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MODEL AIRPLANE NEWS

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MARCH 1986 VOLUME 112 NUMBER 3

MODEL AIRPLANE NEWS

FEATURES

12/ The Golden Age of R/C
by Hal "Pappy" DeBolt
Find your R/C roots

16/ Setting Up Your Airplane
by Dan Santich
These tips on how to build will show you the right way to success

20/ The Glasair TD
by Dan Santich
A new concept in home-builts

26/ Fine-Tuning Propellers
by Carl Risteen
A little twist goes a long way. How to get more out of your old props

32/ O.S. Max-77VR-DF
by Peter Chinn
Engine review

34/ Laser 75
by Peter Chinn
Engine review

50/ S.T.A.R.S. Rally
by George Privateer
Event coverage. This contest emphasizes scale, not size of scale

52/ R/C In Space
by Dan Santich
R/C has reached new horizons with the help of NASA

54/ Top-Flite Elder 40
by Thomas W. Burdin
A Field & Bench Review

ON THE COVER: The Glasair is Tom Hamilton's dream-come-true. Your own dream can also become a reality with the model, which starts on page 22. The Elliptic 40 (above) looks sleek but flies like a dream. This is a different approach to fun-fly airplanes that retains the excitement of the hobby in one package. Construction starts on page 62.

60/ Craft-Air RV 4
by Chris Chianelli and Steve Scotto
A Field & Bench Review

64/ Southwest Fan-Fly '85
by Rich Uravitch
Event coverage. This year's event was smaller, but interest was high.

62/ Elliptic 40
by Alex Bouknight
The easy-to-build Elliptic 40 is a hot ticket for fun-flies and turn-around pattern. Span is 58 inches with a wing area of 653 square inches. The model will fly on .40 to .51 two-stroke engines or on a .60 four-stroke engine.

CONSTRUCTION

22/ Glasair
by Ron Sebosky
This great looking scale model is between 1/4 and 1/3 yet has a wingspan of 71 inches and isn't ungainly in size. For .90 to 1.20 engines.

COLUMNS

10/ Fifty Years Ago
by Dan Santich

36/ Control Tower
by Charlie Kenney

44/ Giant Steps
by Dick Phillips

COLUMNS

46/ R/C News
by Art Schroeder

48/ Four-Cycle Forum
by Eloy Marez

56/ Inside Track
by Mike Lee

78/ Soaring News
by guest columnist Sean Walbank

84/ Offshore
by John Oian

DEPARTMENTS

7/ Contact
by Dan Santich

8/ Airwaves

40/ How To:
by Randy Randolph

76/ Product News

88/ Hints & Kinks
by Jim Newman

114/ Club of the Month

115/ Name the Plane

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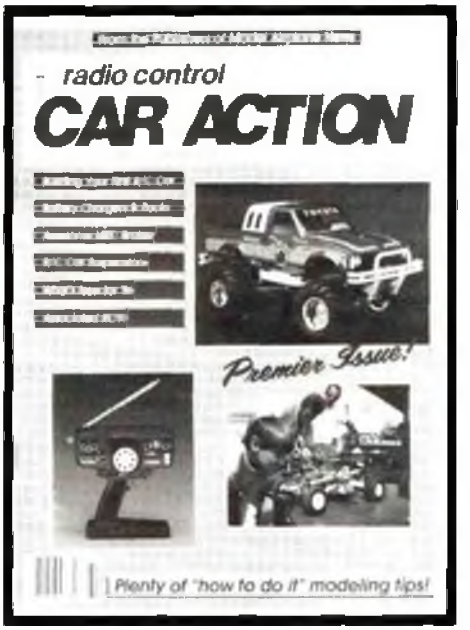
Editorial

by DAN SANTICH

WHAT IS THE growth potential of R/C? Most of you will assume that I am referring to radio control airplanes, right? Right. But did you ever stop to consider non-flying objects, such as cars, as an avenue to growth for airplanes? Well, you should. We have a tremendous source of new blood right at our fingertips and we probably don't even realize it.

For every R/C car that is sold, there is a potential Dave Brown or Hanno Prettner in the purchaser. Think about it. Mastering the intracacies of flying an airplane is not all that different from running a car through an obstacle course or a slalom. Certainly you have another dimension with airplanes, namely altitude, but if you take that away, what do you have? If you pull the wings off your airplane and run it on the ground, what you have is a body with wheels that can't fly. And isn't that what a car is?



