american
aircraft MODELER

MAY 1969

60c (7/-)

FULL-COLOR CENTERSPREAD
Messerschmitt Bf-109
AND
RADIO-CONTROL PLANS
PAGE 23

FOR THE ROCKETEER
PLANS FOR BUILDING MANTA BOOST GLIDER
PAGE 44

FOR THE TENDERFOOT
RUGGED CONTROL-LINE TR
F

BUILD AND FLY
Neighborhood Nieuport
ER JOB

IT'S SUPERTIGRE-68 NATS

OUR THANKS TO HARRY ROE FOR MAKING THIS EVENTS SUMMARY

CONTROLINE SPEED**

Possible Places	Places Won	Age-Event
5	5	J A-Speed
3	2	S A-Speed
5	3	O A-Speed
5	5	J B-Speed
3	3	S B-Speed
5	4	O B-Speed
3	0	J C-Speed
3	2	S C-Speed
5	4	O C-Speed
5	3	J B-Proto
3	2	S B-Proto
5	5	O B-Proto
2	2	J FAI Speed
2	0	O FAI Speed
54 Total	40 Places Won	

$\frac{40}{54}$ = 74% of Speed Placings won by Super Tigres

MISCELLANEOUS CONTROLINE

Possible Places	Places Won	Age-Event
5	0	J-Stunt
5	0	S-Stunt
5	1	O-Stunt
5	4	J Combat
5	3	S Combat
5	4	O Combat
3	1	J Scale
3	1	S Scale
3	1	O Scale
5	2	J Navy C. I.
3	1	S Navy C. I.
3	2	O Navy C. I.
3	0	J Navy C. II
3	0	S Navy C. II
3	0	O Navy C. II
5	4	J Rat Race
5	1	S Rat Race
5	4	O Rat Race
74 Total	29 Places Won	

$\frac{29}{74}$ = 39.2% of Miscellaneous Controline Events won by Super Tigres

FREE FLIGHT GAS**

Possible Places	Places Won	Age-Event
5	1	J A-Gas
5	0	S A-Gas
5	2	O A-Gas
5	2	J B-Gas
5	3	S B-Gas
5	3	O B-Gas
5	2	J C-Gas
5	2	S C-Gas
5	2	O C-Gas
5	1	J FAI
3	0	S FAI
5	5	O FAI
5	0	J-S Scale
5	0	O Scale
3	0	Helicopter
71 Total	23 Places Won	

$\frac{23}{71}$ = 32.5% of F.F. Events won with Super Tigre Engines.

RADIO CONTROL

Possible Places	Places Won	Age-Event
5	1	J-S FAI Qualifications
5	0	O FAI Novice
10	1	O FAI Expert
10	0	JSO Finals
10	1	JSO Pylon
5	2	JSO Scale
45 Total	5 Places Won	

$\frac{5}{45}$ = 9% of R.C. Places won with Super Tigres

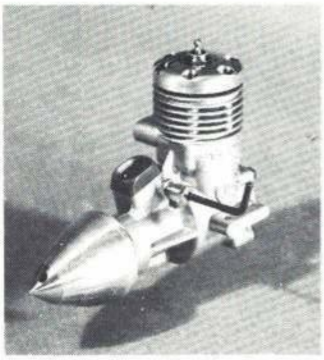
** ALL ½A EVENTS and JET SPEED NOT INCLUDED.
* THIS DATA FROM AMA OFFICIAL RESULTS.

KING ORANGE

WESTERN PYLON R/C WON WITH ST G21/40 R/V

Norm Hooper, one of the fellows who fly up around Seattle with Doc Brooks, took first at the Western States Pylon Championships with a Supertigre G.21/40 RV. His time was 1:50:5. Norm was flying a Shoestring and had a point total of 25. Thanks to Doc Brooks for calling this into us here at World Engines and also thanks to the NMPRA—Ed Shipe, Editor, for the news release in his November 10th paper. The G.21/40 RV engines that Supertigre builds has real stamina which is the reason for its growing popularity in U-Control Rat Race. We hope to see more R/C Pylon racers winning with the G21/40 R.V. in the future.

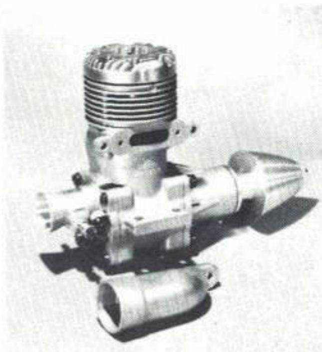
G.21/40 R.V.R/C **$32.98**



G-15 RECORD SERIES

The G.15 series designates the latest configuration in Supertigre's Racing 15. This F.A.I. speed event is the international speed event and, of course, is an important competitive yardstick among engine manufacturers. Arnold Nelson placed second against a field custom engine with tuned pipes in this years U.S. F.A.I. speed eliminations in St. Louis September '67. The glow 15 and the diesel are available in front and rear configurations. The 19 in this series is a F.V. glow engine. We also stock a conversion kit for changing the front valve engines to rear valve engines. Bill Bertram holds an R/C endurance record with the F.V. Diesel of 11 hrs. 17 min. as of 12-20-67. The G.15 rear valve holds the U.S.A. Speed U/C record of 162 mph.

G.15 Speed w/spinner **$19.98**
G.15 R/V w/spinner **24.98**
G.15 RV Diesel **24.98**
G.19 Glow F.V. **19.98**



199.0 MPH WINS ORANGE

199.0 mph with a Class "C" U/Control Speed job must be really something to handle as it screams around the Pylon. This is the speed turned without a pipe that won all the "oranges" for the boys from North Carolina this year at the King Orange. The engine that they were using was an almost stock ABC Supertigre G.65. ABC means aluminum piston running a brass chrome plated sleeve. This combination of metals permits a uniform expansion as the engine heats up and this is particularly important to the Speed enthusiast because after the model takes off it always leans out to a degree and if this degree is not anticipated properly the engine will go too lean or over the hill. An "over the hill" run with conventional metallurgy in the engine more often than not results in a burned up engine whereas an ABC engine will usually tolerate such an experience. The fuels that many of these top U/Control Speed men use is straight nitro and oil with a little Propylene oxide thrown in or some other exotic blend and it takes a well built engine to stand up burning this liquid dynamite.

In the picture you will notice an engine lead-off elbow which connects the engine to a tunned pipe. These elbows alone many times increase the performance of an engine. We have these in stock now for the "C" engine that will retail for $2.50 and for the .15 $1.95.

G.65 Speed **$49.95**

DEALER OF THE MONTH

This month we congratulate Jim and Ruth Van Loo of Jim & Ruth's Toy & Hobby Shop, 5310 Morningside Ave., Sioux City, Iowa, who have been chosen as our DEALER OF THE MONTH. We are sending them FREE a Controlaire 3 Ch. Propo System valued at $200.00.

WORLD ENGINES OF CANADA
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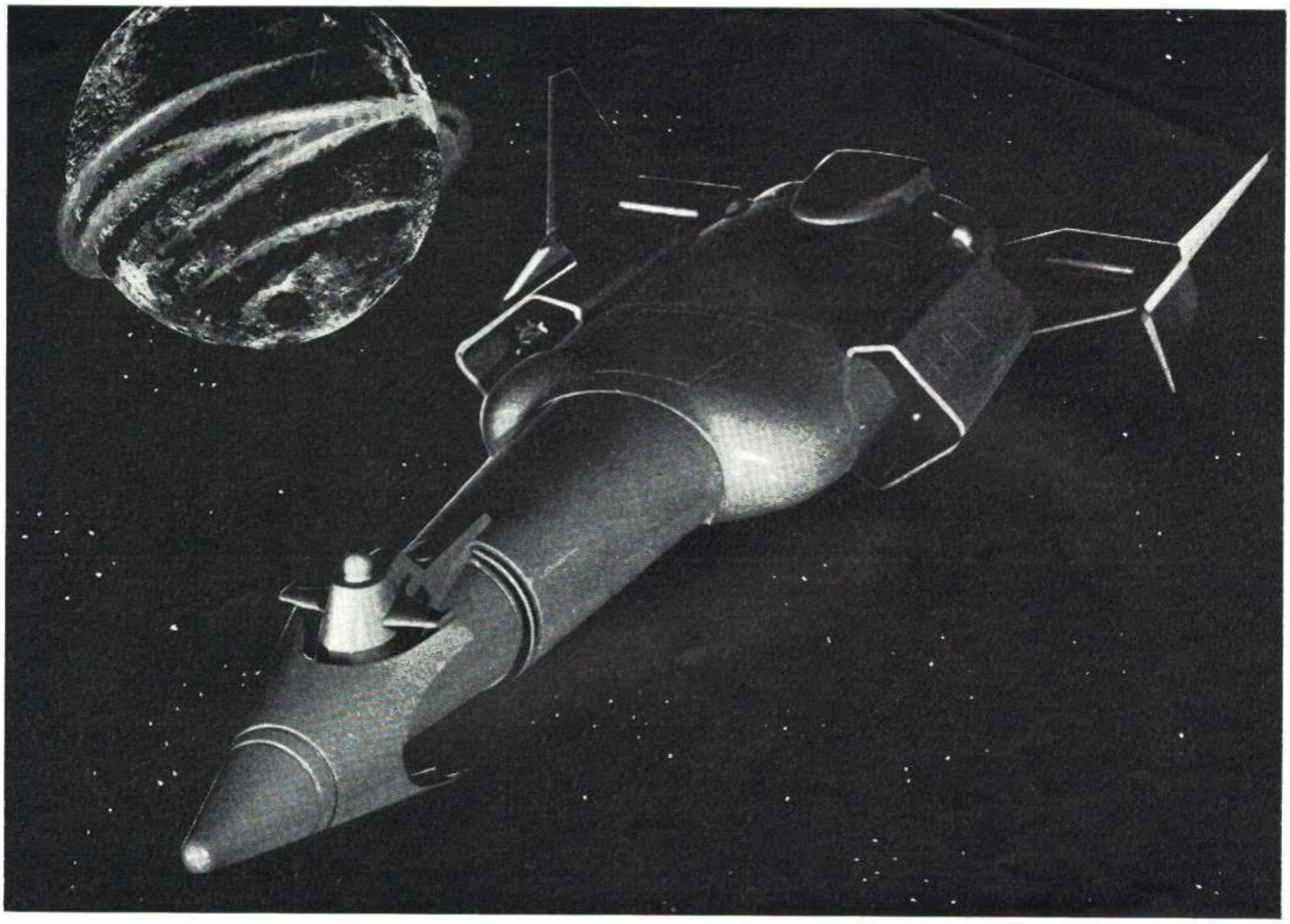
WINDSOR, ONTARIO
CANADA

SUPERTIGRE IN CANADA 30% HIGHER

CONTROLAIRE & M.A.N. 25 % HIGHER

WORLD ENGINES

8960 ROSSASH AVE, CINCINNATI, OHIO 45236



"SSC Leif Ericson"

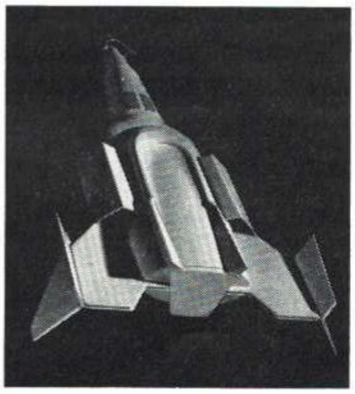
Galactic Cruiser (EXPLORER CLASS)

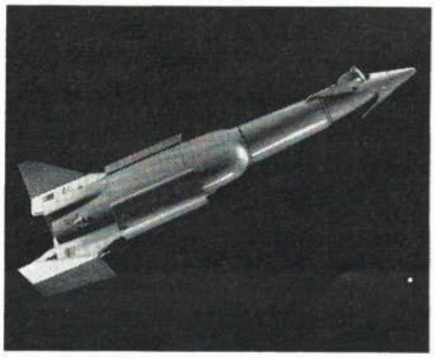
STRATEGIC SPACE COMMAND SERIES—

The first scale model kit in AMT's new series of 21st century space ships and model kits.

SPECIAL FEATURE...

A SCOUT SHIP HOUSED IN THE VAST INNER-STRUCTURE OF THE GALACTIC CRUISER





Retail Price: $2.50

EXCLUSIVE 33-1/3 rpm RECORD INCLUDED IN THIS KIT

SOUNDS of OUTER SPACE

THE EXCITING MODEL KITS ARE FROM AMT

american aircraft MODELER

VOLUME 68, NUMBER 5 **MAY 1969**

COVER PHOTO: At flying field of Pikes Peak R/C Club, Colo., is Messerschmitt Bf-109, featured R/C model on page 23. Cadet Ron Schrenck, left, Ivan Munninghoof, right. Ivan's model photographed by Gerald Hayhurst.

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INTRODUCING THE NEW HEATHKIT® GD-19

5-CHANNEL PROPORTIONAL R/C SYSTEM

NEW – SMALLER, LIGHTER RECEIVER NEW – KRAFT CONTROL STICKS

NEW – 3 CHOICES OF BANDS – 27, 53 OR 72 MHz – SAME LOW PRICE $219.95*

WITH FOUR SERVOS

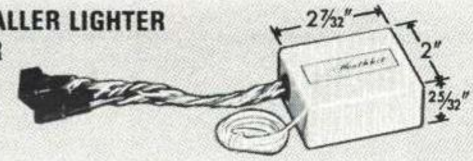
• Powerful, efficient transmitter has preassembled & prealigned RF circuitry • New Kraft control sticks with thumb lever coarse adjustment plus Trim Controls that don't change stick centering • Servo travel easily reversed at stick potentiometers • Transmitter is switch-locked to prevent accidental turn-on • On-Off Switch has double parallel contacts for added reliability • New flat-pack transmitter battery features nickel-cadmium cells • Charger for both transmitter & receiver batteries built into transmitter with one-piece charging cord • New miniature receiver features space-age ceramic filters in IF for extra reliability, increased selectivity and no alignment ever • Unaffected by noise or temperature variation • Extremely light weight — only 2.3 oz. • Housed in an almost indestructable nylon case • Exclusive Heath space and weight saving military-type terminal blocks • Receiver powered by a rechargeable flat-pack nickel-cadmium battery — weighs only 3.9 oz. • Highly reliable variable-capacitor servos for improved resolution • Two linear outputs (one with vertical tabs) plus rotary output • Compact nylon case for rugged service • Choice of five operating frequencies in each of three bands — 27 MHz, 53 MHz or 72 MHz (see list below) • Buy the complete system kit (supplied with a free soldering iron) and save up to $200 over assembled gear • Buy components separately — new receiver is fully compatible with previous Heathkit GD-47 R/C System

The New Heathkit GD-19 R/C System represents the most value and engineering sophistication ever offered in a 5-channel propo rig. Here's why — the new transmitter couples advanced circuit design with famous Kraft sticks to give you positive, exact control at all times. And the locking, double parallel On-Off switch means greater reliability and safety — important at crowded meets. The new miniature receiver features exclusive ceramic filters for exceptional selectivity with no alignment ever needed. Exclusive Heath terminal blocks, flat pack rechargeable batteries, high resolution, variable capacitor servos, 16 oz. flight weight, and choice of bands round out the picture of this advanced R/C system. Send for your free GD-19 spec sheet and 1969 Heathkit catalog now and be convinced.

System Kit GD-19, all system parts; specify freq. desired; 11 lbs., no money dn., $21.00 mo. **$219.95***
Kit GDA-19-1, transmitter, battery, charging cord; specify freq., 5 lbs., no money dn., $9 mo. **$86.50***
Kit GDA-19-2, receiver only; specify freq., 1 lb., no money dn., $5 mo. **$49.95***
Kit GDA-19-3, receiver battery pack only, 1 lb. **$9.95***
Kit GDA-19-4, one servo only, 1 lb. **$21.50***

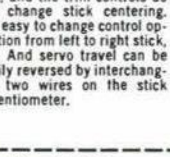
Operating Frequencies: 27 MHz (11 Meters): 26.995, 27.045, 27.095, 27.145, & 27.195 MHz. 53 MHz (6 Meters ... Note: An Amateur Radio operator's license is required for 6 Meter operation): 53.100, 53.200, 53.300, 53.400, & 53.500 MHz. 72 MHz (4 Meters): 72.080, 72.240, 72.400, 72.960, & 75.640 MHz.

NEW SMALLER LIGHTER RECEIVER



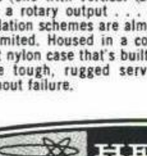
The new Heathkit GDA-19-2 receiver combines famous Heath engineering with extremely small size & weight to deliver unmatched performance & reliability. First, there's ceramic filters for increased selectivity, extra reliability and elimination of alignment forever. Then there's the very small size — the measurements speak for themselves . . . you can put this receiver places others won't fit. No extra weight to carry either — flying weight of receiver and new flat pack battery is only 6.2 oz. Highly sensitive, immune to noise, and unaffected by temperature changes too. Housed in a virtually indestructable, impact resistant nylon case. And the new GDA-19-2 is available on five frequencies in any one of three different bands.

New Kraft Control Sticks



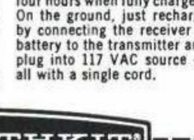
The use of new Kraft control sticks adds even more performance & reliability to this hot new R/C System. Internal thumb levers on the stick potentiometers make coarse adjustment easy and fast, and the trim controls do not change stick centering. It's easy to change control operation from left to right stick, too. And servo travel can be easily reversed by interchanging two wires on the stick potentiometer.

Four Variable Capacitor Servos



The new Heathkit GD-19 System comes complete with four high resolution variable capacitor servos that provide superior performance & reliability over wirewound types. Each servo has two linear outputs (one with vertical tabs) and a rotary output . . . installation schemes are almost unlimited. Housed in a compact nylon case that's built to take tough, rugged service without failure.

New Flat-Pack Battery



In the air, power is supplied to the receiver by this new, space and weight saving flat-pack nickel-cadmium battery ... measures only 5/8" H x 2 1/8" W x 2 3/8" D . . . weighs only 3.9 oz. Keeps your receiver powered for a minimum of four hours when fully charged. On the ground, just recharge by connecting the receiver & battery to the transmitter and plug into 117 VAC source — all with a single cord.

NEW HEATHKIT CATALOG

Describes over 300 kits for stereo/hi-fi, color television, amateur radio, radio control, shortwave, test equipment, CB, marine, educational, home and hobby. Save up to 50% by doing the easy, enjoyable assembly yourself. Mail coupon or write: Heath Company, Benton Harbor, Michigan 49022.

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☐ Please send free specifications on new GD-19 R/C System

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Prices & specifications subject to change without notice. *Mail order prices, F.O.B. factory. GX-178

STRAIGHT AND LEVEL

Doug Rolfe—who loved to make drawings of airplanes. His pen was busy for more than 40 years.

WE read, in Sport Aviation, the official magazine of the Experimental Aircraft Association, of the passing, in Mexico, of Doug Rolfe. Doug, like Frank Tinsley — whom we told you about in the 1968 Annual — Cal Smith, Alex Dawydoff, and too many others —helped make this magazine what it is today. It is customary to label a few discrete paragraphs, "In memoriam" and conclude with something to the effect that we all shall miss him, or that we can ill afford his loss. There is so much more to be said.

A few months ago we recalled the late, great Jim Walker, and the heart-warming mail received from so many readers who remembered him testifies to the inadequacy of merely tolling a bell. Doug, like Jim, was bigger than life. We need to know what he did for us.

Doug drew pictures. Of airplanes. And plans. He drew more of them than any man on the face of the earth. Most readers know Doug for his pen-and-ink sketches of historic aircraft in the magazine Air Progress. Even in just this, there is quite a story. Air Progress began life with the July 1937 issue. It was an annual reprint of Air Trails illustrated features, wrapped around eight four-color aircraft paintings. These were Air Trails covers printed during the year — done by the western-aviation artist, Frank Tinsley.

During the Second World War, Air Progress was developed into a monthly, companion to Air Trails — today's American Aircraft Modeler. Doug came into the picture as an illustrator of "Air Progress" features on such subjects as Machine Guns, Flying Boats, Aircraft Engines and, after Air Progress folded for a few years due to the wartime shortage of paper, Doug switched to Air Trails, pinpointing his efforts on development of airplane types, or manufacturers. So successful was his coverage that Simon & Schuster produced Airplanes of the World, still in print, and regularly updated. It was illustrated entirely with Rolfe sketches.

He was one of the best cutaway artists, for both models and planes — which appeared for years in such places as Mechanix Illustrated, Popular Science, Air Trails and, while we were there, Model Airplane News. Doug, a midwesterner, began his aviation illustrating career with two brothers whom he had known as busboys in a local restaurant. Today, they are New York multi-millionaires, among the mighty publishers. When they gambled everything on their first magazine in the late twenties, Doug single-handedly produced the most famous flying manual of all time, devoted to home-builts. It is so damned good — the English is pardonable and necessary — that it is still reprinted, and used, by home-built printers and builders. It is the nearest thing to an aeronautical bible, and appears as timeless as the good book itself.

Anybody that draws airplanes compulsively, for a hobby and an avocation, for 40 years, has got to love airplanes. This we all dig. You, too, have certainly sketched an airplane. Maybe you wanted to build some model. Or you wished to express yourself — your idea of how a flying machine should look. You've doodled winged things. Doug did that, day after day, by the thousands. A lifetime dedicated to drawing aircraft enjoyed by two generations of readers.

Thousands of real aircraft have been built from his plans. More thousands of models. And, in the aggregate, many, many millions of people have gloried in his work. "We all shall miss him?" We'll never know how much we shall miss him, for in a quiet way he was very much a part of our constant enjoyment of aviation.

There was much more to him, too. Doug, like his brother, who was killed many years ago over Havana when the wings fell off an ancient crate — several civic notables being on the sightseeing flight — was a barnstormer. A genuine Jenny, Standard man. He had a wooden leg for his pains. He got in the way of the Jenny club when he flipped the prop in some forgotten cow pasture.

He was a serious, intent chap — and who wouldn't be if he just had to draw all those airplane pictures! He had worked so hard his hands shook. But he had a marvelous way of steadying the pen just as it touched paper. He'd smoke a pipe while you talked with him, and never miss a stroke, drawing all the while with automatic concentration. He could draw anything that ever flew — his scrap files covered the whole of aviation, anything that ever got off the ground, and a lot of things that didn't. He was a kind of pipeline between the amassed lore of flying machines and all of us who had no other way of learning about the creations of so many other worthy, forgotten men. We won't forget Rolfe, simply because his stuff was so damned good that we shall be seeing it reprinted again and again for another ten or twenty years.

When we noted the passing of the greatest model airplane designer of them all, Cal Smith, Doug had said, "I hope that, should I go, you will say just half as many good things about me." Doug, you are not gone at all.

— the Publisher

CARL GOLDBERG

NEWS, IDEAS, LETTERS

HOW DO YOU JUDGE QUALITY?

When you stop to think about it, what is "quality"? Webster calls it "excellence of character." In model-building, everybody likes the smooth feel of a well-sanded sheet of balsa, but it takes a lot more doing to come up with a model that truly has quality. Some models are beautiful to look at, but not very good fliers. And some are good fliers, but may have a structural weakness, or other problem.

In the kit field, the situation becomes more complicated. The model has to be engineered for both flying and structural soundness, as well as sound manufacturing practices. The plans also have to be drawn and illustrated to clearly answer different questions arising in the minds of thousands of individuals.

Materials in the kit cover many fields, but usually the most important is balsa wood. Here is a natural product, the finest of its kind for modeling purposes, but it varies tremendously. A single block of balsa wood may vary from soft to medium to hard, from one corner to another only four or five inches away. Even in an ordinary sheet, the hardness will vary quite a bit from one edge to the other. Using many thousands of sheets, it becomes difficult to keep some soft ones from getting in with the medium, and some medium ones in with the hard, etc.

When it comes to die cutting, there are some tricks to getting clean die cuts. But no matter how clean, what good are die cut parts that don't fit? Getting a good fit takes some doing.

Every one of these areas concerns responsible kit manufacturers. And we all stumble occasionally. But when you're all done, modelers tend to judge quality not by whether the design is beautiful, or the engineering excellent, or the wood smooth, or the diecutting clean. It's the overall feeling you have of whether or not somebody really cares. Somehow, you can tell.

Carl Goldberg

P.S. How about sending us YOUR comments and ideas?

SKYLANE 62

Semi-Scale Beauty in A Great Flying Model!

DELUXE — Includes New Fittings

Here are the popular Skylanes — stable and forgiving — highly responsive and beautiful flying. Everything we've learned about what the R/C flyer wants has been engineered in. If you're looking for realism and smooth flying, Skylane is the ship for you.

$29.95

1/2A SKYLANE $8.95
For Single Channel — Escapement, Servo or Pulse
Span 42″ Area 244 sq. in.
Length 35″ Weight 22 oz.
For .049 Engines

Tough, roomy cabin and front end, takes single to 10 channels or proportional. Steerable nose gear.

SPAN 62″ AREA 540 sq. in.
LENGTH 50″ WEIGHT 4½-5 lbs.
FOR ENGINES FROM .19 to .35

FEATURES:
- See-through cabin, with die-cut plywood cabin sides
- Shaped leading edges plus sheeting
- Cleanly die-cut parts that fit!
- Clark Y wing section, hardwood struts
- Steerable nose gear, formed main gear
- Complete full-size plans, step-by-step illustrations
- Folder on How to Set Up and Operate R/C Models

The Design That Makes The Simplest, Sound, Attractive Airplane

THE FAMOUS FALCON

Sr. Falcon Shown

SR. FALCON $29.95
DELUXE — Includes New Fittings. For 10 Channels or Proportional
Span 69″ Area 810 Sq. In.
Length 53″ Weight 6¼ Lbs.
For .35 to .45 Engines

FALCON 56 $16.50
DELUXE — Includes New Fittings. Takes Single to 10 Channels or Proportional
Rudder-Only or Multi-Training
Span 56″ Area 558 sq. in.
Length 43″ Weight 3½ lbs.
For .09-.15-.19 Engines

Junior FALCON $5.95
DELUXE — Includes New Fittings: For Single Channel — Escapement, Servo or Pulse
Span 37″ Area 250 sq. in.
Length 28″ Weight 16 oz.
For .049 Engines

More Falcons have been built and flown in the past 6 years than any other R/C. For value and features in a functional, rugged airplane, your best bet is a Falcon. Every design element engineered for simplicity and fast-building. No unnecessary gadgetry or required skills.

FEATURES:
- Semi-symmetrical wing section
- Coil-sprung nose gear...formed main gear
- Shaped and notched leading and trailing edges
- Cleanly die-cut ribs, fuse sides, formers, etc.
- New simple "Symmet-TRU" wing construction
- Complete full-size plans, step-by-step, etc.
- Folder on How to Set Up and Operate R/C Models.

The Goodyear Racer with Enough Wing Area and Stability so YOU Can Fly It!

Shoestring

Most Beautiful R/C Ever Kitted!

$24.95

DELUXE — Includes New Fittings

Here's the sweetest Goodyear design ever, the famous Shoestring, in a deluxe kit! A practical flyer with enough span and wing area, and proven shoulder-wing stability. For simplicity, engine is mounted upright. Also can be side-mounted in cheek cowl.

FOR 6, 8, 10 CHANNELS OR PROPORTIONAL

SPAN 54″ AREA 540 Sq. In.
LENGTH 44″ WEIGHT 4½ - 5 Lbs.
FOR .19-.40 ENGINES

FEATURES:
- Shaped leading edges plus sheeting
- Symmet-TRU wing construction
- Full-length sides, sheeted trailing edges
- Cleanly die-cut ribs, formers, etc.
- Formed spring aluminum landing gear
- Semi-symmetrical wing section
- Complete full-size plans, step-by-step illustrations
- Huge, colorful decal sheet
- Many extras, including folder on "How to Set Up and Operate R/C Models."

World's FIRST Single or Twin Engine R/C Models

SKYLARK

Skylark 56 Shown

DELUXE — Includes New Fittings

Skylark is one of the most unique R/C designs ever to come along. You can build your choice—a sleek single, or an exciting twin engine job—from the same fast-building kit. Controllable with one engine out. Thoroughly engineered, clean die-cuts, and complete step-by-step plan. Kit has full basic info on building and flying.

SKYLARK 56 $18.95
Takes Single to 10 Channels or Proportional
Span 56″ Area 528 sq. in.
Length 44″ Weight 3½ - 4½ lbs.
For Single Eng. .09, .15, or .19
For Twin Eng. Use Two .09's or .15's

JR. SKYLARK $6.95
For Single Channel — Escapement, Servo or Pulse
Span 37″ Area 235 sq. in.
Length 29″ Weight 18 oz.
For Single Engine Use .049
For Twin Eng. Use Two .01's or .02's

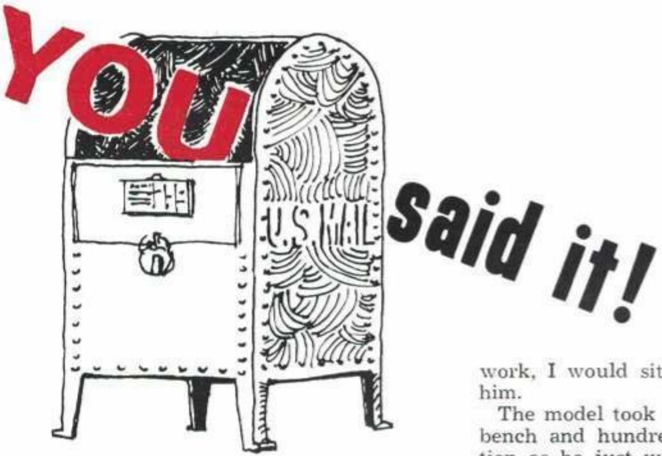
FEATURES:
- Semi-symmetrical wing section
- Coil-sprung nose gear...formed main gear
- Shaped and notched leading and trailing edges
- Cleanly die-cut ribs, fuse sides, formers, etc.
- New simple "Symmet-TRU" wing construction
- Complete full-size plans, step-by-step, etc.
- Folder on How to Set Up and Operate R/C Models.

P.S. For best service, see your dealer for kits you want. If not available, write direct; add 35¢ per kit in U.S., 75¢ outside U.S. Minimum order $1.

Send 10¢ for 4-pg. Illustrated Catalog, with recommendations on "Getting Started in R/C."

CARL GOLDBERG MODELS INC.
2545 WEST CERMAK ROAD • CHICAGO, ILLINOIS 60608

You said it!



Contest for juniors

Recently, our AMA club held a contest for the juniors. Since most of them have been flying U-Control for only one or two months, a stunt contest would have been out of the question. So we held a "Fly-for-Fun" contest.

First, a race was held. The planes were run for two minutes on 25-ft. lines. The winner was the flyer who went the most number of laps.

Second, a balloon bust event as shown in the back of the AMA rulebook. All dimensions are cut in half.

Third, a precision aerial bombing event, in which a simplified bomb-dropping device was made; full down was given to drop the bomb. Closest person to a given point won. This could be made more exciting by building a factory out of cardboard boxes.

Last, a combat event. Streamers are 5 ft. long, and matches last three minutes. This was fun, with several cuts and a number of crashes. No planes were hurt, being profiles.

Prizes were given for all the events, and also for the worst crash, the weirdest maneuver, and to the guy who kamikazed his plane into the factory.

It was a lot of fun for all, and it really helped get interest up. If you are looking for something to spark junior interest, this would be great. The only rules are that only two planes are allowed, and that engines must be ½A. Try it!

Scott A. Conradson, Palo Alto, Calif.

Sudden service

I like your "Sudden Service." I sent away for the Oily Bird plans and six days later they came in the mail.

Keep up the good work!

Walter Martin, Wheaton, Md.

Not only is the service faster but the plans are bigger and better, too. And who wants to wait. Ed.

Learning fast

This is the first time I have written to any magazine except checks to renew subscriptions, but I just have to say "thank you for the life-savers." By that I mean the series you just started known as "For the Tenderfoot."

About a year ago the Coffee Airfoilers sponsored a model-building class and had the youngsters build AMA Racers for a novice contest. We old men decided to build one and have a contest the same afternoon just for fun.

When I brought my kit home, my youngest son Wayne, 3½ years at that time, said "Daddy, I want to build a plane too." I thought to myself that if he could do the work, I would sit on my hands and help him.

The model took about three hours at the bench and hundreds of words of instruction as he just would not read the plans. To make a long story short, he finished it (I bent the pin and tied the knot in the rubber).

He then wanted to enter the contest. And so he did. I held and counted while he wound. Was I ever surprised and pleased when his name was called for the third-place trophy.

After that he built a HLG then assembled a plastic model that he could "keep in my toy box." He insisted on flying in the Airfoiler's contest this summer. He made three flights of over 40 seconds with AMA Racer. After the contest, he started wanting to build a gas free-flight so that he could "beat daddy's Sawdusters." Just when I thought I was really up the creek, you came out with the Tenderfoot articles. We immediately ordered the Oily Bird plans. It is completed but hasn't been flown yet.

As the material for the model is rather large for his small hands and he isn't too proficient yet with knives and razor blades, I put the model in kit form and labeled wood and plans A,B,C, etc. Although he didn't know the names of all the letters, he would match them according to shape. He has now learned some of the alphabet and quite a bit of counting from using a 12" ruler for measuring lengths of balsa and dihedral blocks.

Thanks again for the series. We finished two Mini-Gliders the other night and he has had a ball with them.

O. W. Culpepper, Tullahoma, Tenn.

Thanks to McEntee

You have a great magazine! I would like to thank Mr. McEntee for his articles especially. He helped a lot on choosing and using radio and plane. Thanks to him I got through my "Bang-Bang" time with only a few dents and scratches.

Now down to business. There was a boy who wrote in your Dec. issue that he could not make any money to build planes and buy radios. I wonder if he ever thought of getting a paper route. I am 13 and the route made it easy. I have a Citizen-Ship three-channel radio, Ambroid Charger plane (rudder and throttle) and an Enya-15 TV engine. I paid for all of it within six to eight months.

Again, hurrah for McEntee, your magazines, and the color three-views.

Tom Barkman, Indianapolis, Ind.

Like we've often said, the young folks want in on R/C. Judging by response to editorials, industry has noted. Ed.

Design your own?

Received my copy of the Jan. issue. As always, the first thing I read was the Straight and Level column. I agree with you 100% that the modelers should design their own aircraft.

I must disagree with you on the point that the designer should not have any or very little knowledge of aeronautics. If anyone wants to design their own planes, they should have plenty of knowledge on the subjects of weight and balance, what airfoil is required, and especially on points of stress.

If you can get somebody to write suitable articles on these subjects, I think you will discover more successful designs will appear at the flying fields.

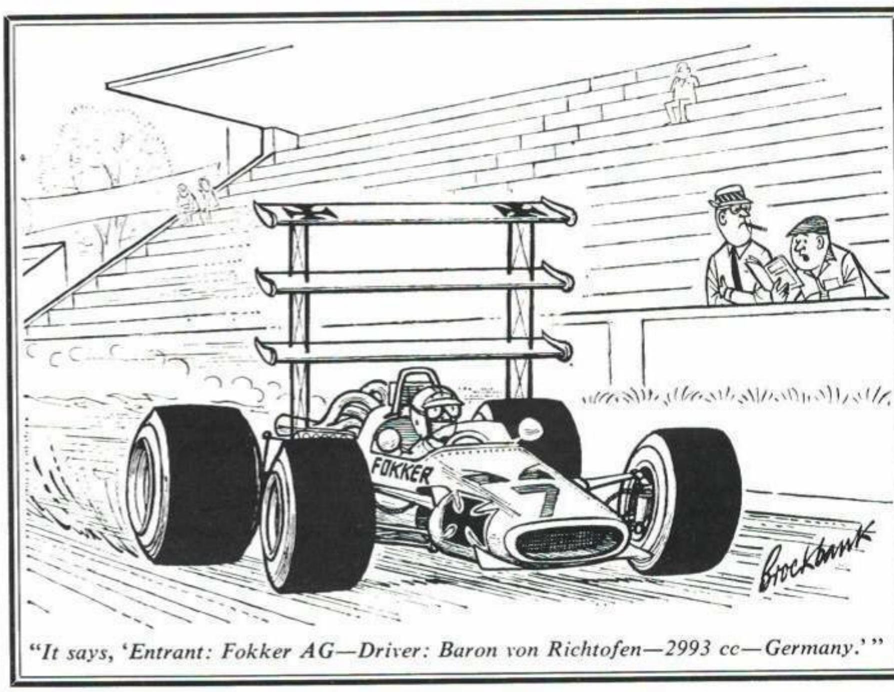
Greg Castleman, Mather A.F.B., Calif.

Great idiotic thing

Read your Jan. Straight and Level editorial. Referring to the first part, on self-designing and what is a *real* modeler — all I can say is that I wish I had said it. I'm with you 100%.

Let's give us midnight-oil magazine-original designers more credit. We're what keeps this great, idiotic thing going.

Bill Northrop, Newark, Del.



"It says, 'Entrant: Fokker AG—Driver: Baron von Richtofen—2993 cc—Germany.'"

John Brock — in memoriam

The Atlanta, Georgia area modelers, in particular the Marietta (Cobb County) Sky-Rebels, are informing you of the unexpected death in October of John E. Brock.

John was a most active modeler in the Atlanta area, a past president of the Sky-Rebels, and competed in nearly all of the AMA District V meets as well as the Nationals for the past several years, usually flying Stunt and Rat-Race.

John had built and flown models since he was 12, and was one of this area's most avid modelers, as his many friends know. Model Aviation, especially in the Southeast, has lost one of its best friends, and we express our condolences to his widow, Lydia, and his two children, Doris and Mike.

Richard Schneider, Cobb County Sky-Rebels, Marietta, Ga.

No one cares!

R/C stinks! Or should I say the men who fly it. Maybe this letter will partially explain the junior problem.

I started building and flying U/C planes about five years ago. After about two years, I received a Testors' R/C Skyhawk for my birthday. Amazingly, I was able to fly this plane without any help at a nearby school field. One day, after many enjoyable flights, I forgot to insert the antenna into the plane. This resulted in complete destruction of the plane.

After many months, I saved up enough money to buy a "Steady Ghost" system along with a Du-Bro Aero Commander 100. I felt that I wasn't experienced enough to fly it by myself. I found a R/C club that flew pretty near where I live. My father, who isn't interested in model planes, drove me there the following week. Most of the men there wouldn't even go near the plane, after they found out that it was a form of Galloping Ghost. Fortunately, I did find one guy who helped me fly it. He had it up for about two minutes, when it went out of range, and on to failsafe. It hit a tree but didn't get badly damaged.

It took me three more trips to the field before we finally got it working right. We were all ready to let it go, when the engine's crankshaft broke. After waiting over a month for good weather, I took it there this morning, finding only a few flyers. I asked if they would help me fly it. They told me they wouldn't even touch it. In my opinion, they were too busy showing off to the small crowd that had gathered to see them fly their $800 planes.

To top this off, they told me not to come back to their field unless I planned on joining their "great" club. I explained that I had no means of getting to their meetings, but I would be happy to join their club if they could get me some sort of transportation to their meetings. They just shrugged their shoulders and went back to flying their planes.

I am hoping that you will print this letter and, maybe there are some flyers in the southern Westchester area who will contact me and help me fly the plane.

Robert Hayman, Mt. Vernon, N. Y.

Happy free-flighter

Just received the November issue of AAM and decided to send off a quick note to let you know how much I enjoyed the issue.

So rare to see Free-Flight throughout a magazine these days. Many good articles featured, including the catapult event and Pussy Cat article. Well done and well presented.

Let's have more such well-presented material.

U. M. Hank, Grand Rapids, Mich.

Missing parts

First of all, I need help! Having been a modeler for over 20 years, I have over this period of time accumulated a few motors, most of which are probably obsolete.

In writing to you, I'm hoping that you or someone on the staff at AAM can shed the inevitable light as to where I might locate a piston and rod assembly and cylinder sleeve for an Allyn Fury Twin (vintage 1955 or 1956), that I'm trying to restore to running condition. The cu.in. displacement is I believe, .098 or .049 twice. If, in the event you have knowledge of the whereabouts of these items, or if you don't, I would appreciate tremendously, hearing from you.

James D. Moffat, Fair Oaks, Calif.

Air Trails

I owe much to your forerunner Air Trails. When I first started building model airplanes, I didn't have much inspiration, except for about 30 copies of Air Trails and a few copies of other magazines.

As any boy of ten, I had big plans for the contest models in these magazines. I was going to enter contests and win prizes and the whole works. But as usual, it was easier said than done. I would build a model, and on the day I would try it out something would always go wrong. I did get many to fly, and the men that used to fly planes of this design, who now fly R/C, helped me, and gave me helpful hints.

I would like to thank your magazine for helping me stick to it in those discouraging starting days. The Hi-Climber (Dec. 1968 issue — Ed.) is such a model that builds confidence in a small boy in the starting stages.

Bob Forsyth, Dallas, Tex.

Relates to the big birds

Thanks for the "good word" in your Jan. '69 "Straight and Level." This testimonial is appreciated and from my point of view, means a lot. But please don't be too hard on the model aircraft people. That is where I got my start. It was a "Wheaties" box and the ol' penny glider of World War II they had on them, and my folks would help me put it together. My love for modeling has grown since that time with more gusto.

Now that I'm involved with model rocketry, my work for Vern takes me from coast to coast. It is interesting to note how the young rocketeers' knowledge about the technical aspects of rocketry relates to the big birds. The thrill of watching the youth of this country collectively working on a rocket project, yet with the old feeling of competition and pride, also helps make this a unique business.

It is our hope that the American people will continue to support the space program and not allow it to disappear as has the British aircraft industry.

Norman Avery, Estes Industries, Inc. Penrose, Colo.

No clubs around

I just bought my first copy of your magazine and I think it's great! But I have a problem. I've been building model airplanes for about two years and I have yet to locate a model-airplane club around my area.

I would appreciate it very much if you could help me.

James Kennedy, Central Islip, N. Y.

James — and all you guys in the same boat — write John Worth, Academy of Model Aeronautics, and he'll put you in touch with your nearest club. Ed.

Continued on page 62

Small-Fry Special

FOR THE TENDERFOOT

With this reliable trainer the kids can go flying by themselves. Today's easy-starting 049 engines are no problem for a youngster. Flyer's sister holds.

Balsa models are painted with model airplane dope so that the fuel and exhaust do not seep into the wood. Use two coats of clear and two coats of color.

For about $3, less its 049 engine, you can quickly build and fly this sturdy control-line trainer.

HOWARD C. MOTTIN

SO you want to fly control-line models? Then try a rugged Small Fry for an easy, economical way to start. The parts for the basic model, namely the two pieces of ⅛-in. balsa, can be bought for under a dollar. The rest of the hardware items can be purchased for around $1.00, making the price for the works (less engine) around $3.00, including paint.

A ½A or 049-size model can be difficult to fly because of its small size, and because it flies on shorter lines. Contrary to popular belief, larger models, say a 35-size, are a lot easier to fly, but they are also a lot more expensive. Thus, thousands of inexpensive 049 engines are sold every year, only to be stored in a drawer when the first building project ends up in a pile of balsa, or worse yet, is never completed because of the building time involved.

The first thing to learn in the model plane hobby is to take enough time to perform each step properly. Something left undone or hurried over will end only in disaster. If you follow the construction steps in this article you will end up with an airplane that does fly well.

This model was test-flown by my 5-year-old daughter! It did take a few crashes before she flew successfully. We went through five versions before we came to the final one, which is a cinch to fly. If set up as described, it will fly for anyone. Another favorable point is that it is rugged enough to survive a few mishaps, and easy to repair or rebuild. Simple parts make it easy to repair. But in case of a total break-up it's not hard to build a new one reusing the same hardware. The important thing is not to become discouraged if your first few attempts at flying result in failure. Remember that even those of us who have been flying for years crash occasionally.

You will crash occasionally when you are starting out. Remember what you did wrong and correct the mistake on your next flight. Not to scare anyone away, these are just facts. It is possible to fly successfully right from the start. All that is required is to remember two controls, Up and Down. In between these is Neutral — where the plane should be flown. It's that simple. Just give a little up to take off and, once airborne, come back to neutral and fly the whole flight.

Now let's get started. First requirement is the Cox 049 engine. I bought a Cox Baby Bee for my model. I also used an old engine from a long-gone plastic model. If you already have an engine you're all set. If not, I would recommend purchasing a Cox Baby Bee or Quiet Zone engine. These are available almost everywhere from hardware stores to department stores and at all hobby shops. While you're at the local hobby supplier buy the rest of the materials on the list and you are ready to start building.

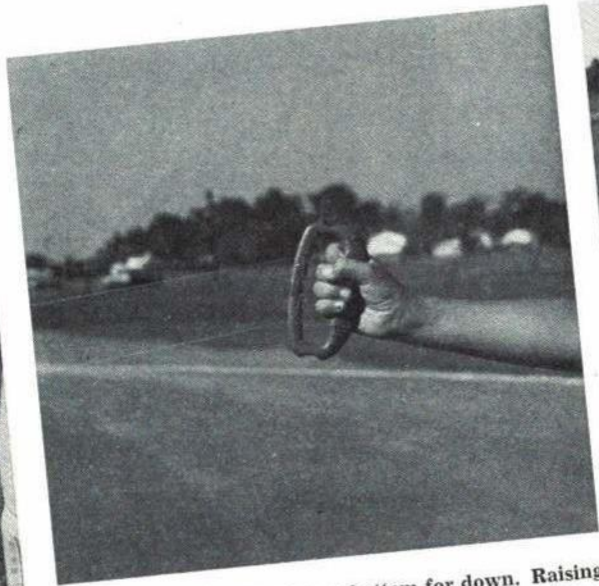
A brief note on the balsa wood: try to get a piece that is not badly warped. Hold the board on its side and sight down the long edge. In this way you can see all the bends. Pick a board that is fairly flat or that has a gradual curve, not one that looks like a roller coaster.

Besides the building supplies on the list there are a few other items you will need. If this is your first building project, you will need a knife (X-acto No. 8 will be adequate), glue (Testors B, Ambroid, etc.), a pack of model "T" pins, and a straight-edge (this can be the metal edge of a common dime-store wooden ruler). Other items are pliers, wire cutter, building board and sandpaper. An optional item that is nice to have but not mandatory is a carpenter's combination metal square. It can be purchased for under $1.00 at just about any hardware department. It also can be used as a straight edge.

Construction: Lay out all the parts on the two ⅛" balsa sheets. A ball-point pen is used to draw these, but do not press too hard. The sketches show how to lay out these parts. It will help to number the nose-pod pieces to avoid confusion. The dimensions for the various pieces can be obtained from the side and top views on the plan. When drawing the lines across the sheets, use the square to keep these perpendicular to the sides. When the layout is completed, cut out all the balsa parts using a sharp hobby knife. A large balsa piece will be left over. Save this for repairs or your next plane. We are now ready to begin assembly.

