes of soft balsa. Notch and glue the 1/4" hardwood dowel into the leading edge of the elevator before cutting the rudder clearance indent in the trailing edge. Sand everything well and round all

to page 120

from page 118/48

edges; the mating surfaces will be hinged when they are covered.

Fuselage:

Cut the fuselage sides from a slab of 3/32" medium balsa that is made by gluing two sheets of 3" x 36" stock along their edges to form one sheet 6" wide. Use the sides as templates to cut the 1/32" ply doublers and epoxy them in place, one right and one left. When the glue has set, pin the two sides together with the plywood inside and edge sand them to the same outline. While they are pinned together, drill the two 1/4" holes for the wing holding dowels. Use fairly soft balsa for the 1/8" longerons and uprights aft of the wing and fairly hard balsa for those forward of the wing. Use medium balsa for the servo mounting rails. Cut and drill the 1/4" plywood firewall for the engine mount, fuel and overflow lines, and the throttle line. Install T-nuts on the aft side to engage the engine mount bolts and epoxy them in place. Cut former F2 from 1/8" plywood and build up F3 as shown.

Use a small square to check alignment and glue formers F2 and F3 to the inside (ply doubler side) of one of the fuselage sides. Again, using the square, glue the other side directly over the first on the two bulkheads. When everything is dry, bevel the two sides at the tail and join them, now bring the sides together at the front and epoxy in the firewall. Check overall alignment.

Before the sheeting is installed on the top and bottom, the following steps should be taken: Install NyRods from the servo area to the elevator and rudder as well as inner NyRod through the firewall for the throttle line. Glue a piece of 1/16" sheet balsa under the nose at the firewall and install the inner NyRod for the nose gear steering. Glue 1/8" brass tube fuel and overflow carry-throughs into the firewall and install the lines and tank. The tank rests on a bed of foam and is wedged in place with the same material. Cut the 3/16" soft balsa bulkhead to fit tightly against the back of the tank. Place a wedge of foam over the tank to hold it in place and sheet the fuselage top and bottom with crossgrain 1/16" sheet balsa. Sand the completed fuselage.

The airplane was designed to be covered with one of the plastic films; follow the instructions packed with the film for covering procedures. The same material makes excellent hinges, or the more conventional type hinges can be used. Epoxy the aileron torque rods into the ailerons after they are covered and when they are hinged to the wing.

Final Assembly:

Cut a slot in the top of the fuselage where the leading edge of the fin makes contact and remove a strip of the covering material from the area covered by the fin. Remove the covering from the center of the stab in

to page 124

U.S. Scale Masters Championships

1981 REGIONAL QUALIFICATIONS SCHEDULE

MINT JULEP: (April. 25-26):
Dale Aruin C.D.
3428 Charlestown Pike
Jeffersonville, Ind. 47130
(502) 588-9109 (O)
(812) 283-5719 (H)

EAST COAST REGIONAL (June 13-14):
P.G.R.C. Prince George (Washington D.C.)
Bill Hennant
2103 Lakeshine Drive
Alexandria, Virginia 22308
(703) 360-3424

SPOKANE SCALE INTERNATS (June 20-21):
Barons Model Club
Dick Carson C.D.
W. 3029 Hoffman
Spokane, Washington 99205
(509) 327-4579 (H)
(509) 747-1644 (O)

WESTERN SCALE NATIONALS (June 20-21):
So. Calif. Scale Squadron
George Killeen C.D.
23261 Del Lago Drive #9
Laguna Hills, CA 92653
(714) 855-4061

TEXAS SCALE AIR GROUP REGIONAL (June 27-28):
Charles Viosca C.D.
3804 Wooded Creek
Farmers Branch, Texas 75224
(214) 241-1172 (Dallas)

THIRD ANNUAL ROCKY MOUNTAIN NATURAL LITE CLASSIC (July 11-12):
Jerry Bible C.D.
1909 Beechwood
Pueblo, Colorado 81008
(303) 542-1856

1981 U.S. SCALE MASTER CHAMPIONSHIPS (August 29-30):
E.P. (Tom) Sawyer Park, Louisville, Kentucky
Dale Aruin C.D.
3428 Charlestown Pike
Jeffersonville, Indiana 47130
(502) 588-9109 (O)
(812) 283-5719 (H)
Hosted by: So. Indiana R.C. Modelers

Harris Lee, Coordinating Chairman
c/o Scale Squadron
24672 Seacall Way
Dana Point, CA 92629
(714) 760-9466 (O)
(714) 493-8083 (H)

HOMER

from page 120/48

the area covered by the fuselage cut-out and epoxy the stab in place. The bottom of the fuselage is flat and can be used to align the stab, and the stab, in turn, can be used to align the fin-rudder assembly. Use epoxy sparingly in this area.

Bend the main gear from 3/32" steel wire and the nose gear from 1/8" wire if a commercial unit is not available. Drill the engine mount to fit your engine and the 1/8" hole through the mount for the nose gear and install the mount on the firewall. The nose gear steering arm is a 1¼" piece of 1/8" copper tube flattened on both ends, one end is drilled to fit over the 1/8" nose gear and the other to fit a clevis soldered to the steering cable. Solder the arm in position just above the coil as shown. *(Plans show a Goldberg 1/8" nose gear and steering arm.)* Slip a wheel collar above the steering arm and place the gear up through the hole in the engine mount and hold it in place with another wheel collar above the mount. Adjust the two collars until the gear is positioned as shown, and tighten them. The main gear is installed in the gear mounts with small wood screws and mounting straps. The wheels can be held in place with wheel collars but I prefer solder and washers. Bend and install the tail skid and mount the engine.

The servos are mounted on plywood trays. In the fuselage the tray accepts three servos and is glued to the rails previously installed. Before the servos are mounted, it is a good idea to temporarily put the batteries, receiver and servos in place and check for balance. The C.G. should fall in the range indicated on the plans. If it does then complete the installation. The throttle line shown on my aircraft is a length of florist wire from the servo to the throttle arm through the inner NyRod. I like to bend a V-shaped kink in this wire between the firewall and the throttle arm to act as an

to page 140

HOMER

from page 124/48

adjustment and also as an over-ride to eliminate servo stalling. The nose gear steering cable is attached to the rudder arm with a swivel link and it is used to adjust the nose wheel centering. NyRods are used to the elevator and rudder with L bends at the servo end and clevises to the elevator and rudder horns; threaded rods and clevises connect the ailerons. Adjust all controls to neutral when the transmitter sticks and trims are centered; adjust the throttle for full idle. Range check the system and let's fly.

Flying:

There should be no surprises here, make sure that the C.G. is in the right place, there are no warps, the surfaces move in the proper direction with the transmitter sticks and that the engine will hold a good solid idle.

Homer will not take-off by himself so apply some back pressure on the sticks when you are ready to rotate. This is a groovy airplane and will pretty well stay where it is aimed; the control response is solid and smooth and it is a very pleasant airplane to fly. Landings are nearly automatic and can be almost walking slow. The ailerons are effective into the stall, so control is positive all the way to touch down. With a good instructor, Homer is an excellent trainer and the fuel mileage is such that the student should be trained before the first quart is consumed, fuel that is! □

MIDWEST RK-20B

from page 46

five lb. maximum limit in my mind, scaled up my drawings and started building. An interesting sidelight here is that this F-86 was almost an F-100 since I had drawn that airplane first. I decided against the design only because of the additional complication of the near mid-wing placement requiring a carry through structure. I'll probably build it in the future anyway since I now know the characteristics of the fan and have the plans.