Many articles have been written about the growing age of model airplane enthusiasts, yet the car scene is loaded with youngsters. Unfortunately, these newcomers to the hobby of R/C don't stay around long. They get their car, run it around the neighborhood a few times, get bored with it, and go on to something else. The ones who stick with it are usually the ones who find a group of similarly interested individuals who have formed a club. And many members of these car clubs are also involved with R/C airplanes. This is where the cross-over takes place. Exposure to airplanes and the lure of another dimension are a sure hook in anyone's book.

We are overwhelmed by the response to our new publication, *Radio Control Car Action*. The orders are pouring in and it's a fact that radio control cars are here to stay. The big reward is in the age group, from 11 to 16 years old. These youngsters have been buying and running R/C cars, but most know nothing about airplanes.

Most hobby shops, and certainly most hobby suppliers, will tell you that their hottest-selling items are R/C cars.

The exposure of car enthusiasts to airplanes and the parallel of required skills is a natural combination. The growth of our hobby depends on the excitement and rewards that it gives. The evolution of model airplane flying used to come from such aspects as control line and free flight. This is no longer the case. It has to come from another place and that place is R/C cars.

THIS MONTH: The Glasair is a jewel in anyone's eye, and Ron Sebosky's scratch project is no exception. This is one airplane that has been a "sleeper," yet we feel that it won't be for long. The Elliptic 40 is a dynamite model for you hot rocks out there, and the Top Flite Elder 40 brings a bit of nostalgia back to modeling. You'll enjoy our "Tech Tips" this month, as well as a review of the Craft-Air RV-4 and event coverage of the Third Annual Southwestern Fan-Fly.

We are still working out the details for the new Tournament of Champions and hope to have some more information for you next month. Stay tuned, fly safe, and keep your aspirations high. We are with you.

'Til next month.... DBS

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AIRWAVES

Where Do They Go?

I would like to know what happens to all of those planes that your magazine does articles on.

What do you do with the planes when you have completed the articles? I have just begun R/C flying and I really love it. I have a "Trainer" called the Cox Cessna Centurian. It's kind of underpowered with a .049 engine.

If possible I would like to purchase the Snark 20T from your article in the August issue. I think it would be cheaper that buying it from the hobby company. Please inform me if I can purchase the Snark 20T.

SEAN BREEN
Hanapepe, Hawaii

Sean, the planes, boats, and cars that are featured in product reviews are built by modelers all over the country. They build them, write the article, and take the pictures. In all cases, the subject of the article is their property, not ours, so we couldn't sell them if we wanted to. M.A.N. sells plans to build the airplanes that are featured in the construction articles; we don't sell any kits or models. DBS

50 Years Ago

I used to listen to *Model Airplane News of the Air* on the radio. It started with the sound of a model airplane engine running. That must have been about 1939 or '40. I was 14 or 15.

My friends and I hadn't progressed to flying gas models at that time, but we all had engines. After school we would "run our engines." It was a big deal to get two going at the same time. One fellow had a GHQ that gave a 30-second burst once after about 100 hours of cranking. Another fellow had a Brown Jr., and I had a Synchro Ace.

Our most successful projects were 36-inch, rubber-powered "Fireflys" (by Scientific I believe). I wish I could get the plans for this beautiful model.

Please write something about the *Model Airplane News of the Air* program. I remember a boy yodeler, Olivio Santoro, who used to come on just before or after *Model Airplane News of the Air*. The station may have been WOR or WJZ, Saturday mornings.

What a thrill it was to go to Cherry Hill, New Jersey on a Sunday to watch the big guys fly their Comet Clippers and Buccaneers. Someone had a huge (7-foot) Stinson Reliant for free-flight. It was beautiful. The level of today's equipment is amazing. I still have to pinch myself to make sure I'm not just dreaming.

Thanks for the memories.

ROY MCGUCKIN
Rochester, New York

Thanks!

Thank you for sponsoring the Aero Picnic on September 22, 1985. I had a very enjoyable day and every other flier I spoke to had a great time.

Model Airplane News was the first model airplane magazine that I subscribed to, but over the years I allowed my subscription to lapse and I became only an occasional reader. Enclosed you will find my check and a completed order for a subscription. Please regard my subscription as another way of saying "thank you." In addition, I will be sure to let your advertisers know that I am patronizing them because I saw their ad in *Model Airplane News*.