I usually build the fuselage first and, while this is drying, work on the tail or

How you hold control handle is important. Keep your arm straight at all times. Lift arm for up, lower for down. Level is neutral.



Line on top is for up, line on bottom for down. Raising your arm causes pull on up-elevator line and releases the other line slightly, causing the model to climb.

Down-elevator is the opposite of up movement. Positions are a bit exaggerated here. Arm motions only prevent over-controlling.

wing assemblies. Lay down a small piece of wax paper (approx. 12" square) on your building board. This will prevent the parts that will be glued together from sticking to the board. The first step is to glue the two fuselage sides and the front center (No. 1) piece together. Spread a liberal amount of glue on both sides of the center piece and put a small bead of cement on the tail end of one fuselage side. Then put the three pieces together and pin down to the board on the wax paper. Put four pins through the front section to the board, checking the alignment of all three pieces at each step. Pry up the tail end of the fuselage side next to the board and put a toothpick under it, so it is approximately 1/16" off the board. Pin the tail ends together with two pins.

While this is drying you can start assembling the two outside pod pieces. Take four round toothpicks and cut off to the length shown on the plans. Now lay pieces No. 4 and 5 on the building board with the dotted lines up. The dotted lines should be 3/16" from the top and 1 1/16" apart. Using just the point of the knife at an angle of approximately 45 degrees with the piece, cut triangular grooves in these pieces centered on the dotted lines. Do this carefully, taking several small cuts. Measure the groove between these cuts, using the cut-off toothpick as a gauge. Stop when the toothpick just fits in the groove and the top edge is flush. Put the toothpicks in the slots and place the No. 6 or 7 piece on top and check the protruding part of the toothpicks for alignment, using the engine mounting holes for a gauge.

If everything checks out, glue these two assemblies together. If everything was not right, make a new piece from the scrap-balsa piece. Use a liberal amount of glue in the grooves to glue in the toothpicks and pin these two assemblies down to the board to dry. Check the alignment of the front edges to make sure they are flush and double-check the toothpicks with the engine.

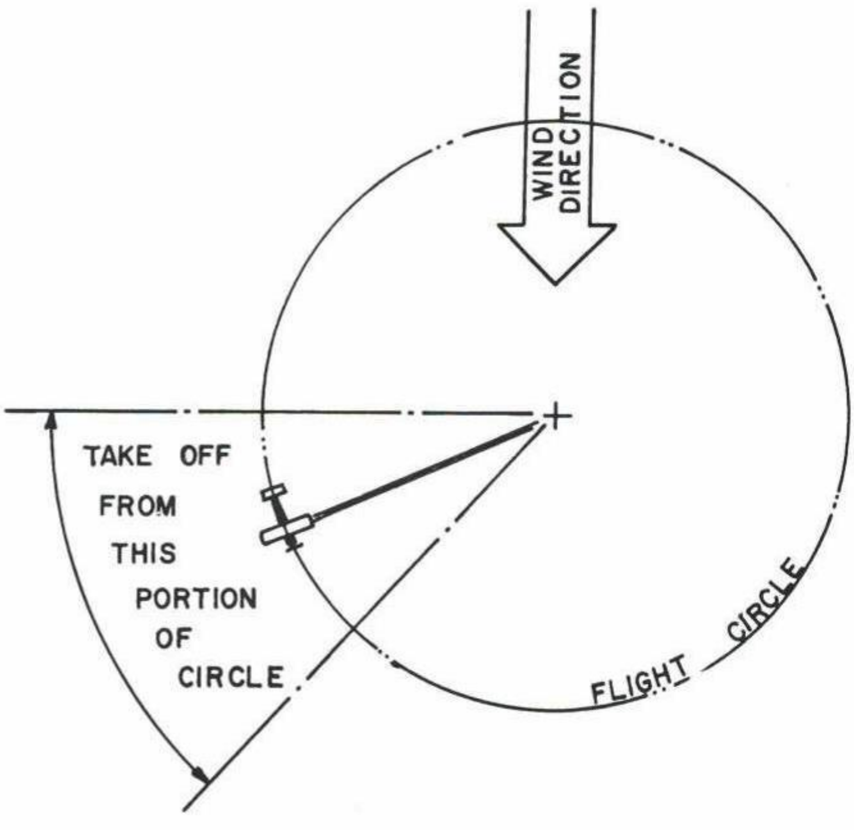
Now take out the two pins in the front end of the fuselage assembly and glue the No. 2 piece flush with the front. Unpin the entire fuselage assembly after the glue has dried. Place the No. 3 piece and the 7-5 assembly and 4-6 assembly on the fuselage and hold the front end with one hand. Use the engine mounting holes as a gauge once again and check the mounting alignment. Chances are that the pins will be too wide apart. But if the engine slides on, go ahead and finish the pod assembly. If the engine

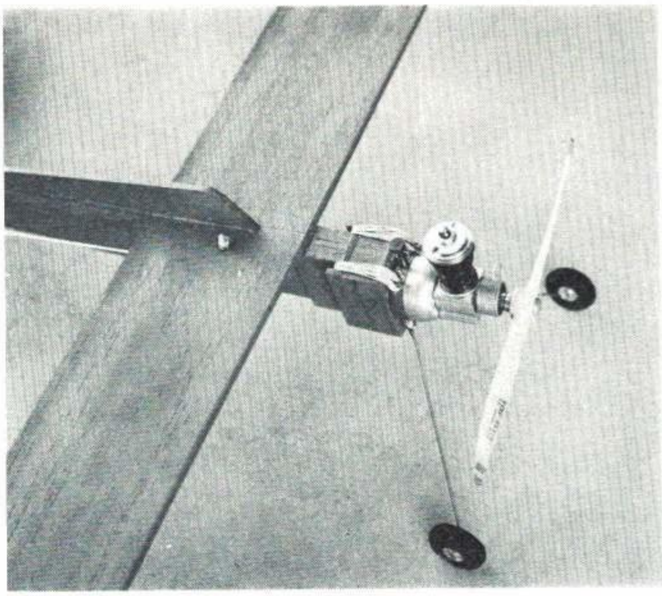
Continued on page 55

MATERIALS LIST

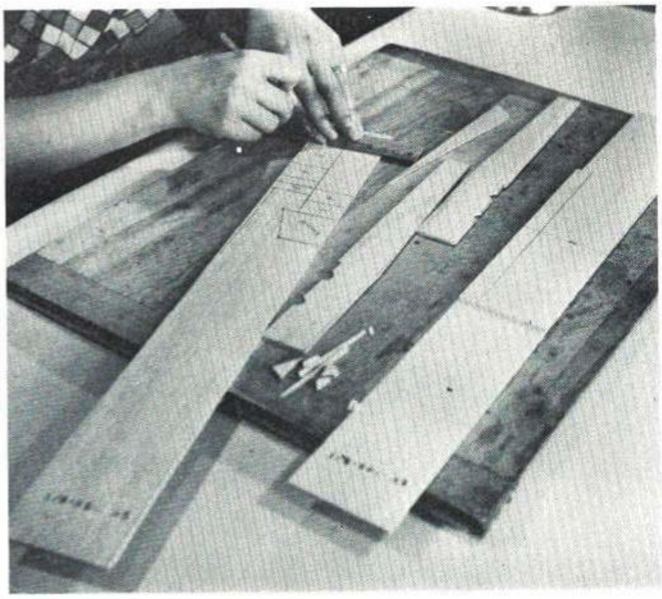
Two sheets 1/8 x 3 x 36" balsa
One piece .045 dia. x 36" music wire
1/2A Bellcrank, Perfect #233
1/2A Control horn, Perfect #234
1/2A Lead out eyelets, Perfect #236
Small cloth hinges, Perfect #202
Wheels 1" dia., Perfect #62

Miscellaneous: Round toothpicks, thread, small rubber bands (size 16), dope (fuel-proof), thinner, brush (1/2 or 1/4"), Goldberg 1/2A handle with Dacron lines.

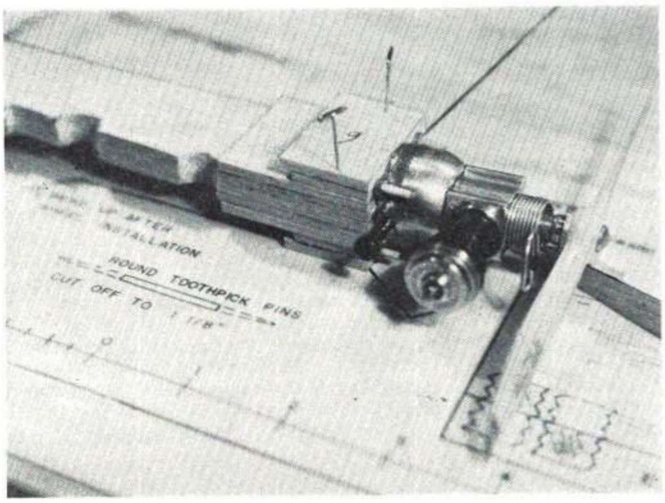




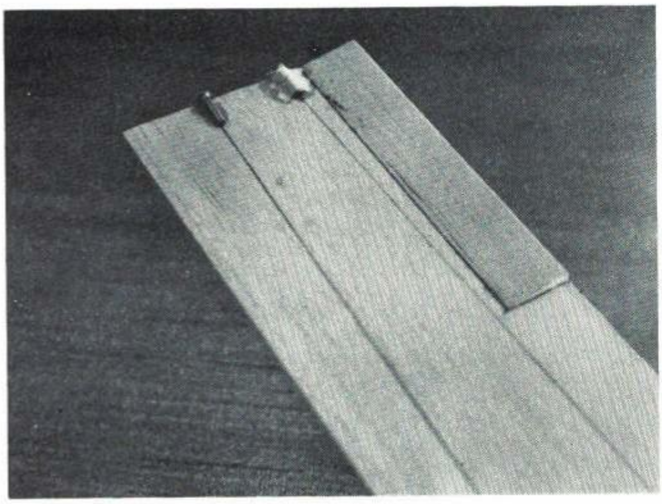
Engine is held in place with rubberbands looped around the mount and toothpick sections which key the motor on the nose. It will come off harmlessly in a bad crash, but is secure in flight.



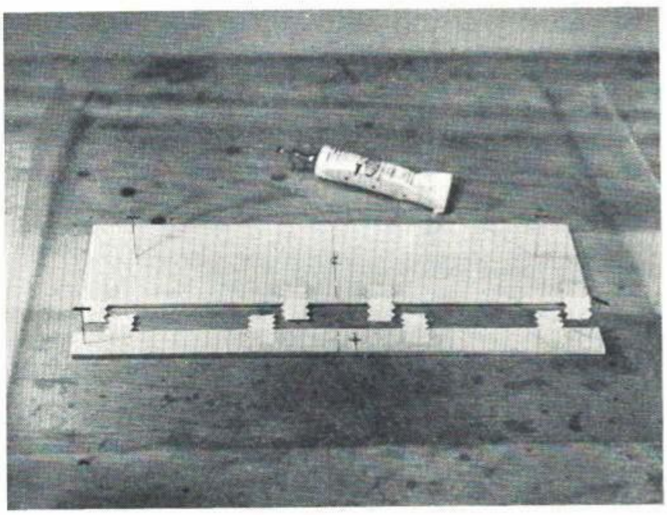
Construction begins with cutting the parts out as per the plans. Only two sheets of balsa are needed, model airplane glue, sharp knife, ballpoint pen, and soft building board.



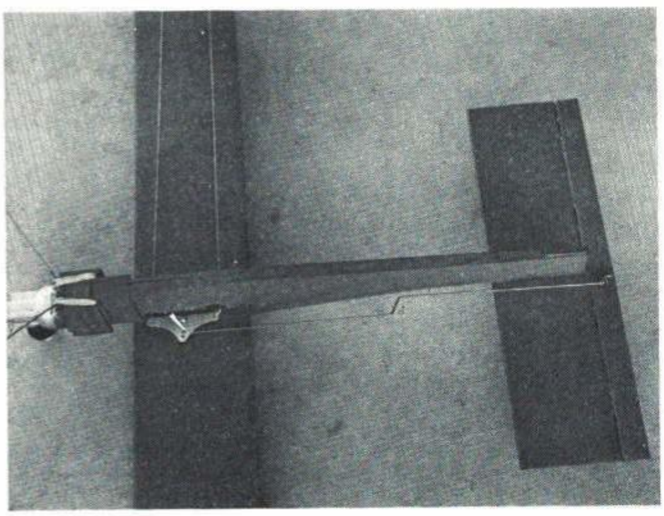
Put the engine on the toothpick studs to keep them properly aligned while assembling the nose doublers. Be careful to keep glue out of the intake screen on the rear of the engine.



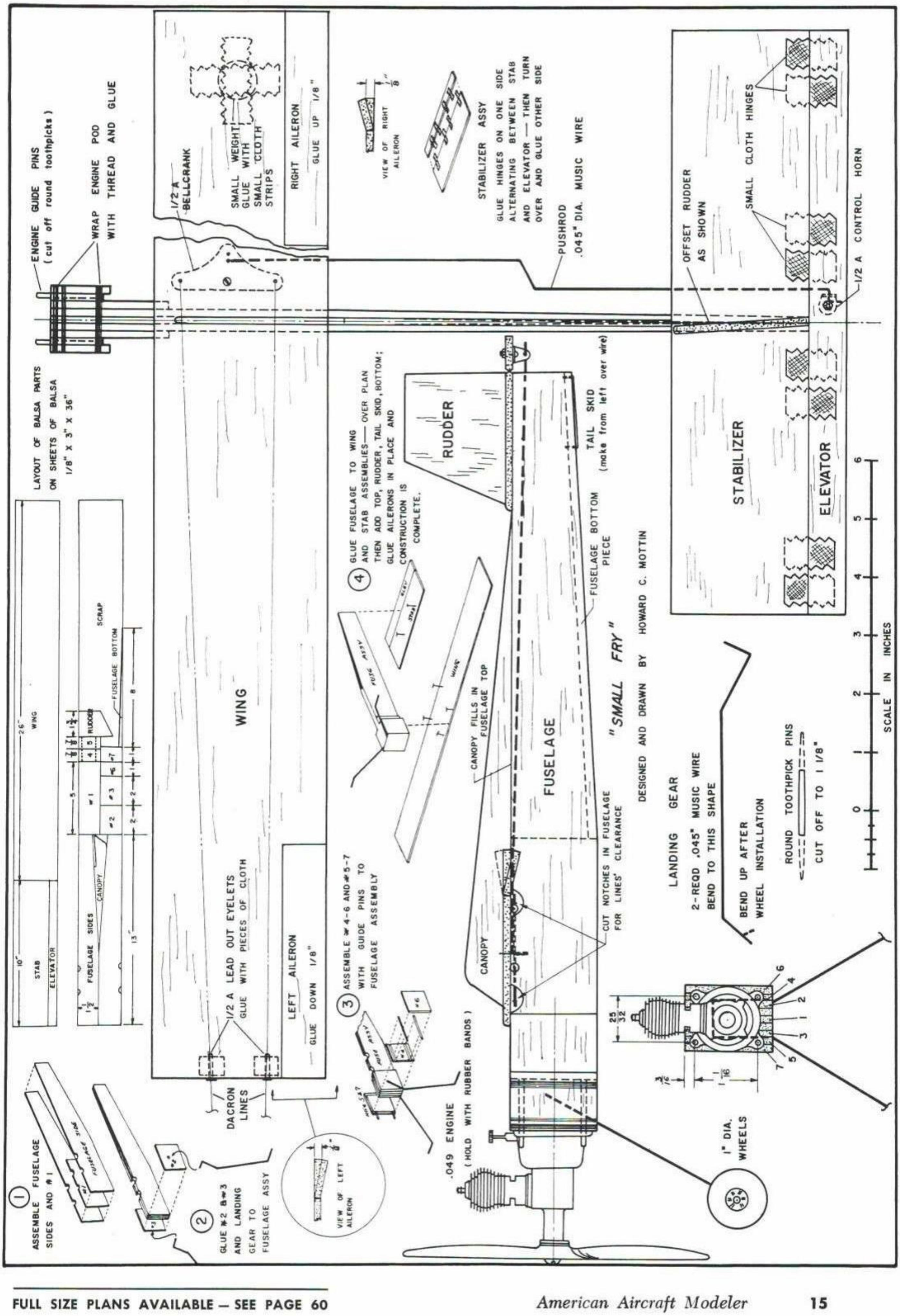
Leadouts from the bellcrank leave the inboard wing tip through eyelets or short lengths of tubing. These must be securely glued and gauzed to the wing. Note the aileron position.



Using model cement, glue short lengths of ½"-wide pinking tape to the top side of elevator and stabilizer with plenty of overhang. When dry, fold down and across to opposite half, then glue again.



Wire pushrod between bellcrank and control horn on elevator has a double bend at its middle so that it can be adjusted for neutral elevator position with bellcrank parallel to fuselage.

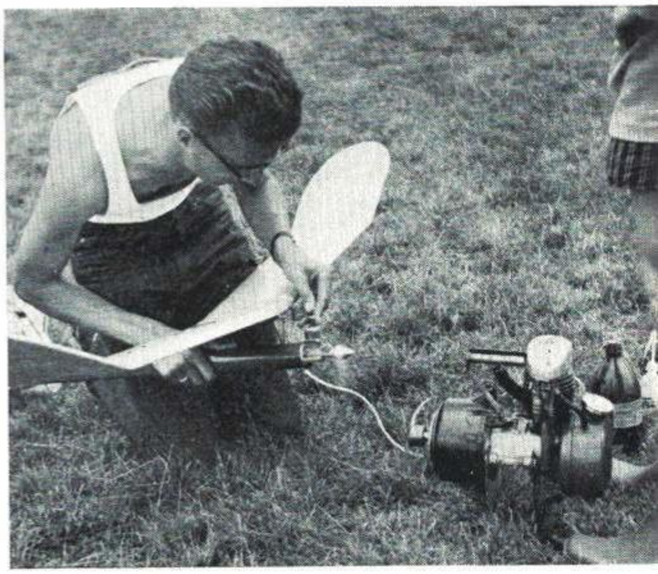


"SMALL FRY"
DESIGNED AND DRAWN BY HOWARD C. MOTTIN
WING
FUSELAGE
RUDDER
STABILIZER
ELEVATOR
CANOPY
LAYOUT OF BALSA PARTS ON SHEETS OF BALSA 1/8" X 3" X 36"
ENGINE GUIDE PINS (cut off round toothpicks)
WRAP ENGINE POD WITH THREAD AND GLUE
1/2 A BELLCRANK
SMALL WEIGHT GLUE WITH SMALL CLOTH STRIPS
RIGHT AILERON GLUE UP 1/8"
LEFT AILERON GLUE DOWN 1/8"
VIEW OF RIGHT AILERON
VIEW OF LEFT AILERON
STABILIZER ASSY
GLUE HINGES ON ONE SIDE ALTERNATING BETWEEN STAB AND ELEVATOR — THEN TURN OVER AND GLUE OTHER SIDE
PUSHROD .045" DIA. MUSIC WIRE
OFFSET RUDDER AS SHOWN
SMALL CLOTH HINGES
1/2 A CONTROL HORN
TAIL SKID (make from left over wire)
FUSELAGE BOTTOM PIECE
CANOPY FILLS IN FUSELAGE TOP
CUT NOTCHES IN FUSELAGE FOR LINES' CLEARANCE
1/2 A LEAD OUT EYELETS GLUE WITH PIECES OF CLOTH
DACRON LINES
.049 ENGINE (HOLD WITH RUBBER BANDS)
1" DIA. WHEELS
LANDING GEAR
2-REQD .045" MUSIC WIRE BEND TO THIS SHAPE
BEND UP AFTER WHEEL INSTALLATION
ROUND TOOTHPICK PINS CUT OFF TO 1 1/8"
SCALE IN INCHES
1 ASSEMBLE FUSELAGE SIDES AND #1
2 GLUE #2 & #3 AND LANDING GEAR TO FUSELAGE ASSY
3 ASSEMBLE #4-6 AND #5-7 WITH GUIDE PINS TO FUSELAGE ASSEMBLY
4 GLUE FUSELAGE TO WING AND STAB ASSEMBLIES — OVER PLAN THEN ADD TOP, RUDDER, TAIL SKID, BOTTOM; GLUE AILERONS IN PLACE AND CONSTRUCTION IS COMPLETE.

Free-Flight: COMPETITON

(frē-flīt), to plan, design, devise and concoct a contest-winner.

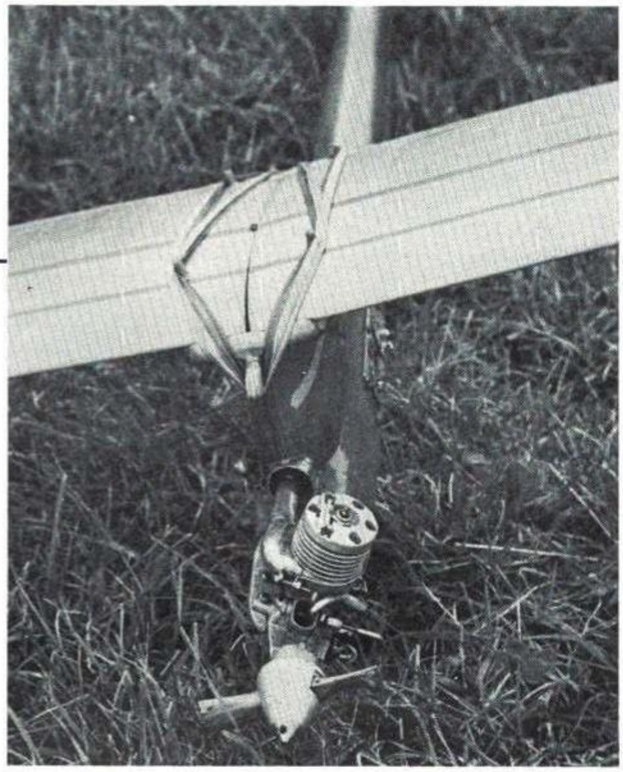
Photos by O. Saffek and Ritsuri Honda

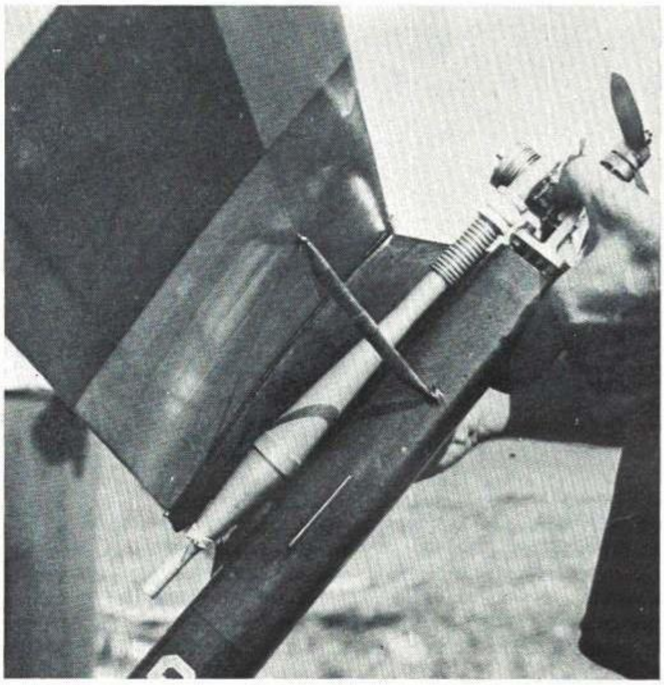


Engines used in FAI Power models can be temperamental, are developed for extremely high-speed operation (over 20,000 rpm) and use thin-bladed fragile propellers. This makes hand-starting a tricky procedure. Current trend is toward use of mechanical starters; hand-cranked, electric, or gas-engine powered. Latter type unit is shown in use by Piet Broerse from the Netherlands — the spinner is pressed against cone-shaped cup on starter.

Photos on left show Italian FAI Power contender by Bruno Fiegl which features a metal forward fuselage with a tail boom held on by rubber bands. Two mechanical timers are used: front for engine cutoff, rear for dethermalizer action — note extreme aft-mounted horizontal stabilizer surface, shown in d-t'd position. Vertical fin is mounted well forward on boom for minimum airflow interference with horizontal tail. Hook-shaped skid below engine absorbs d-t landing shock; flexibly mounted tail boom also helps prevent landing damage. Engine is Supertigre G15, nestled in a smoothly contoured nose cowl with perfectly faired spinner. Extensive use of metal and machined fittings indicate exceptional sophistication of FAI world championship competition models — products of many years of experience in model building and flying techniques.

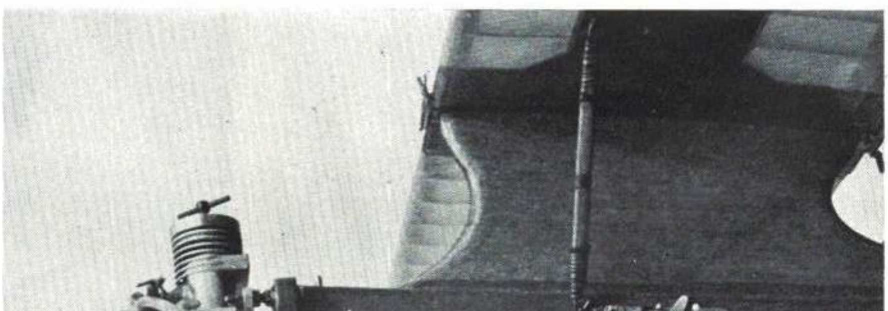
The challenge of Free-Flight is to blend a designer's ideas with a craftsman's skill to overcome the elements of luck and weather; the goal to consistently outperform all others who accept the challenge. It's a worldwide effort, as these pages show, in which the best modelers from all countries compete regularly for the title of world champion. Every two years the Federation Aeronautique Internationale schedules a world championships for three classes of Free-Flight models: *Power*, using a gas engine limited in size to slightly less than 1/6 of a cubic inch in piston displacement and only seconds of operation per flight; *Wakefield*, using all the turns that can be wound into a rubber motor which cannot weigh more than 1.4 ounces; *Nordic*, using a kitelike towline not more than 164 feet in length. No matter which means is used to get any of these FAI class models airborne, the decisive part of the flight comes when the launch power quits — it's the glide which is counted on to stretch the air time to the maximum. But these models don't merely glide — they soar and float; so much so that "dethermalizer" gadgets must be used to force a return to earth. Without a dethermalizer the model would easily fly out of sight. Since the object of F/F competition is to obtain the most flights of a given duration a dethermalizer permits fast retrieval for repeat flights. These photos show what it will be like at the '69 Free-Flight World Championships to be held in Austria this August.

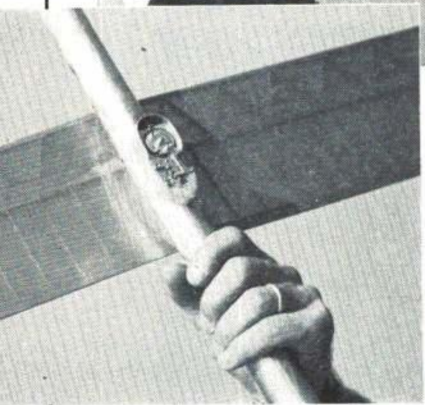




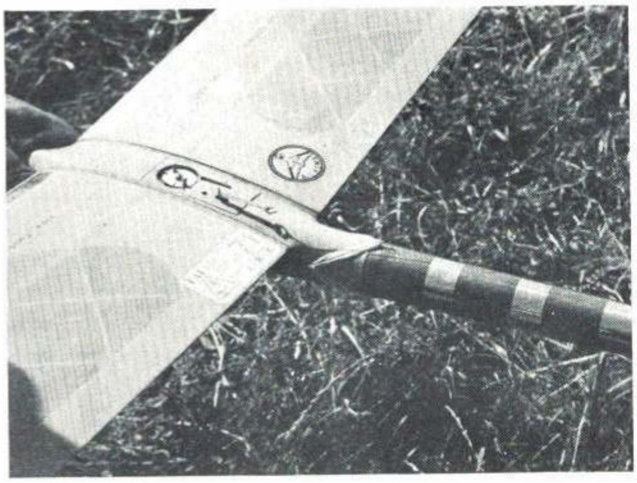
Tuned exhaust extractor pipes are now in common use on FAI Power models. Two examples are shown here. Russian model at left, by Eugeny Verbitsky, has expansion chamber of pipe alongside wing mount. Italian model above, by Carlo Lenti, has pipe through hollow section of wing mount — note engine tilt to allow pipe to be aligned along fuselage center. Note also how rubber bands hold two-piece wing together — good too for shock absorption on d-t landings.

Czechoslovakian Power design by Varoslav Sedlak, while incorporating many typical features of this class model (two-piece wing with struts, nose skid, mechanical timer for engine shutoff) also has some which are unusual: timer is home-made, engine is mounted on threaded studs which permit quick adjustment for down or side thrust. Engine is MVVS diesel, with aft-facing exhaust port. Music-wire bellcrank behind firewall, shown squeezing fuel line for engine cutoff, is triggered by timer release of rubber band.

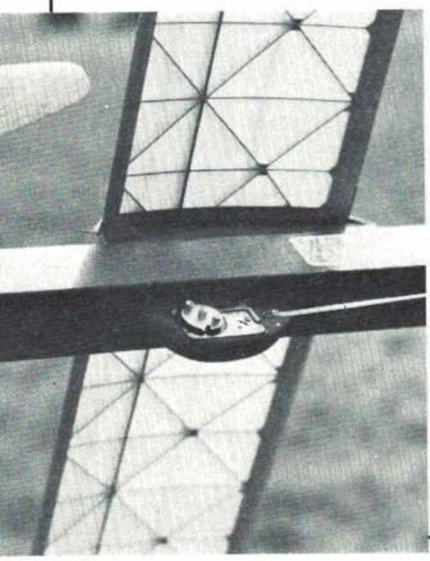




Above and at left, photos show Wakefield class rubber-powered model by Giovanni Casi of Italy, with refinements of design which make for high performance: precision hub mechanism for accurately folding prop to obtain minimum drag glide, long moment arm fuselage with small horizontal stabilizer for stability, light but strong high aspect ratio wing, precision determalizer timing unit in pod below fuselage.



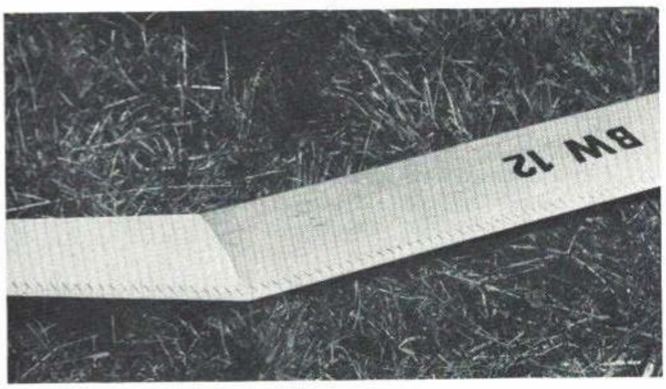
Extremely clean wing-fuselage junction includes dethermalizer mechanism on this Nordic glider (above) by Agostino Cosma of Italy. Detachable tail boom is held to fuselage by rubber bands just behind wing trailing edge.



Another Italian Wakefield model is shown at left, this one by Piero Cervosi. Dethermalizer unit is mounted in streamlined pod which also acts as a skid during landings. The wing shows geodetic structure which many flyers use because it resists warps—accurate flight trim requires straight surfaces. Warps spell trouble.

Well faired folding propeller blends into hexagon fuselage on Wakefield model shown above, by Rene Kieft of the Netherlands. Just ahead of wing leading edge are threadlike lines which are used to turbulate airflow for efficiency.

This Nordic glider is from Luxembourg, by Norbert Mertes. Design uses exceptionally high aspect ratio wing, with turbulator threads strung between leading edge projections. Purpose of turbulator is to prevent airflow separation from wing surface.



Another form of turbulator uses sawtooth pattern of thin wedges which roughen airflow as it passes over wing leading edge. The rough air clings to the wing and helps maintain lift under conditions which might otherwise cause the wing to stall.

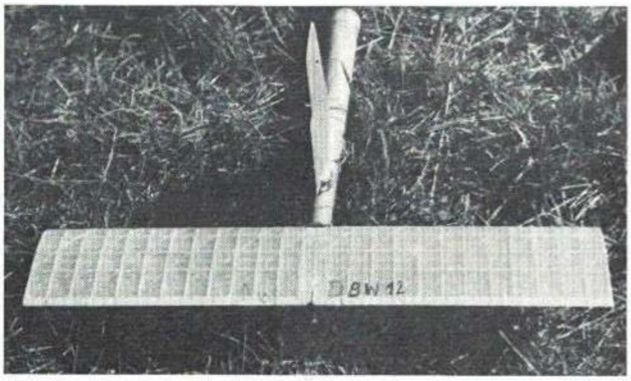
Photo at left shows two positions of folding prop. Lower blade is extended in normal power position, while upper blade is pivoted back in low-drag gliding position. Music wire for prop hub and drive shaft. Model by Hans Martin of Austria.

Upper photo gives closeup view of typical Wakefield propeller details. Hub has music-wire blade pivots and double-hooked drive shaft for rubber motor. Two sets of detachable blades are shown; removable for easy repair or replacement.

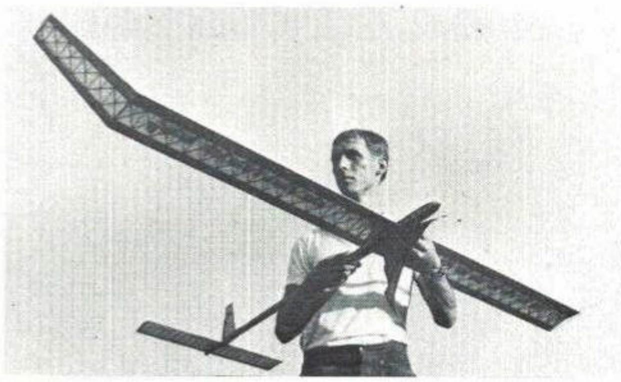
FAI Power model by Claude Zimmer of France has unusual construction feature: diagonal lines on wing surface are fiberglass threads secured with epoxy cement; provides extremely light resistance to warps.

The Japanese are famous for intricate craftsmanship and this Power design by Kuniji Ojio is a good example. His geodetic wing and tail structures feature many more diagonal ribs than are usually seen.

This Japanese Nordic glider shows off the Jedelsky structure which is famous in FAI circles. All-sheet-balsa wing is contoured by triangular-shaped ribs on lower surface. Wing is strong, quick to build, and efficient.



Another example of fiberglass thread reinforcement of surfaces is shown on Wakefield tail by Rainer Hofsass of East Germany. Diagonal threads shown clearly from lower left to upper right. Almost invisible are threads at right angles.



A "classic" European Nordic class glider is shown here by Endre Voros. Because these models do not have power to get higher than their towlines permit, the obvious design emphasis is in the wing to obtain maximum lift.

AERONCA MODEL L SERIES

One of the first truly successful cabin low-wingers to enter the private market, the "L" was another ahead-of-their-time unfortunates.

PAUL R. MATT

TO many aeronautical buffs the introduction of the Aeronca low-wing in 1935 earmarked this design as one of the most interesting and eye-appealing airplanes ever produced. It was then, and would forever be, a classic example of progress in light-plane design and engineering.

The model L series (LA-LB-LC), which followed another classic design by Aeronca, the C-2 and C-3, was indeed a marked departure in private aircraft during this period of time. Not only was the Model L a change of pace for the Aeronca firm but it can well be classified as one of the first truly successful cabin low-wing aircraft to enter the private and commercial market. At the time the number of low-wing aircraft available to the private buyer could be counted on one hand.

Recalling some of these single-engine low-wing machines that appeared in the 1930's is not difficult. The Fairchild 45 and Spartan 7W were large, 4-5 place, rather expensive machines. They had good all-around performance but were costly in operating expenses and intended for the executive transport market. Curtiss-Wright introduced the 19W Coupe, powered with a 90-hp Lambert engine. It was underpowered, suffered aerodynamic problems and was abandoned as a commercial product.

The 70-hp Aeronca cruised over 100 mph, with range over 500 miles and initial climb of 600 ft. per min. Similarly powered planes 30 years later have not bettered this performance. Landed at about 45 mph.

The Kinner Envoy-Playboy, Bellanca Junior, Dart G and Culver Cadet series of the late 1930's were of a better breed in the lightplane field. Most became quite successful. The Ryan SC of 1938 was about to make inroads but World War II intervened. Generally speaking, it can be said that the cantilever, low-wing aircraft was pretty well reserved for the military and transport field prior to the war. The Aeronca thus stands out as a pioneering design and a bold thrust into the future, for it was a 1935 production machine.

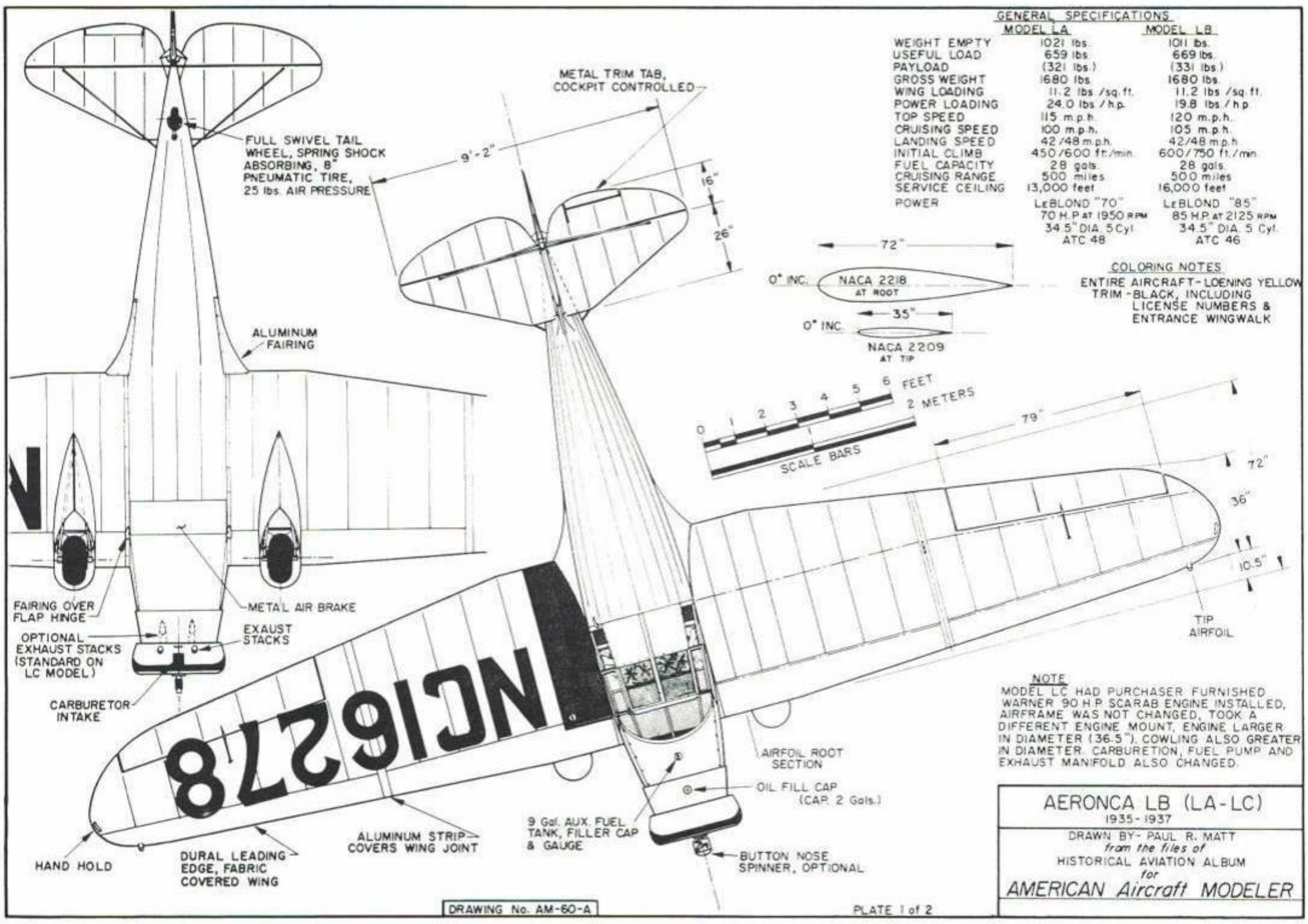
The Aeronca low-wing was designed by Giles E. Barton. The first of two prototypes was produced in the fall of 1935. Final general-arrangement drawings were completed in October. The first plane, X 14558, rolled out of the Aeronautical Corp. of America's plant in Cincinnati, powered with the standard Aeronca E-113 40-hp horizontally opposed, two-cylinder, aircooled engine. This was the same powerplant used on all preceding C-2 and C-3 models. It seemed fitting and economically advantageous to employ the same engine in the new low wing design — a decision made by the executive department over some protests of the design engineer.

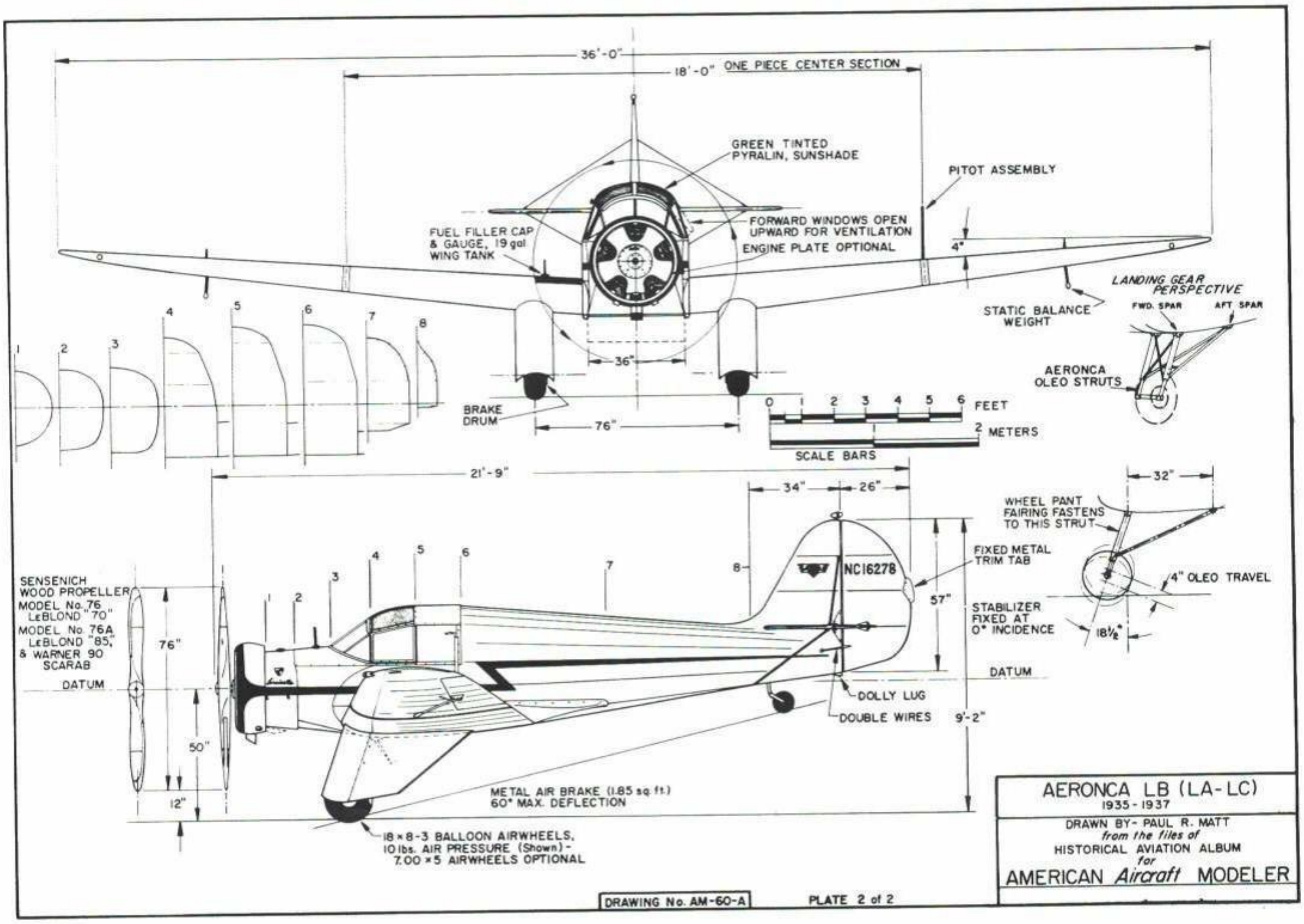
The aircraft, although of new configuration compared to what the company had been building, was nevertheless conceived as a light-weight two-place machine. Initial studies appear to have confirmed the fact that the E-113 would render sufficient power. In practice the combination proved otherwise. The prototype was pitifully underpowered. A few abortive hops were reported in which the plane staggered into the air for a few brief seconds and then fluttered back to earth with a resounding bounce.

The plane was immediately modified to accept a larger and more powerful engine. The 70-hp LeBlond radial was chosen. The five-cylinder aircooled engine had proven its reliability, low cost upkeep, honest output, and being locally manufactured, was readily available.

The new plane now weighed around 1,650 pounds, quite a bit more than Aeronca was used to. The high-wing C-3 weighed in at the 1,000- to 1,010-lb. mark. The E-113 engine was adequate for these "powered gliders," as they were often called. With the low-wing, however, certain aerodynamic features come into play which are different. Here the C.G. becomes more critical and there isn't the pendulum weight of a fuselage hanging below the supporting surfaces to render some inherent stability. The LeBlond engine provided nearly double the power of the E-113 and, with this, the low-wing model proved highly successful.

Once a balanced power-to-weight ratio was established, the plane was reworked, streamlined and faired out into more appealing lines. By the end of the year the





second machine was brought up to "production line" standards and, after extensive testing, manufacturing and sales promotion got under way.

Construction of the model Ls was conventional for the day. The fuselage was of welded chrome-molyldenum steel tubing, faired with plywood bulkheads and stringers and fabric covered. The Aeronca triangle steel-tube method of construction was employed for the basic framework. Aluminum was used for covering between the engine and firewall. The engine was cowled with a Townend ring-cowl and a full engine-crankcase fairing plate was employed to assist in smooth airflow between the cylinders.

The wing was built in three sections. The center section was exceptionally long, measuring 18 ft. Two spruce box spars were used and the ribs were of truss type construction. Double drag-wire trussing was used throughout. The leading edge was of dural. A 19-gal. gas tank was situated in the center-section just right of the fuselage. A second tank of nine-gal. capacity was located just ahead of the instrument panel in the fuselage.