I wish I could say that the all wood prototype F-86 fell together, but quite the contrary, all those nice rounded shapes require time and some prior building experience. I'll try to take you briefly through the design sequence, and pass along information which I hope will provide some basic guidelines for those of you who might be interested in designing a ducted fan airplane.

Basic Design Requirements

Airplanes using the internally mounted ducted fan system require a great deal more design time than their prop driven counterparts since they must be designed from the inside out. Unlike prop aircraft, the fan thrust you have available, except for

to page 142

MIDWEST RK-20B

from page 140/46

small increases by fine tuning, higher nitro etc., is all that you are going to get. With the prop machines, if it comes out a bit heavy, we add power with a larger engine. Not so with the fans . . . you either meet weight requirements or produce a severely performance limited airplane which may, in fact, be good for only high speed taxi runs. Remember, jet airplanes are supposed to perform, or at least create a damned convincing illusion.

All the information regarding the required inlet area for fan efficiency initially led me a bit astray. I had been led to believe that only the **swept** area of the fan was the key factor in determining proper inlet sizing. This **swept** area (in the case of the RK-20B is the fan diameter (4.125") less the spinner/hub diameter (1.875) yielding 2.25" multiplied by π (3.1416) giving us 7.06 square inches **swept** area. I figured that a 50% additive for margin would be acceptable, so . . . 7.06" x 1.5" = 10.5 square inches required inlet, right? Wrong! 10.5 square inches barely got the F-86 off the ground! A bit of cosmetic surgery doubled the inlet to nearly 20 square inches and the performance difference was astounding! So, forget **swept** area and go directly to a 50% increase in duct diameter, 4.125" x 1.5" = 6.1875" x 3.1416 = 19.438 sq. in. All of my future fan designs will use this figure as a minimum. If you can get this area through the auxiliary inlet (wing cheater hole) and the scale nose or wing inlets are additive, better yet.

As equally important as the inlet area is the manner in which the intake air reaches the fan, the ducting. Without getting into drag, turbulence, and related factors, just make all air paths to the fan as smooth and obstruction free as possible. Of similar import is the exhaust. If you think of the fan unit as an "air mover," you'll see that all efforts in smoothing out the inlet can be for

to page 144

from page 142/46

naught if the exhaust is turbulent or necked down (restricted) too severely. The exhaust tube will tolerate a taper to 92% of duct shroud diameter over a reasonable length with minor thrust degradation, i.e., 4.125 (.92) = 3.795 or approximately 3¾" efflux diameter. This will necessitate a deepening of the aft fuselage, in most cases, for scale subjects. You'll note that the lines of the F-86 were not seriously disturbed in achieving the required area.

With this basic requirement in mind, I proceeded to translate drawings into parts, and parts, hopefully into a flyable airframe.

The fuselage was built in two half shells split along a horizontal reference line since I wanted to make the forward upper half removable for fan and radio access. Building directly over the top view, it started looking like a boat hull. Since strip planking rates one notch above watching a Tom Snyder/Barbara Walters T.V. Special on my "Things I Can Do Without" list, I used as many large pieces of 3/32" soft balsa sheeting over the frame structure as I could. After completing both shells, I temporarily joined them . . . eureka, they matched! Having subjected myself to this deSade syndrome, I opted for solid sheet tail surfaces. After cutting and sanding, they were pinned in place on the fuselage to provide stimulus for the next step . . . the wing.

The wing uses scale sweep-back, dihedral and outline. You'd think with this much to work with, the rest would be easy! Up looms a decision . . . the airfoil! Since I, quite optimistically, knew the airplane would fly, I now thought in terms of **how** I wanted it to fly. Not wanting a projectile wholly dependent upon pure thrust to remain airborne, thin sections were out. Thick Clark Y types were discarded because of inherent "draggy" tendencies and general unscale appearance . . . this is to be a fire breathing, breathtaking jet, remember? So rather than plotting ordinates, coordinates, inordinates, discordinates and explosive ordinates, I fell back to the base line teachings of my Aero professor. "If you lack the talent to develop, at least develop the talent to copy!" Besides, my steadiness with an X-Acto readily converts a laminar flow airfoil to a flat bottom, full symmetrical section. I decided, based on sound engineering practices, "It looks good," to use an airfoil similar to that of the House of Balsa P-51 Mustang, as I recalled that airplane, properly balanced could maintain high angles of attack at minimum power with no tendency to fall off to either side. Another session with the balsa wood and we had a wing.

After a lot of anquish, obstacles and close encounters with scrapping the project, I

to page 150

from page 144/46

finally had an airframe that was within weight limits, provided a container for the fan and radio and, best of all, looked like the F-86 I started out to build! The prototype was finished with a layer of 1/2 oz. glass cloth on the fuselage (lightweight) followed by two coats of polyester resin (heavy!), two coats of auto primer (heavier) and three coats of white lacquer topped off with two coats of clear epoxy. The weight was now perfect . . . without the wing! As a quick out, I white MonoKoted the wing and figured I'd lie about the weight to anyone who asked! The all up weight was not that bad . . . not what I wanted but ideal to test "worst case" limits.

So, the culmination of this exercise was really the flying, since the design and building of an R/C scale model are secondary or totally unimportant if the machine won't fly. The airplane flew quite well, but was a bit overweight (at 5¼ lbs.) and a bit underpowered (2½ lbs. thrust). The prototype is still flying and has been successfully flown in winds gusting to 20 knots (where enthusiasm overshadowed commonsense). It has provided a great deal of information which will be incorporated on my next designs (two presently in the works). Fan modifications discussed in previous issues will provide a reliable 3 to 3¼ lbs. of thrust and House of Balsa's production F-86 kits with an epoxy glass fuselage (hooray!!) are averaging 4½ to 4¾ lbs., ready-to-fly. This is a readily achievable, realistic thrust to weight ratio which yields excellent performance.

It is my hope that the F-86 will herald the introduction of a whole new wave of .20 size ducted fan sport scale models and accelerate the interest in this exciting form of scale modeling. Any questions you may have regarding additional design requirements may be directed to me through this magazine. □

COMPACT COMPETITION CADDY

from page 42

shelf was made from .065 T 6 aluminum, however, this shelf could also be made from other materials such as wood or plastic.

The box shown in this article is in a "left handed" configuration or intended to be used with it being located to the left of the individual who is starting the engine.

If you normally place your starting box to your right during starting procedure, the Caddy should be assembled opposite hand to what is shown in this article, (starter on the right — battery on the left).

Construction is very basic and easy, therefore a detailed part "A" to part "B" sequence is not necessary. Start by cutting

out all the plywood parts. The handle center section is cored to accept the starter and glow driver wiring to the battery. A male/female threaded type connector was used for the starter cord connection. This enables a 1/2A starter to be substituted for the conventional starter and also provides a more positive and trouble free connection than the commonly used phone jack types. These connectors are readily available in radio and electronics stores. They are referred to as audio connectors and, if purchased at a Radio Shack outlet, the part numbers are 274-001 for the plug and 274-002 for the socket. The socket portion of the connector and the internal wiring are installed and the three handle laminate pieces are glued together. The internal starter wiring should be the stranded type and at least 14 gauge in size. The wiring to the glow driver is tapped off of the starter socket connector. This wire can be much lighter or smaller in size. 18 to 20 gauge fixture cord type wire is more than sufficient for this purpose.

The Caddy is assembled using glue and small wire nails or brads. The aluminum transmitter shelf plate is cut to size and bent to shape. The plate tracks, which also serve as the Caddy's bottom legs or skids, were made from scrap polypropylene plastic. Either wood or plastic can be used for these parts. If wood is used, be sure to install rubber or steel nail-on type furniture glides to protect the skids from the certain abuse they will be subjected to when used on hard surface runways. These glides are available in any hardware store.