BOB BENNETT
Larchmont, New York

Welcome back, Bob, and we are pleased that you enjoyed our '85 Aero Picnic. Next year's should be even better. DBS

FIFTY YEARS AGO...

by DAN SANTICH

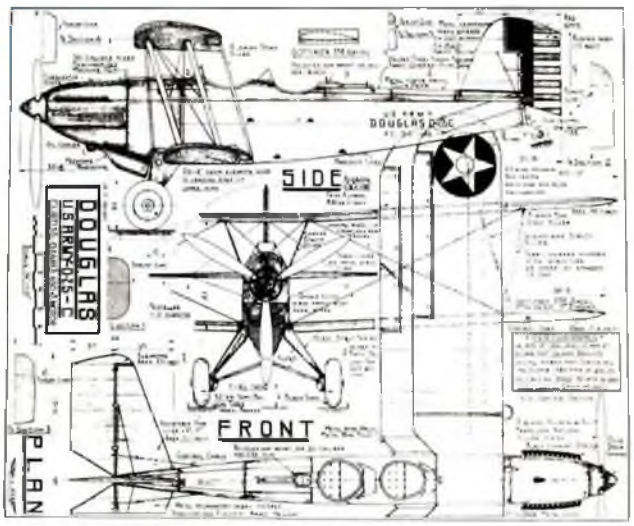
The Weick W-1 was a candidate for the so-called "fool-proof" airplane designs of 1936.

IN MARCH 1936, if you wanted to buy a model airplane engine, you had a total of two to choose from: the Brown Junior, an engine that had received great acceptance all over the world, or the Baby Cyclone, which, according to the maker, was "built to stand the gaff." The Brown sold for $21.50 and the Cyclone was priced at $15.95. Plans for the other gas engines were available for do-it-yourselfers. You could make your own Fergusson Eagle, Falcon, or Condor. Forster Brothers were offering their engines in partial or finished condition, depending upon the purchaser's metal-working capability. Airplane kits for these engines were not that abundant, although Cyclone Aircraft offered a 7-foot span, scale, Bull Pup for $10. Berkeley had the legendary Buccaneer and the Cavalier at 7-foot and 9-foot spans respectively, and the Modelcraft Company of Los Angeles offered a 70-inch-span scale model of the Corben Ace at $12.75. Cleveland, Comet, Scientific, Berkeley, Peerless, Guillow, Ideal, and Megow were the largest model companies making kits, although their success was based on the tried-and-true rubber-powered models.

Full-scale aviation witnessed the introduction of so-called "fool-proof" airplanes, such as the Waterman Tailless, Pitcairn autogyro, and Hammond Y for sport, and commercial aviation was being romanced by Douglas, Fokker, Sikorsky, and Lockheed for contracts on their new passenger-carrying aircraft. Robert C. Morrison, noted aviation historian and author, commented in his "Frontiers of Aviation" column that, "The use of four-engined land planes on our airlines will probably not prevail as soon as is hoped; however, when they are built, they will be here to stay."

Modeling and full-scale aviation went hand-in-hand in March 1936, and *Model Airplane News* was there to tell you about it, 50 years ago this month. ■

Nye drawings complemented M.A.N issues then and are still available today.



The Hammond Y was developed toward U.S. Department of Commerce specifications.

The Golden Age of R/C

by HAL "PAPPY" deBOLT

IN THE early days of R/C developing progress in a short period of time. Modeling advancements and events were most thrilling to see! Remember, we went from just a "guided free flight" to full aerobatics, step by step, in less than a decade. It was nothing like today's matter of fact and expectant atmosphere. There is still much of these developments we can see in today's OT R/C.

From time to time I want to feature aircraft designs which created the progress and became the formula for what we have today. You may find *your* OT R/C among them. How did we get from simple "guided free flights" to today's ultra sophisticated machines? With hindsight the path we followed is obvious, but in those times, day-to-day activities were as dramatic as the first Shuttle flight! I'll concentrate on the more well-known types, but I welcome data about more obscure aircraft.