The fuselage itself was clamped to the center-section, making these two components an integral structure. The wing-tip sections had solid spruce spars, truss-rib construction and double drag-wire trussing. The entire wing was fabric covered. The outer sections were joined to the center section by four tapered bolts. An aluminum fairing strip covered the joint. The wing was exceptionally rigid and torsionally stiff.

The ailerons were of built-up dural channel sections, riveted together and fabric covered. These were attached to the rear spar by three piano hinges. A static balance extended below and forward of the control arm on each aileron. (See the drawings.)

Tail surfaces were of welded steel tubing and fabric covered. The fin was built integral with the fuselage framework. The stabilizers were interchangeable, rigidly fixed to the fuselage and wire braced. The left elevator had an inset dural trim tab which was operated from the cockpit by means of a cable control.

The landing gear had twin Aeronca-developed oleo struts. There was sufficient room between the parallel struts to accommodate airwheels of 7.00 x 5" to 18 x 8" size. The wheels were equipped with brakes, operated through a Bowden wire to the control in the cabin. Large full-skirted aluminum fairings formed classic wheel pants.

The cabin was upholstered and soundproofed with Sealpac insulation. The extra large entrance door was located on the right side only. The small windows on each side of the cabin could be opened for ventilation. The overhead windows were tinted green pyrolin to act as a sunshade, but still provide exceptional upward and rearward visibility. Seating was side-by-side with dual control sticks and rudder pedals. Each set of controls had individual cable systems and were not a "throw-over" method or interconnected at the cabin juncture.

The rudder pedals were adjustable and acted as brakes when a hand lever at the right of the pilot was pulled back. This hand brake also acted as a parking brake, being interconnected with the wheel-brake line and rudder pedals as a single backup system. The instrument panel was finished in a black crackle paint to minimize glare. Although these ships were seen in various color schemes, the standard finish was overall Loening Yellow with black trim.

Normal VFR flight instruments were included in the standard price, along with seat cushions, fire extinguisher, log books, first aid kit and wiring for navigation lights. Special equipment, optional at extra cost, were such items as navigation lights, retractable Grimes landing lights, flares, cabin heater, radio gear, engine starter and a metal "air brake," better known today as a landing flap.

This air brake, made of heavy-gauge aluminum, was situated between the landing gears on the under surface of the wing at the forward or main spar line. It was adjustable, from zero through 60 degrees, from a spring-loaded lever in the cockpit. It was a mechanical system. The flap increased the steepness of the glide during landing without increasing the forward speed. This caused altitude to be lost rapidly for short-field landings and still have the aircraft fully under control at all times thus eliminating, for the most part, any need to fish-tail or slide-in during approach. This same idea, method and system was used a few years later on the Ryan SC. (See American Aircraft Modeler, July 1968.)

Aeronca offered three versions of the low-wing during 1936. The first was the LA, powered with the 70/75-hp LeBlond S-E-70 engine. The second was the LB, with the 85/90-hp LeBlond S-F-90 for power. A third model, the LC, was powered with the customer-furnished 90-hp Warner Scarab engine.

The reason for the stipulation "customer furnished" Warner was that this engine required a different engine mount. It was larger in diameter, had a different exhaust manifold and carburetion system, and these features had to be accounted for as the airframe was being built. In choosing an LC model, the customer automatically or-

Continued on page 72

Messerschmitt Bf-109

This warbird is based on a 45-powered stunt plane which was designed for fast building and flying at high-altitude locations. Author is U. S. Air Force Academy student who happens to like 109's.

Scale-like German fighter of WW-II stunts like crazy, is realistic enough to land in winner's circle.

IVAN MUNNINGHOFF

EVER since I was old enough to appreciate the differences between one airplane and another, I've had a soft spot for the Messerschmitt Bf-109. To me, it's the epitome of what a fighter plane ought to be. Long, lean, and mean, yet efficient looking with pleasing lines.

Since I started flying proportional, I've always wanted a 109 of my own. I decided to modify one of the local popular Class III designs because I knew it would fly well, and I liked the strong and simple construction techniques. All I was after was a good flying weekend airplane that just *looked* like a 109. It wasn't supposed to be a scale model. However, I took it along to this year's Mile-Hi R/C contest in Denver to fill the time between Class III flights. I accomplished nothing at all in Class III but got a third in Scale. What it lacked in scale appearance it more than made up for in flying. At the meet in Wichita, Kan. late in June, it got the highest flying points of all the entrants in Scale.

Two of these 109's have been built so far. Both are great performers. The spread-out landing gear makes takeoffs different but not difficult. Landings are simple. You'll never miss a spin — it just pops in and out, but only when you want it to. The dihedral makes it quite stable even at slow speeds. Build one — you'll like it.

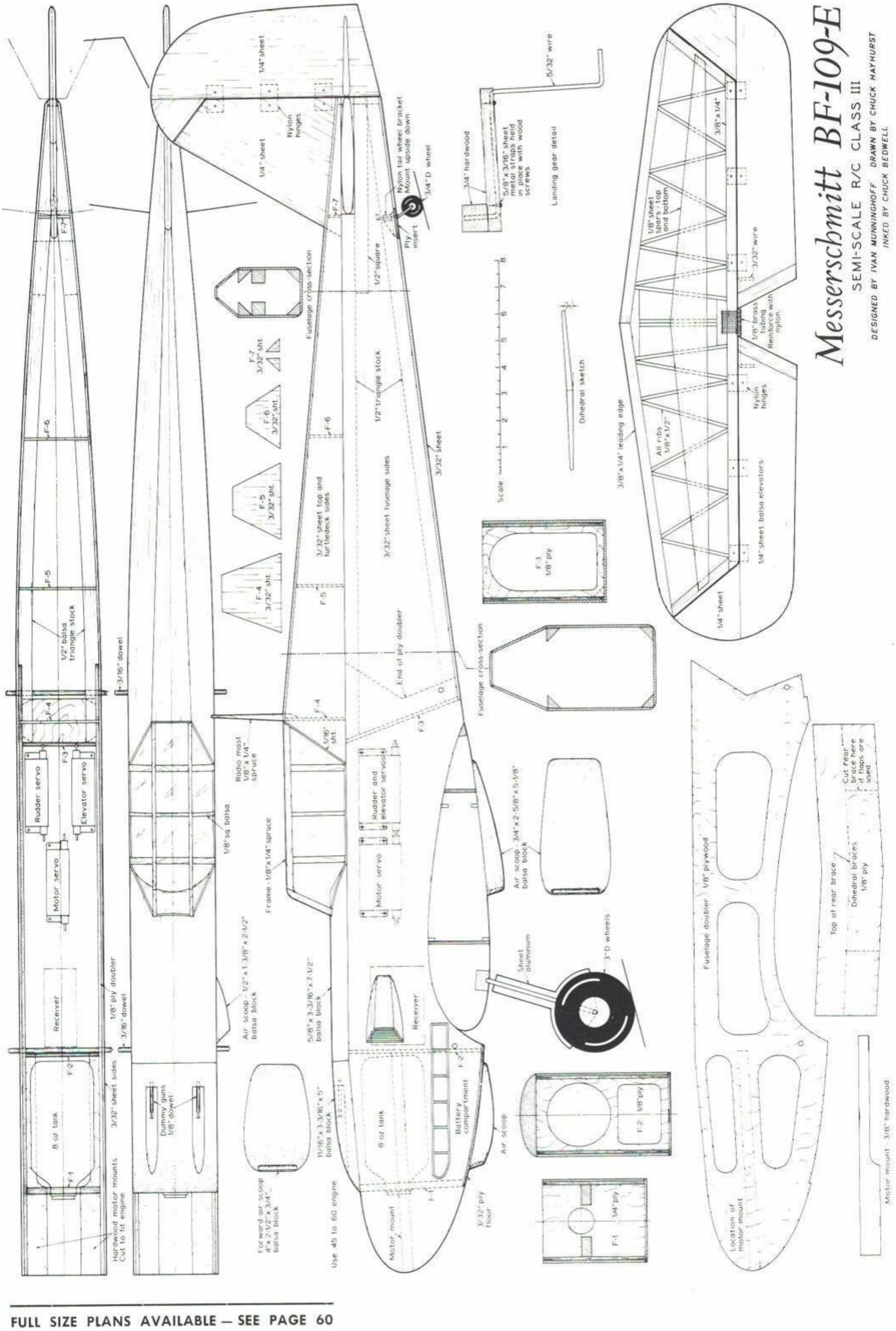
Wing: This is the easiest part of the plane, and probably the most gratifying because you get such nice results with so little effort. Start by cutting out the plywood templates. Use a piece of styrofoam that is 31" long for each panel. To get the right taper, stagger the leading edge of the tip template back 1½" from the tip of the root template, so that the leading edge will be swept back a little bit. Cut out the two panels. Cut off the trailing edge squarely so that it will fit a ½" by ⅜" trailing edge.

With a Moto-Tool, cut out a full-span notch on the top and the bottom of the surface for a ⅛" by ¼" hardwood spar. Next, cut a full-depth notch for the two plywood dihedral braces. Glue in the spars and the trailing edge along with a piece of scrap-balsa ⅛" sheet tip rib on each panel to make the covering easier, and to protect the tips from one-wing-low landings.

Decide whether you are going to use strip ailerons or a conventional setup. If you're going to cut out flaps and ailerons, do it now. Cover and hinge them any way that you like. Install all the linkage before covering the rest of the wing, and make sure that everything works smoothly with no binding and no slop. Slop will allow fluttter which will tear the surfaces off. Follow the notes on the plans as to methods or installing the linkages. If flexible cable is used, make sure that the cable fits the tubing well, especially around corners. Small solder globs work well to keep things tight.

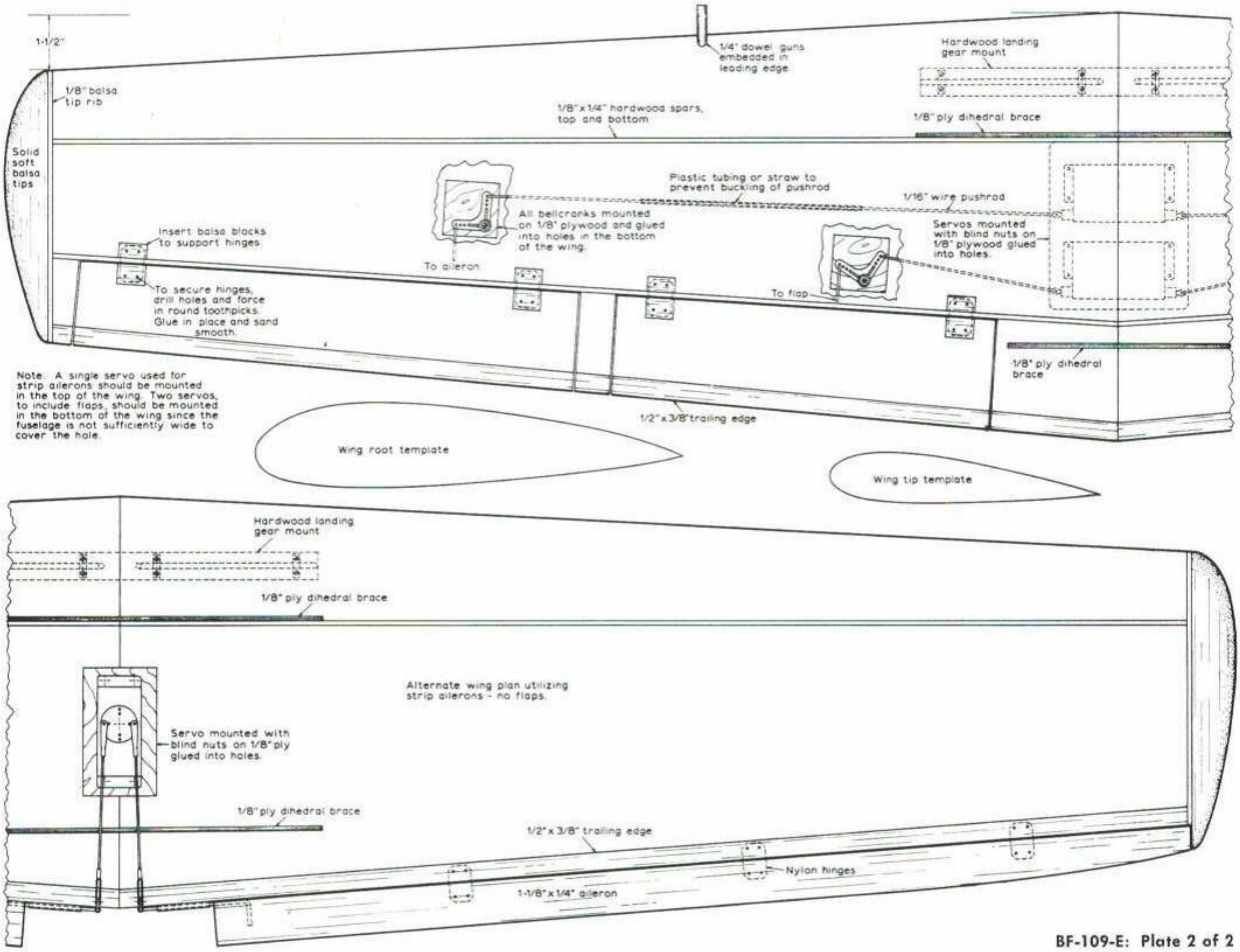
Sand the whole panel smooth. Cover each

This version of the 109 has the engine side-mounted and uses strip ailerons. Flies just as well as author's built-in aileron plane.



FULL SIZE PLANS AVAILABLE — SEE PAGE 60

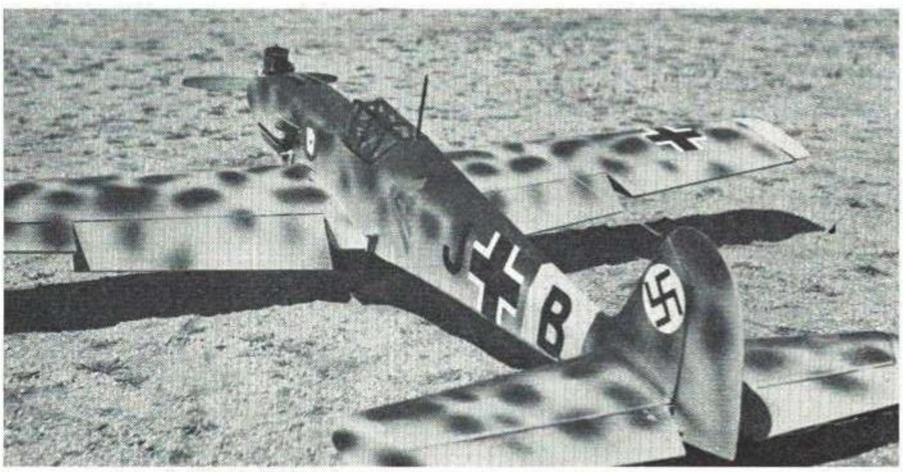
FULL SIZE PLANS AVAILABLE — SEE PAGE 60



BF-109-E: Plate 2 of 2

one individually with poster paper called "Chromecoat." The technique is the same as if you were covering with thin balsa or veneer, but this stuff is lighter and gives an automatic glossy, fuel-proof finish. The cover paper is quite glossy. Sand it with very fine sandpaper before painting, or the dope will chip off. Also, it's strong, but don't hit it with a sharp object — it will puncture. If you do get a hole, seal it well; as you must at the tips, the trailing edge, and anywhere else that fuel may seep in because the paper will soak fuel residue, discolor and rot it.

Install curved wing tips and a hardwood landing gear mount. Make the landing gear from 5/32" music wire, making sure that it is bowlegged as on the real plane. Use sheet-aluminum landing-gear doors. Anything else will be wiped out taxiing through grass. As per the plans, the oil coolers and the supercharger inlet are blocks and the machine guns are dowels. Try to keep the wing light. It is easy to pick up a lot of weight quickly if you are not careful, and your 109 will perform much better without the extra pounds.



Is this for real, posed on a North African air strip ready to go hunting? Nope, just Ivan's model airplane waiting its first flight. Wood dowels make good machine guns.

Stabilizer and rudder: These are simple and strong. Build the stab on the plans, all but the bottom spar. This assures that it will be straight. Don't pick it up until it is thoroughly dry. Cover it with Silron. The rudder is made of solid sheet. You might pick up a couple of extra scale points if you cambered the rudder to offset torque the way the original 109 did.

Fuselage: Start out by cutting out all the formers, fuselage sides, and doublers for the fuselage. Contact cement the large plywood doubler to the 3/32" balsa sides, being careful to make a left and a right. Then, after figuring out where all the formers are going to go, put in the 1/2" triangle bracing along the back end. Double-glue both motor mounts and all the formers and locations for all. Locate the mounts on the fuselage sides carefully. Before these are completely dry, glue in all three formers and the tank compartment floor. Clamp the whole assembly tightly, making sure there is no twist, and that it is square and true, using the tank compartment floor as a guide. When all this is dry, bring the two halves of the tail together and glue, making sure that there is no twist here either.

The bottom of the nose (the battery compartment floor) should be sheeted with 3/32" plywood to keep the chin from getting

Continued on page 61

Aerodynamics Simplified

Almost anything will fly, but it will fly better if you understand basic aerodynamics. This article is written for all modelers—without engineering double-talk.

RON ADAMS

AIRCRAFT modelers are a strange breed. Countless hours and dollars are invested in building a contest model. No stone is left unturned to re-work an engine for top rpm. Complicated fuel systems are designed to feed exotic blends of chemicals into the combustion chamber. In stunt, three weeks of airframe construction are a mere prelude to three months of finishing and lettering.

Finally, all this effort and time and money is taken out to the flying field. The engine is revved up. The plane takes off and staggers through the air. Right away I hear someone scream, "What do you mean? Everything I build flies like a dream!"

I agree. It flies all right, but from the point of view of what might be, the dream, in most cases, is more like a nightmare. The big question to answer about the plane is this: How well does it fly in comparison with what it might do given the best we know about aerodynamics?

We work with a wonderfully forgiving hobby. Almost anything built with some sort of lifting wing will get off the ground. For the average Sunday-afternoon sport flyer this is fine. These people are having a great time, and getting a lot of fun out of the hobby — in some cases more fun than the serious contest entrant.

For those who are interested in contest work, where every last bit of performance is required, something else is needed. This last little bit of performance is what brings home the trophies. To get the most out of our models we are going to have to take a look at a science called Aerodynamics. Science? Well, we can call it that, if you remember that engineers figure everything to the nth degree and then hire a test pilot to see if it works.

The phrase, "back to the drawing board," seems to have come into being about the time of the first airplane. The Theory of Flight is quite accurate for component parts of an aircraft. It is when these parts are brought together that you get some unpredictable interrelationships. Fortunately, most of the larger variables have been worked out. What we are going to do is take a look at ways of using the research paid for by good old Uncle Sam (our taxes), and see if it will help us take home the hardware.

Anything that flies is governed by four basic forces: Thrust, Drag, Lift, and Weight.

Thrust is generated by the engine-propeller combination, or in the case of hand-

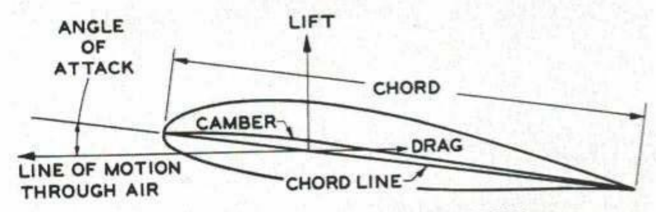


FIG. I AIRFOIL GEOMETRY

To describe any basic airfoil one must be familiar with labeling shown here. Note camber line is midway between airfoil surfaces.

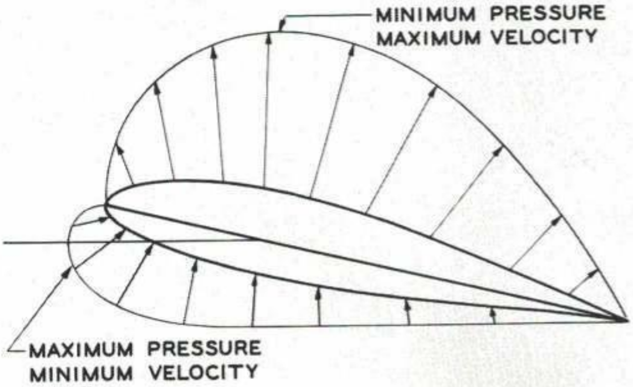


FIG. 2 PRESSURE DISTRIBUTION

How an airfoil lifts, and how much, depends on difference of pressure between top and bottom of wing, speed, and angle of attack.

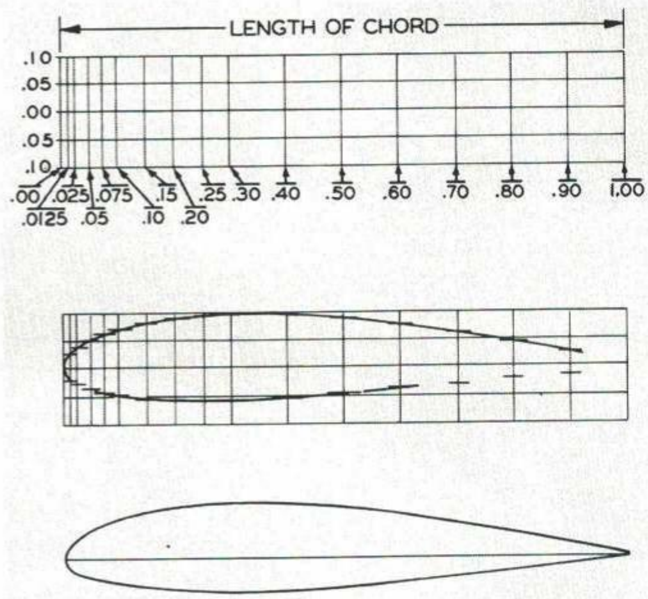


FIG. 3 AIRFOIL LAYOUT

LAYING OUT AN AIRFOIL:

1. DRAW A LINE EQUAL TO THE LENGTH OF THE WING CHORD FOR THAT RIB.
2. MULTIPLY THE CHORD LENGTH BY .0125, .025, .05, ETC., TO FIND POINTS TO ERECT VERTICAL STATION LINES.
3. MULTIPLY THE CHORD LENGTH BY ORDINATE FIGURES FROM TABLE TO FIND THE HEIGHT OF AIRFOIL CURVE ABOVE AND BELOW CHORD LINE.
4. DRAW A CURVE TO CONNECT PLOTTED POINTS.

launched glider, by our arm. Engine size in most cases is limited by the AMA rules for any event. Finding the proper propeller for a given engine and model requires some trial-and-error effort since each case is different. Experimentation pays off here but will not be covered in this article. The effort is worth the trouble, however, since the power output of the prop-engine combination is a major factor in how well the model performs. Thrust is the positive factor that overcomes Drag.

Drag comes from two main sources — the airframe and as a result of generating lift. Airframe, or parasite drag, is the lack of ability to get perfect streamlining in any airplane. There is also the tendency for air to be a little sticky. The layer of air molecules touching the surface of the plane has a tendency to stick to the surface. The next layer of molecules is pulled along by the surface layer, and so forth, until at a small distance from the surface the air is no longer pulled along by the model. This surface drag tends to absorb some of the aircraft's momentum. The other source of drag is induced by generating lift. We will talk more about this later.

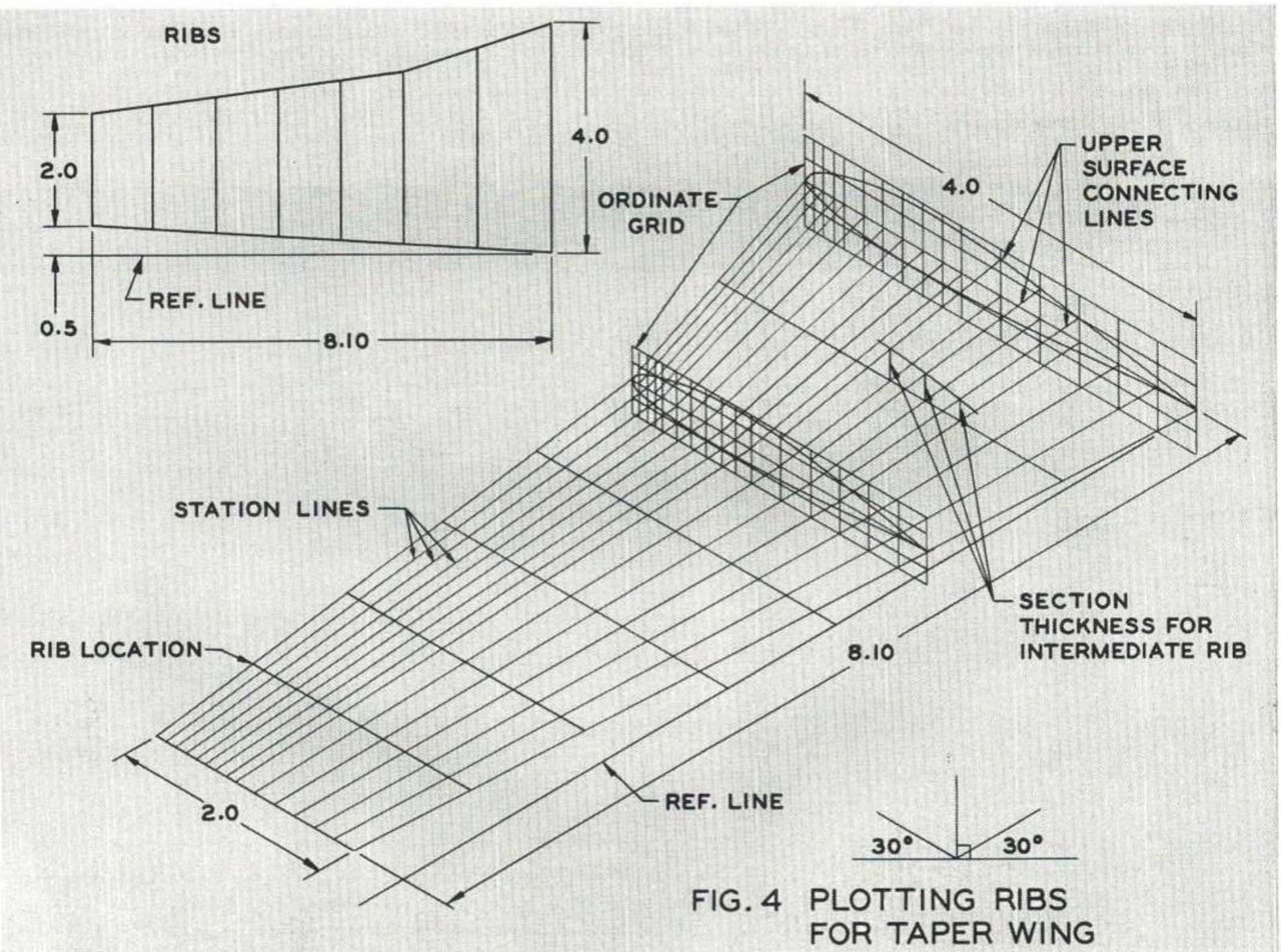
Weight is the result of the pull of gravity on the mass of the model. Gravity, of course, tries to keep the model firmly on the ground. We overcome the pull of gravity by generating lift.

Lift and Thrust are positive forces working for us. Drag and Weight are negative factors to overcome. Lift is generated by changing air pressure on the surfaces of a wing. Let's take a close look at how this works.

For starters, take a piece of 1/8 x 4 x 36 in. balsa. Hold it by one end and swing it through the air, edge on. If there is no angle between the wood and its line of direction through the air, the sheet will move easily without bending up or down. The lack of bending means that no lift, positive or negative, was generated. The only drag was caused by air hitting the leading edge of the sheet and swirling into the area just behind the trailing edge. There was some surface drag caused by the rough surface of the wood. The total amount of drag, however, was really not too noticeable.

Now take the same piece of wood and

Most scale models fly best with the same airfoil and control surfaces as their real counterparts. This 6½-lb. T-28B by Bill O'Conner makes good use of scale flaps.



Using arithmetic one can even plot a double-tapering airfoil-section-changing wing. To layout the airfoil for each rib station, determine the chord, thickness, and airfoil percentage required. Draw the airfoil allowing for wing skin thickness. Make templates.

swing it through the air flat side to the direction of movement. The sheet bends back. In fact, as you may have already found, with enough speed, the sheet will break. In moving the sheet flat on to the air molecules a high-pressure area is built up on the leading side where the air is trying to get out of the way. On the other side of the sheet, a lower pressure is created where the air has not had a chance to move back into the same position it was before. In trying to move into this low pressure area the air moves in a random pattern of eddies called turbulence.

Moving the air from one side of the sheet to the other takes work. This is why it takes more effort on your part to swing the sheet flat on than edge on. Turbulence takes energy to create. This energy has to come from some place and this means subtracting it from the thrust available.

Let's swing the wood once more, this time at an angle halfway between edge on and flat to the air. This time, the end of the sheet will bend up, and the force required to move it through the air will decrease from the time before. By moving the sheet at an angle, called the angle of attack, we have still let the air pressure build up on the leading surface of the sheet (in this case, the bottom) and have a pressure drop on top.

This pressure differential creates a net upward force on the sheet. This difference in pressure between the top and bottom of a wing is as far as the usual explanation goes in explaining the lift generated by a wing. There are other factors, however, that are not considered above, that make one wing and airfoil more efficient in getting this pressure difference.

When we decrease the air pressure on the top of the airfoil we are also doing something else. We are also increasing the speed of the airflow in the low-pressure area. This is according to one of the basic laws of fluid flow, the Bernoulli Principle. Simply stated, an increase in the speed of air results in a pressure drop and vice versa. By the same token the increase in pressure on the bottom of the wing slows that air down. When the top and bottom airstreams get back together the combination of fast air from the top and slow air from the bottom, combine to give a net downward movement of air behind the wing. This is called downwash. Since any action requires a reaction, the downward air movement behind the wing imparts an upward movement to the wing which, of course, increases the lift.

The trouble with a flat-plate wing, such as our balsa sheet, is that the airflow over the top surface is very turbulent at any effective angle of attack. We get lift, but at the cost of much drag. Never-the-less, you can see that even a plank will fly, but not very well. We use up so much thrust in producing turbulence drag, it is not worthwhile.

A trick developed by the Wright Brothers, was that, adding a curve to the plank wing would increase the downwash angle, and help smooth the airflow over the top of the wing. By directing the airflow in this manner, the curved, or cambered, wing would act much like a lever, giving a mechanical advantage in producing lift.

After some years of experimentation, designers found another way of getting a pressure difference even more than found on a simple thin, curved airfoil. They found that, by giving the wing some thickness, they could force the air to travel a greater distance over the top of the wing, thus lowering the pressure ala Bernoulli.

A quick look at most modern airfoils will show how this is done. The Clark Y is a good example. Most of the curve is on the top of the wing, while the bottom remains almost flat. It is very easy to see how much further the air must flow over the upper surface, and thus how much faster if it is going to get back to the same spot after the wing passes.

The beautiful part of the whole thing is that by giving the foil thickness for a good streamline shape, we can also cut down the drag by making the air flow smoothly over the surface. To explain how this turbulence is developed imagine the air flowing past a wing to be made up of thin sheets of glass. You can bend glass a little, but bend it too much and it shatters into little pieces. When the wing moves between the sheets of our imaginary stack of glass, the sheets nearest the wing have to bend most. The further from the surface the less deflection required. As long as the glass nearest the wing is led around it in a smooth gentle manner it will not break.

Suppose the glass has to bend around a sharp corner, such as the top leading edge of our flat sheet. The sheet touching the sharp edge will shatter forcing the next sheet out to grind its way across the broken pieces. This is drag. The same thing can happen to smooth flow if the smoothness of the wing is broken by bumps and ridges due to poor finish or construction. One of the reasons a smoothly planked wing is more effective than a paper-covered job is precisely this.

To summarize, we have seen that a plank, or more technically, a flat plate, will generate lift by moving through the air at an angle of attack. Part of the energy required to move the plank is used to generate lift; the other part is used to overcome drag. By curving the flat plate we can increase the angle of downwash, effectively increasing lift, and can still further increase lift by adding thickness to the plate in such a way as to force the air to travel farther over the top of the wing than the bottom. By properly streamlining the whole thing we can minimize the drag-producing turbulence.

Continued on page 64

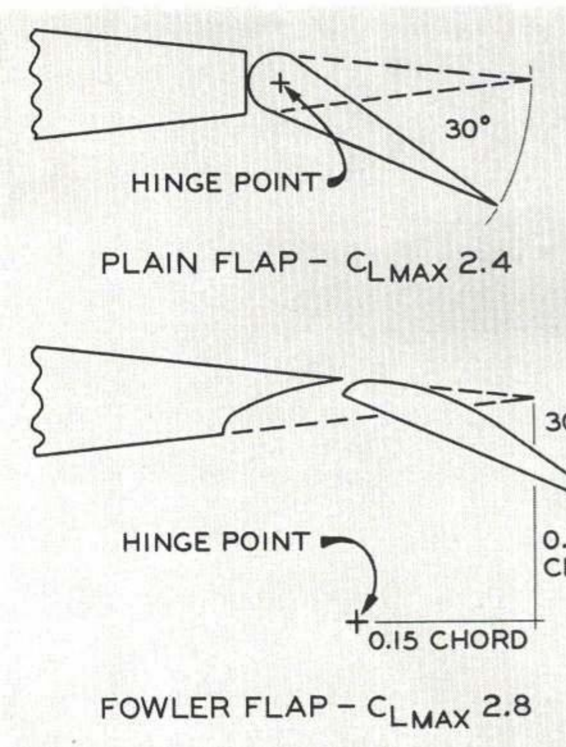


FIG. 5

Plain flap is typical of control surface with hinge locus at the leading edge. Highly efficient Fowler flap moves out and down about hinge locus below the flap.

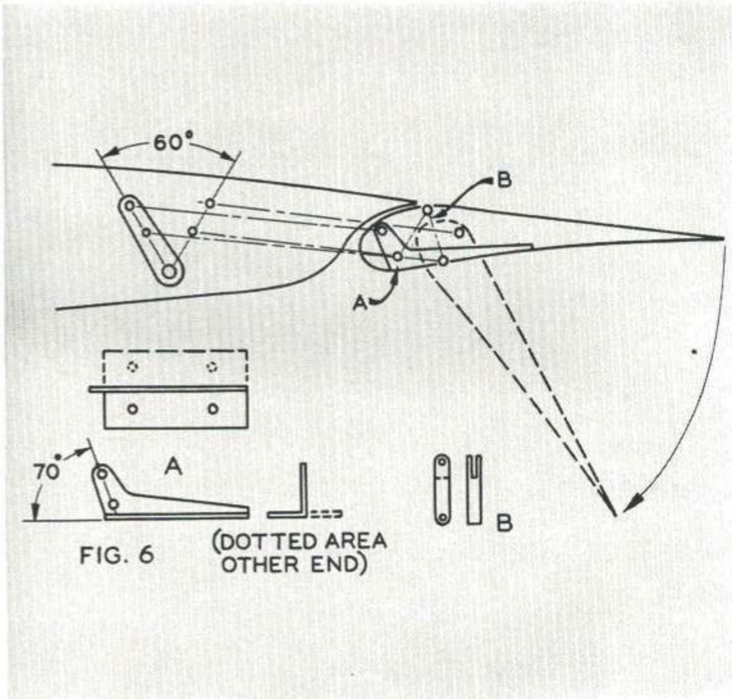
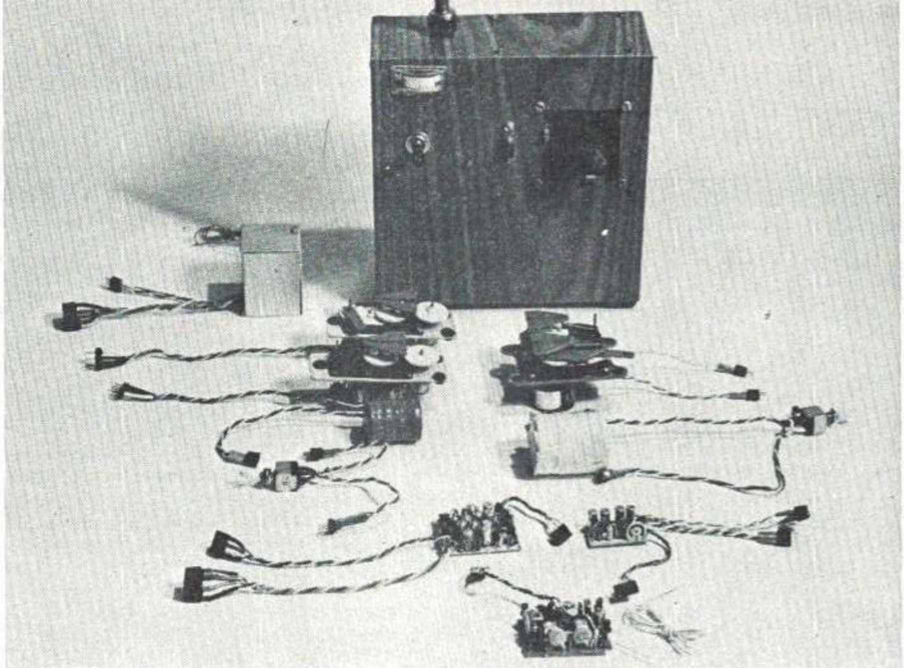
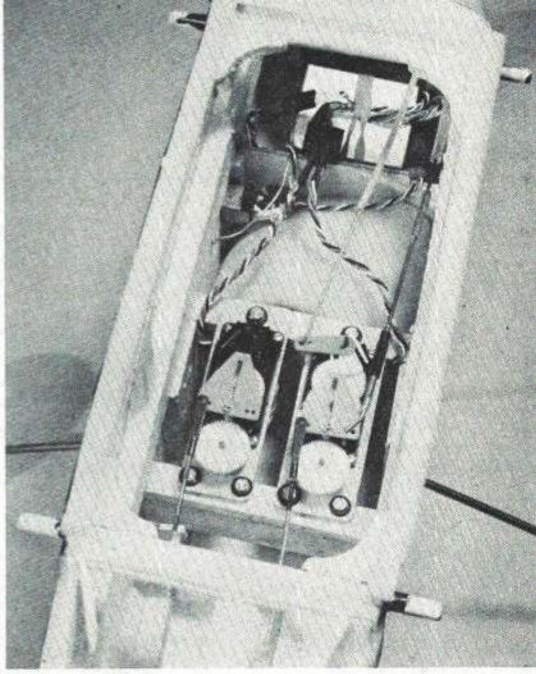


FIG. 6

Fowler flap operation on a model is possible with either an external hinge below the wing, a set of rails on which to slide the flap down, or linkage shown here, designed by Mr. Aylors. Method is used on experimental scale model, offers completely internal operation, is fully adjustable, and can be operated by conventional model control systems. Gap between wing and flap can be set to vary lift and drag factors. Linkage shown is needed at the root and tip of each flap section.





Two versions of Versapro dual-servo system are shown with Versapulse transmitter. The compact, inexpensive, pulsing set on right; lighter, powerful, feedback set on left.

Equipment installation shows use of one servo for steering, rudder, and throttle!

VERSAPRO SS-2

Two-function decoder/filter gives dual-proportional and one trimmable function with either pulse or feedback servos.

FRED M. MARKS

VERSAPRO SS-2 is a pulse-width, pulse-rate decoder followed by filters which provide two independent analog signals for control of existing analog servos — or the feedback conversion of the Rand servo presented in the March '69 issue. Lock-out is applied to both of the feedback servo signals to provide for neutral position during throttle changes, or in the event of signal loss.

Features: In keeping with the versatility promised for the Versapro system in the March issue, a number of modes of operation are possible. They are presented in order of complexity, and might well represent an evolutionary approach to construction of the system by the builder.

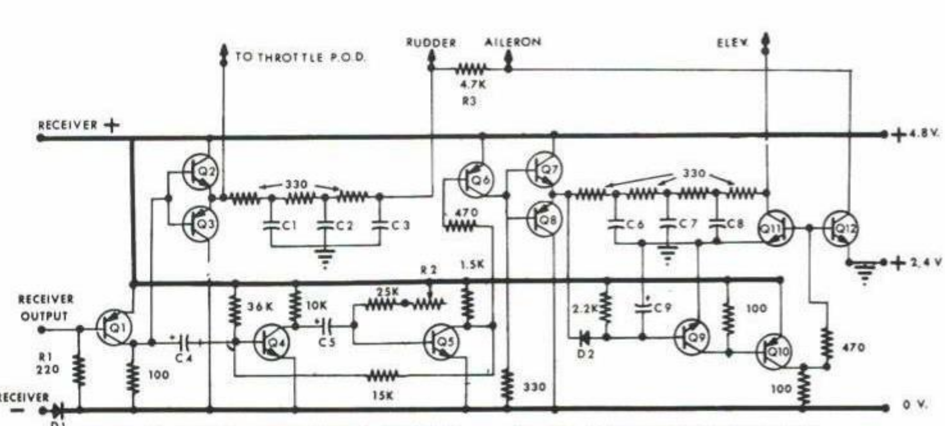
Mode I requires only that the decoder and driver amplifiers be built for use with two standard Rand LR-2, or similar, servos for normal pulse system operation. Full-on and -off are used for go-around throttle from the rudder servo. This mode complete, will weigh under 11 oz.

Mode 1a will permit elevator to be retained during throttle changes. The design of the rate detector is such that elevator control can be retained at pulse-width ratios in excess of those required for extreme rudder positions, and more than enough to permit the rudder servo to go-around for throttle changes. A minor modification to the Versapulse transmitter which was presented in the April '69 issue (and in most cases, other transmitters) is required to give excess width change from the throttle control lever-switch instead of on-off. In this mode, throttle movement is slower than in Mode 1.

Mode 2 requires that one Rand servo be converted to feedback with go-around for rudder and throttle. The second Rand servo is converted to the standard feedback configuration. These conversions were presented in the March '69 issue. The remainder of the decoder is needed for Mode 2. Full on-off is used for throttle control. Elevator servo stops at neutral until pulsing resumes. This mode complete will weigh under 10 oz. with 250 mah batteries.

Mode 2a will permit elevator control to be retained as for Mode 1a, so that we now have proportional elevator at all times, and proportional rudder with go-around throttle.

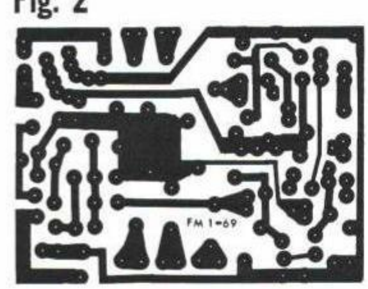
Mode 3 adds a servo to the Mode 2 configuration to give proportional elevator and coupled proportional rudder and aileron, with go-around rudder during throttle changes. The aileron and elevator neutralize during throttle change. Full on-off must be



• C1, C2, C3, C7, C8, and C9 AMPEREX 80MF 2.5V
• C4 0.15MF TANTALUM- C6 AMPEREX 40MF 2.5V
• C5 1.2 MF TANTALUM (SCM 6605-65)
• R1 SEE TEXT — R2 25K TRIM POT
• D1 IN 914 — D2 IN 34A
• Q1, Q6, and Q10 MOTOROLA MPS3638A
• Q2 and Q7 2N2430 — Q3 and Q8 2N2431
• Q4 Q5 Q9 Q11, and Q12 MOTOROLA MPS2924

Fig. 1 Schematic uses readily available non-critical components. Operates up to four servos. Rate decoder has broad adjustability and no pulse-width interaction.

Fig. 2



Copper-side full-size PC board. For photographic-process, PC-board reproduction make film positive. Holes by #64 drill.

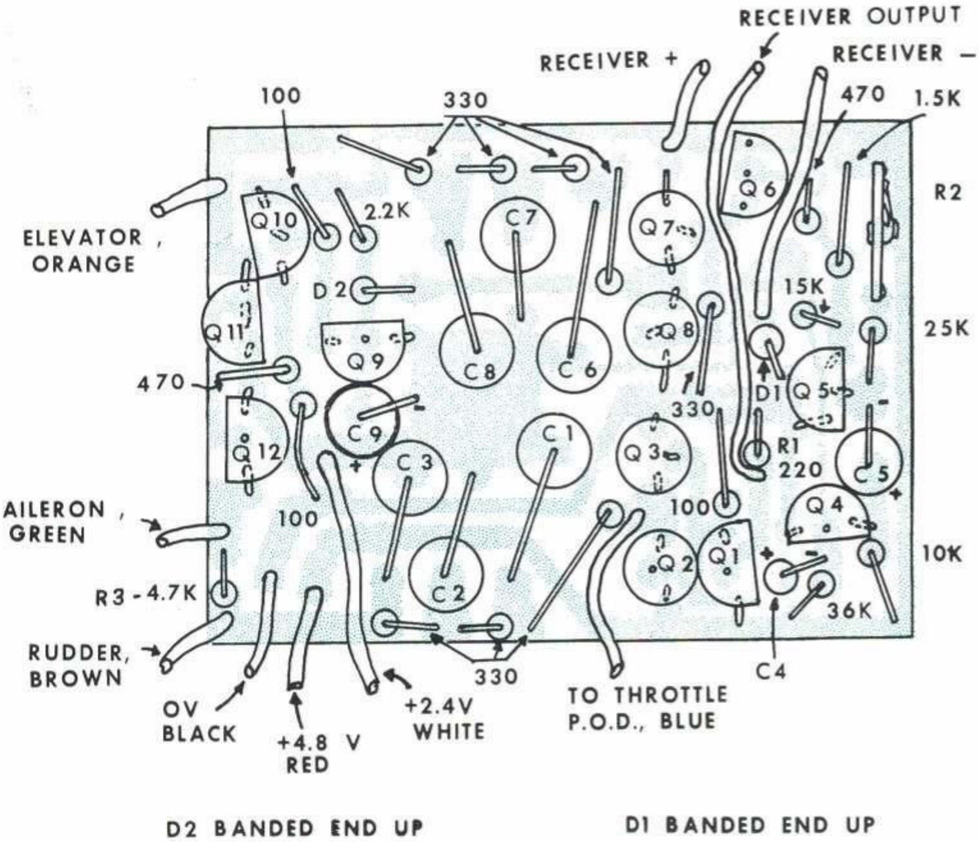


Fig. 3 Parts placement diagram for decoder with filters and lock-out POD. Mount all capacitors with positive end toward PC board. Each piece should be as close to PC board as possible; be especially careful with Amperex transistors.