The Caddy shown is designed to accept a 12 volt motorcycle battery. This battery is 4¾"L x 2 5/16"W x 5⅛"H and is the type that is available from Tower Hobbies, as well as several other outlets. If you elect to use another size battery, the dimensions of the component parts of the Caddy should be adjusted accordingly. The aluminum transmitter slide out, support plate is cut to size and bent as shown. This plate slides in the grooves which are cut into the bottom leg blocks. An elongated slot is cut in the plate, which limits the pull-out distance of the plate. A small round head wood screw is used inside the slot to serve as a stop.

Another elongated slot is cut in the aluminum plate to accommodate the battery overflow vent tube which is routed out of the bottom of the Caddy.

The Caddy can now be fine sanded and finished via your favorite finishing method. K & B Superpoxy enamel was used on the Caddy shown. The use of an epoxy type finish such as K & B Superpoxy or Hobbypoxy is strongly recommended, as it provides an attractive durable finish.

After finishing the Caddy, the tachometer compartment was lined with foam carpet pad material. This padding is obtainable at all carpet stores. As the carpet installers generally discard the small scraps or strips of this padding, they can usually be acquired for a "please and a thank you," if you explain your intended use. It is also a very handy item to have in your shop as it has

many other uses in our hobby/sport.

The aluminum transmitter plate was covered with a piece of textured vinyl upholstery material, which was glued in place with contact cement. Two small screw eyes, screwed into the side of the Caddy, and a large rubberband are used to hold the transmitter in place.

The tool compartment may be left open or an organizer type plate can be mounted on top (as shown in the photographs) to keep each item in its place. A piece of scrap foam packing material was cored to the same pattern as the top organizer plate and placed inside the compartment to keep each item from flopping or rattling around.

The Caddy won't make you fly any better or faster, but it will surely make the trip to the starting line seem much shorter. ☐

SOARING

from page 40

turn, causes the model to accelerate downwards and drop the nose. The pilot 'naturally' pulls in up elevator, the latter action slows the model still further and may easily result in a stall from which there is no hope of recovery. It will also be found, when making a landing approach through a wind gradient, that when the plane is flying level it will be very quick to respond to down or up elevator, but once it is in a nose down or

to page 154

SOARING

from page 152/40

nose up attitude it will be very difficult to correct. The 'nose down' response has already been explained but the 'nose up' effect is a bit different. Should the plane be allowed to 'balloon' it will meet faster air and thus have more lift, but it will also lose ground speed quickly, and when it is again brought down to slower air it is likely to be well below stalling speed."

I keep telling you guys — watch out for the term "stalling speed." Speed has little to do with the stall, it is almost entirely a function of angle of attack. In Dave's example, as the ship hits slower air in its descent, lift goes down. To generate more lift to support the plane, the pilot increases the angle of attack with up elevator. When the critical angle is reached, the wing stalls, and kapow! In Dave's wind gradient situation, the degenerative effect of lower altitude — lower air speed — lower lift can happen very quickly. Anyway — that's what Dave intended.

I've taken a scunner to wind. It can make the controlled arrival look totally unplanned. It is critical to keep the nose down and bore directly at the spot. Let the nose come up and you are all finished. One thing that's important is to use the same landing pattern every time you land. It is important to practice spot landing every time you land. Don't just come down in the same county. And, for goodness sake, don't catch your airplane. I've seen more sailplanes broken this way. A good landing pattern is the standard full scale down wind leg, base, and final. I plan to come abeam myself on the downwind leg with 20 seconds to go. The base turn is at a time entirely dependent on the wind velocity. This turn takes practice, practice, practice — in all sorts of wind conditions. Anyway — even if you never intend to fly a contest in your life, learn to land like a pro — throw out a paper plate and see if you can stop on it every time — it's fun!

★

On the morning of December 7, 1941, eleven B-17's were en route from the mainland to Hickam Field, Pearl Harbor. As they were letting down through a hole in the clouds, the pilot of one of the planes asked his radio operator why there was a tremendous cloud of smoke rising from the island ahead. "Well, this time of year they burn the cane fields," was the answer. It was odd they could get no answer from the tower but the pilot reckoned he could find Hickam by himself. Suddenly the tower operator broke in, "Air Force 5 you are cleared to land North to South — we are under attack by Japanese aircraft." About that time the B-17 was jumped by three Zeros. To make matters worse, the Navy was shooting at them. Being unarmed and

low on fuel, the pilot made a quick turn out of the traffic pattern and landed, down wind, ground looping at the end of the runway. Out of the plane and into World War II scrambled the crew, followed by the pilot. The Japanese arrived at 0755, Col. (then Lt.) Bob Thacker arrived at 0810. Col. Bob flew 17's for a year, through the Battle of the Coral Sea, then flew a tour against the Germans. He arrived back in the Pacific Theater in the summer of '45, when the war came to an end.

After the war, Col. Bob went to Air Force Test School at Wright Patterson. For several years he did test work on such ships as the XP80 Shooting Star, P82 Twin Mustang, and others. While at Wright Patterson he had the duty of modifying the twin Mustang for long range service, in conjunction with the Air Force & N. American Aviation.

When the modifications were completed, Col. Bob established a World's speed/distance/weight lifting record by flying non-stop from Honolulu to New York in 14 hours and 30 minutes. The record setting Twin Mustang is now on display at the Air Force Museum.

Later on, the Colonel flew B-29's in the Korean War and B-66's in the Vietnam War, retiring from the service in 1970. Now, Col. Bob Thacker is totally involved in the R/C glider wars and the flying scale wars. He is a familiar sight at the flying field. He will be the only man there wearing a long sleeve white shirt & narrow black tie. He won 1st in Scale Gliders at the '76 & '77 NATS with his famous Baby Bowlus. He has won many awards in powered scale with such ships as the Twin Mustang, Sopwith Camel and Turner Racer. He extinguished himself at the 1980 NATS by wiping out the judge's stand with his power scale canard, OMAC-1. Just to keep his 1980 record unblemished at the NATS, he entered Standard Class in gliders. He finished 15th out of 16 with an incredible 43% of perfect.

I visited the Ole Colonel in his beautiful home, with a spectacular view of the Pacific, on a hill in San Clemente, California. He has a workshop full of beautifully crafted aircraft. His latest creation is a canard glider, named Catfish. It features a section of bamboo fishing pole for a fuselage. He said, "It glides like a toad,

Col. Thacker with new canard glider, "Cat Fish."

to page 158

SOARING

from page 155/40

throw it and it goes plop — has absolutely no buoyancy." After this display of wild enthusiasm, the Colonel proceeded to tell me of the changes planned which will turn the toad into a prince. Aside from a big kiss, he intends to give the ship a larger, lighter canard plane and smaller fin area. In the December issue of RCM, I discussed building a small balsa model of proposed designs to conduct stability tests. The Colonel delighted me by bringing out a mini model of the canard. He then proceeded with stability tests, snipping off a bit of the fin with each toss. I had the feeling that he wouldn't stop until he had the Catfish flying like a Paragon. Col. Bob Thacker is not only a modeler's modeler, but a very fine gentleman and good competitor. Just thought you'd like to know the Ole Colonel. Howzat!

Col. Bob Thacker adjusts mini model of Cat Fish to test stability.

□

GIVE IT A WHIRL

from page 39/38

really got a very quick grasp of what was needed to make it look like he was really flying the helicopter. I wasn't lucky enough to meet Barbra Streisand, however.