Prior to 1948, most successful R/C craft were from converted free flight designs. From the late 1930s to 1947, the Good brothers dominated competition with their "Big Guff," basically a free flight design. I'm sure the Goods learned much from their experience with this design, but it left a lot to be desired when you consider that it only flew in relatively calm air and aerobatics were unheard of. Others tried what were essentially modified free flights. In all fairness, Jim Walker showed a break from this approach, but Jim was close-vested with his findings. It was no great surprise, therefore, when Walt Good unveiled a completely new design that was to revolutionize R/C. The all-new "Rudder Bug" was detailed in the May 1949 issue of *M.A.N.* History shows that the Bug quickly became very popular, and was the vehicle that brought R/C success to many more modelers. You only have to compare its outlines to previous designs to realize how different it really was. Walt must have used a performance projection and designed the plane to meet every need.

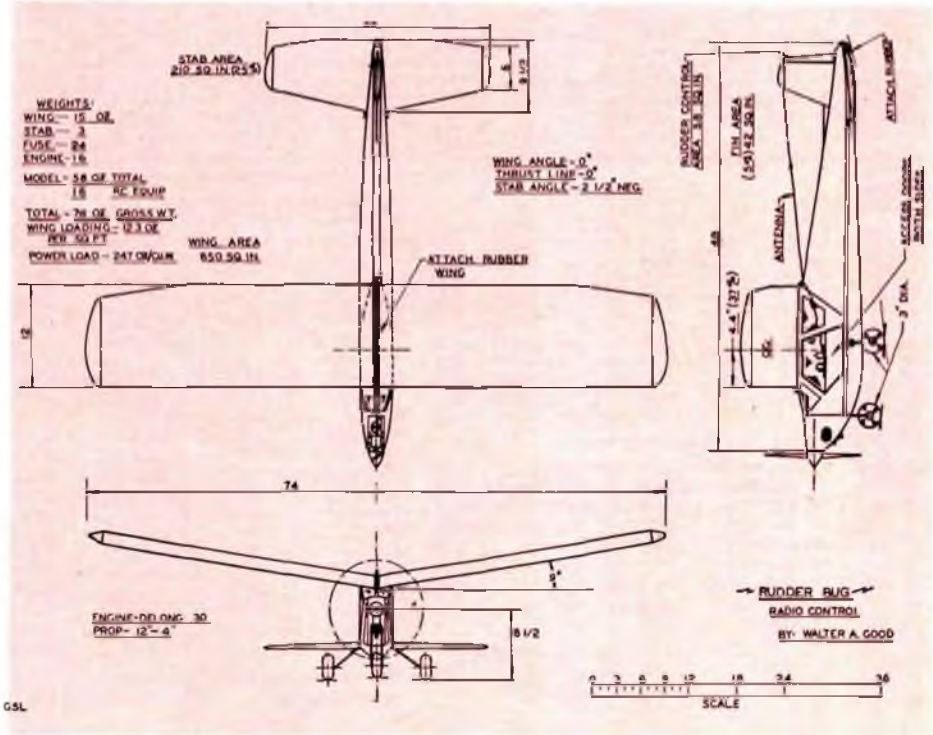
When it came to structure, Walt must have felt safe in staying with basic free flight practice—maybe the aerodynamic changes seemed enough for one outing! Noteworthy was his use of a fuselage "crutch" for strength and ease of assembly. Also, there were two *large* cabin side doors. Access to the radio was important, as a lot of diddling was always involved!

The unique, for that time, three-wheel gear stands out. It opened the door for today's trike gear. No, you couldn't steer the nose wheel. The reasoning for the three wheels was simple. Most important with rudder-only was that there was no elevator for glide path attitude. Three-point landings were more rare than normal. "Nose-ins" were common, props were expensive, and Walt had an inverted engine to protect, so that nose wheel made a good bumper. Also, big underpowered airplanes didn't take off quickly and three-wheel tracking helped in that respect.

Walt Good's Rudder Bug is a design that established R/C as practical.

Otherwise, note the generally clean lines of the design. Attention was given to drag: a cowled engine with spinner and a sleek fuselage with a triangular aft section. It was quite a step forward for that day!

Aerodynamic designing begins with known parameters and with the wing. For a 4½-pound weight and a desired 12-ounce wing loading, the area was 850 square inches. The NACA 6412 airfoil was a good choice, well proven in many



models. The 10° dihedral would be too much today, but it would be an asset with rudder-only control. Dihedral enhances rudder action and adds desired stability.