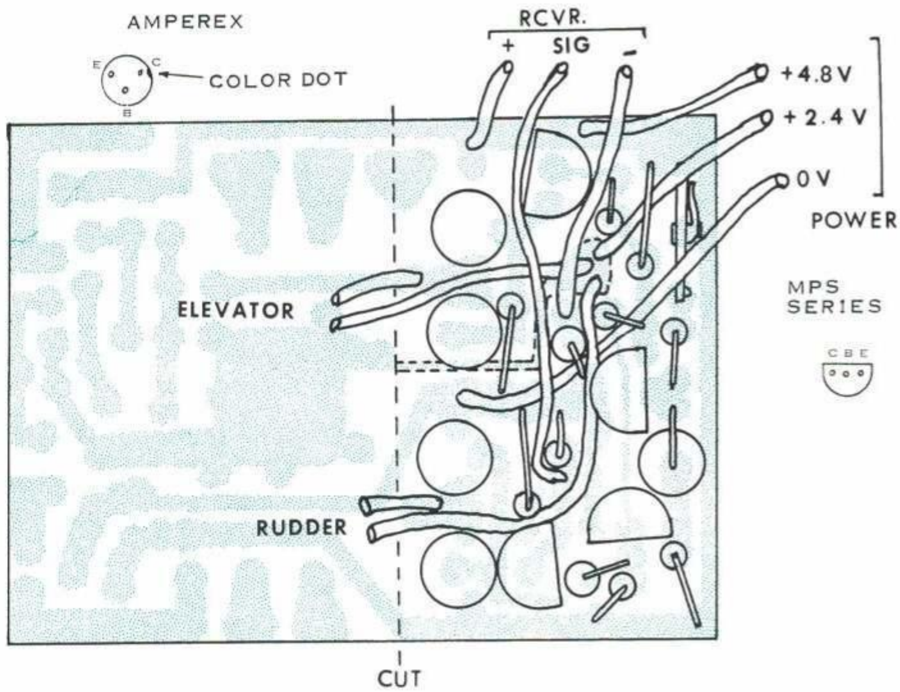


Fig. 4 Use only decoder and drive transistors for pulse servo set. PC board may be cut but, if not, parts can be added later for feedback operation. Pulse servos should oscillate 1/32" at neutral; set rate and decoder pot accordingly.

used for throttle to provide lock-out of the ailerons. (Full aileron would be experienced if the Mode 2a throttle arrangement were used.)

Mode 4 will be known as the SS-3 (next month's article) and will incorporate a dual pulse-omission detector for a trimmable throttle servo. The aileron and rudder are coupled and all surfaces neutralize during the fraction of a second required for throttle changes. Even the aerobatic Kwik-Fli may be flown with this four-servo single-channel system.

Limitations: This system was designed to meet two specific problems. First, it permits the flyer who has a quantity of pulse equipment to maximize the use of his investment, while learning, quite pleasantly, something about simple electronics. Second, those who build digital kit systems generally will have a good system but, if there is a problem anywhere in the system, it can be found only by using at least an oscilloscope, which the average tinkerer may not have. The Versapro is limited to basically dual-proportional operation with coupled ailerons and rudder, plus trimmable throttle. The parts count is not significantly less than for a comparable digital. But, you can use your existing equipment, and you can find anything wrong using simple test equipment.

Operation: The design is relatively straight-forward. Fig. 1 presents the schematic diagram and lists the parts required. Fig. 2 is a full-size layout for photo reproduction of the printed-circuit board. The schematic is divided into five sections as it is laid out. The first is the receiver output squaring amplifier, Q1. (Resistor R1 must be varied for use with receivers other than the Ace Commander Superhet. Values will be determined and presented in the next issue.) The output from Q1 is a positive-going square-wave used to control the rudder driver amplifier (Q2 and Q3) and its filter circuit C1, 2, and 3, plus the 330-ohm resistors, shown in the upper left-hand quadrant of the schematic.

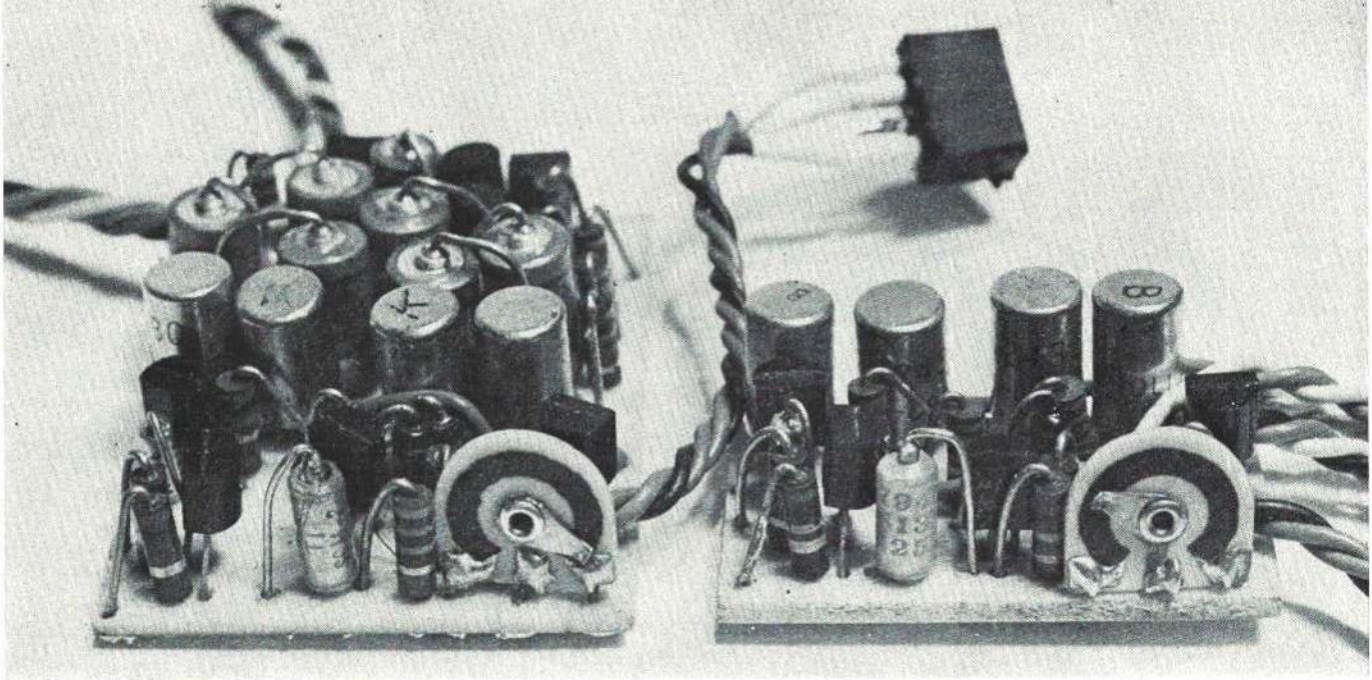
The rate decoder is shown in the lower left quadrant as Q4, Q5 and associated components. The leading edge of the squared receiver-output pulse is coupled via C4 to trigger Q4 in a short pulse. This short pulse charges capacitor C5 which can discharge only through the 25k resistor, R2, and Q5. Thus, the length of time Q5 is on, is set by the pulse rate and by the trim pot R2. Operation is feasible from pulse rates as low as 10-12 pps up to about 20. Broader ranges may be attained by changing the values of C5 and the 25k resistor in series with R2.

The output from the rate decoder is squared by Q6 to control the elevator driver amplifier and its filter in the upper right-hand quadrant, identified by Q7 and Q8, plus C6, 7 and 8 and the related 330-ohm resistors.

If only pulse operation is desired, the rudder-driver output is available at the junction of the emitters of Q2 and Q3, and the elevator drive is available at the junction of the emitters of Q7 and Q8. The other terminal of each servo motor is attached to battery center tap (+2.4V).

The lock-out detector for feedback operation is shown in the lower right-hand quadrant. The output from the elevator driver is coupled through D2 to the base of Q9. As long as the pulsing, unfiltered elevator drive signal is available to Q9 and capacitor C9, the detector keeps Q11 and Q12 solidly turned off. On cessation of pulsing, the detector permits Q11 and Q12 to turn on, thus permitting the output analog signals to elevator and aileron to be locked to battery center-tap to drive the servos to neutral. You will note that there is a 4.7k resistor (R3) which isolates the rudder signal from lock-out for Mode 3 operation. This resistor is jumpered for Mode 4 operation.

Construction: Fig. 3 presents the overlay of components for the complete decoder. Fig. 4 shows the layout changes only required for Mode 1. The changes required to obtain Modes two through four are external to the decoder with the exception of jumpering R3 when rudder lock-out is required. On Fig. 4 is a drawing of the transistor basing arrangements for Motorola and Amperex units. View is from the top



Decoders are so small that, when packaged with small, single-channel superhets, the unit is as small as a modern digital. In pulsing servo set, drive transistors will become quite warm — this is normal. Approximate pot position shown for each type of set.

with leads pointing down and away.

Decide which mode of operation is to be used and build the decoder board accordingly. The wiring diagram for the full decoder is shown in Fig. 5. A Brunner plug block was used to simplify wiring requirements. A separate aileron plug is shown and can be deleted if aileron is not used. Separate plugs can be used for all functions, if desired, and lands are provided. The receiver may be connected by a plug or wired directly.

Fig. 6 presents the layout for a simple .031 aluminum receiver-decoder case dimensioned to accept the decoder and the Commander receiver. The bent-up case is shown in the accompanying photographs. Place the leadout holes as required for your chosen plugging arrangement, but be absolutely sure to provide grommets at all points at which wires exit from the case. The receiver and decoder/filler were held in place in this case using double-sided servo-mounting tape.

If the Brunner plug block is used (on this or any other system), observe one precaution: the power plug is a male plug, i.e., the pins are exposed, and the power pack can be shorted if the plug is removed and the pins touch metal with the switch on. *Do not* lay this plug down without being absolutely certain that the switch is turned off.

The smoke test: 1) Having completed the decoder board and wiring, connect your receiver and power pack to the decoder. The power pack may be made up of four 250 to 600 mah nickle-cadmium cells. Do not use dry cells because their voltage drifts and the servo neutral will drift with neutral voltage. Check out of the simple pulse version will require only steps 2 and 3. The feedback modes require all steps. Note: do not attempt to use coupled aileron-rudder servos in the Mode 1 or 1a configurations.

2) Plug in the rudder servo, turn on the transmitter with controls and trims centered, turn on the airborne system and adjust the broad transmitter width control for neutral rudder servo position. Plug the same servo into the aileron channel (for feedback systems only.); the servo should still be centered.

3) Plug the elevator servo into the elevator output channel. Adjust R2 for neutral elevator at the pulse rate of your transmitter. Remember, this system is not designed to operate at Galloping Ghost rates (6 pps nominal) and the repetition rate must be above 10 pps. If the elevator servo can not be centered, the repetition rate of the transmitter should be increased until the servo centers.

4) *Steps 4 and up apply to the feedback modes only.* With a servo plugged into the

Continued on page 59

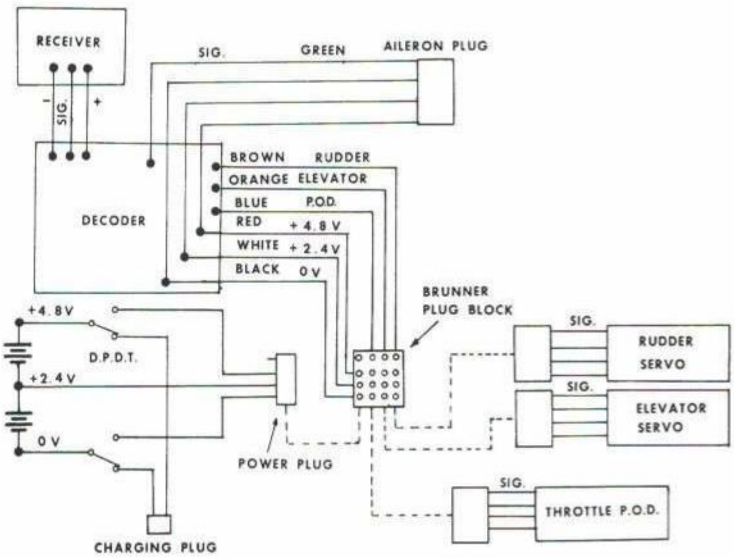


Fig. 5 Interwiring the feedback system for four servos. Use any good superhet receiver and analog servos. Little Orbit PS-3A, converted Rand, or even older disused units.

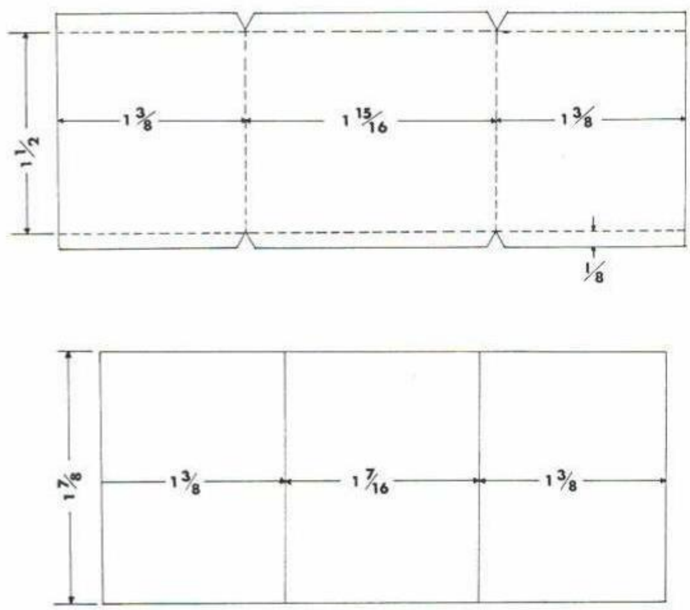
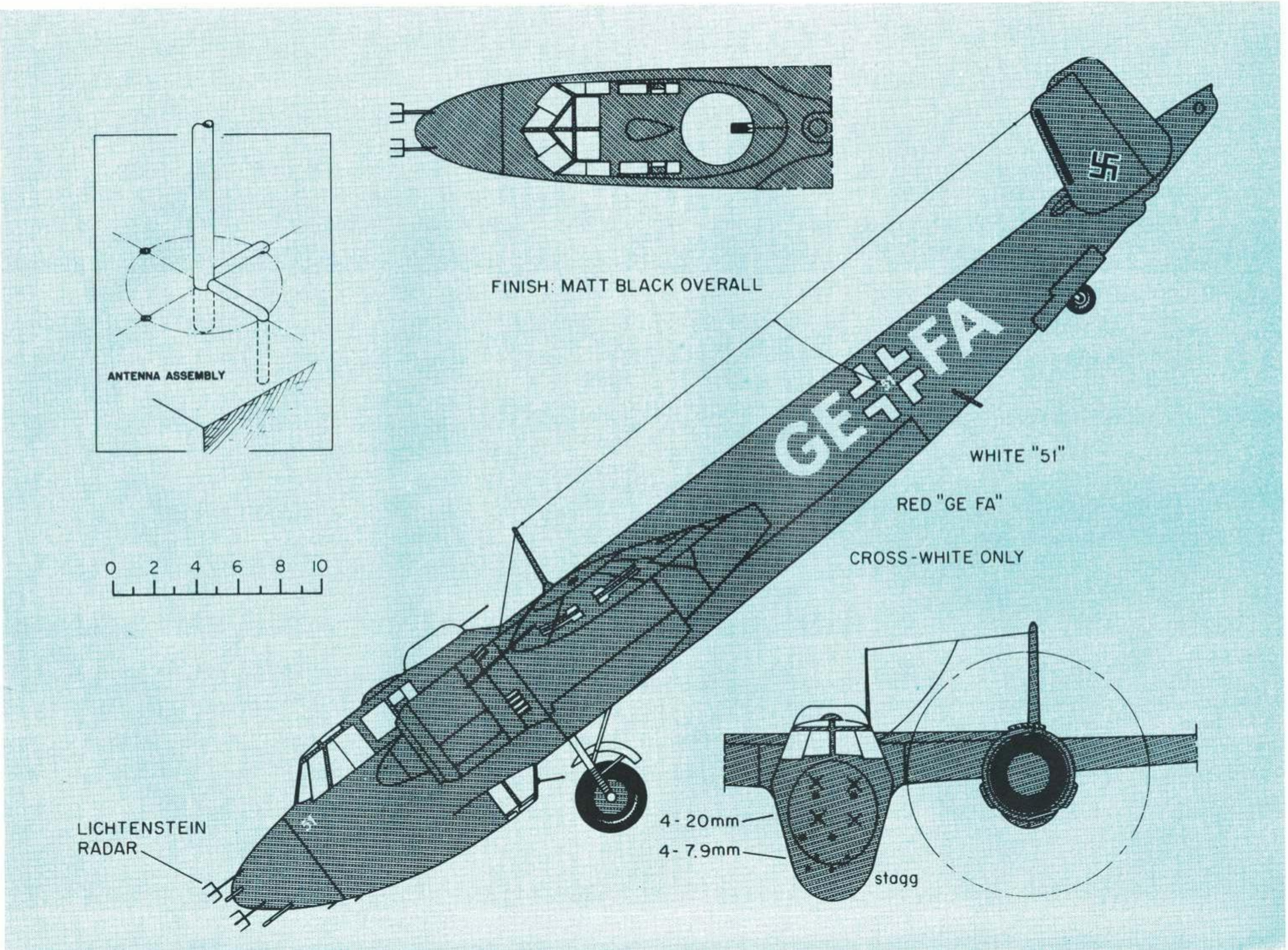
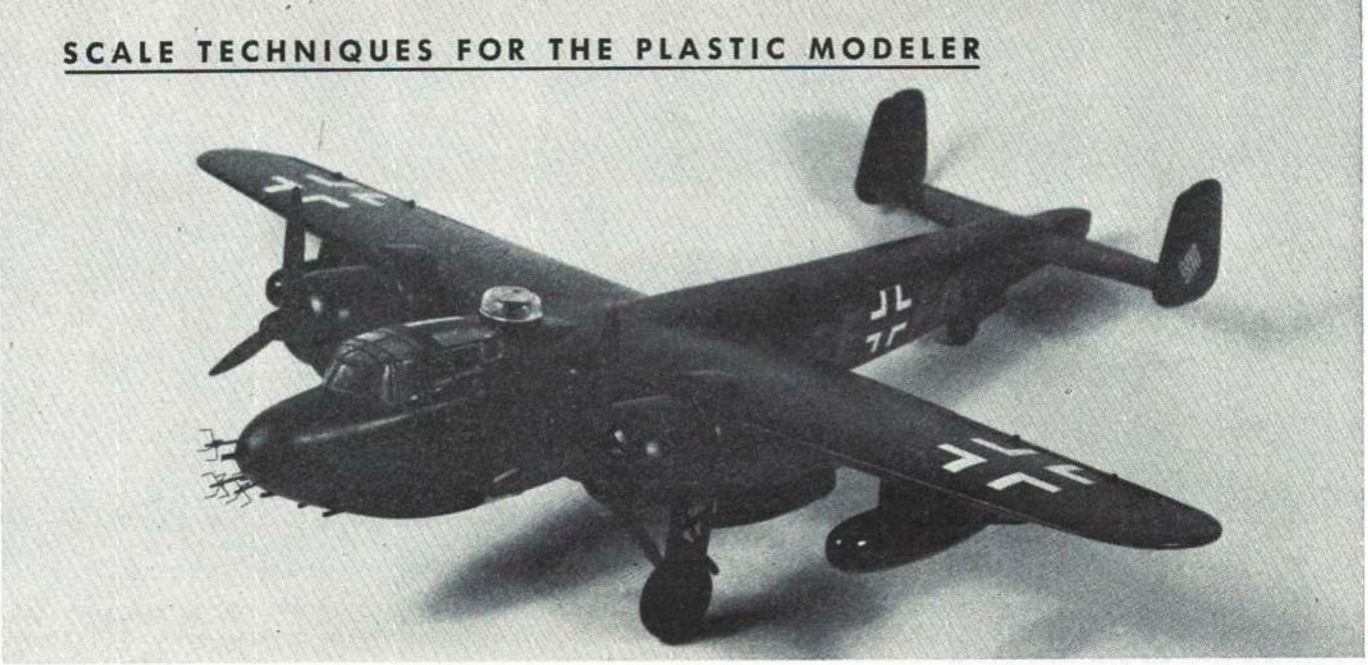


Fig. 6 Case dimensions shown above for decoder with ACE Commander receiver. For other units, case needs to be only slightly longer on its top and bottom by 1/8".


ANTENNA ASSEMBLY
FINISH: MATT BLACK OVERALL
GE FA
WHITE "51"
RED "GE FA"
CROSS-WHITE ONLY
0 2 4 6 8 10
LICHTENSTEIN RADAR
4 - 20mm
4 - 7.9mm
stagg



Dornier DO 217J-2

The night-fighter/intruder shortage in 1942 forced the Germans into this interesting bomber conversion.

JOHN N. TOWNSLEY

IN 1942 the Germans converted about 175 Dornier 217-E twin-engine bombers to help fill the gap in the night-fighter/intruder shortage.

Basically, the conversion consisted of a redesigned nose, housing four 20-mm MG-FF cannon and four 7.9-mm MG-17 machine guns. The dorsal turret (which mounted one 13-mm MG 131) was retained, and a similar gun could be mounted in the rear-firing ventral position. The aft bomb-bay usually accommodated eight 110-lb. SC 50X bombs. The Lichtenstein radar was fitted in the conversions and the FUG 25A (FF1) equipment; these were standard on the DO 217J-2, this variant being intended solely for night-fighting. It had the bomb-bays faired over.

Most of the conversions were done on the Freidrichshafen assembly line; maintenance units and the DO 217J-2 became an important factor in the "Kammerhuber Line," equipping several Nachtjagdeschwader. The "Line" was a chain of night-fighter boxes and anti-aircraft batteries placed at strategic points along the Bomber Commander night route.

In 1941 the Italians also used the DO 217J-2 for defense of important industrial areas. The planes were piloted by the Italian 59 and 60 Gruppi of the "Forza Aerea Intercettori."

Specifications: Type: three-seat night-fighter. Powerplant: two B.M.W. 801-A radials, 1,600 hp. Armament: four 20-mm MG-151 cannon and four 7.9-mm MG-17 machine guns in nose, one 13-mm MG 131 machine gun in dorsal turret and one MG 131 on ventral position. Performance: maximum speed 320 mph at 18,700 ft., 290 mph at sea level; service ceiling 29,200 ft.; maximum ceiling, 31,170 ft. Maximum range: 1,500 mi. Weights, empty and equipped: 20,700 lbs.; normal loaded: 29,100 lbs. Dimensions: span 62′ 4″; length: 58′ 9″; height: 16′ 3″.

As usual, kit must be checked for missing or broken parts; this serves a dual purpose. You will know if any parts are missing and you will be able to familiarize yourself with the location of all parts on model.

Parts are dunked in warm detergent suds, rinsed in warm water, then air-dried.

Assembly: Cement fuselage together using rubber or masking tape to apply tension. Pull seams together as tightly as possible. After dry, remove tape or rubber

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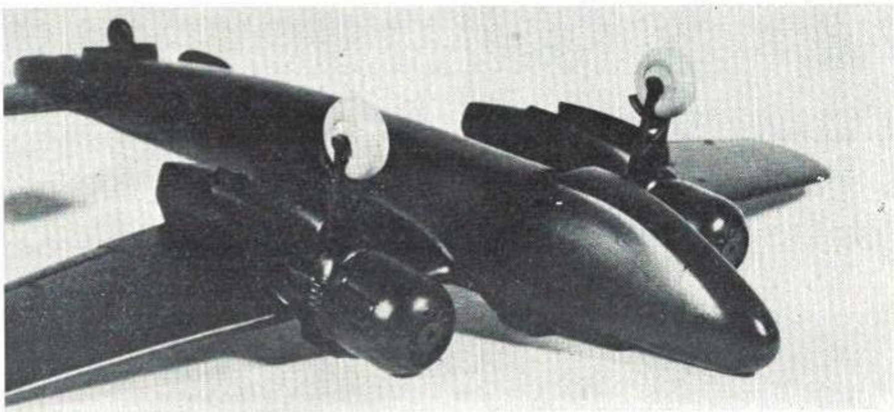
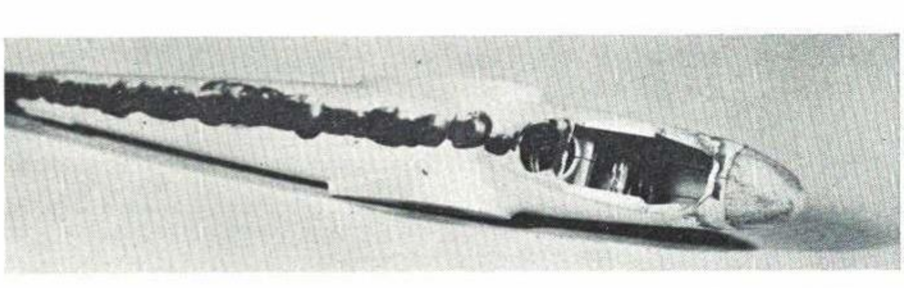


Conversion of the Dornier bomber basically involves gluing a balsa block to the nose where the bombardier would have been, then installing radar systems and weapons.



As a night fighter, the entire plane, including wheels, is painted semi-gloss black. Use an aerosol spray can. Sixteen holes are drilled in nose for cannons, machine guns, and radar.

To make a lady out of Jenny, Hal deBolt added a few refinements to this now-familiar plane. It is still the 24-hour-assembly model, but with wheel pants, engine cowl, and canopy it sure looks classier. Now named "Jenny plus 10."

RADIO CONTROL WORLD

A ROUNDUP OF LATEST NEWS

CONDUCTED BY HOWARD MC ENTE

Stu Richmond and George Wilson, avid R/Cer's, put on a Junior Event at 15th New England R/C Championships. Everybody enjoyed it. Here are the winners.

Technical Notes

Cutting tapered ribs: Most modelers hesitate to tackle a tapered wing — unless building from a kit — due to the chore of plotting and cutting each rib separately. Actually, there are many shortcuts to making a set of ribs, either for straight or tapered wings. A basic method is to "stack" all the rib blanks together and cut them in sets for each wing half. If you have access to a band saw, you can speed the process, and probably do a more accurate job. Suggestions from Dale Root (6036 Telegraph Ave., Oakland, Calif.) are given here.

You need a set of 1/16" plywood templates for tip and root ribs; it makes no difference if they are the same or different airfoils. Bore matching dowel holes on these templates (sketch B), and locate one hole to serve later for the aileron pushrod. Cut the spar notches on the templates and mark the chord line on each. Prepare rib blanks, bore dowel holes with tool (seen at F) used in a drill press. Bore a 2 to 3" stack of blanks at a time. (Push tiny discs out of cutter tube with a dowel, after boring each hole in each stack.) Make sure holes in ribs match those in templates!

If wing taper is more than 2" in a stack 2 or 3" high, use filler sheets between each two ribs. You can cut a stack 4" high with a 5" taper this way. The fillers could be used in another wing. Mark them so you won't mix them with the regular ribs.

Assemble the rib stack with dowels, as at A and B. Pins hold the ply templates firmly at each end. Cut the stack to size of the larger rib first, with root rib flat on saw table. Then draw L.E. and T.E. guide lines (shown dotted in B). Cut taper in the stack with large rib end on table, as at E. To prevent cutting large template with blade, use method indicated in sketch C. Or make a 1/16" ply guide as at G; notch in guide is deep enough so blade can't cut root rib template when guide ends contact this template. When starting cut, follow guide lines you've drawn on L.E. and tilt stack to follow tip template.

Spar notches are cut with a ply guide per sketch D, tilting stack so tip-rib notch goes to correct depth. Several saw-kerf widths will make a neat notch. If you saw carefully, a minimum of sanding will be required. Slight taper on rib edges won't

Powered glider by Dr. Morris, left, uses two complete Falcon 56 wings. On right, is the "Thermus" by Dick Sarpolus.

matter if they are to be cap-stripped. If not, assemble wing, then reduce excess taper on 4 or 5 rib edges at a time with a long sanding block.

You can cut a stack of ribs without a saw, stacking them in the same manner. But use long bolts instead of dowels, as much more handling of the stack will be required. Be sure to make a right and left stack of ribs! If some ribs are to be of thicker (or harder) wood, use the equivalent rib from the stack as a template to cut same.

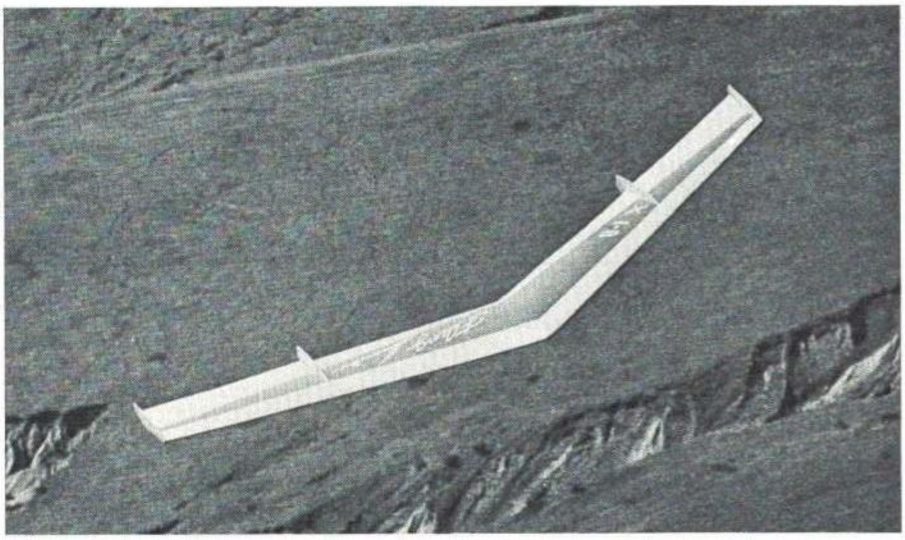
Simple throttle link: Simple method used to bend the throttle-end of a music-wire link, by Lawrence W. Hoffman (Shin Taiso Bldg., #52 Ohwada-Cho, Shibuya-Ku, Tokyo, Japan) is seen here. This rod end needs no separate "keeper." Put the hairpin end at upper left behind the throttle arm, then pop the right-angled end through the hole. Heavier wire has been used by Larry in same manner for attachment to rudder control horn on single-channel planes.

Linking nosewheel: A nosewheel linkage that has worked well on a Falcon 56 for Tim Brown (8715 Glenloch, Houston, Tex. 77017) is shown in sketch. It has been found useful to have the nosewheel strut steering-arm outside the fuselage — for easy line-up after a "hard landing." The Z-bend going through fuselage bottom will soak up quite a shock, but wire will bend if the plane smacks in. Nylon clevis is preferred on steering arm — it will either break or pull loose under severe load. A fellow club member of Tim's uses this system in a Lanier plane. A bolt through ply side doubler holds the bellcrank firmly. Latter allows easy reduction of nosewheel throw, via extra holes indicated.

Slicked-up Jenny: Because it was never intended to be pretty — it was designed as a very easy-to-build plane of good flying capability — Hal deBolt has done a little research to beautify his design. The result is the "Jenny plus 10," for reasons we'll note.

To a stock kit was added a set of Williams Bros. wheel pants, a Hartman 5" cowl and Dmeco CL-4 canopy. These dress-up items come to around $10 — hence the new name. Plane in pic has Silron covering, Hobbypoxy and Aero Gloss finish, Orbit 4-8 controls, ST 40 engine, and with all "improvements," weighs 4¾ lbs. This plane also can be raced in the new Formula II category.

That Radio Shack "Slave": We had a few notes on p. 37 (Feb. '69 issue) on a very low



Rex Taylor's fascinating flying-wing glider results from considerable aerodynamic engineering. Two control functions are combined to operate the elevons which give roll and pitch control. Four rudders are necessary to provide adequate lateral area and yaw stability. It offers excellent controllability, fast glide, good performance, quick building.

cost superhet receiver sold through the 300 Radio Shack stores in the U.S. This is a handy, compact monitor for a single frequency. Oscillator crystals plug into shift frequency. At $7.95 (less 9v battery) this little set is a best buy for the experimenter.

The most ingenious circuit is indeed a superhet — even though only three transistors are utilized. The first one acts as mixer-oscillator, the second as an IF stage. Things get really complex in the third! It is a second IF stage, also "reflexed" to act as the 1st (and only) AF stage. There is no loud speaker. An earphone comes with the set. The earphone cord acts as an antenna! A cute 15½" collapsible antenna is included, but it simply is connected to receiver "ground" or common, when screwed in place.

The receiver has an effective AGC circuit. Seems some sets come with a circuit pasted

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An editorial *'Youngsters with these noxious instruments hide at the edge of a model flying area and try to knock planes out of the air!'*

MOST of us have knowledge of serious interference to R/C operations, which have generally occurred on the 27-MHz spots, and virtually always have come from CB phone transmitters. In many cases this interference has been caused by the unlicensed, very low power "handy-talkies" (supposedly, they must have less than 100 mw input to the transmitter stage connected to the antenna) right on the flying field, or very near it. We've even seen cases where youngsters with these noxious instruments hide at the edge of a model flying area and *try* to knock planes out of the air!

Some of this 27-MHz interference is accidental, of course. We operate on the 27-MHz spots under FCC provisions saying in effect that we must put up with any *non-intentional* interference, since this band is in effect a wide-open party-line. All well and good, when the interference comes from those using designated CB phone channels, and who are operating their equipment in a legal manner.

Unfortunately, more and more CBers — though probably a relatively small minority — are operating neither legally nor on legal CB phone frequencies. Some purposely obtain R/C crystals, since our measly five channels (six, if you count 27.255 MHz, which is in little use for R/C — due again mainly to intolerable interference) sound pretty dead, when compared to the cacophony found on the 23 CB phone spots. This, of course, is strictly illegal phone operation, compounded by the fact that such operators generally utilize our spots for hamming — general chit-chat of the sort quite common and legal on the amateur radio bands, but strictly prohibited (supposedly!) on CB phone and R/C spots.

Individual R/Cers and clubs can do more than just gripe about such interference. Send a report of the details to the FCC, with a copy to AMA Headquarters. If we get enough such reports, possibly we can bring some pressure on the FCC through our attorneys.

We note these reports should be "detailed." By all means include dates and times, frequencies, atmospheric conditions if you know them. We are on a high point of the sun-spot cycle, and stations from thousands of miles away could be causing you interference on 27-MHz. We hear that U.S. CB phone sigs are troublesome to R/C flyers in England! Include the call letters of the interfering stations and their locations if you know them. *But do not include quotes from any conversations you monitor.* For reasons best known to the FCC, this is strictly taboo — a violation of the "Secrecy of Communications" rules. You are not allowed to divulge such conversations to anyone — not even the FCC itself!

Include in your report an account of any planes you are certain were "shot down" by CB interference. You can certainly say in your report that you know the interference was intentional, that it was on your R/C spot frequencies, from comments you heard while monitoring — but again, don't quote or even summarize such comments. We know this sounds like a stupid rule — it does to us, too. Especially, when it comes to reporting what's heard on this "garbage band." But it's the law. Let's not get into trouble by violating it ourselves.

The FCC took into account the serious interference problems to R/C on 27-MHz when they allotted our 72-MHz band spots. Of course, there has been interference there, too. But at least it has been "legal," as a rule coming from nearby TV stations.

Since the FCC has proven completely powerless to regulate the activities of CB phone users (though they hand out dozens of stiff fines and license revocations each week), we should undertake a campaign to gather documented reports of interference on our R/C spots, particularly when it appears to be due to malicious or lawless phone operation.

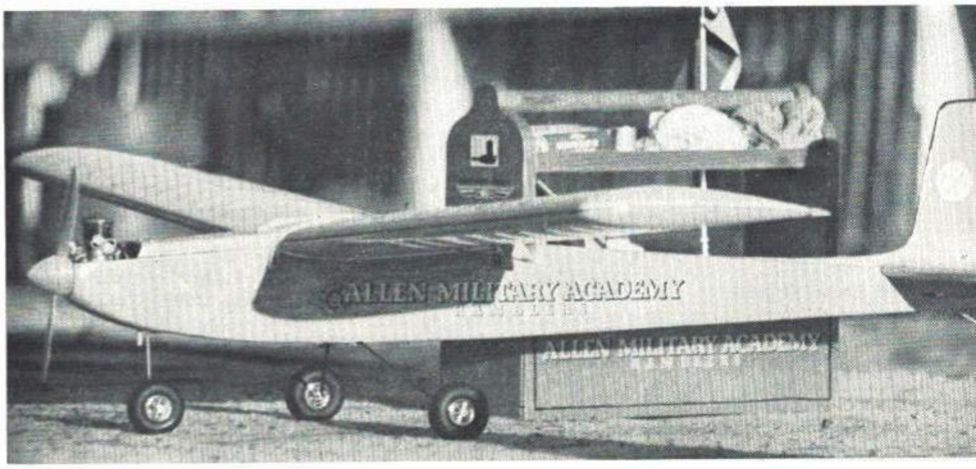
As noted above, send the report direct to FCC offices (Washington D. C. 20554), with a copy to the AMA. And meanwhile — let's make sure our own house is in order! Be sure all the flyers in your own group have valid licenses, and are operating on permissible R/C frequencies.

in the case — others don't. If you want to tinker, be sure to get the circuit. For some odd reason, the designers arranged the AF circuit so that, when you turn the set on via the volume control knob, the sound starts quite loud, gets louder. We found an extra 1K resistor in series with the "low" end of the volume control (this resistor doesn't show on the circuit). It's the one closest to the antenna terminal, and if it is shorted — you must remove the PC board to do this — the volume control acts more normally.

Radio Shack tells us they do not stock R/C crystals but can get them at about same price as the CB crystals (which are $2.49 each) if there is any demand. Doubtlessly, regular R/C receiver crystals will work. They should be 455 MHz lower than the frequency you wish to monitor. A 27.085 MHz crystal comes in the receiver. It appears to us just about impossible to put even the tiniest loudspeaker in the case — there just isn't enough room. If anyone finds a speaker small enough, let us know — it would have to be 1½" dia. by 3/16" thick!

Besides monitor use, Walt Good suggests this little rig could be useful for telemetry, picking up sigs from a tiny transmitter in a model. The best bet for this might be 27.255 mc — it is little used either by CB phone or by R/C transmitters. Another possible use is a small loop antenna connected in place of the tuned input coil, to make a tiny direction finder. It might help find planes in hard-to-search areas!

Norm Hooper from Portland won Formula I event at Western State Champs in California. Model is Bob Kern's Shoestring design with narrow, fiberglass fuselage and thin wing.



Monte Groves Jr. is a talented 15-year-old model pilot and builder. Here are his well-built Sr. Falcon and field box, both of which faithfully display the name of his school.

Grassroots

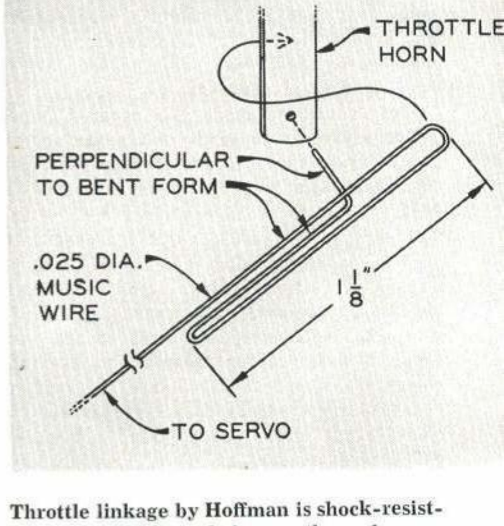
Where are the juniors? "We had hundreds of them," writes Cliff Piper. And at an R/C meet! This was a special event for youngsters from 5-14 years of age, conceived by New England R/C Modeler Pres. Fred Angel, and run by Junior Event Directors Stu Richmond and George Wilson. Meet was the 15th Annual New England R/C Championships. Some 3000 spectators watched the flying of 77 contestants.

To get younger spectators into the mood, 60 nickel gliders were on hand for those under 12 years of age, and fifty 15c rubber-power planes for the 12-14 age group. Sixty competitors under 10, and 50 in the 11-14 group, caused a furious change in rules, to accommodate the models at hand. Once this was done, it took only an hour to run off the event. Adults were assigned 3-5 youngsters, told to bring back a winner from each group. Then there was a fly-off until the top six winners were chosen. One of these was a young lady!

As an added Junior event, there was a judging of models built by these contestants. As for R/C, NERCM was happy to find six Junior flyers entered in the regular events, all of whom received special prizes. The Junior glider and rubber events were well-announced over the P.A. system. Much enthusiasm among the participants, and praise from their parents, made it mandatory that these events be repeated in 1969. In fact, the same fellows long ago signed up to officiate again this summer!

Scale expert: Members of the Northern Connecticut RCC were thrilled to see a fine model of the old Gee Bee Baby Sportster brought to a fall club meeting. The builder, Tony Giovanetti, who was one of the designers of full-sized plane, along with Bob Granville, who gave a talk on the history of the big plane. "Gee Bee" stood for

Cliff and Mrs. Weirick hold their Minnow racer. Model has foam wing and fiberglass fuselage. R/C modeling's most exciting and fastest competition is Formula I pylon racing.



Throttle linkage by Hoffman is shock-resistant, self-locking, and cheaper than a keeper.

Granville Brothers, originators of this famed line of sport and racing planes. Tony's model was built for Goodyear racing, which NCRCC has actively promoted. The model certainly should be authentic!

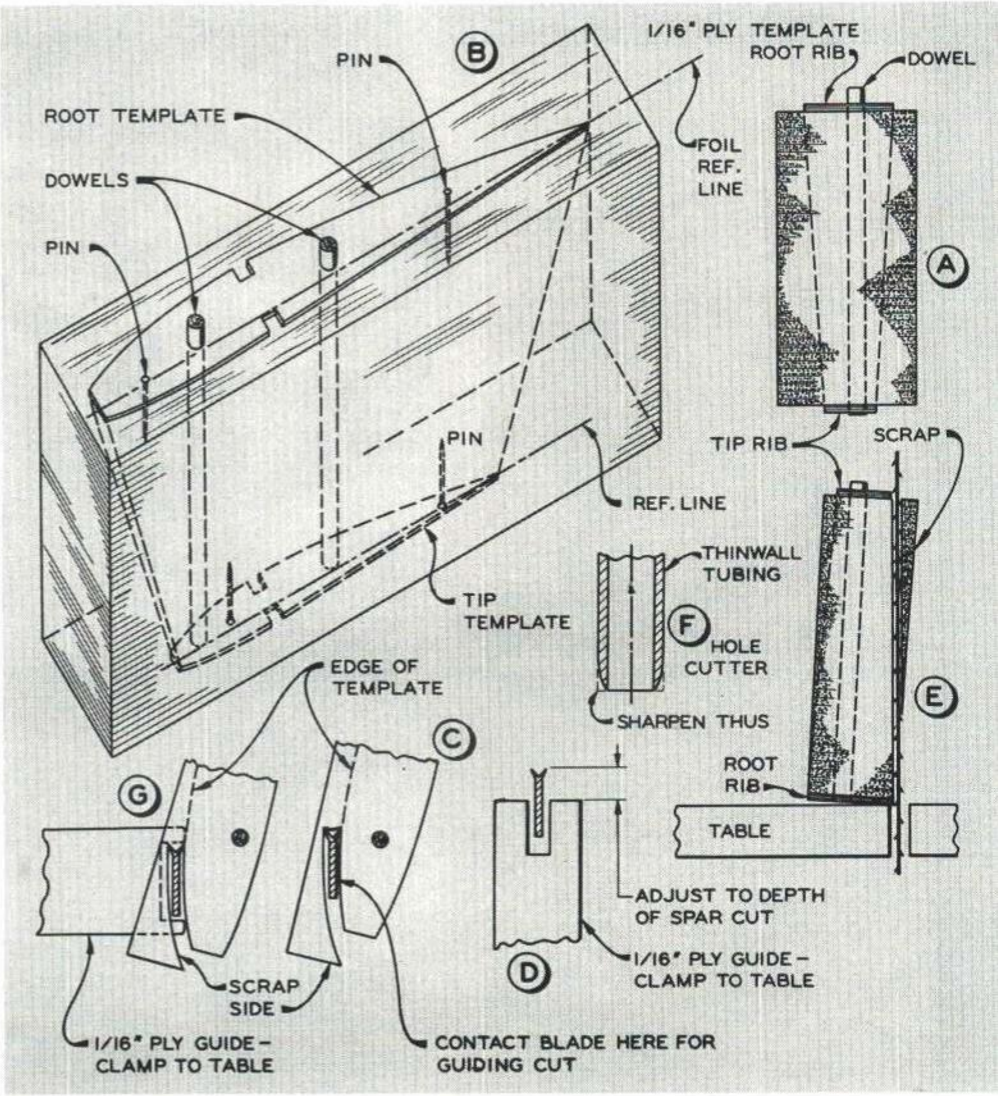
NEWS 1st annual banquet: We learn from Phil Heller (2558 Las Casas Way, Rancho Cordova, Calif. 95670) that the first annual banquet of Newsletter Editors & Writers Society will be held at the forthcoming Philly Nationals. There will also be an Editor's seminar during the Nats week. With some 100 or more R/C club newsletters printed in the U. S., several in Canada, plus many non-R/C papers, there should be a good turnout for these activities. Phil, who originated R/C Cue as the newsletter of NEWS, conceived the latter organization when he was drafted as temporary editor of his own club paper. A considerable proportion of the R/C club papers we receive now contain reprints from R/C Cue — one of the main purposes of the latter.

Glider enthusiasts: It's a bit hard to visualize a glider with a wing made from two complete Falcon 56 wings, joined tip to tip. But Monmouth MAC member Dr. Morris built and flew such a creation. Though the wing had pine spars, and was planked well out from the center-section, Doc broke it in half showing how the big job would roll.