At the end of the formal shooting we were asked to make a number of extra 'takes' which may or may not be used in the movie. One of them included 'hot dogging' around the drug store in that 5' space of air between the tops of the aisle shelves and the ceiling. This we managed to do without anymore crashes but each time we passed over one of the merchandise racks boxes the merchandise would fly all over the place from the downwash of the helicopter blades. I apologized for this but was told that "it was great." The next thing that happened was that 'special effects' arranged it so that even more boxes would fly around than the

helicopter could move by itself.

Well, I hope that the foregoing has given you some idea of what it can be like to make a movie. It's difficult enough to fly an R/C helicopter in a small space but to do it 'on call' is even more so. I was very thankful when that shooting was over and we finished up with only one "Cricket" a little bruised from hitting the wall. The other one survived fine from the two days of shooting. This particular movie episode is an example of when it can be fun and exciting. There are many other movies that are made where you may wait around for several days in the desert before making just one 'fly past' scene, or perform something 'spectacular' such as an explosion of the helicopter. And then there are other movies like "Capricorn One" (done this time by Ernie Huber and John Minasian) where the flying can be quite difficult and very exciting. Remember the chase scene when the Hughes 500's crashed and exploded into the face of the cliff?

So here we are again at the end of another "Give It A Whirl." Next month we will get back to some more flight instruction and technical hints. Keep 'em whirling. □

AVRO 504K

from page 33/32

length by kinking one end as shown on the plan. Arrange the angled stubs so that you have to twist the wire to get the stub in place.

A collegue made a 3 channel REM version and his model flies very well — so if you prefer aileron-less flight, don't despair!

The strut ends allow you to adjust the struts to accurate length while the epoxy dries. However, number the struts according to position so you don't have to fit them by trial and error after disassembly. For the rigging, eight 20" long pieces of elasticated thread are needed, with loops tied in the ends.

Engine Installation:

I used a racing car silencer, but the cylinder inclination chosen enables a standard silencer to exit below the front fuselage. Nowadays I always try to arrange the tailpipe so it ejects goop away from the model so as to reduce the amount of cleaning needed. With this ship, a brief wipe with a wet sponge on the undersurfaces is all that is needed after a five flight session!

Covering and Finishing:

I experimented with silk over tissue on this model. After doing a tissue and dope job, cut a piece of silk about 1" oversize and iron flat with a cool iron. Lay the silk in place and, using a soft brush, apply thinned dope at the center of the area to be silked. Working towards the edges, swab the dope through the cloth, taking care to avoid air bubbles. Practice on the tail-plane first. When dry, apply a final coat of dope to fill the weave. I would like to have tried Coverite, but it is hard to get this in the U.K.

Paneled areas were sealed and sanded.

Hinged panels were simulated with polycard contact-glued in place.

My chosen color scheme is that of a joy-ride operator and was an interesting and fulfilling exercise in research. I lettered the fuselage by first spraying it silver, masking off the registration with fablon letters and spraying the red. I masked off the wing registration letters using Scotch Tape, brushing the lettering. The owner's nameplate I marked out in soft pencil then painted with a No. 0 brush and one hour's patience. A soft rubber eraser subsequently removes pencil marks. I still find nitrate cellulose the best color medium, followed by a thin coat of eggshell polyurethane clear household paint which is fuelproof.

FLYING

General:

Leave off the front skid for first flights, and get the C.G. right. I use 3 oz. of lead screwed to the engine mount. The total weight is 64 oz. with a 2 oz. tank, H.B. 20, and 1 lb. of old Futaba radio gear. I use 5% nitro fuel. The wing loading is average at 16 oz./sq. ft., but don't use less than a .19, because of the high drag factor. The engine run is over ten minutes, as you will use half throttle for much of each flight. I originally fitted a T-F 10/3½ wooden prop, but the Graupner 10/3 glass filled nylon is better for aerobatics, again because of the high drag; the finer pitch allows more revs from the engine.

My first flights were hairy because the model totally lacked in directional stability around the yaw axis. The scale sized rudder I had fitted was too small, and she would fly crab-wise after a turn. Furthermore, aileron adverse yaw was so great that on applying right aileron slowly to full extent, she would perform 360° left turns ad infinitum! This really got me all crossed up when landing towards myself, as the correct aileron deflection always produced the wrong response! I discovered that to minimize adverse yaw, I needed to double fin area; this was first done experimentally by taping huge chunks of 1/32" plywood to the rudder. Previous experiments using differential aileron throws were unsuccessful; the differential made the model wallow alarmingly and did not help at all.

I now had a new problem in that her behavior in turns was inconsistent. To the left, she performed aileron turns very well, but to the right, she dragged around, tail hanging low, and she fought against the turn all the way. She needed a fair amount of coordinated right rudder. The effect was caused by insufficient right side thrust. The phenomenal amount shown on the plan produces reasonable right turns on aileron/elevator only, except at very low speed when she needs a tad of rudder. Please note that I've not described the above details just to frighten people off Avro 504's! My experience should help readers to identify and cure similar symptoms in many other models, e.g., Curtiss Jennys. Slight adverse yaw is still present, but by feeding in a touch of coordinated rudder, the effect disappears

completely. 3 channel jobs will have no problems on this score, of course, assuming a REM set-up is used.

Take-Offs:

Open up, and let her fly herself. She needs slight right rudder to track straight, and climb-out is gentle though faster than scale.

Landings:

Since she is quite unstreamlined, with stacks of wires and struts, approach at a fast idle to maintain headway, chopping the throttle on landing. This ship will 3-point, as there is plenty of elevator authority. On grass, she lands straight, but on asphalt she may ground-loop since the skid doesn't bite.

Maneuvers:

She'll trim out for free-flight in left turns, and loop, roll, stall-turn, split "S" and spin (left) with ease. The full size Avro's roll was very slow, so I wired a roll-rate switch on my TX, using full throw for general flying, and 2/3 throw for slow, staggery, vintage rolls!

For spins, one needs as much rudder as possible, but then you must go easy on the rudder stick in other situations — perhaps a rudder dual-rate switch would be useful. This is the only model I've had which would perform a falling leaf; probably because the large moments of inertia and drag slow her down to my reaction speed! A falling leaf is a series of incipient spins, each checked instantly, to have the direction reverse, and is a vintage maneuver almost as old as the airplane itself. Position the ship downwind pointing towards you so that you can see the maneuver's shape best. Engine rotation tends to make movement faster to the model's left, and you have to watch out for snap rolls in this direction!

Throttle back, stall gently, and holding full up all the while from now on, feed in right rudder. As the wing drops, bang in left rudder. She will slow her turn, then flick the other way. You immediately reverse rudder direction, repeating the successive opposite rudder commands until you chicken-out. I suggest you start high and finish high. This maneuver is much prettier than a spin and you will have great fun trying to make it symmetrical. Strictly speaking, one should feed in down elevator at each reversal of direction as part of the normal spin exit procedure. However, I always find I nearly drop the transmitter at this point so I have given up playing with the elevator.

She looks most distinctive in the air, and that prominent skid really sets her off, besides reducing nose-over tendencies on the ground. Perhaps surprisingly, the landing gear is very durable, so don't let its apparent complexity put you off building an otherwise straightforward and very satisfying design.