The real difference between free flight design and what made the Bug special for R/C is seen in the side view planform. Note the low location of the side area in the aft section. The low area enhances spiral stability and assures quick recovery from tight spiral turns. With rudder-only, you used "spiral dives" to gain speed needed to execute a loop.

Next note the high line of thrust, either on or close to the center of resistance. All rudder-only planes had to be trimmed for a shallow climb or else you could not gain altitude. Too great a climb angle resulted in poor turn control. Also when there would be an increase in speed, there would be a tendency to stall or "balloon," as it was called. The high thrust line kept ballooning tendencies to a minimum.

THE GREAT "ESCAPEMENT" MYSTERY SOLVED!

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STANDARD ESCAPEMENT

This was always in neutral when no signal was being sent. With one held-on signal, it moved 90° to one control position. With one momentary and a second held signal, it moved 180° to an opposite control position. It self-neutralized, automatically, from either position.

MOTOR CONTROL UNIT

This was an engine shut-off device based on the Standard version. The two-position action opened or closed an airbleed line connected to the engine's fuel line. It was an auxiliary unit to be used with the Compound escapement.

COMPOUND ESCAPEMENT

This version gave two control positions, the same as the Standard escapement. In addition, if two short signals were sent, followed by a third held signal, the additional movement closed a switch. This switch could be used to actuate a second escapement. Note the speed-regulating ratchet to assure constant rotation speed, no matter how much rubber power was available. Control combinations were usually rudder and engine or, if you were brave, elevator.

deBolt's first R/C in 1951 was a modified Rudder Bug with Aerotrol radio, Fox .29 engine. Model shown here with daughter Pat, who now has teenagers of her own.

Note how the thrust line passes near the center of the vertical tail area. With power on, the rudder would provide more yawing than rolling action. Turns could be flatter. Also, the vertical area is minimum, which enhances turning ability, requiring the least power for the rudder. Remember, escapements were "flea power" compared to servos.

Other subtle differences from common free flight cabin design would be the short nose moment and the airfoiled stabilizer. The short nose adds to power on stability and aids turning ability. The more efficient stab airfoil improves pitching characteristics, adding to overall performance. Locating the stabilizer on the fuselage bottom was simply for convenience and utility, an idea soon adapted by many other designers.

With our current design experience, it's easy to dig into Walt's Rudder Bug and see why he used the philosophy he did. His design was a first though, and very radical for its time, but it was done so well that the basics are still the law today.

Rudder Bugs dominated the contest scene and the workshops of many R/C experts for several years. It probably would have continued for many more, if control system advancements had not come so fast and furiously.

The opening up of the "Citizens Band" enticed many modelers into R/C with the Bug, including myself. My entry might not have been normal, but the results were typical. With the help of two local modelers I switched from C/L to R/C overnight and never looked back. Tim Parry gave me the inspiration with a flawless demonstration of his Berkeley Aerotrol-equipped Brigadier. To get going quickly I made a deal with George Swank for his completed but inoperative Aerotrol Rudder Bug. I lucked out when

(Continued on page 70)

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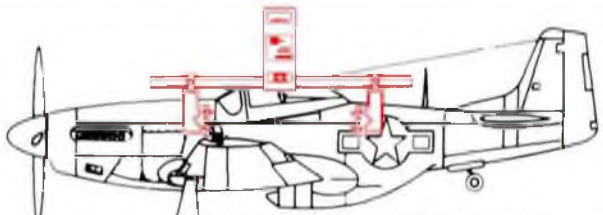
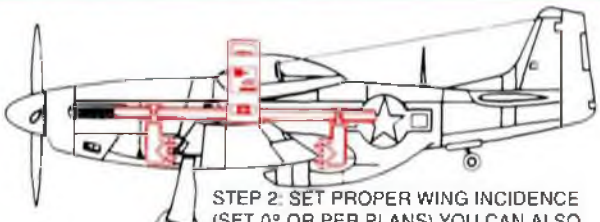
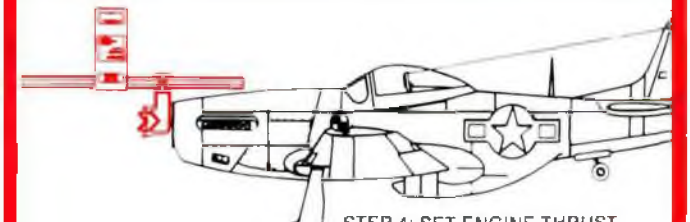


STEP 1: LEVEL THRUST LINE WITH WORK SURFACE (0° ON INDICATOR DIAL- A WEIGHTED ROBART SUPER STAND EASE THIS TASK)



STEP 2: SET PROPER WING INCIDENCE (SET 0° OR PER PLANS) YOU CAN ALSO CHECK WASHOUT BY SIMPLY MOVING THE DEVICE OUT THE WING TIP AFTER STEP 2 AND READING THE ANGULAR DIFFERENCE.