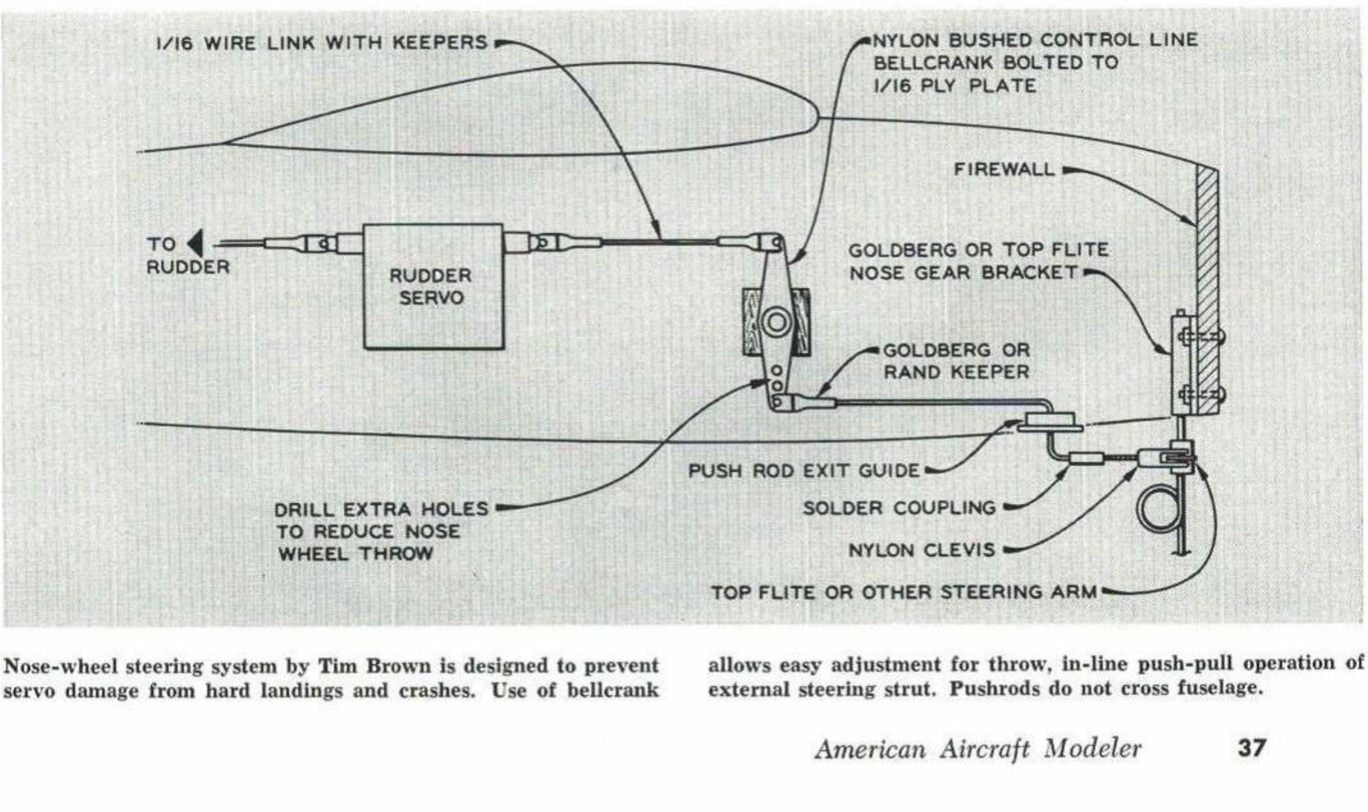
A somewhat similar wing was built to 12′ span, with foam cores, fully sheeted with 1/16″ balsa. It had two full-depth spruce spars. The halves were joined at the center with 1/4″ steel rods and matching tubes — the same as on the double-Falcon wing. This one has also proven successful. We show herewith a view of the latest version —Doc Morris is at the left! Alongside is Dick Sarpolus (32 Alameda Ct., Shrewsbury, N. J. 07701), whose "Thermus" is rather dwarfed; it has a Thermic 100 wing, Taurus tail surfaces and a new slender fuselage.

Doc sent his monster aloft with an Enya .29 on the nose, but they are hoping to try a strong Hi-Start. Probably due to the success of this big job, a club project is underway to build half a dozen copies for members. Fiberglass fuselages have been made, and the 12′ wing will be as noted. Dick says six of these big jobs will fill up their flying field!

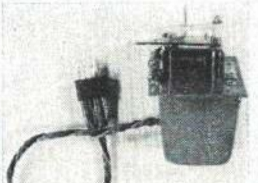
Continued on page 80



Foam wings are fine but sometimes a built-up structure is preferred. Here is Dale Root's method for band-sawing a stack of tapering wing ribs accurately. This is much quicker than hand-shaping each rib. If the stack of ribs is too thick, you might make two shorter stacks, one for each wing half and perhaps accommodate a short stack on a jigsaw.



Nose-wheel steering system by Tim Brown is designed to prevent servo damage from hard landings and crashes. Use of bellcrank allows easy adjustment for throw, in-line push-pull operation of external steering strut. Pushrods do not cross fuselage.



R/O PULSE MOTOR CONTROL

Now you can add motor control to your Commander RO Packages. May be used for Testor System. The high Pulse Rate Motor Control by Ken's R/C uses four wires to hook up to your pulse installation, and is complete with a three position spring wound escapement to give you high, medium and low motor control on a throttle valve engine.

Entire unit weighs 1.1 ounce with leads, completely wired and tested. The high pulse rate required is approximately four to seven times the rate normally put out by your pulse transmitter. For the Commander RO Package, a simple conversion kit, which consists of an extra capacitor and a pushbutton switch allows the high pulse rate to be added economically and easily. Motor command does NOT affect rudder positions.

No. 16K63C—Ken's Motor Control with escapement, $19.95

COMMANDER R/O TX CONVERSION KIT

Conversion kit for the Commander RO transmitter, as described above, complete with instructions, and all components required.

No. 15K62—HPR (High Pulse Rate) Kit for Commander, $2.50

NEW! NEW! NEW!

VERSAPRO

Fred Marks

Components and Parts Packages for all of the Versapro Systems as detailed in American Aircraft Modeler are available. Sent with all new catalogs or separate listing available — send a stamped self-addressed envelope.

SERVO MECHANICS—Controlaire S-3 and S-4 and Kraft-Hayes KPS10. For the tinkerer to make his own digital or analog servo. All are complete with motor, feedback pot, gears, shafts, output hardware, etc. S-3 and S-4 in easy to assemble kit form; KPS10 preassembled. Mechanicals only, no electronics. No. 14K17—S-3 $9.98; No. 14K18—S-4 $8.98; No. 14G55—KPS10 $13.95

LAHTI ANALOG SERVO ELECTRONICS—Complete kit of all electronics needed to make an excellent analog servo with highest resolution from S-3, S-4 or KPS10 mechanics. Use it with the AAM decoder for simple rudder only NON-FLAPPING control. No. 15G31—Lahti Analog electronics only kit, $11.95

AAM PULSE AMPLIFIER-FILTER provides the analog signal required from the Commander DE receiver for use with analog servo. This provides proportional with no flapping of the surface. Much more powerful and uses current only when servo is in motion so smaller batteries may be used. Kit contains PC board, transistors and components for filter. No. 15G24—AAM Analog Pulse Amplifier Filter $6.95

LAHTI DECODER COMPONENTS

We have the PC base and all components required for the several versions of the Lahti Decoder System as published in RADIO CONTROL MODELER. We are offering here only a few of the selected components, but we do have a parts list which is yours for a self addressed stamped envelope, which contain all of the other components required, depending on the version of the decoder that you choose to build.

No. 28K50—Lahti PC Board, G10 etched and drilled $3.45
No. 18K30—22 mf 15 volt $1.00
No. 18K39—10 mf 6 volt $1.00
No. 18K1—1 mf .... $ .75
No. 29K36—5K trim pot .... $ .79

All ¼ watt resistors and capacitors, connectors, and other components are in stock.

COMMANDER R/O PULSE PACKAGES
Ideal for Beginners and Sport Fliers

Get one of the Ace Commander R/O packages and you get the Commander DE Superhet Receiver, Commander Pulse Transmitter, Adams Actuator of the size you want, along with matching nickel cads, and completed wiring harness, AND you save up to $10.00 over buying singly.

We have the packages as matched sets in three basic offerings to suit your every R/C sporting need from the smallest to the larger sized aircraft. Ready for easy installation.

The Baby Pack is for the .010 and .020 jobs although it can be used with tame .049's. Package has two GE 225 ma BHL nickel cadmium batteries and Baby Adams. With wiring harness and switch, completely assembled.

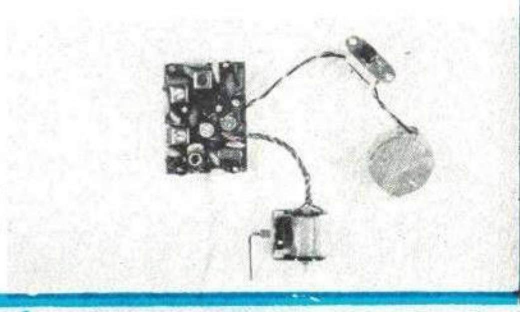
The Standard uses the LV Single Adams for more power for .049 to .07 size. Is furnished with two GE 500 ma BHL nickel cadmiums. With switch harness, assembled.

The Stomper uses the LV Twin of the Adams line for up to .15 or even .19 size jobs. Comes with two GE 600 ma cylindrical cells. With switch harness, assembled.

(Charging equipment not furnished.)

No. 10G15—Commander R/O Baby pack $69.95
No. 10G16—Commander R/O Standard Pack 71.95
No. 10G17—Commander R/O Stomper pack 74.95

(Specify frequency: 26.995, 27.045, 27.095, 27.145 or 27.195)



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Will charge nickel cadmium batteries—20 mils to 150 mils. Capable of charging up to 12 volt packs. Indexed dial & simple chart for correct milliamp reading for charging different size battery packs. Completely isolated from AC line supply. An extra deluxe item. New transformer of highest quality. UL approved line cord. On-off switch. 500 milliamp diode. Full instructions.

No. 34K21—Ace Vari-Charger assembled $8.95
No. 34K22—Ace Vari-Charger Kit 7.50

NEW HANDBOOK-CATALOG FOR 1969!
For the Fun Flyer and Tinkerer

Our 1969 Handbook-Catalog is bigger and better than ever. We specialize in equipment for the Beginner, Sunday and Fun Flyer. More items for the do-it-yourselfer; more products from most major manufacturers, in addition to many Ace exclusives. Greatly enlarged HANDBOOK section. Last year this was called "bible for R/C", "a MUST!" by R/C editors. Price is just $1.00 POSTPAID. This is completely refundable on your first order! And that order also puts you on our mailing list for our newsletters and R/C Data Service—acclaimed the world over. You can't lose—send your buck on a round trip today. It could be the best dollar you ever spent!

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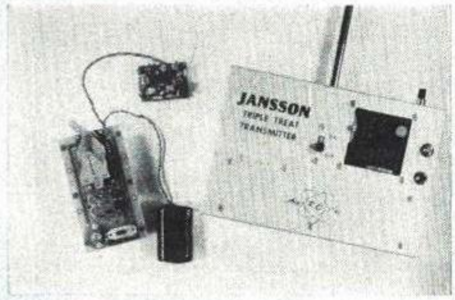
°Ace Virgin Vinyl Binder. For the protection of your Ace Catalog R/C instructions, data, news letters and much more! Only $2.00

Important: For overseas delivery on catalog or Binder please add 50¢ for additional postage.



GG PACKAGE #2

The Ace GG Package #2 is the lightest and most reliable Galloping Ghost unit on the market today. Thoroughly flight proven, the package uses Don Dickerson's See Saw Switcher which is unique in that it develops full power with only 2.4 volts.

The See Saw Switcher was expressly designed for use with the Ace Commander DE Superhet receiver which is winning critical acclaim from R/C fans all over the world.

Add to this, the updated Jansson transmitter which has been revised to provide clean RF output and you have a truly outstanding package.

The airborne pack has the Switcher, charging jack, on-off switch and Rand LR3 mounted on an epoxi PC panel measuring 2¼ x 4$\frac{5}{32}$". The receiver and battery are connected to this board by cables. This allows best weight distribution. Total airborne weight is 5½ ounces, yet the GG #2 works for engines up to .19 and has been successfully used with larger aircraft.

Batteries furnished are the GE 600 mah sintered self sealing vented cells for flights of approximately one hour per charge.

By buying the package you save almost $20.00 over the individual component costs—AND you get the assurance of a matched and tested rig that will give you hours of pleasure and let you fly, fly, fly—!

No. 10G2—Ace GG Package #2 $109.95
(Specify frequency desired. All 27 MHz, except 27.255.)

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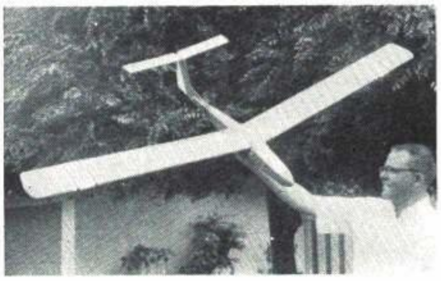
Ace Radio Control/1969 Handbook-Catalog. Bigger and better than ever is Ace's new catalog. There's equipment for the beginner, the sport flyer and the do-it-yourselfer. The handbook section of tips, ideas and answers to many, many questions has been revised and updated. Price is just $1.00 postpaid, and that amount is refunded on your very first order. Write: ACE RADIO CONTROL INC., 203 W. 19th St., Higginsville, Mo. 64037.

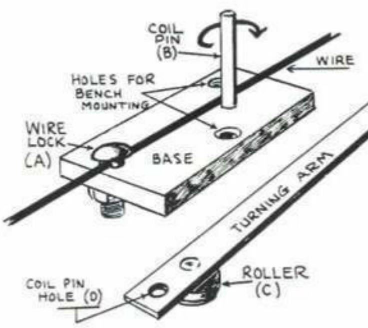


Soaring "T" Flitekits/R/C Gliders. Two glider kits recently released by Keith Brewster's firm are the "T" Halfback (shown in photo) and the "T" Quarterback. Fly them with a winch, hi-start or off a slope. Each employs a sweptback wing and tail with the horizontal tail surface an all-moving stabilator. Foils are a "Laminar Y" section. Kits are hand crafted. The "T" Halfback has a 74" span; wing loading is under 10 oz./sq. ft. with a flying weight of 32 oz. Its kit costs $24.95. Smaller "T" Quarterback has a span of 57", area of 365 sq. in. and a flying weight of 25 oz. (loading-$10\frac{1}{2}$ oz./sq. ft.). Kit price here is $19.95. Kits are available from: Willoughby Enterprises, 225 W. First St., Tustin, Calif. 92680. SOARING "T" FLITEKITS, Sunnyvale, Calif. 94087

Model Products Corp./New Plastic Aircraft Kits. MPC has unveiled several 1/72 scale kits at $1 each. The assortment starts off with the Ford Tri-Motor and its corrugated wings and fuselage and the P & W Wasp radial engines.

The WWII era is represented by the Italian SM-79, a land-based torpedo bomber. Armament also consists of pivoting/elevating machine guns. Tail surfaces and the ailerons are moveable too. The P-51D Mustang can be built as a military aircraft or as a custom air-racer. Germany's Stuka Ju. 87B was a feared dive-bomber over Europe and MPC's kit features all of its military hardware. The Hellcat was one of the fastest (371 mph) carrier-based aircraft. A 2,000 hp P & W engine helped. It saw much use in the Pacific. Japan's Zero appeared at Pearl Harbor and was used by Kamakaze pilots. All detail is there.

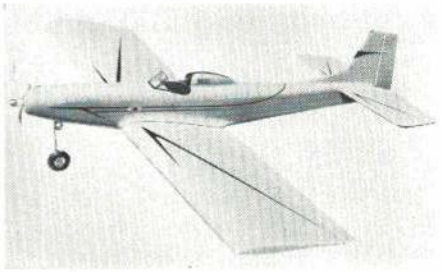
More current is the French Mirage IIIC as used by Israel in the recent conflict with the Arabs. Its incredible top speed is Mach 2.05. Britain's first combat supersonic aircraft was the Electric Lightning F1A. Two Rolls-Royce turbo-jets gave it a speed of Mach 2.3. MPC's F-111 features actual swing-wings, moveable elevators and optional fixed or retracted landing gear. All of these kits include a modular display stand, stock and custom decals, customizing parts and simulated "spinning-prop" discs. Query: MODEL PRODUCTS CORP., Mount Clemens, Mich. 48043.



MPI Systems/Wire Bender. Music wire is always tough to bend and even more so when its diameter is in the 3/32" to 5/32" range. And these are popular sizes with the R/Cer. MPI's Coil and Angle Wire-Bender makes quick work when fabricating landing gear, particularly those with coil-springs involved. Wire can be bent to any angle too. As the drawing shows, the wire stock is locked in position. The roller bears against the wire, and by applying pressure on the turning arm, you force the wire around the coil pin. The bender also allows you to make "S" bends and other offsets in pushrod ends, etc. Tool cost is $12.95 including postage. Write: MPI SYSTEMS, P. O. Box 1861, Billings, Mont. 59103.

Top Flite Models/Full-Size Kwik-Fli Plans. What's in a plan? That's being asked at Top Flite since requests for full-size Kwik-Fli III plans began to pour in. Their staff felt this advanced R/C model would be popular only with experienced modelers, who could easily interpret the construction sequences. But many builders found it difficult to work this way.

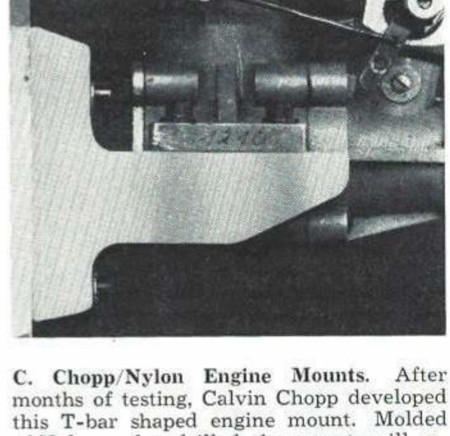
So full-size plans were printed and enclosed in all current kit shipments. Those who have purchased a Kwik-Fli III with the building sequences may obtain a set of larger plans—free and postpaid—by merely clipping off the Top Flite insignia and the Kwik-Fli name from the lower right hand corner of the reference sheet. Mail these with your name and address to: TOP FLITE MODELS, INC., 2635 S. Wabash, Chicago, Ill. 60616.



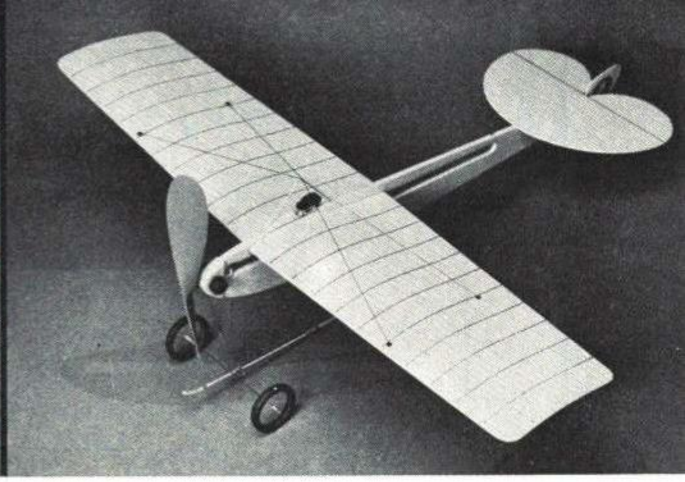
Flite Line Products/Skooter R/C. This is Flite Line's first R/C kit. Up to now they have concentrated on the C/L field. Skooter, with a 57" span (625 sq. in. wing area) and a length of 43", features a machine-cut foam wing covered with Flite-Span. Ailerons, tips and L.G. block are shaped. Keel type of fuselage construction assures alignment. Fuselage sides and top are one-piece. All parts are die-cut from balsa and hardwood. Building time is said to be six to 12 hours. Flying weight runs from $4\frac{1}{2}$ to $5\frac{1}{2}$ lbs. Engines from .35 to .60 can be used with .45's suggested. Fly it full-house or with just aileron, elevator and motor controls. Introductory price is $24.95. When writing, ask about their foam wing kits. FLITE LINE PRODUCTS, 3207 34th St., Lubbock, Texas 79410

Sullivan Products/Fuel Tanks and Tubing. Their new style of polyethylene slant tanks can be installed in any position against the firewall. Because of the flat sides and slanted section you will find the fuel lines always accessible. Reinforcing ribs are molded into the tank's top and bottom. A screw-mounted rubber gasket holds the tank cap securely. Capacities available are —6, 8, 10 and 12 ounces.

Sullivan has also developed a fuel tank tubing of a soft brass alloy. It's easily formed with just the fingers. The 1/8" O.D. tubing is available in 12" lengths at 30c each. Write: SULLIVAN PRODUCTS, 535 Davisville Rd., Willow Grove, Pa. 19090



C. Chopp/Nylon Engine Mounts. After months of testing, Calvin Chopp developed this T-bar shaped engine mount. Molded of Nylon and undrilled, the mounts will accommodate most beam-mounted engines except the rear rotor Super Tigre and the HP61. Locate and drill-for-clearance the firewall mounting holes. Drill only pilot-type holes for the engine itself. Do not tap these as the engine's mounting bolts will cut their own threads. No lock nuts are needed. The Nylon is fuel-proof, tough and it dampens vibration. They're lightweight too. Order direct at $2.75 postpaid per pair. C. CHOPP, 21 West 210 Ahlstrand, Lombard, Ill. 60148



This caricature in miniature is styled after a 1910 racer designed by Edouard Nieuport. Wheels are built up, prop is store-bought plastic type, the rest just balsa. Easy-to-fly plane is small but tough enough for both indoor and outdoor flying.

Neighborhood Nieuport

Incredible, stupendous, death defying, that was Gramps in his 1910-11 vintage racer.

WILLIAM HANNAN

THE name "Nieuport" generally conjures up visions of rotary-engined biplanes darting through World War I skies in the pursuit of German Fokkers. However, if one were to read a bit farther back into the pages of history, one would find in an earlier era, that Nieuport was synonymous with racing monoplanes. Edouard Nieuport, himself was responsible for the design of these machines, which were far ahead of contemporaries, by virtue of their fully enclosed fuselages, clever undercarriages, and general clean lines. In addition to the aircraft, Nieuport also produced the two-cylinder opposed engine, which powered some of these delightful little machines to several speed records.

Our caricature model represents an attempt to reintroduce the nostalgic charm of these 1910-11 vintage racers. Two of these profile Nieuports have been built to date, and both have proven to be satisfying flyers. They have been flown indoors at the Wilmington, California Recreation Center, and outdoors in front of our home, much of the time by my seven-year-old son.

Fuselage: Select a light but stiff piece of 1/8" sheet balsa for the fuselage. Shape as shown on the plans, and sandpaper to a smooth finish. Remember to cut the vertical slot for the rudder. Drill a 1/16" diameter hole in the nose to accept the prop shaft bearing. A drilled aluminum rivet was used on the originals, but a short length of aluminum tubing will work just as well. Glue the hard 1/16" sheet balsa reinforcements to both sides of the nose. Be sure to add a couple of washers to the prop shaft before installing the prop. Glass beads are not recommended, as they will shatter under even a mild impact. A 5" diameter Kaysun plastic prop is trimmed down to 4 3/4", and should be carefully balanced to minimize vibration.

Landing gear: Bend the landing gear wire and axle as shown on the plans. The landing gear skid may be made from either reed or bamboo, which is bent to shape over a heat source, such as a candle or soldering iron. Try to avoid scorching the wood which would significantly weaken it. The axle and landing gear wire are bound to the skid with strong thread, and glued generously. The assembly may then be inserted and glued into the fuselage.

The wheels are quite easy to make, and add to the "vintage look" of the model. Heavy clear acetate is used for the wheels, with light needle scratches giving the visual impression of spokes. The tire portion of the wheels are cut from cardboard, and may be sanded to a rounded contour, then painted flat black, prior to gluing them to the wheel disks. The hubs are made from short lengths of aluminum tubing. Run a small fillet of glue on either side of the disk to hold the hub securely in place. The finished wheels are retained on the axle with drops of glue.

Wings: The wings are made from 1/32" sheet balsa, with 1/16" square leading edges glued to the underside of each panel. The wing-rib lines add character to the model, and may be drawn on with a fine tip marking pen, or even a ball-point pen. The actual ribs (R-1 and R-2) are cut from fairly hard 1/16" sheet balsa, and pre-glued before attaching to the wing panels. While it is quite possible to pin the wing panels to the ribs while they are drying, ours were hand-held, in the interest of eliminating any unsightly pin holes. The root ribs should be installed at a slight angle, for dihedral purposes.

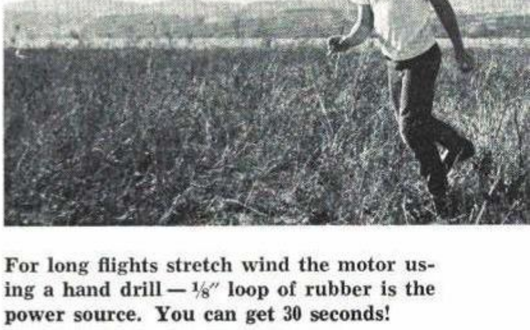
Tailplanes: Select very light sheet balsa for the tailplanes to help minimize the amount of nose ballast which will be required. The lines representing the division between the stabilizer and elevators may be drawn on with a marking pen, as used to simulate the wing ribs. The racing number for the rudder may either be drawn on, or cut from colored tissue and doped in place.

Assembly: With a paper template as a guide, mark the exact location of the wings on each side of the fuselage. Pre-glue these areas for added strength, and install the wings. Be certain that both the incidence and dihedral angles are correct.

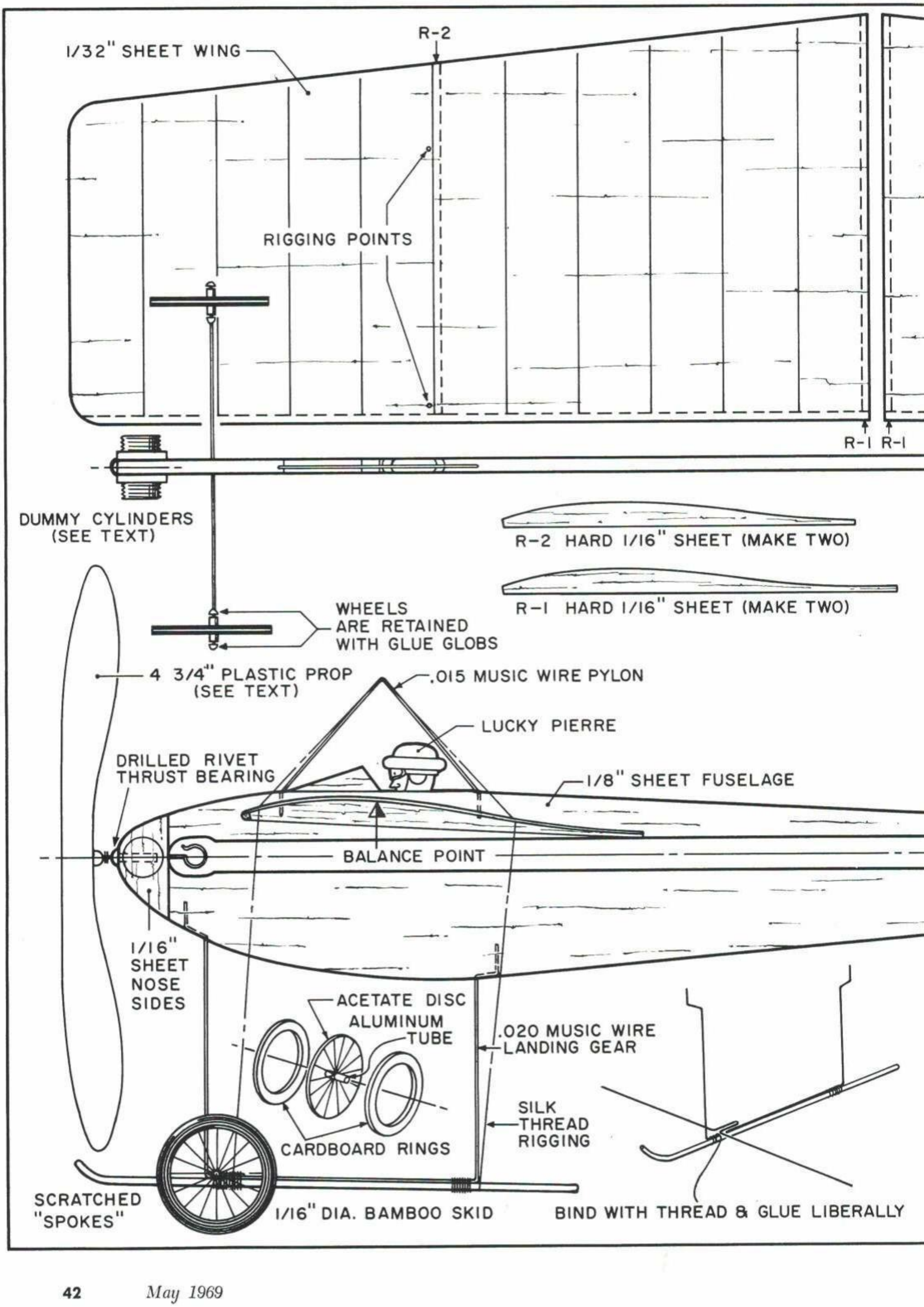
Now install the tailplanes, being cautious to line them up properly. The upper rigging pylon is bent to shape from music wire, and cemented into the top of the fuselage, as shown on the side-view drawing. With a needle and thread, install the rigging. A little forethought will convince you that it can be done with one continuous length of thread, but if you don't like puzzles, go ahead and use two! If any slight warps have developed in the wing panels, they may be effectively removed with the aid of the rigging. It is important to reinforce the points at which the thread passes through the wings. This may be done with drops of glue, cloth patches, or even tiny eyelets.

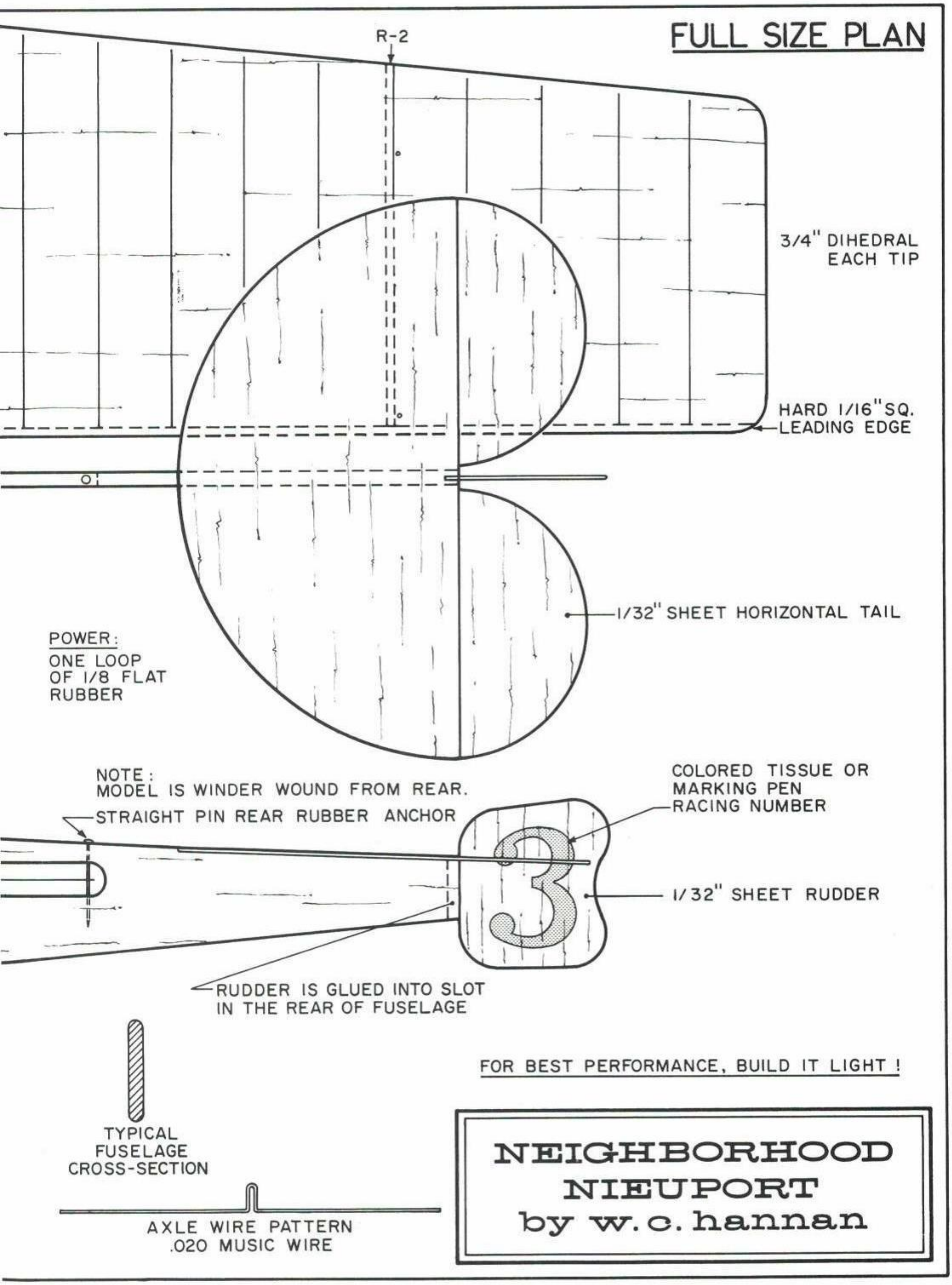
Your model should be complete at this stage, except for the dummy cylinders. These items also function as ballast, and their composition will depend upon the amount of nose weight that your particular model requires. Short slices from a fine-threaded bolt may be employed, or use set

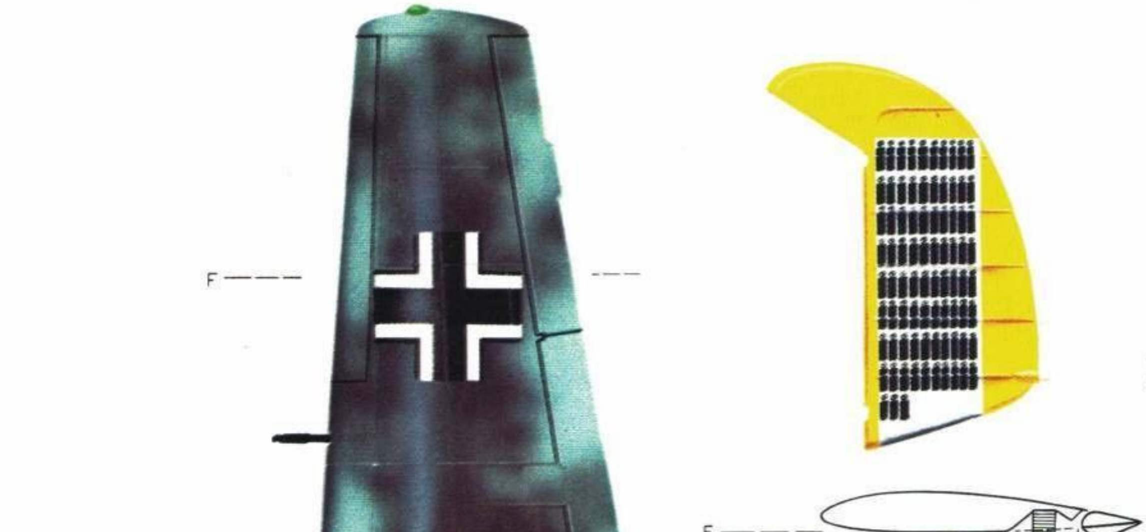
Continued on page 77



For long flights stretch wind the motor using a hand drill — 1/8" loop of rubber is the power source. You can get 30 seconds!

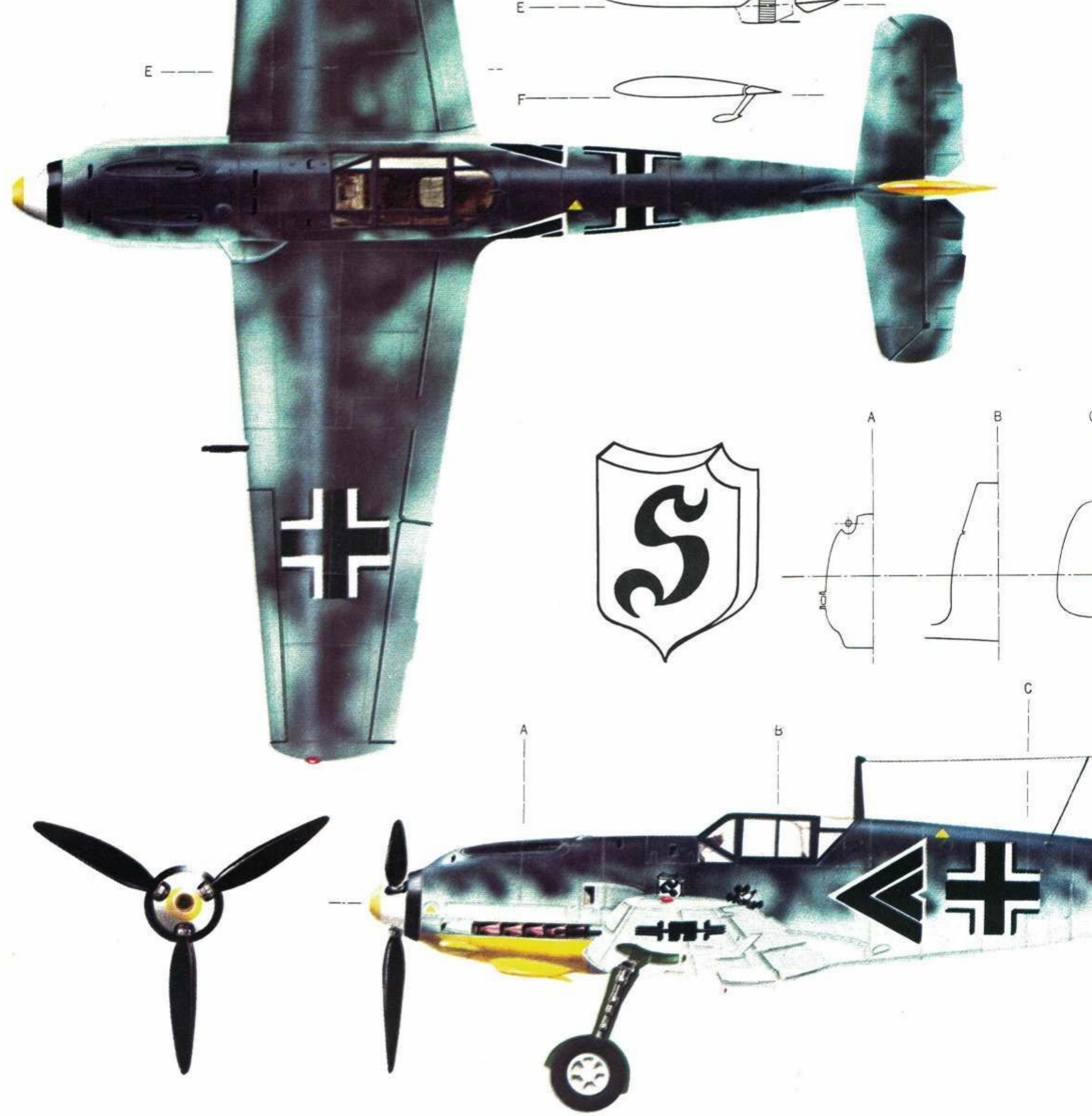

1/32" SHEET WING
R-2
RIGGING POINTS
R-1 R-1
DUMMY CYLINDERS
(SEE TEXT)
R-2 HARD 1/16" SHEET (MAKE TWO)
R-1 HARD 1/16" SHEET (MAKE TWO)
WHEELS
ARE RETAINED
WITH GLUE GLOBS
4 3/4" PLASTIC PROP
(SEE TEXT)
.015 MUSIC WIRE PYLON
LUCKY PIERRE
DRILLED RIVET
THRUST BEARING
1/8" SHEET FUSELAGE
BALANCE POINT
1/16"
SHEET
NOSE
SIDES
ACETATE DISC
ALUMINUM
TUBE
.020 MUSIC WIRE
LANDING GEAR
SILK
THREAD
RIGGING
CARDBOARD RINGS
SCRATCHED
"SPOKES"
1/16" DIA. BAMBOO SKID
BIND WITH THREAD & GLUE LIBERALLY


FULL SIZE PLAN
R-2
3/4" DIHEDRAL EACH TIP
HARD 1/16" SQ. LEADING EDGE
1/32" SHEET HORIZONTAL TAIL
POWER:
ONE LOOP OF 1/8 FLAT RUBBER
NOTE:
MODEL IS WINDER WOUND FROM REAR.
STRAIGHT PIN REAR RUBBER ANCHOR
COLORED TISSUE OR MARKING PEN RACING NUMBER
3
1/32" SHEET RUDDER
RUDDER IS GLUED INTO SLOT IN THE REAR OF FUSELAGE
FOR BEST PERFORMANCE, BUILD IT LIGHT !
TYPICAL FUSELAGE CROSS-SECTION
AXLE WIRE PATTERN .020 MUSIC WIRE
NEIGHBORHOOD NIEUPORT
by w.c. hannan



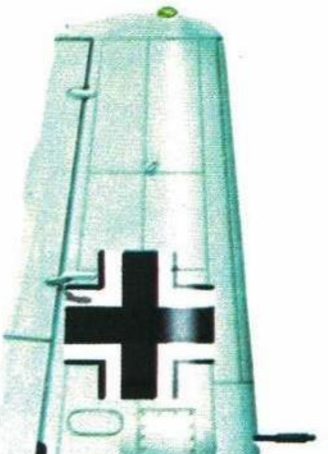
M...

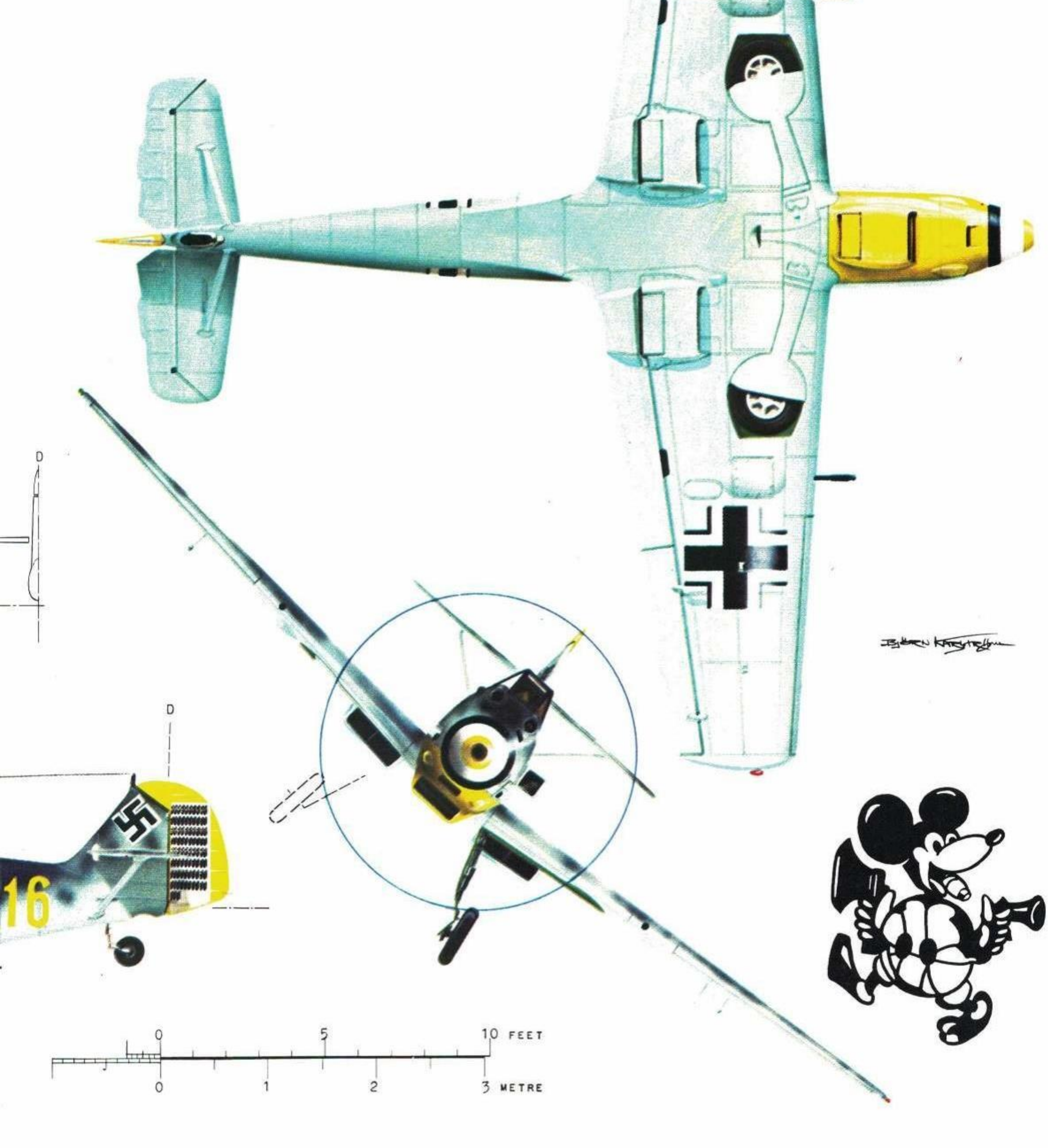
Flown in the Battle of Britain, t...
between December 1940 and ...