Conclusion:

Well people, this ship really furthered my education and, since I know from experience that her early behavior is exhibited in varying degrees by many bipes, I hope that in spilling the beans I've done a little more to improve your knowledge of

to page 164

AVRO 504K

from page 161/32

vintage type flying machines. If you do get around to building her you will have a model which will thrill everyone with the ultimate in vintage experience. □

POWER BOATING

from page 31

the K & B Ladies Day race, as well as a lot of test runs on weekends we aren't racing. The point is not how wonderful our engine is, but that the K & B 3.5 engine with a few modifications, can give you many hours of service even using 60% fuel. The engine should be loaded with lots of WD 40 oil after each days running since most synthetic oil fuels have no rust inhibitors. If you start the engine with the glow plug 1/4 turn loose to keep starting stresses low, you should get a similarly long lifetime. In closing, I want to caution you that although this set-up works for me, you may find that different props and pipe length work better for your boat. No two boats are the same, so don't be afraid to try something different.

I want to thank those of you who have taken the time to write and wish to encourage more input from my readers. Send all your stories, information, hints and questions to the address at the end of this column.

To close, we will return to the topic of tuned pipes. In the last column I described how to mount the pipe so that easy changes in length can be achieved at the lake. This is essential because only by testing can the proper pipe length be determined. Remember also that if you change the load on the motor by changing props of if atmospheric conditions change such that motor horsepower is reduced, a different pipe length for best operation will result. The only way you can keep track of these things is to keep a log in which important information can be retrieved when needed. My particular book has the following columns of information: prop type, pipe type and length, engine rpm, lap time, speed, lake location, temperature, and miscellaneous notes. When I am testing or when I go to different race locations the book helps me to know what to do when conditions change.

Before you get to the lake you will have to pick the type of fuel you will use as well as a propeller. Higher nitro fuel will allow you to turn larger props and thereby increase speed. I will assume for the remainder of this discussion that the prop and fuel will remain the same and that it is desirable to find the best pipe length.

Starting with the pipe mounted at the suggested starting length (9" for 3.5 cc, 10" for 7.5 cc, and 11" for 10 cc engines), launch the boat with a needle valve setting that is rich. If the prop that you have chosen is too large, the boat will run very slowly or

the engine may even stop when the prop hits the water. In this case, change to a prop with less pitch and try again. If the boat runs at a reasonable speed however, adjust the needle valve leaner until maximum rpm is achieved. Do not run for long periods of time at a lean mixture condition for this will harm a good engine quickly. A lean mixture can be recognized by reduced rpm, unsteady running at maximum rpm, glow plug damage, or the complete stoppage of the engine upon launch. Once you are satisfied that the mixture is correct, note the rpm achieved. Engine rpm should be measured with an audio tachometer as the boat is in the water running. An audio tach is a device that emits a tone that is variable. Its control knob has been calibrated so that when frequency of the tone matches the sound of the motor exhaust, the engine rpm can be measured. With practice you can accurately measure rpm within one or two hundred revs. If you don't have an audio tach you will have to rely on your ear to determine maximum rpm.

Now cut 1/2" off the headpipe and adjust the mixture again. Usually shortening the pipe will tend to lean the mixture so the needle will have to be backed out for best running. Shortening the pipe will increase rpm at full throttle but will decrease the torque developed at low rpm. By shortening the pipe 1/2" at a time you will find a pipe length that is so short that the torque load of the prop at high rpm is larger than that developed by the motor. When this occurs, maximum rpm will decrease and the engine may run erratically. The needle valve will be very sensitive, the temperature of the pipe increases and the glow plug element may be damaged. Increase the pipe length 1/2" when any of these conditions are reached and you will have found the tuned length for the prop and fuel you have picked.

An increase in temperature usually decreases air density which, in turn, reduces engine power because fewer oxygen molecules are ingested each stroke. The pipe length, therefore, may have to be lengthened to maintain acceptable performance. A similar effect occurs if you race at a lake that is at an altitude several thousand feet higher than your test lake. Keep track of these effects and your reliability will increase.

Well, that wraps it up for another month. Next month, if space permits, we will discuss how to pick the right propeller for your boat. Send your questions, comments and boating information to: Howard Power, C/O Hobbies Unlimited, 766 Broadway, Seaside, California 93955, (408) 394-1200. □

SILENT POWER

from page 30

I used Super Jet and finished the model rather quickly. I chose to stick with rudder for turning as opposed to aileron control.

The model was trimmed in the traditional Skylark color scheme: Red and black with white stripes. Again MonoKote was used.

Futaba installation — servo mounting tape used for RX and battery.

With a Futaba FP 35 radio installed with three S-20 servos, the ready to fly weight is 27 oz. I used rudder, elevator, and a motor on/off switch powered by the third servo. A 225 ma pack is used to power the flight system. The model has 235 sq. in. of wing area to net a wing loading of 16.5 oz./sq. ft.

Bottom of Skylark showing air cooling vent.

After the usual pre-flight testing, I turned on the twins and shoved the Junior Skylark to the air. The result was fantastic. The little ship climbs well and is unbelievably stable. Flight time is in the 5 minute range. This is no doubt related to the excessive dihedral used in the design. The model is not an acrobatic wonder but it was not designed to be. It is a fun to fly sport plane --- a trainer. I like mine! The sound of the twin 020 is fantastic.

One note is in order. I had to take the flight batteries out of the plastic Astro Flight battery pack ends and tape them in a trapezoid pack in order to fit them in the fuselage

to page 170

SILENT POWER

from page 166/30

Jim Zarembski launching Jr. Skylark twin in neighborhood park behind his house.

Toledo 1981

Remember that the Toledo Weak Signals R/C Exposition will be held on April 10, 11, and 12, 1981. There will be an Electric Power category again. So bring your electrics to Toledo. In its premier year in 1980, seven models were entered. It would be nice to draw twenty-five or more in 1981. In any event, look for me in Toledo. I'll talk about Silent Power to anyone.

Good flying. □

ENGINE CLINIC

from page 26/24

which will cause it to kick and take-off running in the opposite direction. Try flipping the engine backwards to start and it will probably take-off in the correct direction. I do not know how much experience you have had with the running of model engines but if you are just getting started it would be a good idea to locate another more experienced modeler to help you get the engine running properly the first few times.

You can tell if the engine has the proper crankshaft or not by checking the opening and closing timing. Remove the carburetor and back cover. With a conventional crankshaft the intake port should start to open with the crankpin approximately 35°-45° past bottom center, and completely close with the crankpin approximately 45°-55° past top center when rotated in the proper direction — clockwise when viewed from the rear — counter clockwise when viewed from the front. A counter rotating crankshaft would have the same timing but with the crankshaft rotated in the opposite direction. If this is the case, then the engine should be returned to Midwest Model Products (the importer) for replacement of the crankshaft.

Dear Mr Lee:

Do you know whether or not an O.S. .604 cycle can be installed and run in the horizontal or inverted position?

I would appreciate any advice you can offer. Thank you.

Very truly yours,
C. Turdik
Omaha, Nebraska

You could probably get away with running the O.S. four stroke engine on its side but you might run into problems running it inverted. The lower end receives its lubrication from fuel/oil that blows by the rings. This accumulates in the crankcase lubricating the internal parts. Excess that accumulates is blown out the vent fitting. Inverting the engine would allow an excessive amount of oil to collect in the inverted piston causing erratic operation. Unlike a two stroke engine where the fuel charge passes through the crankcase and flushes it out, the four stroke is closed other than for the vent.

Actually, I have never tried running my O.S. four stroke inverted and it might run okay. However, before building a model intended for inverted operation I would run the engine this way on the bench for a while to make sure.

Any of you fellows out there having had any experience running the O.S. four stroke inverted might write in and let us know how it worked.