STEP 3: SET STABILIZER INCIDENCE (USUALLY 0°)



STEP 4: SET ENGINE THRUST (IF ANY, IF NONE SET AT 0°)

Setting Up Your Airplane

by Dan Santich

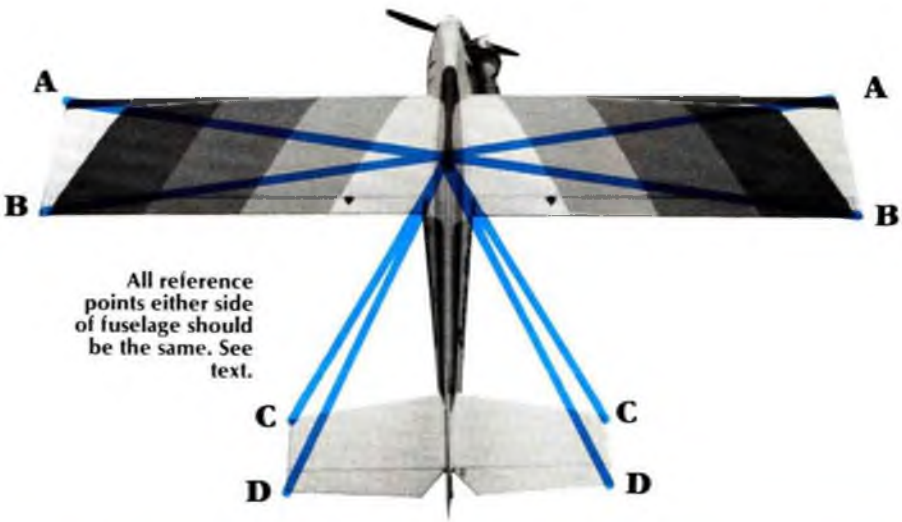
Proper alignment means less headaches in the air.

Robart Incidence Meter reading from wing tip, left, to root, above, should reveal any wing warps.

BUILDING MODEL airplanes is a lot of fun. The art of assembly and seeing your creation take shape has little equal in the way of personal satisfaction. Even building the ready-to-fly airplanes gives the modeler a degree of pride in ownership by the way they fly.

The law by which all things fly is equal. What goes up must come down. It's during the interim period of this law that modelers "do their thing." The sky is a vast arena, but with the exception of wind conditions and altitude, most things are constant. Sky is sky, and air is air, and to fly our models, obviously we must have air.

As our models travel through this wonderful piece of space, doing the things that we command them to do, they sometimes do things on their own that we really wish they wouldn't. Some of these errant quirks make us think that the airplane has a mind of its own. Not so. With the exception of those things we can't control, our models are a direct reflection of their design intent and our ability to build them right. By "right" I mean several things. First, the model should be balanced correctly, not only in the usual manner by lifting the model under the wings, but in other ways. Have you ever checked your wing for balance? From the centerline of the wing, both halves should weigh exactly the same. The same thing goes for the horizontal stab. For an airplane to fly properly, all



All reference points either side of fuselage should be the same. See text.

A most valuable tool for accurate alignment and setup of your aircraft is the Robart Incidence Meter.

things should be equal, weight-wise, on either side of the centerline. In other words, if you took your airplane and cut it right down the middle, from spinner to tail, and put these halves on a scale, they should be equal.

The next important factor for a great flying airplane is proper surface exposure. Any part of your airplane that is exposed to the passing air will affect the aircraft's performance. From the spinner to the rudder, virtually everything that is exterior has its own little say on the way your airplane flies. This is called aerodynamic balance.