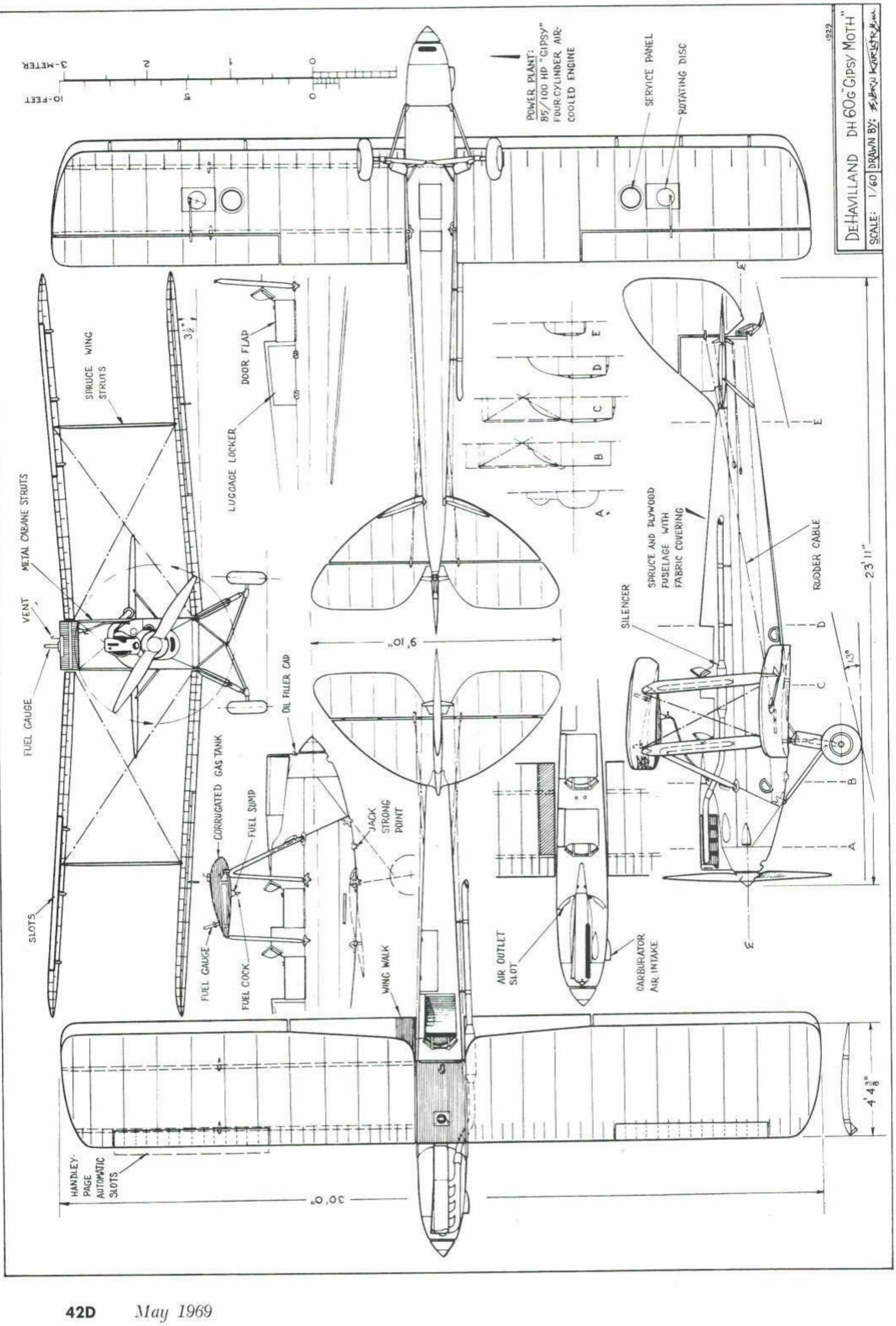


SSERSCHMITT Bf. 109E

particular aircraft shows the camouflage on Major Adolf Galland's machine e 1941. Daimler-Benz DB601A 12-cylinder 1,100 hp (at takeoff) engine.







DeHAVILLAND DH 60G "GIPSY MOTH"
1929
SCALE: 1/60
DRAWN BY:
POWER PLANT: 85/100 HP "GIPSY" FOUR-CYLINDER AIR-COOLED ENGINE
SERVICE PANEL
ROTATING DISC
3-METER
10-FEET
SPRUCE WING STRUTS
3½°
DOOR FLAP
LUGGAGE LOCKER
METAL CABANE STRUTS
VENT
FUEL GAUGE
SLOTS
CORRUGATED GAS TANK
FUEL SUMP
OIL FILLER CAP
JACK STRONG POINT
FUEL GAUGE
FUEL COCK
WING WALK
AIR OUTLET SLOT
CARBURATOR AIR INTAKE
SPRUCE AND PLYWOOD FUSELAGE WITH FABRIC COVERING
SILENCER
RUDDER CABLE
13°
23' 11"
9' 10"
30' 0"
4' 4⅜"
HANDLEY-PAGE AUTOMATIC SLOTS
A
B
C
D
E

GETTING STARTED IN R/C

Antennas and glitch prevention. Don't point antenna at the plane in flight!

HOWARD MC ENTEE

MOST R/C flyers have experienced "glitches"—those sudden momentary twitches a plane will give for no apparent reason. Experienced pilots can often predict when they will have a glitch, especially when flying at the home field. They can also quickly distinguish from a simple glitch and real interference or equipment trouble. Beginners could doubtless do so too, if they knew more of the causes. Let's look at a little, very simple theory, which will help explain glitches, and other factors connected with radio control.

The antenna on your transmitter produces a disturbance surrounding it, in just the same manner as the waves you see when a pebble is tossed into smooth water. Waves travel out in all directions on the water, gradually dying out at a distance. You can't see the waves emanating from your transmitter antenna, nor can you feel or hear them. They are electro-magnetic radiations, and as with light (which also travels in wave-like movement) they can travel through air, or in a perfect vacuum.

For radio purposes, one of the simplest efficient radiators is a half wavelength long (length in feet is roughly equivalent to: 480 divided by frequency in MHz). Half-wave antennas can be "fed" (meaning you can put in power which they will transform into electro-magnetic radiation) either at one end or in the center. Center-feed is more in line with R/C transmitter practice (Fig. 1A), so we will consider only this form. Antennas will radiate efficiently whether they are vertical, horizontal, or any angle between; the pattern of radiation varies drastically when an antenna is shifted from vertical to horizontal. Theoretically, our R/C hand-held transmitters should be held with the antenna exactly vertical. If so held, we would have the closest approximation to the pebble in water—our radio waves would radiate out in a circular pattern in every direction perpendicular to the antenna.

A vertical antenna has the least radiation off the upper end (Fig. 2A), so it's best not to point your transmitter antenna directly at your plane. However, we generally hold our antennas anything but exactly vertical; most of the time the actual radiation pattern is anyone's guess! Fortunately our ranges are relatively short, and our transmitters potent enough that we don't have to worry too much about the theory of radiation angles. But if your plane is vanishing into the distance downwind, you'd have a better chance of getting a signal to it with the antenna vertical and the transmitter held high.

On our 27 MHz R/C spots, a half-wave antenna would be around 18′ long—not exactly portable. But we've found that a quarter-wave antenna (Fig. 1B) is plenty good enough for our R/C transmitter purposes. Even the required 9′ is too long for hand-held transmitters. However, back in the days when all transmitters sat on the ground (most of 'em were too heavy to hold in the hands!), practically all sported 9′ vertical rods. The quarter-wave radiator works because the ground itself takes the place of the missing quarter-wave we have eliminated.

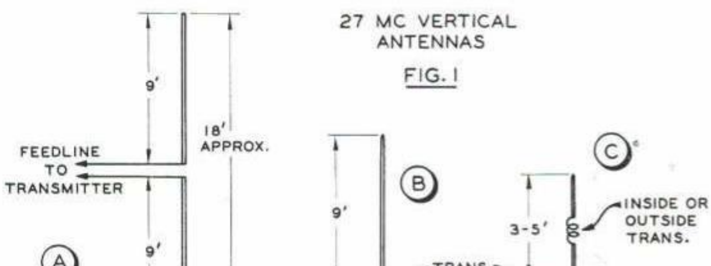
Since we don't want to carry a 9′ rod atop our transmitters, we use a much shorter rod, usually from 3-5′ long, and make up the difference with a "loading coil" as in (Fig. 1C). The latter can be either inside the transmitter, or outside and 1-2′ above the transmitter case. Other means are also used to make a short rod appear to be electrically a full 9′ long. This has to be so; an antenna of incorrect length will not properly "load" the transmitter output stage. Conversely, an antenna of incorrect length for a given frequency will radiate little of the power you try to put into it.

It is quite possible and practical to load a short rod—say four or five feet long—to simulate a half-wave antenna. This is seldom done in R/C work; different problems (and some advantages) accrue from a center-loaded half-wave antenna, but generally the loaded quarter-wave does a sufficiently good job for us.

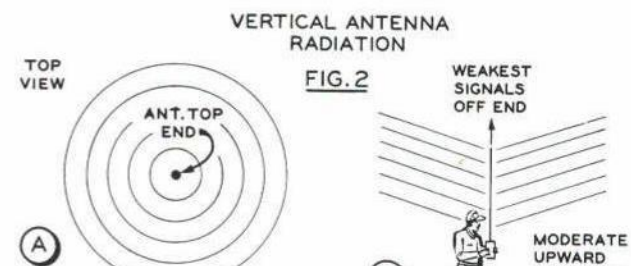
The ground itself takes the place of the missing lower half of a half-wave antenna, to allow reasonable radiation from a vertical quarter-wave rod. By "ground" we mean a good conducting surface, which most ground really isn't. People are even poorer "grounds" than is ground itself! Despite all this inefficiency in the antenna system, we can get away with it due to our short ranges. A hand-held transmitter with quarter-wave vertical antenna is designed and tuned up to radiate best *when it is held in your hands.* Check with a Field Strength Meter and you'll find the signal drops a lot if you hold the transmitter in just one hand—and even more drastically if you set it on a wooden bench or table. Your greasy hands clutching the transmitter case are definitely needed to complete the antenna system, and the more your hands perspire and the tighter you clutch, the more efficient will be the radiation! If you go for a lengthy range check, put the transmitter atop a car roof; even though there is no metallic contact (due to paint on the car and the transmitter case), capacity coupling between the two will allow pretty fair radiation.

While we're on the subject, a vertical antenna (transmitter held in your hands, set on the car or on the ground) does not radiate the strongest signal directly at right angles to 'the antenna—and therefore, parallel to the surface of the ground. The radiation tends to cone upward somewhat, (Fig. 2B); thus you will get a much weaker signal as you walk progressively further from the transmitter with your model, than might be expected. For this reason, if you get satisfactory operation of the plane equipment at a goodly ground distance—say 100 yards or more—you can be pretty confident of satisfactory range in the air, for at an equivalent distance from the transmitter the plane flying at reasonable height will get several times the signal strength it had on the ground.

We've taken so much space explaining some of the mysteries of antennas and how they work that there is no room left for our explanation of glitches. We'll definitely cover this next issue, along with more pointers on transmitter antennas. We'll also cover receiver antennas too; in many ways they aren't as critical as are those on transmitters, but they do have their own little tricks that the R/C beginner should know about for reliability.



Efficient signal radiation requires simulation of the half-wave antenna length. Three-foot loaded quarter-wave works just fine.



Actual radiation pattern from hand-held antenna is anyone's guess. It is basically like dropping a stone in a quiet pool of water.

MANTA

Photo by Centuri Engineering Co.

Designed for competition, its simplicity and ease of adjustment make this an ideal first-try boost-glider.

HOWARD R. KUHN

ONE of the most interesting experiences in Model Rocketry is flying the boost-glider. Since two conflicting sets of geometry apply, it is not a project designed for a first try at rocketry. During the boost or power phase the bird must act as a rocket while, immediately after burnout, it converts into a glider. This requires some method of shifting the center of gravity to the rear to accomplish the transition. The most common competition method of CG shifting is the pop-pod system used by the Manta. During the power phase the pod is attached to the glider by a pin. After burnout and a slight delay, the ejection charge blows the nose cone, and a combination of force and momentum detaches the pod rearward from the glider. The pod with the expended engine returns to earth by parachute while, hopefully, the remainder of the rocket returns in an aerodynamic glide.

The Manta was designed as a competition boost-glider but its simplicity and ease of adjustment make it an ideal project even for a first try at rocket boost-gliders. This bird actually was conceived the night before the start of NARAM-10 (1968 Model Rocket Nationals held at Wallops Island, Va.), while a group of model rocketeers were discussing the pros and cons of the events to come. In less than two hours after its conception, the Manta was ready for its first hand-launched test glide. To the amazement of everyone it did glide and, after adjustment, it became apparent that it could possibly fly. The body of the original model was made longer than necessary and was gradually whittled away to provide proper balance. This eliminated the necessity for adding weight and, in the long run, resulted in a lighter bird.

The day after its conception, after only one powered test flight, the Manta was set on the pad for the Sparrow Boost Glide Event of NARAM-10. An A5-2 engine was used and the bird placed third in the Senior Event. The next day it was flown in the Swift Boost Glide event (a more powerful B4-2 engine was used) where it again placed third. Since then, the Manta has been modified slightly into its present configuration, designed for best all-around flying ability, and has taken a first place in a Regional Meet.

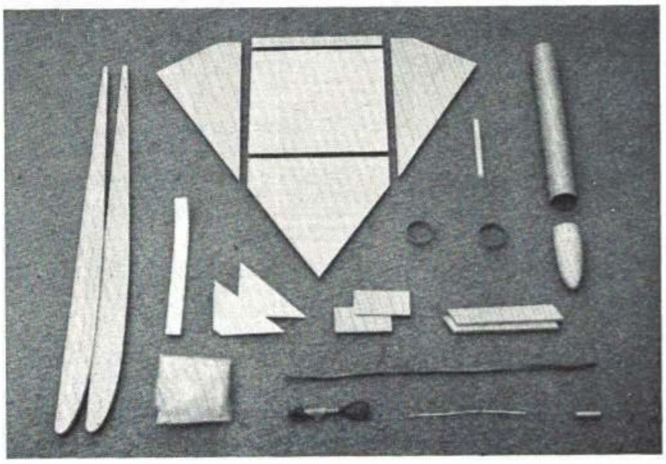
About 20 or more Mantas have been built and flown in meets to date in many sizes down to the micro-Manta, which boosts a 6" wing span, up to a radio-controlled Manta now under construction with a wing span of 18".

Glider construction: The wing is constructed of 1/16" balsa. Cut the parts to pattern, place the center portions of the wing on a piece of wax paper, and then glue together. Hold in place with pins or weights. Make sure the grain is parallel with the leading edge, then bevel the wing tips to fit the junction when the tips have the required 1¼" dihedral. Prop up the tips and glue in place. Finally, glue the rear flap in place so that it is ⅛" above the bottom of the wing. Use epoxy or white glue for all construction. While the wing is drying, cut out the rest of the parts.

The body is constructed of two pieces of ⅛" balsa. A slot for the ⅛" dowel pin on the pop-pod is cut at a 45-degree angle 1½" from the nose into each half of the body parts. Make sure the pin slides in and out freely when the body is assembled. Glue the body halves together so that no glue gets into the slot.

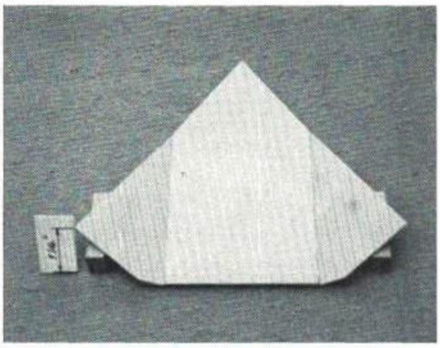
When the wing is dry, invert it and prop up the center section so that the wing tips are above the table. Mark the center and glue the body along the center of the wing as shown. The rudders then are glued at the rear and along the joint of the main wing and tips. The balsa grain on the rudder should be parallel with the leading edge. This completes the assembly of the glider portion of the bird.

Power pop-pod: A 6" length of Estes BT20 or Centuri No. 7 body tube, an Estes BNC-20B or a Centuri BC 70 nose cone, and a 12" parachute kit should be purchased from a model rocket manufacturer. The instructions for the parachute assembly are included in the kit.

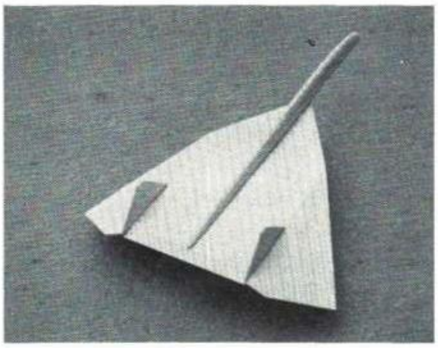


A typical model rocket is inexpensive, using only few parts as illustrated here. Strips on left splice to make glider body.

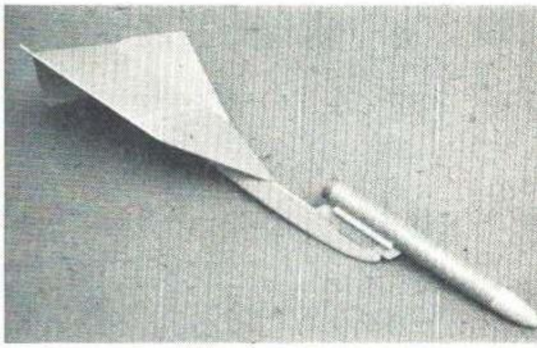
The booster consists of a tube, ejecting engine, parachute, shock-cord, and adapter fittings. Will use ½A through C-size engines.



Glue tips on wing with 1/4" dihedral at tips as indicated. Be sure they are even. Elevator is tail strip with 1/8" up deflection.



Splice fuselage halves together, round bottom but keep top flat. Sand symmetrical section on rudders, glue them on bottom.



Complete model ready for vertical ascent, then graceful descent of the glider. Design will give consistent 40-second flights.

Instead of the parachute kit, I usually construct an 8" square parachute using the plastic from a dry cleaning bag. Engine blocks and shock-cord anchor rings also can be purchased although, to save weight, I use a 1/4" piece of body tube cut to fit inside the pod body for both of these items. The shock cord is an 8" piece of 1/8" flat rubber.

Another useful item is a package of self-adhesive paper tape used for spirit duplicator master corrections. It can be purchased at a stationery store in rolls of many widths. The best size is 1/16" wide, which can be used for tying shock cords, fastening parachute shroud lines to plastic parachutes, and emergency repairs of all sorts.

The engine block is glued into the pod body 2½" from the rear. The best way to do this is to saturate a Q-tip with white glue and insert it 2½" into the pod body. Then rotate the Q-tip in the tube until it has a ring of glue at the engine block location. Carefully remove the Q-tip, trying not to get glue on the sides of the tube on the way in or out. Insert the engine block into place with an expended engine casing, so that the end of the casing extends 1/4" beyond the tube. This will make the engine block 2½" from the rear. Remove the engine casing *immediately*, using a twisting motion just in case you got glue in the pod tube.

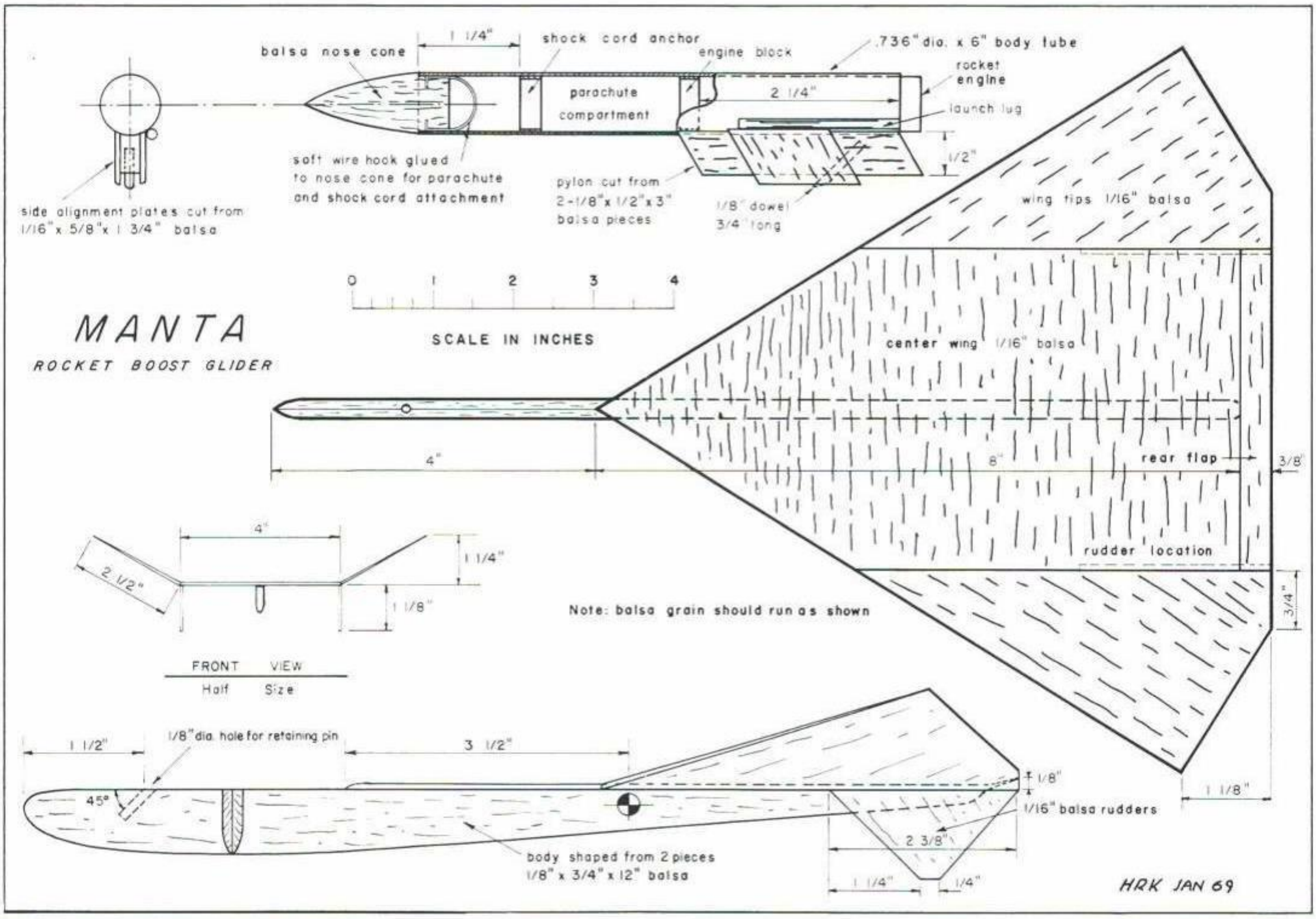
Wrap the shock cord around the shock-cord anchor ring and tie with a piece of paper tape. Glue the ring 1¼" into the front of the pod body in the same manner as the engine block. Make sure the anchor ring is thoroughly glued and seated around the tube.

The standard system for attaching this shock cord and parachute to the nose cone is through the use of a screw-eye. I use a piece of soft wire bent into a loop and hooked into the sides of the nose cone as shown on the drawings. The parachute and shock cord should be tied to the wire or screw-eye, attached to the nose cone.

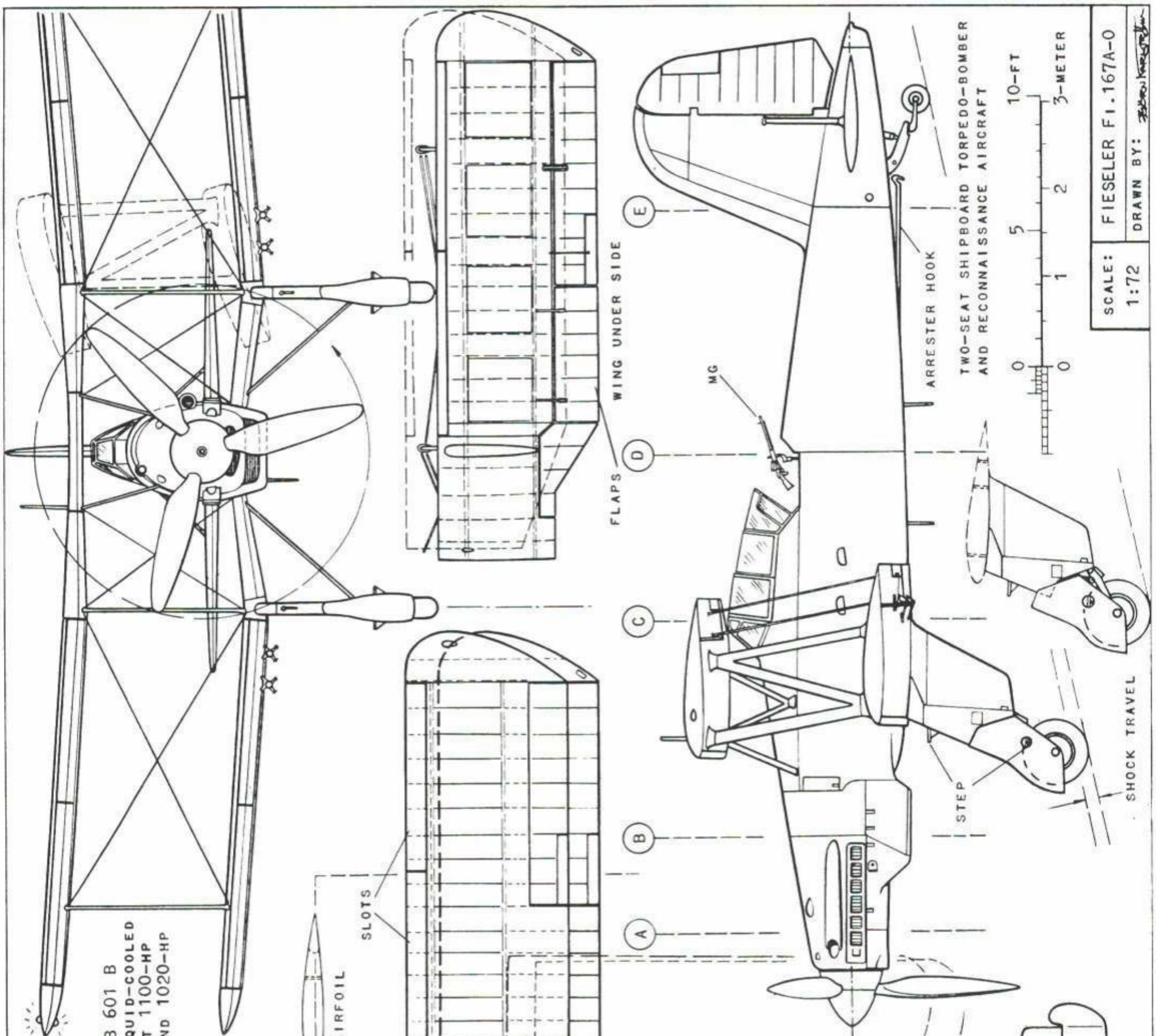
The pylon is cut from two pieces of 1/8" balsa, the same as the glider body. A 1/8" dowel is carved into the pylon at a 45-degree angle, 1½" from the bottom front, to match up with the hole in the nose of the glider body. The dowel should extend about 3/16" out of the bottom of the pylon, and be rounded on the rear side to aid in separation. This dowel is used to secure the pod to the glider during the boost phase.

Glue the two pylon pieces together with the dowel in place and add the 1/16" balsa side alignment plates. Carve and sand this assembly into a symmetrical airfoil shape.

Continued on page 60



FULL SIZE PLANS AVAILABLE — SEE PAGE 60


DAIMLER-BENZ DB 601 B
12-CYLINDER LIQUID-COOLED
ENGINE RATED AT 1100-HP
FOR TAKE-OFF AND 1020-HP
AT 14.765 FT.
MG
AIRFOIL
SLOTS
FLAPS
WING UNDER SIDE
MG
ARRESTER HOOK
STEP
SHOCK TRAVEL
TWO-SEAT SHIPBOARD TORPEDO-BOMBER
AND RECONNAISSANCE AIRCRAFT
10-FT
3-METER
SCALE:
1:72
FIESELER Fi.167A-0
DRAWN BY:
A
B
C
D
E

MAY 1969

MODEL AVIATION

Official magazine

A.M.A. NEWS

AMA

Academy of Model Aeronautics • 1239 Vermont Avenue N.W., Washington, DC 20005

FAI Teams—Perspective for a New Era

The FAI team programs of the Academy of Model Aeronautics are undergoing significant changes. The process started about five years ago and there is more to come. It's all part of an evolution which has seen international aeromodeling become a more important part of AMA activity.

The AMA is responsible for selecting teams to represent the United States in world championship aeromodel competition. We have that authority delegated to us by the National Aeronautic Association. The NAA in turn is authorized by the Federation Aeronautique Internationale to be the official U. S. agency for all aeronautic and aerospace record and competition activity. This authorization is further designated by charter from Congress. AMA, as the aeromodeling division of NAA, shares the authority provided by that charter.

There are currently two aeromodeling world championships each year: Indoor and Control Line in the even-numbered years, Radio Control and Free Flight in odd-numbered years. AMA-directed team selection programs operate in the years between the championships in each category.

Through the 1950's U. S. teams were selected somewhat erratically. Various procedures and programs were used to determine how teams were picked and how they were to get to world championships. It wasn't until the early 1960's that continuity and orderliness began to be applied. And since about 1963 a progression of decisions has established many basic principles which are now working effectively to regulate U. S. team activity.

Disputes, protests, controversy and even law suits were encountered until 1964 when a major policy principle was established by AMA's Executive Council. The decision was to require that a team selection program administrator not be a competitor in the program. Almost immediately we were rid of controversy concerning administrator decisions — not that everyone involved agreed with such decisions, but at least the administrator was freed from charges of personal bias or conflict of interest.

It was also established at the same time that programs and key decisions had to have the agreement of the AMA President, the FAI Coordinator (a presidential appointee) and AMA HQ (the executive director). This assured that programs were operated with regard to basic policy guidelines, established principles, and with fiscal responsibility — the latter a key factor because AMA has a substantial financial investment in FAI activities (approximately 10% of AMA dues).

Since the early 60's it has also been a matter of policy that a large part of team costs — transportation while overseas — is paid by AMA. World championship entry fees, which average about $40 per person, are also paid by AMA. For several years we have thus subsidized teams to two world championships a year — an average of about 15 team members per year at about $150 each — over $2,000 in many years.

Major transportation support comes from NAA. Through NAA, teams are provided with air travel across the ocean — an average of about $6,000 worth a year at commercial rates. This transportation arrangement enables our teams to get from the east coast to England or Germany, then AMA support gets the team to the contest site.

In addition to this aid, each team has a special fund to help get each team member from his home town to the east coast jumping-off point. These funds are derived from contributions and from entry fees in team selection programs.

The travel support removes most of the financial burden from teams. As a result it is not uncommon for a team member to spend less than a hundred dollars of his own money for a ten day trip to Europe — most expenses beyond this are personal: sightseeing or gift and souvenir purchases.

For about five years the team program has been quite stable. World championship schedules, which until the 60's were very erratic, became consistent so that we have been able, since then, to plan team participation a year or two ahead. In prior years we often had frantic situations where teams were picked only weeks before a championships, with barely enough time to get travel arranged, model boxes made, shots taken, visas and passports cleared, etc.

There were some who said this was a good thing, that it got our teams over when they were "hot." But the cost in disruption of other AMA business was too great. Planning for the annual National Meet, other FAI programs, routine contest sanctioning and membership processing, all practically stopped while crash team processing took

The U. S. team for the 1969 International Radio Control Scale Contest: left — Maxey Hester, Montezuma, Iowa; below — Joe Bridi, Harbor City, Calif.; right — Claude McCullough, Ottumwa, Iowa. Hester and McCullough are building improved models — Zlinn Akrobat by Hester and Fletcher by McCullough. No word on Bridi's plans at press time. Unlike world championship teams, this year's scale team members must each bear his own travel expense. However, contributions are desired to help offset expenses; send appropriately marked to AMA HQ.

over. It was also felt by many, including some team members, that the short time element worked against a team effort — it was not unusual for team members to barely know each other or their manager before they plunged into a world championship.

The AMA Executive Council decided all this was not in our best interests and ruled that whenever possible teams would be selected in the year before a world championship. This would then give team members some months to get their models and equipment ready (including the building of spare models), and get all the paper work taken care of without greatly interfering with other AMA business. It even permitted some advance resereach into the contest site terrain and weather conditions.

All things considered, the earlier team selection has worked well. The performance of teams has not suffered and may even have been improved. The record shows that our teams have done as well or better in recent years than before. A big plus has been the fact that team members have gotten to know each other and their team manager better than was possible before.

This year AMA has programs in being to select teams for the 1970 indoor and also the control line world championships (to be held in Poland and Holland). And the first stage of a two year program has been initiated to pick the free flight team for the 1971 world championships (in Sweden). Meanwhile, an AMA committee is developing next year's program for picking the 1971 radio control team.

That's a lot of activity and there's more on the horizon. Scale has, after many years of development, achieved sufficient progress so that it is soon expected to be accorded world championship status. Both control line and radio control are involved. Control line scale has already had a test under FAI rules at the first international meet, held in conjunction with the 1966 world championships in England — a U. S. entry took first in the event. Similarly, radio control scale will be tested this year at a special scale meet during the RC championships in Germany — with a U. S. team to participate.

Until scale receives official world championship status, any U. S. scale teams are able to be only partially supported by AMA, without the direct financial aid usually provided. But when the FAI announces a scale world championships we will be faced with the problem of how to expand our team support. The obvious question is whether we have enough AMA money and NAA transportation to simply add on the scale team load.

Based on previous budgets the answer is no. We may have to forget about scale as a fully supported team effort, or else we may substitute scale for some less popular team program. If the latter is the direction to go, our current programs will be in for a shakeup. Scale seems to be popular enough to cause such a shakeup — the numbers involved are sufficient to justify equal or preferential team consideration.

Our weakest FAI activity at present, in terms of numbers participating, is control line. Speed is particularly vulnerable, with only eleven flyers involved in the previous team selection program — down from 21 in 1966 and 50 in 1964. Team race is the next vulnerable event: 17 entries in the '68 program, 30 in 1966. Stunt follows with 19 competing for the '68 team and 23 for '66. All three control line program entries put together, competing for 12 team member positions, were less in number than the 85 competing for the three indoor team positions and the 58 competing for the three RC team positions.

Although on the basis of numbers FAI control line activity is very weak, control line team quality has been very high — our teams have been excellent — and this factor alone has helped prevent curtailment of CL team programs. But AMA policy is basically to spread support to the greatest number of people involved. In a real showdown CL team activity could be seriously hurt by any comparison.

For control line people a positive approach is needed to show that there is greater interest than has been apparent. The most obvious way is to get more people involved in team selection programs — this year's program, for example, to pick the 1970 team. Another way is to promote purchases of FAI stamps by CL flyers — especially those who may not choose to try for the team (but who can show their support by this means). The number of people entered in team programs *together with* the number of people buying FAI stamps for a particular program are used to measure membership interest and compare one program with another.

Note: FAI stamp purchase by a maximum number of individuals is important, rather than a lot of stamps by a few. Those who do not already have 1969 FAI stamps may purchase same by sending $1.25 to AMA Hq. and indicating whether Control Line, Free Flight, or Radio Control credit is intended.

A crisis seems to be brewing and *now* is the time for those concerned to stand up and be counted — *before* decisions may have to be made. *If* a decision is to come that would favor one category of interest over another, it would be well for all interests to be represented as strongly as possible so that the fairest decision can be made.

A few months ago it appeared that the crisis time might not come before 1971, with scale world championship status anticipated for 1972. But the picture has suddenly been confused by a bid from France to host a world championships for both CL and RC scale in 1970.

If this bid should be accepted by the FAI it means we are already late in planning for official U. S. team participation — a crash program will have to be turned on. And we will suddenly have to face the question of whether scale teams can be provided for without hurting support for any other teams. It might seem that such a question could be answered now, but time is an important factor which can vary the answer.

For example, if we don't have to include scale teams in our next budget, the following budget might be larger — possibly large enough to support current teams *and* any new scale teams. This could be dependent upon continued growth of AMA membership — more members, more dues, more funds available for the FAI portion of the dues budget.

But if we haven't achieved that situation by the time we need to send scale teams, then the crisis may be unavoidable. It could come about the same time this article appears. The French offer may receive action at the annual April meeting of the FAI's aeromodeling "Bureau" in Paris — it is expected that the Bureau will at least clarify whether the offer can be accepted without longer notice.

The FAI's November meeting of the full Committee for International Aero Modeling (CIAM) will provide the final answer, but the April meeting could well indicate which way the final decision may be expected to go. In any case we should know what's coming by the time of the National Model Airplane Championships in July. Between now and then various contingency plans will be explored so that the best decision for the circumstances may be made.

In the meantime our 1969 teams are making final plans for this year's world championships. We'll be sending a four-man RC aerobatic team to Germany in Late July and a ten man free flight team to Austria in August. These will be fully supported AMA teams. We'll also be sending an RC scale team to Germany in July. The team will be at least partially supported by AMA help because it will gain valuable experience for the world championship teams to follow.

The trend is toward expansion of world championship activity. Besides scale there's magnet-steered gliders, RC pylon racing and several other possibilities. Whether AMA can support teams in all categories is problematical. The policy has been to participate whenever feasible.

The expansion of activity means that we need to come up with further improvements and new approaches. These are currently being explored by AMA officers and will be reported on as they progress.

RC Scale Team Selected, Indoor and Free Flight Programs in Full Swing

RC Scale & Aerobatics

A committee composed of Bill Northrop (chairman), Delaware, Bob Noll, New York, and Woody Woodward, Calif., has finalized its selection of the three-man team to represent the United States in the International RC Scale Contest. They are:

Maxey Hester, Montezuma, Iowa
Joe Bridi, Harbor City, Calif.
Claude McCullough, Ottumwa, Iowa

The committee, named in 1968 by then President Cliff Weirick, deliberated several months in reaching this selection. Factors it had to consider were an insufficiency of time to choose a team by a competition process, the known and/or potential quality of existing models and piloting ability, and — foremost — the ability of the modelers chosen to arrange their own transportation to the contest.

First consideration of the committee was to determine the most qualified models and pilots; then they sought out whether these modelers could attend. The final team member selections came from among the top six choices made by the committee.

The International RC Scale Contest is to be held in conjunction with the 1969 RC Aerobatic World Championship in West Germany at Lemwerder, July 23-27. The aerobatic team, chosen in competition during the 1968 Nationals, consists of:

Phil Kraft, Monterey Pk., Calif.
Jim Kirkland, Valparaiso, Fla.
Jim Whitley, Decatur, Ala.

Team manager, originally, was slated to be John Patton. However, Patton resigned from this position following his election as AMA president. Weirick then, in one of his last acts as 1968 president, appointed Ron Chidgey, Pensacola, Fla., as team manager.

Indoor

The 1969 program to pick the Indoor World Championship team for 1970 is now well underway. The four-stage program, detailed fully in "AMA News" for March, began with Local Qualification Trials in January. These Local Qualification Trials are still in progress, but must be concluded by April 30, 1969. Until that date there's still time to get in on the program.

Any AMA sanctioned indoor contest, in addition to the sanctioned Qualification Trials, may serve for the required initial qualifying. Look to the Contest Calendar for the location of these events, or write to one of the area coordinators listed in the March issue. Flight performance required for advancing to the Quarter Final Trials, the next stage, is 60% of the top time at the contest or Qualification Trial. This performance must be done with a model conforming to the FAI rules, but take note of the fact that many indoor models built to AMA rules also conform with FAI. (See AMA rule book.) Even the beginner's AMA Cub complies with the rules, and—who knows—maybe a model less than best would provide a stepping stone (and provide time to build something better) for the next stage. A modeler may try to qualify for the Quarter Final Trials by paying a single program entry fee and flying in as many contests as he wishes during the time period provided.

Entrants must be AMA members who have the FAI stamp. The team program entry fee for Local Qualification Trials (or other contests used for such purpose) is $3 for Open age AMA members, $1 for Juniors or Seniors. This fee may be paid to the Contest Director at the site of the Local Qualification Trial, but it must be paid in advance to AMA HQ if other contests are used for qualifying. There are also program entry fees for the Quarter Final Trials, Semi-Final Trials and national Team Selection Finals. All such fees collected are used to help defray travel expenses of the team members who are selected.

The Quarter Final Trials take place between May 1 and May 31, 1969. Here, the flight performance must be better than required in the first stage; the top 80% qualify for entry in the Semi-Final Trials.

Zone Semi-Final Trials take place between June 1 and June 30, 1969. From each of the Zone Trials the top three modelers will progress to the national Team Selection Finals (if less than 5 enter any Semi-Final, the top 50% will qualify). The top three modelers in the national Team Selection Finals become members of the U. S. team.

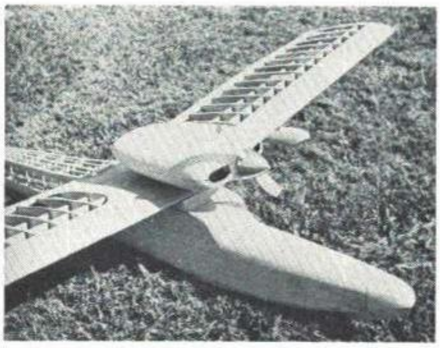
Free Flight

The 1969-70 FAI free flight program to select 1971 U. S. world championship teams is just getting underway as this magazine goes on sale. Teams are to be chosen, through competition, for Wakefield rubber, FAI power and A-2 towline glider. Full details were in the "AMA News Extra" feature of the March issue.

It is a three-stage program commencing with Qualifying Trials from March 29 through August 3, 1969, progressing to regional Semi-Finals over the 1969 Labor Day weekend, and culminating with a national Team Final's over the 1970 Labor Day weekend. The program is open to any AMA member who has the FAI stamp.

A modeler may fly in as many of the Qualifying Trials as he wishes until he qualifies for the regional Semi-Finals by achieving a seven-flight total of 14 minutes. Fly in either regular AMA sanctioned FF meets with scheduled FAI events, or in AMA sanctioned Qualifying Trials.

The program entry fee is $4 per event for Senior and Open AMA members (free for Juniors) when paid in advance to AMA HQ. The fee may be paid at the site only for Qualifying Trials (not permitted for regular FF meets) but the fee is increased to $5. Payment of a single program entry fee for each event allows entry in an unlimited number of trials (although there may be contest entry fees.



"T"ranha by Vincent Carnevale, St. Petersburg, Fla., is a much modified Piranha incorporating a stabalator (flying tail). Power is provided by a Webra 61, control by a Heathkit propo system. Fueled weight is 11 lbs. Carnevale's home is on the bay — flies out of his back yard. Fiberglass engine pod, made in female mold, contains the engine servo in a waterproof case. Receiver, batteries and two servos are in another waterproof case in the hull. Model flies well.

Photo by Brad Wolfe

John Barmore, Portland, Ore., entered his first contest last year and took third place in Open Control Line Scale with the 1932 Lockheed Vega shown, built from Hobby Helpers plans plus Wylam details, used Super Tigre G-60 engine, 12 x 6 Top Flite prop, J. Roberts control system.

An engine collector as well as builder-pilot is 13 year old Darryl Pierce of Chandler, Ariz. Here he is about to mount one of the engines in his Shoestring. Of the 30 engines shown, all but three or four run. Darryl and his dad belong to the Chandler Balsa Bugs MAC.

Photo by Mel Schmidt

The Raider free flight gas design by Mel Schmidt is reported to be gaining in popularity. The Raider 340 model shown here with Dave Schmidt, LaHabra, Calif., is powered by a Cox .049. Raider 620's and 800's already built, 720's and 1000's are on the drawing board.

Off-Year FAI FF Program

During the past summer there was a competition designated as the Off-Year FAI Free Flight Program. It was for the world championship categories of Wakefield rubber, A-2 towline glider and FAI power—staged in a manner generally similar to the team selection program.

Idea was to provide competition for newcomers to FAI free flight and to allow experienced flyers to keep in practice, if they wished, in a year in which there was only the wind-up of the team selection program. The Off-Year Program began in June with qualifying trials which were concluded on August 11, 1968. Unfortunately the program was not conceived and approved early enough for a beneficial prior announcement in these pages; this probably contributed to a rather low entry.

The Off-Year Program was concluded with fly-offs over the 1968 Labor Day weekend. Participating were all those who achieved a five-flight total of 10 minutes in the first stage. They flew in their local areas; flight totals reported by mail were then compared to determine the national winners, who were:

FAI Power
1. William Davis, E. Chattanooga, Tenn.
2. Mike Poorman, Baltimore, Md.
3. Carlton Molesworth, Frederick, Md.

Wakefield Rubber
1. George Perryman, Smyrna, Ga.
2. James Gardner, Jr., Vinita, Okla.
3. Sandy Downs, Austell, Ga.

A-2 Towline Glider
1. George Scott, Frederick, Md.
2. Carl Bogart, Joppa, Md.
3. James Kutkuhn, Wallingford, Pa.

Some of the sought-after goals were met; some were not. Whether the off-year program may be repeated in 1970, another year in which there is expected to be only a Team Finals, for 1971, depends upon whether there is sufficient desire for another try, plus the availability of qualified AMA members to organize the effort.

Maryland State Meet a Multi Club Effort

When the Contest Director handed me a manila folder with the recap of the 1968 Maryland Meet (Frederick, Md., Sept. 15, 1968) I was amazed that all the things involved in putting together a modern AAA meet could be condensed into such a skimpy little stack of papers. Leafing through the sheets started me thinking about all the years this event has been staged here in Frederick.

Originally sponsored by the local Exchange Club, which was new and full of pep at the time, the meet has undergone constant transition through the years. The Frederick MAC, which is beginning to show a little white hair now, gradually took over phase after phase until finally the little club took a deep breath and agreed to take on the whole meet. This included financial sponsorship as well as the job of getting enough people together to operate the various events. At one low point, two members personally gambled on the weather and put up the trophy money in order that the meet could continue. Thank goodness the weather was lovely and our two stalwarts got their money back and the microscopic club treasury showed a profit of five dollars.

About this time, it was conceded that help was needed, and the idea of combined

1968 Maryland State Meet scenes: W. E. Patterson, Media, Pa. (at top) gets ready his A-2 towline glider entry. Allen Ernes, Martins Ferry, Ohio (left) tests the wind before heaving his Hedgehopper HL glider. John Dent, Vienna, Va. (right) revs-up his Cox-powered ½A entry.

sponsorship with other clubs was born. If one club could handle local physical facilities and arrangements, one club run free flight, one run RC and yet another handle control line, the risk could be spread over a larger base which would make it possible to broaden the meet. A series of meetings was held with the Baltimore Aero-Craftsmen, the Radio Club of Baltimore and a group of interested control line flyers from the area. Agreements were reached, committees were set up dividing the work, and it was decided to operate on a basis of three complete meets in one. We would use one overall CD and a separate CD for each of three divisions. A proclamation was obtained from the Governor of the State of Maryland, and the name, "Maryland Model Airplane Championhip," was decided on. Separate Junior, Senior and Open Championship trophies were awarded.

The percentage of Maryland modelers was getting smaller and smaller as the meet began to grow. In 1966 there were flyers from eleven states participating. The State Championship competition was dropped because it was felt that our little country meet had outgrown the bounds of a single state. As a matter of fact, the entire eastern section of the country is represented now, and it is hoped that this condition can be maintained.

We are most pleased at the healthy increase in Junior and Senior entries in recent years. In 1966 there were 47, 40 turned out in 1967, and in 1968 we registered a healthy 65 Junior-Senior flyers out of a total of 218 contestants. Observations made at other meets this year have indicated that the efforts of programs like the Delta Dart and others are beginning to pay off, as we are seeing more and more youngsters putting up really competitive scores.

Because the people who put on this 1968 meet were so busy getting things together for the meet, attending to the endless details like snow-fence liners for CL circles, publishing contest announcements, obtaining AMA sanction, putting up tents, coordinating with local officials and police departments and on, and on, our one weakness finally showed up. Two photographers failed to produce picture coverage for the meet. Only one Aero-Craftsmen stalwart turned in decent shots. It is regrettable that we missed some of the gorgeous RC and CL modeles that were there, but maybe next year. . . .

The 1968 Maryland Model Airplane Meet totals are interesting considering our geographic location, the acute shortage of eastern flying sites, and the real traffic battle to be endured on a two-hundred mile auto journey. The following event entries were posted: 32 for RC, 320 FF and 79 CL, a total of 431 which is quite a lot of flying for a one-day meet. Police estimate about 3,000 spectactors attended.