I do know that in the case of the Damo twin four stroke that I reviewed two years ago (Aug. 78), excess oil in the fuel would lead to erratic operation hence, the manufacturer's recommendation of no more than 5% oil in the fuel. Do not try this with your O.S., however. The Damo being a horizontal twin would, in effect, be the same situation as mounting your O.S. horizontally. The excess oil accumulates and cannot be expelled through the vent. Of course the vent system on the Damo was a bit different in that the excess oil vented through the cam drive gear section before exiting through a hole in the gear cover. This was to lubricate the cam drive gears. The O.S. has a direct crankcase vent. □

SCALE VIEWS

from page 23/22

Mike Shoen (6719 East Malcomb, Paradise Valley, Arizona 85253) is offering a fine 18" x 27" color poster honoring Hawley Bowlus, pioneer glider designer and manufacturer. Art work by Bill Neale illustrates various designs and incidents in Bowlus history. A sharp addition to your workshop wall, particularly if you are a glider buff. Price is $6.00 postpaid or

to page 174

SCALE VIEWS

from page 171/22

$25.00 if signed by the artist. Mike Shoen, a confirmed Bowlus fan, is looking for any information on Bowlus that he can borrow and copy. He also wants to determine the location of remaining Bowlus aircraft, glider trailers, travel trailers and motor homes. □

SUPER DUPER JOY STICK

from page 21/16

(11) Epoxy the remaining gear support block in place and drill the 5/32" holes necessary to mount the main gears. Then bend the mains as per plans and mount them with your choice of landing gear straps as shown in Photo #7.

(12) Using 1/8" x 3" balsa sheet as shown on layout, sheet the center section of the wing; also cut out the wing tip and small braces and glue them in place.

(13) Reinforce the wing center section with a 6" wide strip of 6 oz. fiberglass cloth and epoxy or resin (top and bottom).

(14) Cut out the servo well open to suit servo to be installed and box in opening with 1/8" sheet. Install hardwood servo rails.

(15) Round the leading edge and sand wing to desired smoothness before covering. You may want to add some small pieces of scrap trailing edge stock to the inside of the trailing edge strips where you plan to put the hinges, but try this method once and see how you like it. Cover the top half of the wing first and overlap the covering material approximately 1/4" around the bottom of the trailing edge. Cut the notches for the hinges in the trailing edge and place them in the notches and glue them in place from the inside of the trailing edge with liberal amounts of epoxy. After the epoxy has cured, cover the bottom halves of the wing, overlapping the 1/4" of upper covering for a good seal. Shape and sand the ailerons and drill and notch them to accept the aileron control arms you have decided to use, then cut hinge slots to correspond with the hinges in the trailing edge. Cover the ailerons and glue them on with liberal amounts of epoxy.

Empennage:

(1) Cut out all empennage pieces from 3/8" balsa as shown on layout (Photo #1.).

(2) Glue the dorsal fin to the vertical stab and sand and airfoil all pieces.

(3) Cut hinge slots in approximate positions shown on plans and cover the pieces before epoxying the hinges in place.

Finishing:

Finishing consists of a lot of little time-consuming things, like alignment, balancing, fuel tank and radio installation, etc.

All these things are important and most people have their own way of doing them.

to page 176

SUPER DUPER JOY STICK

from page 174/16

I'll just cover them briefly with more attention given to what to do than how to do it.

(1) Alignment is very important if you want a good flying airplane, so as was said earlier, before gluing the tail and rudder in place, align them with your favorite method and glue them in place accurately so they are true to the fuselage and true with the wing.

It wouldn't hurt to purchase or build an incidence meter to check alignment. This is a good practice in all the planes you build.

(2) Balancing is very important to the flight characteristics of an airplane, so make sure you not only check it nose-to-tail, but also wingtip-to-tip so you won't have an airplane that the best maneuver is a stall turn to the same side every time.

(3) Fuel tank installations are important, so make sure the tank is surrounded by foam to reduce foaming. Also make sure the fuel lines can't kink and the klunk is free and won't bind.

(4) The radio installation is the most important and if done properly can save a lot of problems at the field. I think the key to a good installation is planning. If you start at the control you want moved and go from there and work your way to the servo, you will save a lot of criss-crossing of cables and having too many connections on the same side of the servo arm.

I'll use the throttle for an example. Most throttle arms are on the right side of the engine and pull or turn clockwise to close. Lay the engine on the bench and find the proper servo (left or right) that when placed in the fuselage against the right hand side will move in the proper direction to pull the NyRod or cable from the end of the output arm closest to the fuselage side. Using this "straight shot" method on controls will give you more precise control and will not drain on the battery as much as one full of twists and turns causing unnecessary strain on the servos and slop in the linkage.

to page 183

SUPER DUPER JOY STICK

from page 176/16

Photo #8 shows an uncongested radio installation with both forward cables running along each side of the fuselage straight to their functions with a minimum of deviation. The rudder control is also on the opposite side of the output arm avoiding any possible interference with the steerable nose gear.

The only thing remaining is to wrap the battery pack and receiver in foam for protection from vibration and crash damage.

In summing it up, I hope you'll enjoy building and flying the Super Duper. It has a lot of built-in simplicity and can be covered with any material you choose, including MonoKote-type films. As far as the flying goes, you'll find it's one of the most maneuverable models you can imagine while giving you that little extra edge of forgiveness that we all sometimes need when we get a little too overconfident. Also, when the flight is over and it comes time to land, you'll think you're back flying one of those nice stable trainers that you learned on. Try one, you'll be happy you did.

The kits aren't going to be available from Mile High Models Co. (4805 Baja Ct., N.E., Albuquerque, New Mexico 87111, Phone (505) 296-2405.) for a few months. For this reason I wanted to get the plans and instructions out to my fellow fliers so you can get one in the air as soon as possible and get the same feeling as I did when I first flew the Super Duper Joy Stick. □

FLYING LOWE

from page 14

propulsion and control systems. The competition also affords a great opportunity to trade notes with the "real" airplane illuminaries such as Leo Laudenslager, current World Aerobatic Champion, Gordon Price, Canadian National Champion, Jim Roberts, and others. It's interesting to note that these gentlemen are constantly seeking ways and means to improve their aircraft designs and flying techniques. Gordon Price told me that he worked full time from May til September preparing for the Oshkosh World Aerobatic Championships! So it's the same in all sports. If you want to win — you work at it!

So, thanks again to Bill Bennett and Circus Circus for a hell of a boost to Aeromodeling development. Thanks also to Walt Schroder, Gerry Nelson, Doc Jim Edwards, and all the others who worked so hard to make this happening such a success.

A Promise: Folks, I promise to get back on the basic subject of pattern flying and preparation next time. Thanks for your many letters and calls on the variety of questions ranging from very simple to very sophisticated subjects. I believe that I have

answered all inquiries to this point. **And** thanks so much for the statements of your appreciation for my feeble attempts in this column. Believe me, I don't make a living doing this, but it is very satisfying to be able to help some of you make this hobby just a little bit better! Something else --- the more I learn about the hobby/sport the more I realize that there is a lot more to learn! That's what keeps it exciting. □

CUNNINGHAM ON R/C

from page 12

to another part of the garage to get a tool when, --- "crash." I looked around and there was Miss Fort Worth lying on the concrete floor, with the tail assembly broken away from the fuselage. After a few mild swear words for my dumb stunt, it was nothing to glue the tail assembly back into place, but I got to thinking that in all the years that I have spent in modeling, I have never constructed a building jig to hold the fuselage while installing the radio. I usually rely on a cardboard box, or a cut down foam ice chest to do the job when, with a few pieces of wood, I could construct a kind of universal jig that would do the job. A little more thought and another idea presented itself. Why not build a holding jig that could be used for a number of different sized aircraft, (differing fuselage widths and cross sections) and yet able to hold the model either upright, or inverted, while working on it? It is really very simple and the accompanying sketch shows how to make it using scrap lumber and plastic foam. If you don't have a source for foam, simply go to the local dime (ha!) store and buy a inexpensive foam ice chest and use this foam.

I do most of my building inside the house, in the den. When I'm working on a project I use either a good straight piece of 3/4" plywood for smaller models (I haven't used that piece of wood for a long time), or a very straight door, one that I took a long time to choose. I keep most of my tools in the

to page 188

from page 184/12

garage, which is not attached to the house, but is about 40 feet away from the door to my den. When I'm building I like to be in the den with the family, and with the TV set going, but it is a heck of a chore to lug tools back and forth. This has been solved by buying several plastic tool kits from an Army/Navy store, each in a different color. In one tool kit I keep all of the small tools like pliers, screwdrivers, clamps, etc., that I usually need. In a second kit I keep the several kinds of adhesives that I use from Hot Stuff and Super T to epoxy, Wilhold white glue, and contact cement. In another colored tool kit I keep all the small radio parts that I need, from spare servos to control arms, horns, hinges, wheel collars, etc. This way I can keep all of the things that I need in a portable way, yet have them handy when they are needed. My very understanding wife lets me clutter up the den when a building project is ongoing, but it is relatively easy to clean up when the time comes. Naturally all sanding and painting (in my case, very little painting) is done outside.

Speaking of tools, the one that is by far the most valuable to me is my bandsaw. I really don't know why it took so long to acquire one. If you're thinking of one major tool to buy for your shop, get a bandsaw. It is the most versatile tool that you can own. Also, don't be satisfied with just one blade design. My Sears 12" saw can handle 1/8" wide through 3/8" wide blades, and I have each size with both a ripping tooth and a fine tooth pattern on each blade. I have previously mentioned that I purchased balsa block and use them to build my large aircraft, but I also purchase balsa wood cut to size for sheets and small sticks, 1/4" and under. One of the best and least expensive sources that I have found for good, usable wood is that which is supplied by Balsa USA. They print a price list in RCM each month, and their service is good and so is the balsa wood. If you want to buy bulk quantities of wood, by that I mean an order of several sizes, etc., give them a try, you won't be disappointed.

One of the very neat things that I saw while in Italy is their answer to the problem of transporting materials in a limited space and the high cost of fuel. They have a three wheeled pickup truck machine that is really a three wheel motorcycle with a cab and a pickup-type bed. These small trucks are made by the Paggio company, who also make a line of motorcycles, motor bikes and motor scooters. The pickup trucks were a variety of sizes and types, but some of them come with camper type bodies, and beds that are about 8' long. So here is the answer to transporting big models to the flying field if the compact car business keeps going on.

to page 191

from page 188/12

These motorcycle/pickups get about thirty to fifty miles per gallon, depending upon size and load, and I saw lots of them full of sand, bricks, or cement bags. So, don't give up on the biggies just because it takes a moving van to carry one, there is an answer overseas.

Another thing that impressed me in Italy was the use of motor scooters, mopeds, and motor bikes. Wherever you went, they were there by the scores and, with a few hot rod type exceptions, they were very quiet. In fact, they were so quiet that you really didn't notice them until you started looking. These are similar engines to the ones that we use to yank our birds about the sky, in that they are two cycle and high revving engines. But the difference is that they really are quiet, yet the silence is not lost in a power decrease, they haul people around quite well. The mufflers on the mopeds are attached to a pipe, about 12" from the exhaust opening on the engine. The muffler, just by guessing, is about six times the size of the displacement of the engine, and the outlet size is only about 1/2" in diameter. If a normal US lawnmower was equipped with a similar muffler I'll bet that you would not be able to hear it from 5' away. How about our engines? We need to give more thought to making them more quiet, not to just 85db but making them **really** quiet. Quiet enough so that you could carry on a conversation in normal tones, standing just a few feet from a running engine. In the December issue of RCM, Paul Denson had pictures and a story of coupling a standard muffler to a wood sound box with the result that the engine noise was almost inaudible. Perhaps this is the answer, or an approach to the answer. Whatever it will be, we need to head in this direction. More and more people make finding a flying field harder and harder, and this really should not be. With all of the fantastic brains running around in this great hobby/sport, we should be able to develop a muffler **system** that would allow us to fly on the corner school yard. Just because model engines have always made noise is no reason why they always will in the future. Twenty-five years ago we lost a tremendous Ukie field here in Fort Worth due to people and noise. If the noise had not been there the Ukie pilots would still be flying on this field. The same can be said every day about RC. Many super fields have been lost. Fields that could still be used if it were not for the noise. Let's don't stick our heads in the sand, but really work to develop a **system** for silencing our engines. We have a good start, but we won't be home free until we can develop a system that will allow the engine to use all of its power, and yet doesn't make **any** noise. How about a muffler coupled to two sound chambers?

to page 195

CUNNINGHAM ON R/C

from page 191/12

Bet that by the time the noise gets out of the end it really will be a quiet noise. Let me know what you experiment with and we will pass it along to the rest of the modeling world.

It's time for me to remind you to make plans to attend the Fourth Annual Jumbo Fly In to be held July 18 and 19, 1981, at Thunderbird field, just west of Fort Worth, Texas. More about this year's Fly In later. □

SUNDAY FLIER

from page 6

October 1950 about DeLanne.

DeLanne's concept was the basis for my design that I built and showed at the Toledo show this spring. (See RCM July 1980, page 56.) I called it Double Ganger Two. It took first in Original Design.

My son and I are doing some more models based on the concept — one is a ducted fan model.

I enjoy your Sunday Flier articles and your R/C designs.

Sincerely,
Richard Sprague
Livonia, Michigan

The article from the 1950 Air Trails was fascinating, but too long to print here.

Andy Lennon, of Quebec, Canada, has some interesting thoughts on canards. He writes in part:

Dear Mr. Willard:

I've been interested in canards for many years and have done a bit of research. Enclosed are details of some canard and tandem wing designs developed over the years in various countries — none of which were particularly successful until the advent of Rutan's Varieze, Quickie, and Vari-Viggen, and Paul MacCready's series of unique "Gossamer" designs.

The basic problem is to obtain a C.G. location that provides adequate stability and control in both pitch and yaw, aggravated by interference between canard and main wings, plus the need for careful selection of the wing sections of the forward wing plus its angle of attack.

Additionally, since lift is shared between both wings, high lift devices such as flaps, slots, etc., must be employed on both, presenting pitch control problems.

The jet engines with more flexibility as to location by being lighter helps the C.G. location situation.

Delta wings permit high angles of attack before stalling and high lift coefficient — have you seen the "Concorde" landing?

Enclosed is a photo of a pusher canard R/C controlled model developed in 1972,

intended as a "scale model" of a light airplane. This employs slotted flaps on the canard for pitch control which droop in conjunction with slotted flaps on the main wing — but which, when so drooped, can be moved for pitch control. Five servos are used.

To obtain the desired C.G. location, all the radio equipment had to be in the forward fuselage. One serious flaw in the original design was the use of a wing section in the canard that reached a zero lift angle of attack (NACA 2415) while that of the main wing was still providing lift (NACA 4415) resulting in some spectacular dives. Using the same section in the canard as in the wing (NACA 4415) corrected this fault.

While the fuselage contours closely resemble those of DeHavilland TK5, I did not know of the existence of this plane until well after 1972.