Plans are already being discussed for 1969 now that all our people who were saying "never, again!" at day's-end last September have gotten their strength back. It is hoped that the AAA "full house" concept of every type flying can be sustained for many years to come.

Carlton Molesworth

Once Over

British Championship Teams

The British teams for the FAI World Championships to be held in 1969 are as follows:

Radio Control: **M. Birch, D. Hammant and S. Foster.** *FF FAI Power*: **D. Wiseman, R. Monks and G. Fuller.** *FF A-2 Towline*: **A. Young, E. Drew and C. Batty.** *FF Wakefield Rubber*: **L. Barr, J. O'Donnell and R. Monks.**

N/E Profile Carrier

Competition in the Profile Navy Carrier event in Michigan is keen — so much so that the Michigan Model Airplane Association recently decided to separate entrants into novice and expert classes in its contests. The MMAA definition of an expert for this purpose is one who, based on his own personal experience, would declare himself an expert; or one who has won three or more trophies in carrier events during the present year and two years preceding.

The principle has worked well in RC competition during the past few years — seems like it could do the same for control line.

RC Team Planning

Photo by Joe Stream

Photo shows Betty Stream, Tom Rankin and Nate Rambo in a meeting in California they had early this year. Betty and Nate are members (she is secretary) of a committee which Rankin heads as program administrator for selection of the 1971 radio control world championship team. Rankin, of Silver Spring, Md., met with the Californians during a business trip.

No SHOCs at Mile Square

Because of an oversight of the Sky Hoppers of Orange County (Calif.) in not securing the AMA certificate naming the Marine Corps as additional insured when it renewed its AMA club charter, the group for a short while was denied use of the Marine Corps' Mile Square facility for model flying. The situation has since been rectified. Clubs should note that, for a flat fee of $5 each, owners of flying fields and other premises used by the club may be provided with a certificate naming the owner as additional insured.

New Members Urged for Committees

Several new members of the Greater Pittsburgh Aero Radio Control Society were listed in the December issue of the ARCS paper. "Welcome to the club," wrote Phil Catanzara, secretary, "and may I invite you to get better acquainted by getting on a committee. I really believe that even if you don't think you can help, we think you can."

CL Symposium?

A few AMA members are kicking around the idea of a symposium at the Nationals for control line flying — much on the idea of the successful Free Flight Symposium organized by the National Free Flight Society. Unfortunately there is no similar national control line society; thus, if such a CL symposium is held, the organizing work would have to be the volunteer effort of a number of individuals. One well known CL personality interested in a symposium is George Aldrich, 3219 Shady Springs, San Antonio, Tex. 78230. Other like thinkers may want to contact Aldrich and volunteer their services. Probably it is too late to organize a CL symposium for 1969 in connection with the Nats — but it's not too early to begin thinking about 1970.

Record Error in February

In February "AMA News" W. Vanderbeek was listed as a new national record holder for the Junior age class, at 21 minutes. This listing was incorrect; Vanderbeek's record was established in the Senior age class of Unlimited Rubber. We regret the error.

Competition Newsletter

The first issue of the AMA Competition Newsletter came out on schedule in mid-January. The new publication series for AMA is designed to improve communications of, by, and for the competition model flyer. The initial issue featured tips on operating tuned pipes by George Aldrich, RC sailplane news by Dale Willoughby, national AMA record listing, 3-view sketch of Lee Polansky's Class A FF record setter at 70 minutes plus, a rundown of proposals before the Contest Boards, a wrap-up of the FAI team selection programs, an up-to-the-minute contest calendar, a story on FAI world records by Red Gunning, and District IV competition news by Cliff Telford — eight pages chock-full of info. Competition Service, including the Competition Newsletter, available only to AMA members, is priced according to the time fee is received by AMA HQ as follows: $3 Jan. 1-March 31; $2.50 April 1-June 30; $2 July 1-Dec. 31. Service begins with first Newsletter aavilable after fee is received — ends in December. First Class mailing is used, so news is timely.

FF Manager Preps Team

Pete Sotich, manager of the 1969 U.S. FAI FF World Championship Teams (Wakefield rubber, FAI power and A-2 towline) is rounding up all the information available about the 1963 FF WC. Not only is he locating magazine articles about the 1963 Championship, but he is also seeking information from 1963 team members. Reason for all this is that the 1969 FF World Championship is to be at the same site as the 1963 meet — Wiener Neustadt, near Vienna, Austria. Sotich hopes to inform the team of the flying site, weather conditions, thermal activity, etc., as well as any other information that may be of use.

Cruise Youngsters "Hook" Sailor

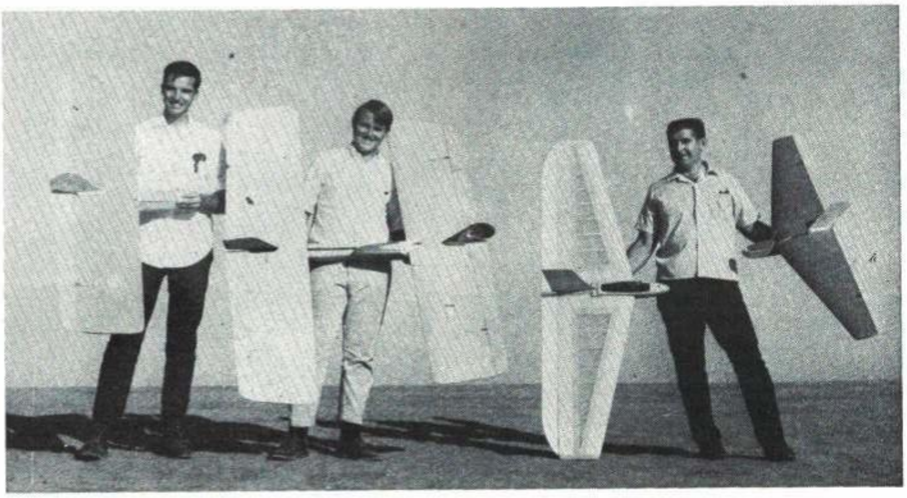
Tyrone Marcucci, Newport, R. I., writes, "While serving on the USS Lexington from June '61 through August '64 I had the great pleasure of seeing the Nats winners give two shows on our flight deck. I promptly went out and bought a plane, and taught my bride of four months to fly; now she builds finer looking planes than I."

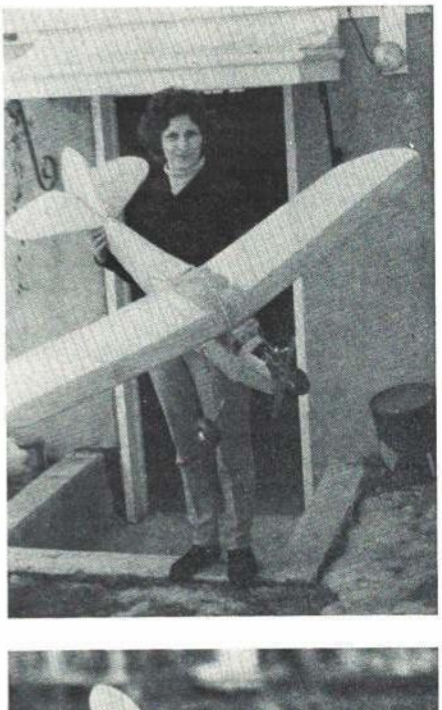
This shows how getting others interested in modeling is a two-way street. Mostly we look to grown-ups to get youngsters started, but here's a case where the youngsters inspired the adult. In recent years, the carrier cruise aboard the USS Lexington at Pensacola, Fla., has been provided to outstanding Junior or Senior Nats entrants under sponsorship of the Hobby Industry Association of America.

Photographs here and on page 49 were contributed by AMA members. Additional ones covering all subjects are needed on a continuing basis. The most interesting ones will be used. Send photos, which cannot be returned, with sufficient information for captions and photographer's name, to Picture Editor, AMA HQ, 1239 Vermont Ave., N. W., Washington, D. C. 20005.

Left: F. A. Verser, Jr., Manhattan, Kan., believes his modified Top Flite Top Dawg will be a hot, fully stuntable, plane Uses Logictrol III, Super Tigre 23.

Below: Three members of the West Coast Harbor Slope Soaring Society hold aerobatic RC gliders. Grant Munsey and Mike Charles hold the Akro-Bat designed by Dr. Rolf McPherson. Don Harris holds a larger original design and an earlier Kom-Bat. Submitted by D. Willoughby.

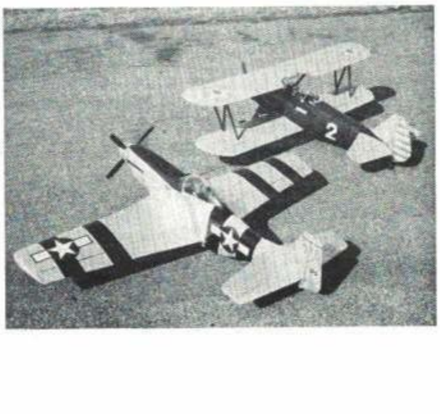




Right: Ann Nye, Cortland, N. Y., holds 31 year old Buckaneer Standard. Originally constructed by Don Gardner of Miami, Fla., it was rebuilt by Carl Nye. It still has the Brown Jr. engine and all other original equipment except for the spark coil and tires. Carl Nye photo.

Below, right: In-flight photo of a 24" span catapult glider designed and built by John Thornhill, Mt. Rainier, Md. He recommends that all catapult models have a rounded nose for safety. Edward Marrone photo.

Below: Two RC scale models built by members of the Rocket City Radio Controllers of Huntsville, Ala. The P-51D, built from RCM plans by R. L. Klineyoung, is Merco 61-powered, has Hobbypoxy finish. The PT-17 Stearman was built from a Sterling kit by H. Rodgers, powered by a Veco 61, Kraft radio. H. Rodgers photo.



AMA News Extra . . . . .

1969 NATIONAL MODEL AIRPLANE CHAMPIONSHIPS   WILLOW GROVE Naval Air Station, Penna.

Official Dates: Monday, July 14, through Sunday, July 20

Monday--1. Registration--for those entered previously, in advance, by mail.
2. RC Pylon Qualifying--Two events: Formula I and II.
3. RC Transmitter Processing--Scale, Pylon and Pattern--at night.
4. Indoor Rubber-Powered Events, at Lakehurst Naval Air Station, N.J.
5. Late Entry/Registration--on this day only; no entries after July 14.

Tuesday--Same as Monday for items 1., 2., and 3., above.
Indoor at Lakehurst--Flying Scale and Hand-Launched Glider events.

Wed. thru Sun.--Full competition schedule, 8 am to 5 pm each day, 1/2 day on Sunday.
Registration, for those entered by mail only, Wed. thru Sat.
RC Transmitter Processing Wednesday night.

Same official events as 1968, except:

a. RC Class C Pattern instead of FAI (trophies for Expert, Novice, Jrs., Srs.).
b. RC Pylon Formula II added--qualifying and finals sharing Formula I time.
c. RC Scale will use FAI rules (with AMA engine and model weight limits).
d. Indoor Flying Scale added--sharing site with Hand-Launched Glider event.
e. CL ½A Profile Proto added--Juniors only; same time as ½A Proto event.
f. CL Profile Carrier added--same time as other Carrier events.

Special RC Information:

a. 3 Pattern qualifying flights; top 15 get 3 more flights--all short pattern. Top 5 qualifiers fly 3 final full pattern flights--best 2 flights win.
b. Pattern flying Wednesday through Friday--four flight lines (one for finals).
c. Scale flying Wednesday and Thursday--required prior to Scale Judging.
d. Pylon Finals Saturday and Sunday--Formula I and II.

Special Control Line Information:

a. Two days for Open Stunt--Finals on second day.
b. Jr. & Sr. Stunt one day each--complete each day.
c. Jim Walker Stunt flyoff on Sunday (Jr., Sr. & Open winners).

Special Free Flight Information:

a. Five flights for FAI events--no rounds.
b. Three minute max. flights for all events, except two min. for H.L. Glider.
c. Flyoffs retain same max. flights; engine run reduced 2 sec. each extra flt.

ENTRY INFO: a. Advance basic entry fee: $10.00.
b. Late basic entry fee (Mon. only): $25.00.
c. Advance entry postmark deadline: June 15.
d. Entry forms available April 15. Send stamped, self-addressed envelope (with 6¢ postage for each form desired--10¢ each if Air Mail return is desired) to:

ACADEMY OF MODEL AERONAUTICS, 1239 VERMONT AVENUE N.W., WASHINGTON, D.C. 20005.

By special arrangement with the publisher this page is produced at the very last minute, just before the magazine is printed, to bring you the latest news concerning current Academy of Model Aeronautics events of national significance.

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M. Weisenbach, 4568 West 146th St., Cleveland, Ohio 44135 (West)
IV: D. L. Johnson, 3367 Sudlersville So., Laurel, Md.
V: T. McLaughlan, 4140 Fern Ct., Pine Glades, Pensacola, Fla. 32503
VI: Wheland Webb, 15722 Vine Ave., Harvey, Ill. 60449
VII: Odell Marchant, 2004 N. Hillsboro, Minneapolis, Minn. 55427 (North)
W. Hartung, 14759 Kilbourne, Detroit, Mich. 48213 (South)
VIII: M. Frank, 2933 Blankenship, Wichita Falls, Tex. 76308
IX: R. R. Combs, RR #1 Box 712, Morrison, Colo.
X: D. C. Farnsworth, 301 Carl Dr., Visalia, Calif. 93277 (North)
Pete Brandt, 5817 W. Ironwood, Palos Verdes Peninsula, Calif. 90274 (South)
XI: A. L. Grell, Rt. 1 Box 165, Tangent, Ore. 97389

CONTEST BOARD COORDINATOR: Don Lindley, 301 E. Elizabeth Dr., Crown Point, Ind. 46307
Bold type below indicates Chairman of Contest Board.

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IV: J. V. Boyle Jr., 219 Shenandoah Rd., Hampton, Va. 23361
V: Jerry Wagner, 274 E. 9th St., Hialeah, Fla.
VI: Chuck Borneman, 1401 W. Taylor, Kokomo, Indiana 46901.
VII: P. W. Klintworth Jr., 894 Brooklawn Rd., Troy, Mich. 48084
VIII: Robert Combs, c/o American Bank of Commerce, Asst. Vice President, Odessa, Tex. 79760
IX: Frank Monts, 6519 Marjorie Lane, Wichita, Kans.
X: John Pond, 2162 43rd Avenue, San Francisco, Calif. 94116
XI: J. Lenderman, Route 2, Box 460, St. Helens, Ore.

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VI: Arthur J. Johnson, 1818 Oslo Drive, Rockford, Ill. 61108
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VIII: Leland Morton, 8614 Triton, Dallas, Texas 75227
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XI: Keith Loutocky, 1419 S. 48th, Tacoma, Wash.

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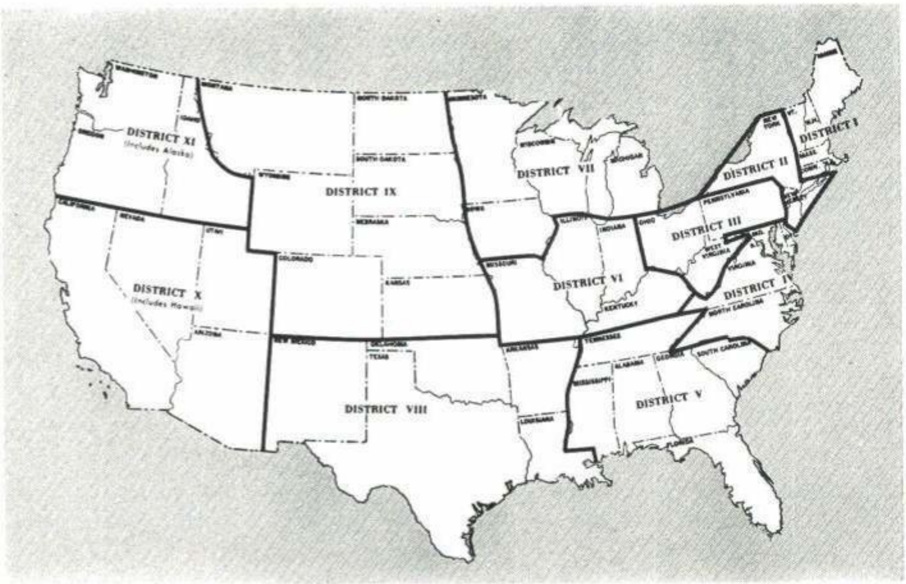
IV: W. C. Northrop Jr., 56 Holly Lane, Newark, Del.
V: Don Coleman, P.O. Box 436, Citronelle, Ala. 36522
VI: Bud Atkinson, 734 North 6th St. Terr., Blue Springs, Mo. 64015
VII: James E. Northmore, 28207 Grand Duke, Farmington, Mich.
VIII: Wm. A. Knost, 6914 E. Admiral Pl., Tulsa, Okla.
IX: Loren Tregellas, 3003 S. Everett, Wichita, Kans.
X: G. E. Nelson, 121 Medinah Pl., Ramon, Calif. 94583
XI: R. Brooke, 17845 3rd Ave., S.W., Seattle, Wash.



CONTEST CALENDAR

Official Sanctioned Contests of the Academy of Model Aeronautics

April 27 — Creve Coeur, Mo. Spirits of St. Louis RC Fly for Fun. Site: Spirits Field. R. Williams CD, 4060 Bondurante Dr., Bridgeton, Mo. 63042. Sponsor: **Spirits of St. Louis RC Club.**

April 27 — Fresno, Calif. (A) Fresno Monthly FF Meet. Site: Near Kerman. F. Gallo CD, 1725 Kenmore Dr. W., Fresno, Calif. 92703. Sponsor: **Fresno Gas Model Club.**

May 3-4 — High Point, N. C. (AA) High Point Model Air Meet for CL. Site: Spinners Flying Field. L. Underwood CD, 1507 Whitehall St., High Point, N. C. 27262.

May 4 — Dallas, Tex. (AA) Annual Mother's Day FF Meet. Site: Great Southwest Site. C. Hornbeck CD, 2506 Duchess Tr., Dallas, Tex. 75229. Sponsor: **Dallas Cloud Climbers.**

May 3-4 — Dallas, Texas (AA) 4th Annual Dallas RC Club Contest. Site: North Lake City Park. C. Summers CD, 7132 Shook Ave., Dallas, Tex. 75214. Sponsor: **Dallas RC Club.**

May 3-4 — Taft, Calif. (AA) SHOC Annual FF Meet. Site: Gardner Field. J. Tischler CD, 1306 Kings Ct., Anaheim, Calif. 92804. Sponsor: **Sky Hoppers of Orange County.**

May 4 — Wichita, Kans. (AA) 2nd Annual Wichihawks Spring Rally for FF & CL. Site: Wichita Modelers Council Field. J. Mason CD, 2214 S. Pinecrest, Wichita, Kans. 67218. Sponsor: **Wichihawks.**

May 10-11 — Memphis, Tenn. (AA) MRCC Pylon Race Meet. Site: Club Field. L. Hord CD, 5050 Poplar, Suite 319, Memphis, Tenn. 38117. Sponsor: **Memphis RC Club.**

May 10 — Tulsa, Okla. FAI Indoor Quarter Finals. Site: A.N.G. Hangar. B. Hanford CD, 3838 S. 88th E. Ave., Tulsa, Okla. 74145. Sponsor: **Tulsa Glue Dobbers.**

May 10-11 — Tulsa, Okla. Indoor Record Trials, Cat. II. Site: A.N.G. Hangar. B. Hanford CD, 3838 S. 88th E. Ave., Tulsa, Okla. 74145. Sponsor: **Tulsa Glue Dobbers.**

May 11 — Great Southwest, Tex. FAI FF Qualifying Trials. Site: County Rd. & Chapel Rd. W. McCormick CD, 4612 Pleasant St., Ft. Worth, Tex. 76115. Sponsor: **Ft. Worth Planesmen.**

May 11 — Richmond, Va. Brainbusters FAI FF Qualification Trials. Site: Curles Neck Farm. R. Lynch CD, 742 Tanbark Dr., Newport News, Va. 23609. Sponsor: **Brainbusters.**

May 11 — Urbana, Ill. (AA) Midwestern Rat Race Champs. Site: Illini Airport. J. Fruit CD, 406 E. Newkirk, Tuscola, Ill. 61953. Sponsor: **Champaign-Urbana Aeronauts.**

May 17-18 — Tulsa, Okla. Outdoor FF Record Trials. Site: TGD Field. B. Hanford CD, 3838 S. 88th E. Ave., Tulsa, Okla. 74145. Sponsor: **Tulsa Glue Dobbers.**

May 17-18 — Tulsa, Okla. FAI FF Qualifications. Site: TGD Field. B. Hanford CD, 3838 S. 88th E. Ave., Tulsa, Okla. 74145. Sponsor: **Tulsa Glue Dobbers.**

May 17-18 — Skaggsville, Md. DCRC 12th Annual Technical Symposium on RC. Site: John Hopkins Univ. Applied Physics Lab. J. Spalding CD, 5803 Ellerbie St., Lanham, Md. 20801. Sponsor: **DC RC Club.**

May 17-18 — Jacksonville, Fla. (AAA) Rebel Rally for FF, CL & RC. Site: White House Naval Field. W. Lyle CD, 1908 Holly Oaks Ravine Dr., Jacksonville, Fla. 32211.

May 18 — Hastings, Minn. Mpls. FAI FF Qualifications. Site: Webers Flying Field. D. Monson CD, 131 W. Wentworth Ave., W. St. Paul, Minn. 55118. Sponsor: **Minneapolis Model Aero Club.**

May 18 — Denver, Colo. (AA) Model Museum Spring Old Timers 7th Annual FF Meet. Site: East Colfax. T. Dannels CD, 1265 Yates, Denver, Colo. 80204. Sponsor: **Model Museum Flying Club.**

May 18 — Creve Coeur, Mo. Spirits & Signal Chasers Challenge Meet. Restricted. R. Williams CD, 4060 Bondurante Dr., Bridgeton, Mo. 63042. Sponsor: **Spirits of St. Louis RC.**

May 18 — Hastings, Minn. (AA) Minneapolis MAC Annual Spring FF Meet. Site: Webers Flying Field. D. Monson CD, 131 W. Wentworth Ave., W. St. Paul, Minn. 55118. Sponsor: **Minneapolis Model Aero Club.**

May 18 — Tucson, Ariz. (AA) CCMAC Spring Invitational CL Meet. Site: Rodeo Park. T. Snow CD, 909 E. Ellis, Tucson, Ariz. 85719. Sponsor: **Cholla Choppers.**

May 24-25 — Sumter, S.C. 1969 Iris Festival RC Invitational. By invitation only. Site: County Airport. J. Bradham CD, P. O. Box 163. Sumter, S.C. 29150.

May 24-25 — Lafayette, La. Model Aviation Day for CL & RC. Site: Comeaux School. C. Castaing CD, Box 52385 OCS, Lafayette, La. 70501. Sponsor: **Acadian RC Club.**

May 24-25 — Hampton, Va. (AA) 5th Annual Southeastern Va. RC Contest. Site: Langley AFB. D. Holmes CD, P. O. Box 814, Grafton, Va. 23490. Sponsor: **Southeastern Va. RC Group.**

May 24-25 — Atlanta, Ga. (AA) Greater Atlanta RC Meet. Site: Club Flying Site. R. Roberts Jr. CD, 2443 Woodside Way, Chamblee, Ga. 30041. Sponsor: **Atlanta RC Club.**

May 24-25 — Chicago, Ill. (AA) 7th Annual Season Opener RC Contests. Site: Kickapoo Woods. C. Ziemba CD, 5540 S. Pulaski Rd., Chicago, Ill. 60629. Sponsor: **RC Club of Chicago.**

May 25 — Baltimore, Md. (AA) Flite Streaks 3rd Annual Combat Contest. Site: Skyview Park. L. Lauer CD, 831 Lannerton Rd., Baltimore, Md. 21220. Sponsor: **Flite Streaks.**

May 25 — Endicott, N. Y. (AA) 4th Annual Northeast Pylon Champs. Site: Tri-Cities Airport. R. Noll CD, 96 Pine Knoll Rd., Endicott, N. Y. 13760. Sponsor: **Aeroguidance Society, Inc.**

May 25 — Tullahoma, Tenn. (AA) 5th Airfoiler Old Timer FF Meet. Site: Airfoiler Flying Field. C. Tuthill CD, 101 Westwood Dr., Tullahoma, Tenn. 37388. Sponsor: **Coffee Airfoilers.**

May 25 — New Castle, Pa. Open Fun Fly for RC. Site: PORKS Field. Z. Allerton CD, 124 Richelieu Ave., New Castle, Pa. 16101. Sponsor: **P.O.R.K.S.**

May 30 — Van Nuys, Calif. (A) Circle Burners 500 Lap Races. Site: Sepulveda Basin. T. Lowry CD, 23448 Vanowen St., Canoga Park, Calif. 91304.

May 31-June 1 — Clarksdale, Miss. (AAA) Clarksdale Climbers 9th Annual FF & RC Meet. Site: Fletcher Field. Mrs. G. Pickel CD, 1631 Steen Dr., Clarksdale, Miss. 38614.

May 31-June 1 — Troy, N. Y. (AAA) Northeastern N. Y. State CL & RC Invitational Model Airplane Meet. Site: Industrial Park. A. Hurd CD, 22 Racklin Lane, Loudonville, N. Y. 12211. Sponsor: **Flying Knights MAC.**

1969 NATIONAL MODEL AIRPLANE CHAMPIONSHIPS TO BE AT NAS WILLOW GROVE (NEAR PHILADELPHIA, PA.) JULY 14-20. PLAN TO BE THERE.

Small Fry Special

Continued from page 13

didn't fit, slide out the No. 3 piece. Lay a piece of sandpaper flat on the building board and lay the No. 3 piece on it. Holding it flat against the sandpaper, slowly slide it back and forth sanding it down on one side. Recheck the fit after every three or four sanding strokes until it fits snugly between the fuselage assembly and the 7-5 piece. When everything fits properly remove the engine, and glue the No. 3 piece to the fuselage assembly.

While this is setting, mark the location for the landing gear mounting hole. This is approximately 5/8" from the front and 5/8" from the top. One of the leftover round toothpicks can be used to start these holes. The two landing gear wires should be made to the shape shown on the plans. Now mount the wires to the fuselage assembly and cut grooves so that the top of the wire is flush with the surface. The engine pod is completed by gluing on the two outside pieces, reinforced by wrapping with thread at the front and back. As the assembly is pinned together, check the alignment, using the engine as a gauge. Spread a small coat of glue over the thread and over the entire front surface of the pod. The triangular hole in the bottom of the fuselage can be filled in with a piece of scrap.

Next comes the assembly of the stabilizer or "stab." If you have not already done so, cut apart the elevator and stab. With a piece of sandpaper, round off the leading edge of the stab and the two edges that will form the hinge line. It is easier to work with the stab if it is pinned down to the building board. The stab and elevator should be lined up properly and an approximate one-inch gap left between them.

Now take four of the small cloth hinges and cut them in half. With a ball-point pen, make a small "x" at each position where the hinge will be glued on as shown on the plans. Then taking them one at a time, put a small glob of glue on the "x" and press on the hinge cloth leaving about 2/3 to hang over the edge. After these have dried, unpin and turn over the stab and elevator and again mark an "x" where the hinge will be glued on. This will be opposite to where the hinge material is sticking out of the pieces. Slide the two pieces together so that all the hinges are sticking straight up and pin to the board. Then repeat the gluing procedure making sure hinges are tight.

Now lay the plan on the building board and lay a piece of wax paper over the top view. The stab is pinned down to the location on the plan, and likewise the wing. Glue on the fuselage following the location on the plan. While this is drying you can glue on the leadout eyelets and the wing tip weight. But remember the plane is upside down, so glue them on the opposite ends of the wing from what you are looking down at on the plan. The weight can be just about anything from a flattened-out fishing sinker to a washer (about the size of a penny). Small pieces of left-over hinge cloth should be glued over these to strengthen them.

We're now in the final stages of construction. The canopy piece (top) and the rudder are now glued on. Be sure and offset the rudder so the plane will have a tendency to turn (yaw) to the outside of the circle. Cut out the ailerons and glue in place as shown. The left aileron will be down and the right will be up. The holes for the bellcrank and control horn are added. They can be made using a round toothpick as a drill. The control horn can be fastened on and a small amount of glue should be put over the nut to keep it from

model rocketeer

NATIONAL ASSOCIATION OF ROCKETRY
1239 Vermont Avenue NW, Washington, DC 20005

NAR

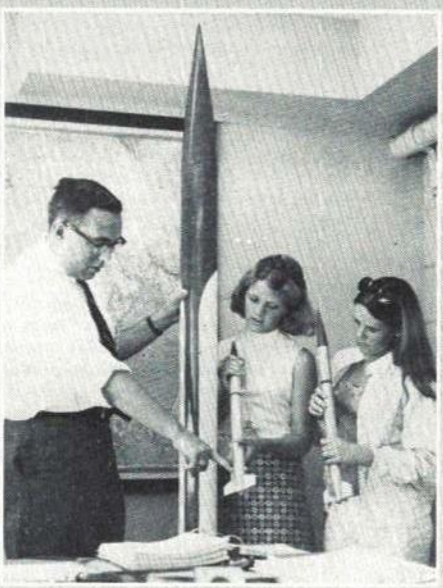
MODEL ROCKET BREAKTHROUGH PENDING IN CALIFORNIA

Model rocket firing may soon become legal within the city of Los Angeles. If this situation does materialize it will be a result of efforts started in late 1967 to incorporate model rocketry into the aeromodeling activities already taking place at the L. A. Model Airport near Van Nuys, California. The prospective launch site is the Sepulveda Flood Control Basin located between the Ventura and San Diego Freeways and has been in use by modelers for the past 20 years.

As part of a $75,000 proposal to the city Parks and Recreation Department, modelers would have permanent flying areas within L. A. A $5,000 model rocket facility would be included in the package to be completed in the next few years. This would be perhaps the first permanent and locally subsidized model rocket site in the United States.

Tim Skinner, Chairman of the Model Rocket Division of the HIAA, claims the importance of this breakthrough cannot be underestimated. The model rocket facility as planned for the Los Angeles area can conceivably form a pattern for other areas throughout the State of California. Dealers and Wholesalers in the Los Angeles area welcome this news and have expressed the desire to see Trade restrictions on model rocketry eased for the entire State.

The favorable development of model rocketry in Southern California can be attributed to the NAR Southland Section, and Michael Poss of Los Angeles, in particular.



Gordon Wood of the Atlantic Research Corp. explains details of the ARCAS rocketsonde to Connie Stine (at right) and her sister Ellie. Connie was the 1968 U. S. Jr. Nat. Champion. Both girls — here with their model ARCAS rocketsondes — visited the aerospace firm with their family after NARAM-10. All sections should enhance their activity schedules with visits to aerospace industry and research corporations.

NAR'S R & D METHODS GUIDE

Members of the Association received an unexpected holiday present in '68 when NAR Hdqs mailed out a guide for research and development projects. It was mailed to all 1968 NAR members but not to new members registered for '69 (see below). The guide set a precedent for drafting/printing/mailing, when handled through the organization's sources.

A teamwork effort, the guide was produced by Lindsay Audin and Carl Kratzer, as a special project under the leadership of Jim Barrowman and the NAR Publications Committee.

John Worth, NAR's executive secretary, called the effort "a worthy experiment with direct benefit to the members. It also serves as a sample effort of what the Pubs group can do when it has a specific project and budget."

"Perhaps the greatest value of this job, is the fact it provides NAR officials with specifics to measure with when evaluating publications," he said.

Total cost, including printing, was 16c per member. By mailing the guide first class the operation was simplified, since sorting and packaging into Zip Code groups was eliminated. So, by utilizing the services of qualified NAR Members such as Lindsay Audin, 15c may be considered the basic cost for any standard publication of similar size.

A side benefit of the guide project is that the item can also be sold via NARTS; provided like projects have lasting value, they too will be printed in sufficient quantity to supply NARTS.

For those who haven't received the Guide, it is an eight-page brochure explaining how a Research and Development project should be planned, conducted, and presented. It is a great aid for NAR R & D competitions and also for science-fair efforts. Nineteen-sixty-nine members of NAR may obtain copies by sending 50c and their NAR license number to: NARTS (NAR, Technical Services), Slot and Wing Hobbies, Dept. F, 511 South Century, Rantoul, Ill. 61866.

ALSO AVAILABLE FROM NARTS

Handbook of Model Rocketry, by G. Harry Stine, for $4 in the paperbound edition, or $6 in the Deluxe edition. Both have over 300 pages, with 170 photos and diagrams.

ANNAPOLIS ASSOCIATION OF ROCKETRY ELECTIONS

Recent AAR elections showed Sam Atwood gained presidency (his father works directly with Tiros satellite systems at Goddard Space Flight Center); Russell Cadorette, VP; Mrs. Edward Anderson, secretary; and Mr. Robert Atwood, treasurer and senior advisor.

Continued on page 70

working loose. Do not turn the nut so that the balsa is squeezed together, but merely bring it up snug to the surface. The glue will keep it tight.

The bellcrank will be installed after the plane is painted. The wheels now are added and the protruding wire bent up so they will not slide off. Make a small wire tail skid from left-over wire and glue in place at the bottom of the tail end of fuselage. This will prevent the balsa from being scraped away.

The one remaining task is to paint the little gem. Since this plane will never be a candidate for a best-finish award, there is no sense in spending a lot of time here. Besides, at this point you probably can't wait to get it into the air. So give it two coats of clear dope followed by two coats of your choice of color and call it a day. Be sure and coat the engine pod area thoroughly to keep the fuel out of the wood.

Now make a pushrod from the left-over landing gear wire to the shape shown on the plan. Don't forget the "Z" bend in the middle as this is used to adjust the length should one of the ends be a little off. When the paint has dried, attach the pushrod and bellcrank. Line up the bellcrank so it is parallel to the fuselage and look at the tail and see if it is in the neutral position (elevator straight with the stab). If it is not, adjust the length accordingly by bending at the "Z" until it lines up. Take off the bellcrank and thread the Dacron flying lines through the leadout eyelets and the holes in the fuselage. The lines should be tied to the bellcrank using three or four good knots. Tug on the lines to make sure they are securely tied. Bolt the bellcrank back on the fuselage and bring the nut snugly against the wood and add a dab of glue to hold it securely. The construction now is complete.

Flying: If this is your first attempt, the best advice is to find someone who knows how to help you. But since this is not always possible, and since human nature is to "go it alone," I will give the next best advice. First, if you have purchased a new engine, you must learn how to start it and how to keep it running. Follow the instructions on the engine package. You can use the plane itself, or a small test stand consisting of a board with the engine attached with wood screws for the break-in period.

You should run at least four tankfulls of gas through the engine before attempting any flying. By this time you should have learned how to set the needle valve so that the engine will run steadily for the complete tank of fuel. If not, keep on trying until you do learn. We will have enough problems with flying and can not afford an erratic engine run. After you have learned how to start the engine, and have broken it in, attach it to the plane with two rubber bands per side. Check the installation and make sure the engine fits securely and there is no looseness.

There is a little scheme we can use to make sure our first flights are a success. This is to spring-load the elevator so that, in effect, the plane will fly itself. This is very easy to do and I recommend it if this is your first flight. All you need are two rubber bands and three pins. The thin small rubber bands, about 1½" to 2" long, are best. Put one pin in the edge of the elevator opposite the rudder. Loop one end of a rubber band around the pin in the elevator and the other end around a pin attached to the rudder. With no tension on the flying lines this rubber band should hold the elevator in a slight up position ($\frac{1}{16}$"). Now unhook the top rubber band and turn the plane upside down. Loop the second rubber band around the pin in the elevator and around a pin fastened to the fuselage. This should be positioned to just hold the elevator in neutral. Now attach the top rubber band and recheck the position of the elevator. It should be in a slight up position with both rubber bands attached. If not, add a little more tension to the top rubber band. With this little scheme the plane will actually fly itself and you will still be able to control it by over-riding these spring-loads. If the plane should go slack on the lines, which happens most of the time in windy weather, the plane will continue to fly and you will have no problems.

For your first flights you should pick a day when there is little or no wind. Pick your flying site carefully. The most important thing is to make sure that there are no overhead power wires in the vicinity. A good site is one where there is a smooth takeoff area approximately three quarters of the flying circle over a grass area. This will help prevent damage to the aircraft. If we have these conditions present then we're ready to start flying.

Put your plane down on the downwind side of the circle so that it will be crosswind at takeoff. Then unwind the lines to the center and make sure they are not tangled. This can cause sticky controls. Next, a preflight check of the controls is in order. Have your helper hold the plane at flying height and, keeping the lines tight, hold the handle in neutral position. You should be facing the model with your arm pointed directly at the model. Your helper should check and see if the elevator is in neutral (straight with the stab). If it is not, adjust the length of the lines until it is. Then check both up and down control and come back to neutral and check again.

You are now ready for the big moment. Fill the fuel tank half full by holding the plane on its side and then start her up. Hold the handle again in neutral position or with a little down control and signal your helper to release the plane. Let the plane roll along the ground and fight the tendency to give up control. The plane will rise on its own if it is neutral and fly at shoulder height. Try to keep it in level flight about 10 feet off the ground and soon the engine will quit. As the model glides downward, give up control, and it will settle to a three-point landing and it's all over.

If this is the way your flight went you are ready for your second flight as soon as your heart stops pounding.

But, if you had problems with the first flight, here are some additional words. First, recheck the controls. If the plane flew high when you thought you were holding neutral, readjust the lines to give a little more down or readjust the top spring tension to give less up. If the plane did not take off, but rolled along the ground until it hit the grass and quit, you can give a little more up, or try another flight, without changing anything and give a little up control after it has rolled about 10 feet. But come back to neutral as soon as it is airborne. Too much up on takeoff can be disastrous and sometimes results in a wingover straight into the ground.

If you got the plane into the air, but had trouble keeping it level, this is caused by over-reaction or over-control. This is a common fault with beginners. This will clear up with more experience, but keep in mind that only a little arm movement is needed for control. Also, with this spring-loaded elevator, all you should have to do is just hang on and let the plane fly itself.

What usually happens is that you are applying control without realizing it. Remember to point your arm straight at the plane as if it were an extension of the control lines, and you should have no problems. If you should happen to crash, check over the plane before attempting another flight. Make sure everything is proper.

Now that you have earned your wings, welcome to the U-Control flying sport!

Versapro SS-2

Continued from page 31

aileron and elevator channels, command throttle changes. Both servos should "twitch" slightly then center until pulsing is resumed.

5) Check the travel of the servos. Servo throw can be reduced on any channel by connecting a variable resistor (trim pot) from the rudder or elevator signal land on the decoder board to the lands carrying +2.4V (battery C.T.). Adjust the pot until servo travel is correct at full commanded travel. Then replace with the equivalent fixed resistor. If the Versapulse transmitter presented earlier is used, the adjustment for width sensitivity is built into the pulser section and can be adjusted there.

6) The above procedure will have set up the basic control signals for the two independent channels. The set-up for each model of operation is essentially as indicated by the earlier description of the mode.

System Compatibility: The decoder was designed to operate with the Ace Commander superhet receiver and the Versapulse transmitter at repetition rates of nominally 18 pulses/second (pps) and width ratios of 30-70, 70-30. However, the decoder should be quite compatible with a number of the current high-pulse-rate transmitters and receivers such as those produced by ACE, Citizenship, Royal, Hallco, and the Bonitron.

The decoder analog outputs were originally tailored for use with the Orbit PS-3A servo. The analog output sensitivity is compatible, or can be made compatible, by means of the trimming resistor described in checkout step 6, with the Phelps, Sampey, Orbit PS-2A and PS-3A, ACL, Dickerson, and the Rand conversion. Some crosstalk will be experienced in the Controlair-Phelps servo because: a) no separate wiring is provided for reference and, b) the wire-wound pot gets dirty and must be cleaned frequently.

Operation has been satisfactory with the Citizenship SSH-P receiver and, to some extent, with the SH-100. (There are several versions of the older SH-100's; some will work, others require modification.)

A pulse-omission detector for trimmable throttle, compatible interface with a number of single-channel receivers, and a modification to the transmitter which will permit elevator to be retained during throttle changes, will be presented in the next issue of American Aircraft Modeler.

Manta

Continued from page 45

The top of the pylon should be sanded slightly concave to fit, then glued to the rear and parallel to the center-line of the pod body. A 2" piece of launch lug is glued along one side at the intersection of this pylon and pod body. Check again to insure that the pylon and launch lug are parallel to the center line. The power pop-pod is now ready for finishing and adjustment.

Finishing: Sand the wing to an airfoil shape, and the rudders to a symmetrical airfoil. The glider body is sanded round on the bottom but is flat on the top. Fine-sand nose cone and all balsa surfaces, then coat with sanding sealer or clear dope. For light weight, just fill and sand sufficiently for a smooth surface. Generally, two coats will suffice, although in some cases, three coats will be required. Of course, a beautifully done, colored finish is ideal for appearance. I have found that the added weight of pigmented paint does affect the performance somewhat.

Pre-flight adjustment: Fit the pop-pod on the glider so that the ⅛" dowel pin fits into the hole in the nose of the glider body. You should be able to "pop" the pod of the bird by hitting the nose cone lightly with the palm of your hand. If the pod fits too tight, sand inside of the alignment plates until it comes off easily but does not fall off when you hold the glider.

The CG for the glider phase is 3½" from the front of the wing where it connects to the body. Balance the bird with clay without the pod attached until the CG is correct. Hand-glide and trim as necessary. Generally, exact trim cannot be determined until the bird actually has been flown under power.

Power adjustment: Although the bird will generally lift off the pad and rise vertically with no adjustment, sometimes a little adjustment is necessary for a perfect vertical flight. Load the power pod with a ½A6-2 engine, wrapped with tape for a tight fit, for the first test flight. The nose cone should fit snugly into the body tube to get proper ejection of the power pod. Don't forget the wadding in front of the engine before you load the chute and insert the nose cone.

A piece of masking tape should be placed on the launch rod so that the power-pod weight is resting on the tape. This keeps the pod from separating from the glider before ignition. Fire the rocket and observe the flight under power. If the bird veers over on its back during the initial flight, shave the nose of the glider to tilt down the pod. This should be done only 1/32" at a time until the trim is correct.

The Manta has been flown consistently successful with ½A6-2, A5-a, A8-3 and B4-2 engines with perfect vertical flights. There is no doubt that it would also fly with a C-type engine. However, space limitations in my area prevent using a large engine.

The bird built especially for this article flew perfectly on the first test flight with no power adjustment required. Six flights were made using ½A6-2 engines. The flights ranged from 35 to 40 seconds in duration. The total weight of this glider and pod, minus the engine, came to 21 grams.

Messerschmitt R/C

Continued from page 25

scraped up in nose overs and to keep your batteries in the plane. Now is the time to install the tail-wheel assembly. Use a nylon tail-wheel bracket upside-down. Bend the wire and firmly cement it and the bracket into the tail, making sure that the arm on the tail-wheel wire comes out the same side of the fuselage as the rudder horn will eventually, so that they can both work in the same direction. Sheet the bottom of the fuselage with 3/32" balsa.

Before starting on the top half of the fuselage, cement on both the stabilizer and the rudder. The movable control surfaces will be added later. Start at the cockpit and go in both directions. At the nose, a solid block is shaped and carved out for the simulated gun ports. Between here and the canopy, it's all built-up using your own favorite methods. Mine is two pieces of triangular stock on the sides with 3/32" sheet across the top. The turtle deck behind the cockpit is an eyeball affair.

It is not really possible to draw a set of plans for the size of the formers. No two fuselages will be exactly the same width due to different grades of wood and different techniques of sheeting the bottom. So start at the canopy and eyeball a piece that comes up to the right height and is 1½" at the top. This shape determines all the rest. Simply taper the rest so that there is nothing left at the trailing edge of the rudder. Put in the sloping back or the canopy and then sheet the whole back end. The frame of the canopy is made of ⅛" by ¼" hardwood, so that you can not collapse it. A little ⅛" square balsa is also thrown in. If desired, a ⅛" sheet balsa armor plating may be added. To avoid damage don't put the Plexiglass on until the plane is almost finished.

Painting: This is the most fun. There are a thousand different color schemes used on the original 109's. Any one you choose will give your plane a character all its own. Even a home-brew camouflage job can look authentic. On mine, all but the bottom of the wing and fuselage and stab are Aircraft Gray with very dark, almost black, blotches. The bottom is Sky Blue. A good way to make the markings is with Mono-Kote; just cut it out and stick it on.

Flying: If you have a very calm day, hit the throttle hard for takeoff. If you have some wind, you can start off slowly. The reason for this is that the tail wheel comes up so quickly that you need quite a bit of air blast over the rudder in order to be able to steer. When taxiing slowly just hold full up elevator and she will ground-handle beautifully. When taking off, you don't need to hold any elevator at all — up or down — because it has no tendency whatever to nose over. For landings, just set up your glide and she'll come in like she was on rails. Three-point landings are a breeze.

Of the more than 33,000 109's that were built, there are only 12 left in the world. Build another one; keep this gorgeous plane from dying out!

You Said It!

Continued from page 10

No props

You sir, have the honor of being the recipient of the first letter I ever wrote to any magazine or paper and it's all your fault.

I've just reread "Straight and Level" in the March '69 issue for the tenth time and I've worked myself into such a tizzy that I've just got to say something.

All of us older modelers have been hearing for a number of years the chant "Where are the kids?" I say the kids are here to be had, but somehow the industry has passed them by. How? You say, simply, by standing still. Hogwash you say. When you and I were kids in the 30's and 40's we used to hear an airplane overhead, recognize it, get a little bit excited and save some money, buy a kit and build it.

Back in the 40's we had the Spitfire, the Thunderbolt, the Mustang, the 109 and you name it, to work on our minds. Even if a good percentage of these kits was only rubber-powered, they still looked like the things we saw going over our heads, that we read about everyday, and that we saw in the movies.

These days we still have the same prerequisites to set the kids hearts pounding. The only difference is these new-fangled flying machines are jets. That's right, *no props.* I've got two kids who are just the right age to start building but they don't want to build Spits, Thunderbolts or 109's. They want a Phantom or a F-100, a 105 or a Starfighter. Just the names set kids' hearts on fire (mine too). But to build one and put a prop on it — ridiculous!

I've built two jet models, one a ME 262, and a Navy Vought Crusader that I'm just finishing. For the 262, I drew the plans myself and built it five years ago. It's still flying but everytime we go out flying and the kids gather around, one of them always ask "what are those long things on the wings, bombs?" Then I have to explain those are dummy engines, that this plane is supposed to be a jet. That always gets them. They say "How come the propeller up front on a jet? It looks funny!" If you think about it for awhile it does look funny.

My kids wouldn't dream of putting a prop on a Starfighter, so they buy a cotton pickin' plastic model. Does it fly? No, but at least it looks like a jet.

It would seem to me our industry could pool their resources and come up with something. Until they do, I'm afraid we'll just have to continue standing still and watch the kids go by.

Once the kids get a chance to build and fly the jet-age way, maybe they might get the urge to try an old one like a Mustang or Lightning just as us old-folks like to build Nieuports and Fokkers. It's a new generation — let's face it. And don't tell me these engine manufacturers don't have the knowledge and know-how of small turbines. The initial cost to them might be sky-high, or higher, but to my way of thinking, they would never be able to make enough of them.

Bob Strobel, Dimon Dale, Mich.

The biggest problem with "non-prop" jet performance lies in nature. Airspeed is associated with efficiency — and model flight speeds do not approach speeds at which the jet would be truly efficient. The ducted fan — a metal, fan-like prop, on a high rpm engine inside a tunnel — allows sport-type performance from a scale free-flight. Electric drive has been used in control-line with juice flowing through the lines, but results were extremely marginal. A true turbine is costly to manufacture and shows no present possibility of equalling propeller thrust at our working airspeeds. Ed.

Red Baron's missing wing struts

In regard to the "Red Baron" article in the February issue, there is a caption in connection with the large photograph of supposedly the Baron's Fokker triplane, regarding the missing wing struts.

It is my contention that this particular aircraft was a test plane, as it was originally designed to have three fully cantilevered wings. This model was not acceptable to the High Command as thought to be unsafe and flimsy, so Tony Fokker added the single interplane strut to placate them and it was subsequently accepted.

Glenn F. Leidy, Cleveland, Ohio

When the caption was written it was known that the tripe in the picture — which the photo source stated as flown by the "Baron" — had to be a test ship. It was supposed that he had flown it at the factory for evaluation — a practice of a number of German aces before aircraft delivery. However, another reader had demonstrated that this particular plane had never been flown by Richthofen. Ed.

Sold on R/C

I am 14 and have just found an issue of your magazine in our school library.

Now I'm sold on radio-control aircraft. But I read about servos, receivers, and transmitters and I don't know what they are.

Would you please tell me what they are and how I can get started in radio-control aircraft without having to spend a mint.

Tim Riley, Portage, Wis.

Tim, we recommend McEntee's Getting Started in R/C book described elsewhere in this issue. A transmitter may be compared to a radio station, a receiver to your portable radio. The servo is an electric-motor-driven device within the vehicle itself which supplies muscle to move control surfaces. Ed.

No one within miles

I am a member of AMA (the only one in this county). I am probably the only one to fly anything other than ½A control-line (plastic). I fly F/F, R/C and U/C.

I suppose I am better off than guys in the city, since I have a flying field right in front of my house and a dirt runway (made by myself). Also, jobs are more readily available. I am 14, and the only other modeler in my county lives 22 miles away. He has never heard of AMA.

The only place I can get help is in Bloomington, Ind. (18 miles away) at the only hobby shop. The people there have helped me quite a bit, and I am deeply grateful.

I wish something could be done to correct this. I have about 20 friends who would be willing to take instructions on building model aircraft. The "Bloomington Wing Kings" should take steps in this direction.

Also, I would like to start correspondence with another modeler.

Tim Sparks, Possum Trot Farm, Unionville, Ind.

Mail addressed to correspondents in care of this magazine will be forwarded. Ed.

Aerodynamics

Continued from page 28

During the 1930's NACA did much research on airfoils. Much work involved analyzing the effect of various amounts of camber and camber shape. NACA also worked with thickness forms to determine airflow characteristics over different streamline shapes.

Starting from airfoils that worked in practice, they refined a whole series of shapes that gave good performance characteristics. These were the so-called Four-Digit Airfoils. The name of the series came from the method of classification used in listing the shapes.

The first digit told the height of curve in the camber expressed as a percentage of the chord. The second digit pin-pointed the high point of the curve back from the leading edge in tenths of chord length, and the final two figures represented the thickness of the streamline shape, again in percentage of chord.

For example, the NACA 2415 airfoil would have a streamline shape formed over a camber curve that rose 2% of the chord up from the centerline. The high point of the camber curve would be placed 4 tenths of the distance back from the leading edge. The thickness of the streamline shape would be 15% of its length. The thickest part of the superimposed shape would be 30% of the distance back from the leading edge. This last figure was standard for the Four-Digit series.

It is important not to confuse the curve of the streamline shape with the camber curve. The camber line is found by dividing the distance between the top and bottom of the wing shape by two; this is the mid-point of the wing's thickness. The 0015 airfoil, for example, would have no camber curve, thus no camber high point. That is why the 00 in the designation. So this airfoil is the basic streamline shape with a 15% thickness. It is one of the favorites for acrobatic flight.

You will notice that the described airfoils varied the amount of camber curve and the placement of the camber high point. The basic streamline shape, however, remains virtually the same. This indicates a lot of work was done in producing lift variations and pitching moments which greatly affect full-size aircraft performance. Drag factors due to the flow of air over the basic shape, were pretty much left alone. During the Second World War higher speeds were required so a great deal of research was done to reduce the amount of drag produced by streamline shapes. The effort culminated in development of the Laminar Flow sections featuring very low drag factors at certain angles of attack.

Ira H. Abbott and Albert E. Von Doenhoff compiled a listing of most of the useable airfoils in a book called "Theory of Wing Sections" published by Dover Publications, 180 Varick St., New York, N. Y. Available for $3.50, it is the best listing of airfoils I can find. In addition to a complete coverage of airfoil theory it lists the performance characteristics and shapes of most of the best NACA designs.

So far, this has been just general information. The question is how can we use this information to make a speed model fly a

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little faster, or a carrier ship fly both fast and slow?

We have seen that any wing will fly, almost regardless of the airfoil used. We can even carve the airfoil upside down, and it will still fly. That is the same as inverted flight, right? The main question is, how well will it fly? Each airfoil has individual characteristics that enable us to pick one to fit the needs of our event. We can select one for high lift exclusively and accept a lower speed because of increased drag, or we can go for flat-out speed with minimum drag and lower lift. The problem is, which?

Let's analyze the Carrier event since this requires the most versatility from a wing. We need flat-out speed and then very low speed — two things that oppose each other as far as airfoils go.

High speed first. With a given engine-prop combination we have a certain amount of thrust available. This thrust will accelerate the model until the drag generated is great enough to just equal the thrust. The faster the model goes, the more drag is generated. Unfortunately, drag goes up faster than the speed increases. This gives us our first general relationship. In level, unaccelerated flight, Thrust equals Drag. Drag is a function of speed and vice versa.

The second relationship is that in level, unaccelerated flight, Lift equals Weight. Remember that weight is a measure of the pull of gravity. When we say a model weighs 3 lbs., we are really saying gravity exerts a 3-lb. pull on the plane.

I am not going to use actual measurements of any particular model to illustrate how to get top performance. These figures just show how to do it.

Let's suppose we want a model to have a span of 25 in. with an average chord of 5 in. This gives an area of 125 sq. in. The formula used to express the relationship of lift to the other factors in flight is:

$$L = \frac{1}{2}pV^2SC_1.$$

Here's how it works. Lift equals one-half the density of air, times the square of the speed in feet per second, times the area of the wing, times the coefficient of lift for that particular wing shape.

Editor's note: Throughout the article, the lift symbol, C_L, is written with a lowercase "L" which should not be confused with the numeral "1."

Fortunately, we already know most of the factors in the equation. In level flight, lift equals weight or 3 lbs. Now pick a speed of 130 mph. This is realistic since most engines will turn up the rpm to get it, other things being equal. We have to convert miles per hour to feet per second, so multiply the speed in mph by 1.467 to get 190.7 fps. Air density (p) can be taken at 0.002378 slugs per cu. ft. on a standard day at sea level. The wing area is 125 in.^{2} or 0.866 ft.^{2}

Plugging everything into the formula it looks like this:

$$3 = \frac{0.002378}{2} \times (190.7)^2 \times 0.866 \times C_1$$
$$3 = 0.001189 \times 36370 \times 0.866 \times C_1$$
$$3 = 37.45 \times C_1$$
$$3/37.45 = C_1$$
$$0.08 = C_1$$

Thus, we find the coefficient of lift needed for this plane at this speed is 0.08. So what?, you say. Well, let's take a couple of airfoils and see what we have. Without correcting for scale effect we find that we will fly with an angle of attack of about minus ½ degree with NACA 1412 and get a drag coefficient of about 0.0065. With NACA 64_1-112 we fly at a 0-degree angle of attack with a drag factor of just 0.005. In other words, by picking a different airfoil we can reduce the drag coefficient by 0.0015 and get the plane to fly with the thrust lined up with the flight path instead of dragging the plane downward. This, of course, means that the available thrust is being used more effectively in getting the plane around the circle.

The airfoils selected above are not to be taken as extreme examples to use. Both are popular with full-scale designers and both are much more efficient for speed than the Clark Y now used in many carrier models.

The reason for the drop in drag coefficient is that the newer 64 series is one of the laminar-flow sections. It should be pointed out that the difference between various sections is not great. We are talking about a couple of percentage points in performance. For example, the maximum lift coefficient for a flat plate is about 0.7, the Wright Brother's wing gave about 1.3, and modern airfoils come in around 1.6. Beyond a certain point you begin to fight for each little gain. However, with competition the way it is, getting the model to perform just a little better in a couple of different areas, the cumulative effect should be seen in the difference between placing and not placing.

Another point. I mentioned neglecting scale effect. For purposes of comparing one section with another by studying the various section characteristic curves you must keep everything else the same. You cannot switch factors in the comparison without getting into a lot of other things.

For example, the drag coefficients listed above are not corrected for Reynold's Number and, for our model-size wing, would show a much larger drag factor than indicated in the charts. Since the tables are corrected to standard conditions we can use them for relative comparisons without getting into trouble. Watch for comparisons from other sources though; sometimes standard corrections do not match each other. The important thing is this; we do not need to know exactly how much drag a certain section will give us in pounds and ounces. We want to know that for our model, no other section will give us relatively less.

We have gone to a lot of trouble to calculate the requirements to get the right amount of lift at the least drag. The drag we have been working with is Induced Drag (drag resulting from lift). In looking at airfoil sections we notice that there is very little difference in shape, but that little difference means quite a bit in terms of results. It seems almost unnecessary to point out that after all this trouble you should be sure to build the section you select.

Slight errors in carving the wing, or cutting ribs, will cancel all the work we've done. This is particularly true for the front third of the wing. Variations from the section curves or random changes over the wing-span do nothing but detract from performance. If speed and low drag are important, go for a super-fine finish. Nicks, dents, and rough paint are enough to kick the drag up by a factor of 5 or more. If you can feel anything but a glass-smooth surface, it is too much.

We have been talking about a wing for high speed. The same factors apply for other needs. Remember, for higher lift, look for more camber. For gentle stalls look for a thicker section with a well-rounded leading edge. Each wing is a compromise of some kind. To know what to look for, and to control the compromise is what makes a winner. A speed section is fine, but for duration you want a wing with lots of camber and a drag profile that shows a minimum at the higher angles of attack encountered in slower flight.

Section thickness is a source of confusion too. Most theorists agree that going below a 15% section is a waste of time below a couple of hundred miles an hour. A lot of guys flying rat and carrier look at the razor-thin wings of high-performance jets, and say, "I'll build mine out of 1/16th wood thinned down." That's fine, but until they reach Mach 1 or better they are going to be flying at a high angle of attack leaving large globs of turbulence behind them.

Watch a model jet slow down for landing at our speeds. Its nose is pointing at the sky. It is flying with our old friend the flat plate. Not only do you have construction problems with a thin wing, but the flex and flutter characteristics hurt performance greatly. The thicker the section, in general, the softer the stall break. It is very embarrassing to wind up slow with a sick engine and have the nose abruptly head for the ground with little or no warning. Beyond 18 or 20 percent though, you are just getting more form drag with little real gain.

So far we have taken our example carrier wing through the selection process for high speed. How about the other end? The same general rules apply as before. First you have to know the performance requirements.

Taking the same wing, but instead of figuring the Lift Coefficient for 130 mph, aim for a low of, say 20 mph.

With the new figures we get:

$$3 = 0.001189 \times (29.34)^2 \times 0.866 \times C_1$$
$$3 = 0.001189 \times 860.8 \times 0.866 \times C_1$$
$$3 = 0.886 C_1$$
$$3.39 = C_1$$

Taking a quick look at the stall point of standard airfoils, we find we are not going to get anywhere near that figure, let alone with the one selected for our high-speed end. Most airfoils have a maximum C_1 in the neighborhood of 1.6. What can we do? One thing that helps is that in slow flight the plane is flying at a high angle of attack. This means the thrust line of the engine is angled up, adding part of the thrust force to the lift of the plane. Also, the air movement from the prop over the wing lowers the effective angle of attack and delays the stall, at least for part of the wing. These factors are still not enough to get the low speed we want and must have to win.

We know there are two ways to get higher lift at a given airspeed. These are evident from our lift formula. One, we can increase the wing area, and two, we can give the wing more camber increasing the C_1. The second method is probably the most familiar. We can change the camber of the airfoil by bending the wing. This is possible by the addition of a drooping leading and/or trailing edge. When we droop the trailing edge, the mechanism is called Flaps.

When flaps are lowered, we can get a great increase in C_1. This trick is used in stunt to help lift the model through corners. To slow down enough to land on a reasonable length of runway, modern jets droop both the leading and trailing edges. In addition, their leading- and trailing-edge flaps move outward to effectively increase wing area, as well as to add camber. A still greater effect is achieved by combining the flaps in section to direct the airflow in such a manner as to delay the separation into turbulent flow.

The common flap now used in carrier is hinged at the leading edge of the flap and the flap section merely rotates downward. By hinging the flap at a point below the bottom surface, the motion is down and back, which if designed properly will also increase the wing area. This is called a Fowler flap. It is used frequently on real planes. By using the Fowler-type flap it should be fairly easy to get the high C_1 needed for this slow a flight.

We have used carrier as our main area of discussion since the combination of high and low speed puts the greatest demand on airfoil design. The principles of lift needed are the same for any wing. For example, I use a NACA 63_2-018 section for my stunt models. I am working on the design for a full-size acrobatic airplane that will have a NACA 63_2-015 on a 26-ft. span. No matter how big or little, the basic requirements are the same.

A lot of work has been done by NACA and other research teams all over the world. We can use this information to get maximum performance out of our models — if we know how to find it and use it. It does require extra effort to use this knowledge, but if you are in the position where the last little bit of performance makes a difference, then you should be willing to make the effort. Somebody will, and someday you will have to fly against them.

Model Rocketeer

Continued from page 55

A growing organization of 40 active members, AAR has lots of activity, including workshops, classes, launchings, films, building equipment.

A good little item from AAR that impressed us when it came across our desk recently was an information sheet they give to new members, news media, or officials seeking information on the organization. We thought it was a good idea because the obvious question people ask when you talk up your section or NAR is: "What do you do for activities?" Here's AAR's:

History: For the past three years the AAR has been an active section of the National Association of Rocketry (NAR). Its objectives are to advance the aims of the NAR in the Greater Annapolis area, to operate and maintain a model rocket range in accordance with the NAR Safety Code, to hold business, social, technical, and competitive events for all those persons interested in model rocketry.

Activities: AAR has participated in the last four national model rocket meets, at Aberdeen, Md.; Wilmington, Ohio; Mankato, Minn.; and Wallops Station, Va. The section looks forward to an active 1969 contest year, including several demonstrations, meets, an astronomical observing session, sailplane flights at Wallops Station, and again, the annual nationals (to be held at the USAF Academy at Colorado Springs, unless changed).

(AAR adds the line, "Want to get into the picture?" and several persons to contact.)

NAR SECTIONS

The following were active NAR sections in late '68 or early '69; listed in state alphabetical order:

Anchorage Assn. of Model Rocketry, Robert D. Westmoreland, 2418 E. 20th, Anchorage, Alaska 99504; **Apollo Rocket Society**, A. C. Aldridge, 2611 E. Grandview Rd., Phoenix, Ariz. 85032; **Arevalos Rocket Assn.**, A. C. Erickson, 9452 El Valle Ave., Fountain Valley, Calif. 92708; **Birch Lane**, Thomas E. Hills, 2429 Temple Dr., Davis, Calif. 95616; **Dixon Haven Hitters**, Miss Julie Moriel, 355 N. Almond, Dixon, Calif. 95620;

Loma Valley Rocket Pioneers, Don Leech, P. O. Box 26, Browns Valley, Calif. 95918; **West Covina Model Rocket Society**, Dane M. Boles, Recreation & Park Dept., 1444 W. Garvey Ave., W. Covina, Calif. 91790; **YMCA Southland Assn. of Rocketry**, Michael Poss, 7855 Naylor Ave., Los Angeles, Calif. 90045; **Metro Denver Rocket Assoc.**, Juanita Severe, 8361 Chase Way, Arvada, Colo. 80002; **Cheshire Assn. of Rocketry**, Joe Persia, P. O. Box 123, Cheshire, Conn. 06410; **Fairchester**, Jeff Guill, 32 Gerdes Rd., New Canaan, Conn. 06840; **YMCA Space Pioneers**, G. Harry Stine, 564 S. Ave., New Canaan, Conn. 06840; **Rock Creek Chapter**, Charles E. Townsend, 3529 Tilden St., N. W., Wash., D. C. 20008;

Dreher Park Rocket Society, Science Museum & Planetarium, W. Lake Wood Rd., W. Palm Beach, Fla. 33406; **Beardstown**

Rocket Research Assn., Joe Hamon, Box 185, Arenzville Rd., Beardstown, Ill. 62618; **Black Hawk Section,** Steve Westerbeck, 4310 - 26 Ave., Rock Island, Ill. 61201; **Glen Ellyn Rocket Society,** F. Scott Godron, 476 Main St., Glen Ellyn, Ill. 60137; **Astro-Modelers,** Larry D. Little, Box 172, Owen Hall, W. Lafayette, Ind. 47906; **Ramrocs Model Rocket Research Society,** Steve Nelson, 706 W. South, Jefferson, Iowa 50129;

The Berwick Academy Rocket Society, Charles Andres, Secy., Academy St., So. Berwick, Maine 03908; **Annapolis Assn. of Rocketry,** R. G. Atwood, Route 3, Box 98B, Annapolis, Md. 21403; **Lasalle Section,** Patrick Stakem, Box 1335, Cumberland, Md. 21501; **Major General Holgern Toftoy Memorial Section,** Karin D. Norlin, 1623 Old Joppa Rd., Joppa, Md. 21085; **Metropolitan Area Rocket Society,** Mrs. Peggy J. Sipes, 5427 85th Ave., Apt. 101, Lanham, Md. 20801;

Narhams, Jim Barrowman, 6809 97th Pl., Lanham, Md. 20801; **Randallstown Rocket Society,** Walter Moon, 3702 Woodspring Ct., Randallstown, Md. 21133; **Star Spangled Banner,** Howard L. Galloway, Jr., 428 Ben Oaks Dr. W., Severna Park, Md. 21146; **United Flying Organization,** Jeffrey L. Pauley, 3211 Blueford Rd., Kensington, Md. 20795; **Wicomico Aerospace Section,** Mitchell A. Christian, Route 4, Windham Ct., Salisbury, Md. 21801.

Greater Boston Model Rocket Society, Michael J. Listorti, 71 Waverly St., Everett, Mass. 02149; **M.I.T. Section,** M.I.T. Branch, P. O. Box 110, Cambridge, Mass. 02139; **Zenith,** Dr. E. B. Beetch, 211 Clover Ln., Mankato, Minn. 56001; **Nargas,** Richard Nalick, #2 Bavarian Ct., St. Louis, Mo. 63141; **Pascack Valley,** Karl Feldmann, 4317 Cottage Ave., N. Bergen, N. J. 07047;

Long Island Rocket Society, Andrew Schecter, 75-31 193 St., Flushing, N. Y. 11366; **Liverpool Organization of NAR,** John Knapp, 218 Vardon St., Liverpool, N. Y. 13088; **North Shore Section,** Larry Weiss, 239 Normandy Rd., Massapequa, N. Y. 11758; **Orbiteers,** Bill Arthur, 215 Avondale Rd., Rochester, N. Y. 14622; **Xaverian High School Model Rocketry Society,** Richard Malecki, 7100 Shore Rd., Brooklyn, N. Y. 11209;

Catawba Valley Rocketeers, Todd L. Butler, 807 6th Ave., S. W., Hickory, N. C. 28601; **Columbus Society for the Advancement of Rocketry,** David Gregorek, 4451 Danforth Rd., Columbus, Ohio 43224; **Mansfield Aeronautics & Space Assn.,** Robert Hagedorn, R. D. 1, Taylortown Rd., Mansfield, Ohio 44903; **Natural Science Museum Model Rocket Research Society,** Walter E. Mueller, University Cir., 10600 E. Blvd., Cleveland, Ohio 44106; **Capital Area Section NAR,** Frances S. Guernsey, 2915 Maple Rd., Camp Hill, Pa. 17011;

Delaware Valley Rockets, Robert R. Shue, 100 Overlook Ave., Willow Grove, Pa. 19090; **Hempfield Area Model Rocketeer,** Susan Woodward, 15 Wayne Ave., Jeannette, Pa. 15644; **Monroeville Rocket Research Society,** Al Petrush, 652 Cooper Rd., Monroeville, Pa. 15146; **Pottstown Missile Minders,** Carlton Skip Raymond, YMCA, 338 King St., Pottstown, Pa. 19464; **Steel City Section,** James Davis, 4920 E. Willock Rd., Pittsburgh, Pa. 15227;

Apollo-Nasa, Mark Evans, 12503 Overcup, Houston, Tex. 77024; **Braeburn Community Section,** Ronald Finke, 8403 Braesview, Houston, Tex. 77071; **Saturn Model Rocketry Section,** Robert Johnston, Secy., 975 Gloria, El Paso, Tex. 79907; **Space Central Rocket Society,** Charles Biggs, 5802 Lucy Ln., Pasadena, Tex., **Dulles,** Robert Kaylor, 143 LaFayette Terr., Leesburg, Va. 22075; **Narfax, Bill Dintaman,** 5616 Sedgwick Ln., Springfield, Va. 22151; **Nicolet High School Rocket Society,** William W. Bateman, 9534 N. Wakefield Ct., Milwaukee, Wis. 53217.

Aeronca L Series

Continued from page 22

dered the Warner engine and either had it shipped to the Aeronca plant on his own consignment or had Aeronca order the engine for him. Both LeBlond engines fit the same mount and the original jigs and fixtures were engineered for these powerplants. In the original concept Aeronca was out to promote the LeBlond-Model L combination and these optionals were sales enticements.

In a similar manner, Aeronca also offered the standard low-wing powered with the 90-hp Lambert radial but there were no customers and this fact remains only as a notation on a price sheet. The standard

Model L, less engine, exhaust manifold, propeller, motor mount, Townend ring, cowling plate and sundry powerplant items was $2,100. This bare airframe price enabled prospective customers to utilize just about any engine available at the time in the 70- to 90-hp class. A seaplane model was also proposed for the Warner-powered ship. Termed an LCS model, it likewise gained little attention. There are no records of any low-wings being so fitted. The proposal called for twin Edo floats to be fitted at the cost of $1100.00 with this work being done at the Edo plant.

A standard LA was priced at $2,750.00, the LB at $2,995.00. The LC sold for $2,372.00, plus the customer-furnished Warner Scarab engine, fuel pump, exhaust manifold, carburetor air intake heater and wood propeller, which added about another $950.00 to the basic price. The airframe remained the same on all the L models aft of the firewall no matter which powerplant was installed. While these prices were well within the reach of the average flyer, the Aeronca low-wing failed to really catch the excitement or fancy of the public. Perhaps it was too radical a departure and just a few years ahead of its time. Throughout 1936 only nine LA's, 29 LB's and 15 LC's were produced. Some 53 total, for the year was rather disappointing. The 122 C-3's built that year kept the firm well in the black.

With the low-wing model, Aeronca entered the slightly higher-powered aircraft field, in the class with the Monocoupes, Rearwins and Porterfields. The Model L was economical to operate and maintain. Fuel consumption with the LeBlond 70 at cruising speed of 100 mph was 5 gallons of gas per hour. Performance-wise, both cruising and top speed varied only 5 mph between the LeBlond 70- and 90-powered models. Cruising speed was 100 mph at 1800 rpm with the 70, 105 mph at 1900 rpm with the 90. Top speed at sea level was 115 and 120 mph and landing speed varied 42 to 48 mph, depending upon weight conditions at the time. Initial climb, at gross weight of 1,680 pounds was 600 ft. per min. Cruising range on a fuel capacity of 28 gallons was pretty constant at 500 miles. Performance of the Warner powered LC was about the same as the LB model. Aircraft of equivalent power built 30 years later wouldn't get any better performance.

The year 1937 began with high hopes for Aeronca. The C-2 and C-3 line was terminated in 1936 after some 612 of the models were produced. In their place the new high-wing Model K was introduced. It was destined to become even more popular than any previous Aeronca offering. The low-wing was continued and they geared up for a record-breaking season. Then, near disaster struck and 1937 reigned as a year of confusion.

Aeronca was located at Lunken Airport, then the municipal airport for Cincinnati. The Ohio River flows just a few hundred yards from the field. The winter of 1936/37 was extremely severe — the rains in March extra heavy. Within three days the river went above flood stage, rising to 52 feet. Before the waters receded over 1,000,000 persons were made homeless, over 500 dead.

In the spring of 1937 the waters rose so fast that the entire airport was under seven feet of water within 24 hours. There was a mad scramble as the last minute Doubting-Thomases attempted to get their aircraft out before the waters rushed in.

In a personal conversation with the late Lou Wehring, chief test pilot for Aeronca, the 1937 situation was unbelievable. Lou received a phone call from the plant one morning before the break of dawn. "Get your bucket down here, we have to get every plane out of here we can . . . the

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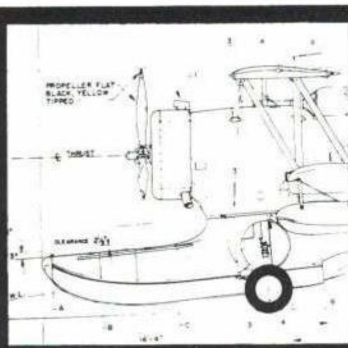

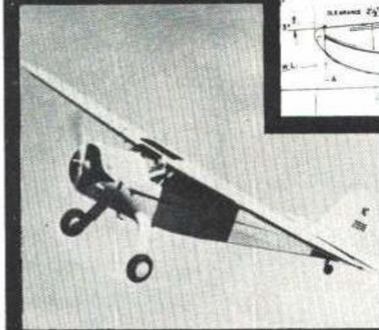

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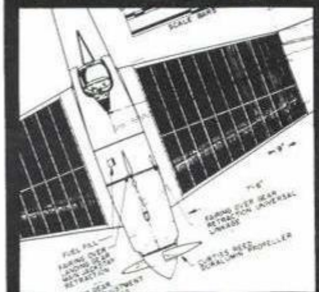

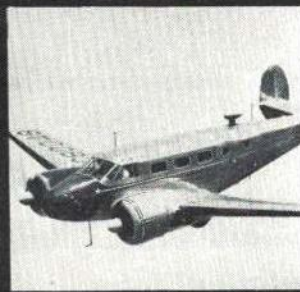

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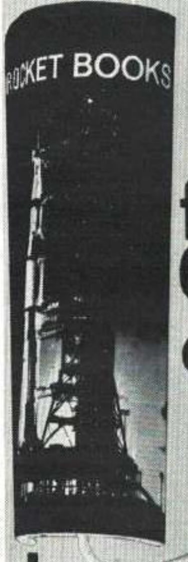

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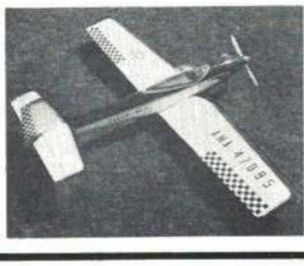

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flood waters have already inundated the basement storage area and the sandbagging of the levee won't hold much longer."

Lou jumped into his flight overalls, put on a heavy jacket and fur-lined boots. Arriving at the plant, he was asked to fly out three or four of the low-wing jobs. "I don't give a damn where you take them, just so it's high and dry." There were other planes ready for delivery, the last of the C-3's and some of the new K models. They were easy to get in and out of tight spots but the low-wings could be tricky and only Lou could be trusted to handle them under emergency conditions. He found out why . . . none were completed. He would have to operate the controls very unconventionally.

The LC's were in various stages of completion. The throttles weren't installed, control cables not hooked up, cockpit interiors bare and instruments not installed. Makeshift throttles were hurriedly wired in place, cables were temporarily fastened and pieces of plywood were bolted to the cabin's lower longerons as a seat. A piece of rope was rigged for a safety belt.

A low mist covered the area, fog and cold winds hampered every movement. On one ship Lou lashed the rudder cables around his boots since the rudder pedals couldn't be installed in time. On another occasion he operated the aileron and elevator cables with his gloved hand only.

Nothing worked smoothly but through skill and determination he managed to get the low-wingers out of Lunken and to safety at neighboring airfields. The other Aeroncas were also flown to safety while incomplete sections and components were hung from the rafters or shipped elsewhere by truck until the waters subsided.

The great '37 flood left the Aeronca plant in sad condition. It took months to mop up and get back into production. Despite these adversities the year closed with production up and the financial ledger in the black. Not so with the low-wing models. Production of the model was discontinued after only eight LC's were built. The model K production more than made up for the slack. That year 297 came off the line.

The demise of the L series can be attributed to several reasons. It failed to catch the imagination of the flying public, with resulting low sales and the disruption of all production due to the flood. The LeBlond company was also effected by the flood and there was a temporary loss of a local powerplant source. The biggest reason, however, was the need for all available space to meet an ever-growing model K production schedule.

Also during 1937, the LeBlond Mfg. sold all rights to their engines to Rearwin Airplanes of Kansas City, Mo. They briefly continued the standard 70 and 90 models in their original forms. Redesign and modifications undertaken by the Rearwin Engine Division led to the eventual development of these engines under the Ken-Royce name.

Although Aeronca had several low-wing concepts under study following World War II, none went into production. Thus it remains for the LA-LB-LC's to have the honor of being the only low-wing Aeronca ever produced in quantity.

Some flyers at the time felt the ship was a bit too hot, tricky to handle with landing speeds above what they were used to in high-wing models and biplane aircraft. Later on, many of these same pilots described it as docile, somewhat underpowered, or on the edge of being so, and "willy-nilly" in performance. You can't satisfy everyone. But all will agree the L model was an advanced design, providing good performance on minimum power. It would seem that experiences during WW II shed a new concept of thinking regarding the low wing monoplane.

According to a recent tabulation there are only two Aeronca low wings (LC's) still flying.

Neighborhood Nieuport

Continued from page 41

screws, which are available in a large variety of sizes and lengths. The balance point indicated on the plans is only intended as a general guide, and will vary somewhat depending on whether you fly your Nieuport indoors or outdoors. Ours were set up for indoor use initially, and were deliberately flown on the ragged edge of a stall to keep the speed low. For outdoor work, a small lump of clay is added to the forward portion of the landing gear.

Flying: Assuming you have achieved a reasonable state of balance, try a few glides, increasing or decreasing the weight as necessary to achieve a smooth descent. Next put 40 or 50 turns into the rubber motor by hand. A bit of gentle bending of the rudder should establish the desired flight pattern, although some slight bending of a wing trailing edge may be needed. Ours flew best in large, open right-hand circles. For best performance, pack in the turns with a winder. Remove the rubber anchoring pin, have an assistant grasp the model by the prop hub, and then you may stretch-wind from the rear. Our models employed a single well-lubed loop of 1/8" flat rubber about 10" long.

A favorite trick of mine is to hand this model fully wound, to an unsuspecting bystander, and invite him to launch it. The facial expression as the tiny ship heads skyward, is more than enough reward for the small effort involved in construction.

Scale Techniques

Continued from page 33

bands, then spot-putty top and bottom seams. While fuselage is drying, make your nose-piece from a 1 x 1" sq. balsa block. Paint forward end of fuselage with black, and while paint is still moist, press one edge of the block against fuselage. Allow to set for about one minute, being careful not to let it shift or the paint will smear. It is very important not to let it shift because if it does, you will have a poor carving guide. Done correctly, you will be able to see the entire contour of the fuselage.

Remove balsa block, check drawing for correct location of holes to be drilled for following items: four radar, four cannon, four machine guns. Mark and drill from back of block. The drill holes must be lined up accurately, so be sure to drill completely through the block, as once you have shaped the block, it is a problem to locate and install your guns and antenna parallel to each other.

After block is drilled, cement permanently, using a good grade of contact cement. Center the nose into position, and set aside to dry. Check nose block to see that it has not shifted out of line. After joint is completely dry, shape block, using knife and sandpaper. This is a very ticklish part in shaping the nose — so do both the sanding and shaping with caution, checking plan frequently, top and side view. If you want to remove all doubt as to accuracy of parts you are making, you can check by making two templates from thin cardboard on which you have traced top and side views. Carve block to your satisfaction, then drill holes again.

Parts 10 and 11 (fuselage) having been assembled, you can now cement instrument panel (part 4) in place in fuselage.

Paint gray-green all parts from 1 through 4; these are seats, instrument panel, and cockpit floor. When dry, cement in place.

Next, cement right wing assembly which includes right upper and lower wing; motor nacelle, landing gear, and fender. Cement landing gear door on right wing assembly unit. Cement upper and lower long-range wing tank, then spot putty all seams which are not a tight fit. Use masking tape on leading and trailing edges of wings, making sure that they are a snug fit and are well cemented.

Assemble left wing, using same method as for right wing. When completed, cement right and left wings onto fuselage, then cement right and left cowlings in place on nacelles. If you wish to do as I did, cut the lower part off part #15 and paint it a gray-green, as a separate unit. By so doing, you can install your #15 part in place after the final paint job; otherwise you will have to install this part before the two fuselage halves are cemented together. I found it easier to do in this sequence.

Follow kit instructions for complete tail assembly. Spot-putty any parts which do not fit well on tail assembly unit. Cement into place on fuselage. After plane is assembled, spray with a minimum of three coats of primer, sanding entire plane smooth after the third primer coat has been applied and is dry. Then paint entire plane black, and wait at least 12 hours to dry if using enamel. If lacquer has been used, allow about ten minutes between coats.

Cement wheels together, and paint entire wheel assembly black. Entire plane actually should be painted flat black, but I used semi-gloss black on my model. Paint landing gear silvery gray; interior of nacelle gray-green (as are all nacelle doors, inside of fuselage, and all other openings). Propellers are flat black. Assemble wing tanks and when dry, fill seams with auto spot putty; when dry, sand smooth, spray flat black. As the entire plane is one color, it could actually be painted with a pressure can of black.

Paint and install pilot, co-pilot, and gunners in cockpit. Personnel uniforms are blue with black helmets, gloves and shoes; faces painted lightly with flesh color. Flat black 1/32 car tape was used for metal strips on canopy. When completed, cement finished clear plastic parts in place with Elmer's Glue or Wilhold.

All decals used on model are from Martin Krasel Studios, Culver City, California. Alphabet is in ⅜" scale from 5 x 8" sheet retailing at 50c per sheet. Swastikas and crosses are from Sheet No. 72-4, retailing at $1.50 per sheet. Trim decals as closely as possible and soak, and apply. The closer you cut to the part of decal used, the better-looking your model will be.

The radar units can be made from old discarded kit rockets filed to shape. The Airfix Bristol Beaufighter kit manufactured by Airfix has eight rockets in it, so you will have enough for the radar, and spares left over in case any of them break. The vanes of the rocket are filed away to make the radar. It is almost impossible to describe this operation, but it is accomplished with a jeweler's file. File away one vane at a time on the stabilizing fin of rocket, filing in the shape of a plus sign—the four prongs will then remain. The slimming down of the rockets is best done with a knife. Scrape the shaft of the rockets until they are as small a diameter as you can manage without breaking them.

Although I made radar from the rockets, these are not the ones I have installed on the model. The ones shown are made by a soldering method; directions as follows: Purchase H.O. handrail wire of .020 thickness for prongs at hobby dealer or art and craft goods department. For the soldering jig, use a compass to describe a circle (get measurement from plan drawing in article) on a piece of illustration board or thin piece of wood. Mark off and drill four holes of equidistant spacing on perimeter of circle (one at every 90 degrees), with a #80 twist drill. Next, drill a hole for center peg (main shaft of radar unit), using a #76 drill.

For the prongs, cut and bend four pieces of .010 wire at 90-degree angles. The #80 drill is slightly larger than the wire used for the prongs, allowing some movement for proper alignment.

Once all are positioned, carefully solder with a minimum amount of solder, as this is a delicate operation. Illustration shows two prongs positioned for soldering; two others positioned for drilling; and completed center peg.

Your local hobby shop should be able to supply you with all of the decals, crosses, etc.; if not, contact Polk's Hobby Dept. Store, 314 5th Ave., New York, N. Y. 10001.

The kit used for the model was the Airfix Dornier 217E.2, Series III, 1/72nd scale. This kit was manufactured under license in the U. S. by Associated Hobby Manufacturers (AHM), Philadelphia, Pa., and Airfix Craftmaster. If you cannot obtain a kit from your local hobby dealer, one can be purchased from a number of domestic mail-order houses.

For its size, the DO 217J-2 is a comparatively easy model to build. The extras which make it a night-fighter will take a little time, particularly the soldered radar; the other method is far easier.

This makes up into a sinister-looking model, if nothing else. Really a wicked aircraft which played havoc with the English Bomber Command, both coming and going and even going as far afield as the English bases.

Radio Control World

Continued from page 37

DC/RC Symposium program: The program for the 12th Annual DC/RC Symposium, May 17, 18, is pretty well shaped up. These papers will be presented: R/C Helicopter (John Burkam); Tiny R/C Models (Dave Robelen); Coupled Flaps and Elevator (Ed Sweeney); Dauntless Scale Model (Dave Platt); Snoopy's Dog House (Al Signorino — this "plane" has a lot more complex aerodynamic angles to it than you might expect!); R/C Glider Status (Ray Smith); Wankel Engine (the Graupner design); Stavely R/C System (new analog multi-propo system developed in England); Servo Interchangeability.

Saturday will be devoted to presentation of these papers. There will be a large display area for manufacturers and for planes brought by attendees. Saturday evening will include a cocktail hour, followed by a dinner-dance.

Sunday's activities will be held at the huge DC-RC flying field starting at 9 a.m. Fun flying will be allowed between special demonstrations. Latter will include: An R/C helicopter; 2½-oz., .01 R/C plane; Snoopy's Dog House; flying with coupled elevator-flaps; plane flown with Graupner Wankel engine; glider pickup by a power model; five gliders launched in simultaneous winch tow.

Pre-registration is urged as attendance at the Saturday sessions must be limited to about 250 (there are also prizes picked from pre-registrants!). Motel Headquarters is the Howard Johnson Motor Lodge (Wheaton, Md.). Room registrations may be had by calling 800-424-9300 (no toll charge for this number). Hospitality night will be held at this motel on Friday night, May 16th. Further info on Symposium may be had from Carl Maroney (11429 Cherry Hill Rd., Beltsville, Md. 20705).

The Bison's Tenth Annual: Successful Midwinter R/C Conference was latest in the series sponsored by the Buffalo Bisons. Due to the need for more exhibition space, the affair was moved to the Executive Hotel, adjacent to Buffalo Municipal Airport. Here it was possible to get all exhibits and manufacturers' displays into one huge banquet hall (it can hold as many as 600 for a banquet). Over 400 attendees saw exhibits.

Saturday evening the exhibit tables were simply pushed closer together to allow banquet space for 220 persons. Plush carpet and huge crystal chandeliers! But it will be even better in 1970. The Bisons have already signed up this Crystal Ballroom, plus an adjoining room that will increase space about 50%. The affair will be in the third week of Jan.

Many prizes were awarded to hobbyist exhibitors, including quite a few boatmen. The Buffalo Model Powerboat Club had a large number of craft on display, including quite a few sailing craft. Top winners were: Best Scale Boat — G. Staubitz; Best Sail — J. Robertson; Best Non-Kit Plane — Ed Izzo; Best Scale Plane — Ron Jones. Ron's gorgeous Staggerwing Beach also took Best in the Show award, and his Falcon Business Jet (two 19 prop engines) won Most Unusual Plane award.

Award for Best Club exhibit went to Aeroguidance Society (Endicott, N. Y. area). Drawing for the full-house Kraft Grand Prize astounded many, including winner Ralph Blenker (Bisons) — he had also won the Grand Prize draw four years ago (an Orbit 3+1 propo outfit)! The Bison's V.I.P. Award this year went to Walt Schroder. It has never been mentioned in this magazine (due to the recipient's modesty) that this coveted award in 1968 went to another magazine man — Bill Winter. The only technical program was a question-and-answer session Saturday afternoon, with about eight "experts" fielding queries from the audience. We'd like to thank Bison Pres.

Competition

Quarter-Midget Goodyear: We've received from Steven Telle (24052 Bessemer, Woodland Hills, Calif. 91364) details on reduced-size Goodyear planes that have apparently been raced quite successfully. Specs are: 300 sq. in. min. wing area, ¾" min. root thickness; landing gear must be non-retractable, have positive provisions for ground steering. Max engine size is 15. Weight less fuel must be 2½ lbs. min. and 4 lbs. max. No handicaps specified. Planes must be a "reasonable" copy of full-size Goodyear or Thompson Trophy racers. No deltas allowed. Schedules are the same as for Formula I R/C Pylon racing. Steve says the planes are not difficult to fly, cost much less than Formula I jobs to build, but at not too much sacrifice in performance. Rand Mfg. Co. is putting a kit into production.

Reducing waiting time: Waiting in "Ready Boxes" for your competition flight is always tiresome, but a system inaugurated last summer by the Spirits of St. Louis (Mo.) cuts this waste to a minimum. Called the "Spirits Flight Schedule," it works like this: Before the contest a time schedule is set up that allows three flights from one circle, with staggered takeoff and landing times jotted down. As each contestant registers he is given his flight times per the listings. Since he knows his assigned times to fly, all he need keep track of is the time each round starts.

A large field clock is reset to an even hour at the beginning of each round. The flyers are spared the tiresome wait and slow progression from ready box 3, up to 2, then to 1, then out to the flight line etc. That often stretches out to a half hour or more per official flight.

The Spirits' system permits the flyer to take his plane directly to the judges when his time comes up. It worked smoothly and will be utilized again this year. They were able to complete 28 flights from the one circle and hope to better this in '69.

1969 World Championships: The German Aeroclub will be running the R/C Championships and the first International R/C Scale contest. These events will be held from July 23 to 27, 1969 at Lernwerder which is near Bremen, N. Germany and about 80 miles west of Hamburg.

Of importance to competitors will be the system of frequency allocation: (1) Only superhet equipment may be used. (2) For

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NEW IN R/C

Members of DCRC club were much impressed upon examining a **sectional fiberglass pole** brought to a meeting by member John Patton. John works for the telephone company; apparently pole is utilized by linemen to pull wires loose from tree branches, etc. But it looked ideal for retrieving models caught high in trees! Might be a fine item for a club to purchase, if their flying site includes many "unclimbable" trees. Pole is made by **Hastings Fiber Glass Products (Hastings, Mich.)** is their #130, costs $66, and trade name is **"Tel-O-Pole."** When all sections are extended, it is 30' long, and surprisingly stiff. Sections have positive locks on them. Pole is 5' long collapsed, largest section about $1\frac{1}{4}$" dia.

Seen at the Buffalo 10th Annual Winter Conference: **Angle Mini-Flite Co. (Fitchburg, Mass.)** has three ARF planes in a **"Fly-for-Fun" series.** Unlike the previous Blue Max series (three WWI biplanes), these are all mono's. The **Citabria** has 44" span foam wing covered with Angel-Cote at factory, smooth flat tail surfaces. All controls have piano-style hinging, including ailerons. Included with this plane are a pair of skis and a pair of 27" long plastic floats. Wing and LG attach to fuselage with nylon bolts — no rubber bands required. Plane designed for engines from .15-.29, and radio from rudder-only to miniature full-house. Average flying weight is 3 lb. 13 oz. Citabria with skis and floats costs $39.95. Others in this new series are a low wing **Fly Baby,** a parasol wing **Pro.**

CC Products (891 Delaware Ave., Buffalo, N. Y. 14209) carries a considerable stock of Stinger Mfg. Co. boat kits, **power boat accessories.** In addition, they produce a high-precision V-drive gear unit with ratios from 1:1 to 1:4; uses stainless steel shafts and gears, costs $49.95. Similar V-drive intended for attachment directly to engine costs $69.95. New O.P.S. .60 Italian racing motor is said to produce over 2 hp, has same mounting dim. as Rossi, price of $90 including matched tuned pipe, flywheel and water-cooled head. Also available in model plane version with air-cooled head, tuned pipe, for $75. Both engines fitted with R/C carb.

At the **Dmeco (Buffalo, N. Y.)** table we saw the **"Jenny plus 10"** (see R/C World this issue), also latest **Orbit equipment** which this Buffalo firm now handles. Big news here, of course, is the tiniest digital servo available, the Orbit PS-4D; measures only $\frac{11}{16} \times 1\frac{1}{2} \times 1\frac{3}{8}$". Orbit 4-8 and 6-12 digital propo systems may be had with these tiny servos, or the slightly larger type PS-3D (measures $\frac{7}{8} \times 1\frac{1}{2} \times 2\frac{1}{16}$") at same price. Both types have rotary disc output, cost $40 singly, have ceramic element pots, and mounting trays to fit may be had.

New line of Japanese **ARF kits** with fiberglass fuselages, balsa-covered foam wings, was shown by **Polks Hobbies** (under their trade name of Aristo-Craft Miniatures). Workmanship is very fine, kits include full landing gear parts (except wheels) and all other hardware. Low wing and shoulder wing versions are offered. Also seen were new imported digital radio systems, and a motor-driven single-channel servo. Latter is called Servo-Trol, may be driven from any relay-type receiver, weighs $1\frac{1}{2}$ oz. and operates on $1\frac{1}{2}$-3V. Rudder or throttle unit costs $8.95.

YK Model Aircraft (Akron, N. Y. 14001) now offers **wing kits** for their Navajo at $14.95; this wing has 64" span, 675 sq. in. area. Next plane to follow the Nieuport in kit form is a reduced-size Cherokee — about $\frac{3}{4}$ size, to be available later this year.

CRC Electronics Co. (Thornhill, Ont., Canada) showed their current 4-6 digital system. **E-K Products (Hurst, Texas 76053)** also had just their current line on display, but we learned that later this year they will market improved transmitters with enclosed control sticks, and their single stick transmitter will also have an enclosed stick, with rudder handled via a knob at stick end.

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