New and bold developments such as the "Star Cobra" are what I find fascinating in our hobby (almost obsession). I'd like to see more details on this model.

Regards
A.G. Lennon

Here's one of the photos of his canard design. Note the forward wing is below the main wing, so he does not have the "tandem" effect.

Andy also enclosed the composite collection of canard designs. Did you know that there were that many? I didn't.

Canard fighter designs were developed in the early 1940's, perhaps the best known of which was the Curtiss XP-55 Ascender --- pronounced carefully, of course. It never went beyond the prototype tests; the stall characteristics apparently were uncontrollable. The other design was the Japanese "Shinden," or "Magnificent Lightning." The first tests of the prototype were so successful that Japanese factories were in an advanced state of tooling for a production rate of 150 a month in 1946. The end of the war stopped all further production. One of the prototypes was brought to the U.S. and was on display at Willow Grove Naval Air Station.

Both the Ascender and the Shinden were relatively straightforward canard designs, with no interaction of any significance between the forward surface and the main wing.

One of the most unusual design patents involving a canard configuration is that of Luigi Pellarini, an Australian inventor who makes the claim that his delta shaped fuselage, combined with cascaded wings in tandem planform "results in an aircraft capable of exploiting more efficiently than conventional aircrafts the potential energy

carried by the aircraft and to comply more accurately with the first degree of universal flexibility as does the atmospheric environment than do conventional aircrafts." Whew! In simpler terms, I think what he's saying is that his design is more efficient aerodynamically and can go farther, higher, and faster than conventional designs using the same power, and also carry a heavier payload. The patent drawings are of two designs, one a small, nine passenger job, the other a huge transport. The cascaded wing location is common to both.

So why don't we see big canard airliners streaking through the skies higher, faster and more efficiently? Well, maybe it really isn't all that simple. From what I can deduce in reading the claims and listening to the experts, canard designs have the potential to be better, but to realize that potential is an extremely high risk undertaking. Interactions between the forward surface and the main wing, such as tip vortices impacting the main wing, downwash from the canard surface affecting the lift angle of the wing, limitations of Center of Gravity, and other considerations make canard design a very challenging assignment.

One thing seems to be accepted, and that is that canard designs are more maneuverable. The HIMAT (Highly Maneuverable Aerodesign Technology) designs for possible future fighters are canards, but you have to remember that the pilots who will fly them are those young, macho daredevils, full of peas and vinegar, who love to rip up the sky. Also, a computer controlled auto-pilot does the flying.

Airliners are a different breed. Think of the problems of fuel management to maintain C.G. location, for instance. And there are many other factors. But maybe the biggest factor for the air transport companies would be public acceptance. Can't you just see Aunt Lydia and Uncle Henry coming out to the gate to board the canard airliner, parked alongside a 747 or 1011?

"Henry, they've parked that airplane backwards!"

"No Lydia, that's one of them new-fangled jobs that flies backwards. Here tell they're really efficient."

"Well, Henry, you can jus' fergit it. Ain't no way you're gonna get me to fly to New York on a plane that flies bassackwards!" □

FROM THE SHOP

from page 4

Good, the father of radio control aviation, whose pioneering "Guff" is featured in a NASM exhibit, will draw from his incredible range of experience to discuss the early experiments of the 1930's, when the equipment was large, cumbersome and unreliable to the ingenious digital systems of the day, which weigh only ounces and are almost failure proof.

Every other aspect of model aviation will be covered in the same authoritative manner, from the gossamer frailities of indoor duration models to the fast flying control line speedsters to the tissue stick and wire free flight models that so many of us were weaned on. All will be related in context with the present multi-million dollar industry which uses the finest new materials, the latest aerodynamics and the most sophisticated engineering to put model building at the very forefront of the world hobby scene. In addition to the lectures, you'll have the opportunity to ask questions, take photos and soak up the unparalleled aviation ambience of the National Air and Space Museum's twenty-three galleries.

Seminar Outline

Each session is planned to allow time for discussion.

Sunday, February 22 — Individual arrivals at the Rosslyn Westpark Hotel, Arlington, Virginia. Reception, orientation program and behind-the-scenes tour of the original Smithsonian building, popularly known as the "Castle on the Mall."

Monday, February 23 — Morning Program: Frank Ehling: ***"The Broad Scope of Model Building: From Paper Airplanes Up;"*** *Hardy Broderson, Executive Director of National Free-Flight Society and former Vice President of AMA:* ***"Rubber Powered Flying Models: Towline and Hand Launch Gliders — The Current State of the Art for American and International Classes;"*** *Paul E. Garber:* ***"The Old Aero Clubs 1910-1930: The Beginning of Model Airplanes as a Sport."***

Afternoon Program: Hardy Broderson: ***"Powered Free-Flight Models (gas models);" Movie clips of world class competitions; out-of-doors demonstration and participation.***

Tuesday, February 24 — Morning Program: Dr. Laird Jackson, FAI Control Line Sub-Committee Chariman: ***"Control Line Models"*** *and film on the world championship contests; Dr. Walter A. Good, winner of five National R/C contests, Model Aviation Hall of Fame. Past*

to page 203

FROM THE SHOP

from page 198/4

*President of AMA and FAI Aero Model Committee: "**Radio Control Models; Historical Highlights from the Early Experimental 1930's to the Ingenious Digital Systems of Today;**" Film — "Early R/C — 1938-1941."*

Afternoon Program: Don Lowe, pilot, designer, competitor, Associate Editor and columnist, "R/C Modeler Magazine:" "R/C Aerobatic Models: The Largest and Most Popular Class Today;" film on remotely piloted vehicle (RPV) technology; Richard Kowalski, holder of national and international records, Contest Director for Indoor World Model Aircraft Championships 1980, World Record model on display at NASM: "Indoor Duration Model Aircraft: Complex and Delicate Structures for Competition and Record Class Flying;" — lecture/demonstration.

Wednesday, February 25 — Morning Program: "The History and Technical Advances of Model Engines: The Unique to the Ingenious, the Unheard of to the Forgotten;" John Preston, Secretary Treasurer of the National Association of Scale Aeromodelers, Sport Scale Judge, 1980 Scale World Championships: "Flying Scale Models: Large and Small."

Afternoon Program: Jack Salmon, Manager of the ALPHA SQUADRON, the original AMA sanctioned Show Team, Chairman, Advisory Committee for Show Teams, AMA: "Specialty Models Used by Air Show Teams: From the Elaborate to the Simple."

Thursday, February 26 — Morning Program: Mike Grady, President of Grady Models, Vice President of RS Systems, builder of fine one-of-a-kind models for aerospace companies, scale contest competitor: "Model Finishes and Scale Detail Realism: The Secrets of Success;" Dr. Frank Mitchell, builder of 6 models for NASM, experienced competitor and well-known columnist: "Plastic Aircraft Kit Conversions and Scratch-Building: Don't Call Them Toys."

Afternoon Program: Robert C. Mikesh: Tour of the Paul E. Garber Facility (formerly known as Silver Hill) — NASM's preservation, storage and restoration facility; Robert B. Meyer, Jr., Curator of Propulsion, Aeronautics, NASM: Tour of the model engine collection.

February 27 — Morning Program: Robert C. Mikesh: "Models for NASM (Museum Standard and Outside Requests for Assistance);" John Worth, Executive Director, AMA, the largest sport aviation organization in the world: "The National and International Sport Aviation Scene Today;" Farewell Luncheon, National Museum of History and Technology.

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See you next month. □

DID YOU KNOW...

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

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