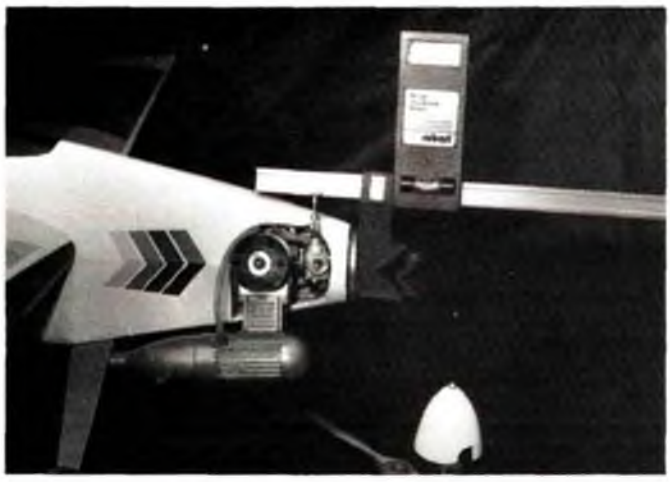
Ever fly a plane with a warp in the wing? Or how about one with a twisted stab? Sure, they fly, but the absence of warps in the flying surfaces of an airplane can really make a difference, even in slow flying aircraft, like trainers or sailplanes. Remember this: any airplane that has warped or twisted flying surfaces or controls is flying in a compromise situation. You have to make trim adjustments to get it to fly right. By doing so you are actually degrading the overall capability of the aircraft. Any trim adjustment that results in a control deflection beyond 0° means that you have induced aerodynamic drag upon that side of the airplane.

Sometimes you have to raise or drop an aileron a bit to correct for a rolling tendency either to the right or to the left. What you should really do is find out why it is rolling. It isn't hard to determine, since it can only be two things, weight or aerodynamic balance. Since the speed at which the airplane flies also affects the aerodynamic balance, you must assume, at least in a model, that the speed is constant.

If you have an airplane that is balanced in the dynamic (static) and aerodynamic (flying) modes, and it's still like flying a corkscrew, the only factor that could cause the problem is alignment. While improper alignment can't affect the dynamic (static) balance of an airplane, it can certainly affect the aerodynamic (flying) balance. Just like a warped wing, incorrect alignment of the flying surfaces will give you trouble, and again, by flying surfaces I mean every square inch of the airplane that is exposed to the airflow.

How do you check for aerodynamic alignment? There are several ways. The first step is to place the fuselage on a centerline running the length of it. Either side of the fuselage should be equal at all points, from spinner to rudder. If you have even a slight difference, it's going to cause you grief in the air. A crooked fuselage is one of the most common causes of an airplane that always needs trim changes. It is also, unfortunately, one of the most difficult things to correct. Short of building a new body, anything you can do to make it as straight as possible will help a great deal. Sometimes you just have to bite the bullet and build a new one. Along that line, if you buy a kit that has a fiberglass fuselage, the first thing you should do is lay it on a straightedge and check for any twists. If you detect any, send it back to the supplier immediately for an exchange.

Assuming you have an absolutely straight fuselage to work on, this will be your basic reference point. The line that you'll now work around will be the centerline of the airframe, running the



Fuselage must be level when checking engine thrust line, left, and horizontal stab, right.

longitudinal length of the fuselage. You'll also use the centerline of the engine mount as a starting point.

Most airplanes have a design intent that determines different angles of force, lift, and drag upon the airframe. For example, most pattern ships are set up so they are 0-0-0. This means that the engine thrust line, wing incidence, horizontal stabilizer, and vertical stabilizer are all set at 0° with regard to the centerline reference point, whereas trainers use a different set of rules. They usually have a few degrees of down thrust in the engine, a few degrees positive incidence in the wing, and a zero incidence stab. To explain the reasons for these differences would take a book-size article. Suffice it to say that the reasons are sound. What you're concerned with is obtaining the proper setup for the airplane you're building.

One of the most valuable tools for this purpose is the Model Incidence Meter produced by Robart*. With this one great tool, you can set up your airplane right the first time and you'll wonder why you hadn't done it before, since it's so simple.

As you can see in the photographs, I've shown the different uses of the Robart Incidence Meter on my recently completed Super Hots. This isn't really the best time to use it. It should be put to use *before* you cover your airplane. That way, if you have a problem, you can correct it on the spot.

Now, back to the centerline of the fuselage. Block up the body until the centerline is horizontal to the ground. Everything will now be worked around this reference point. Mount your wing, stab, and engine, and check them with the Robart Incidence Meter. They should all be the same, at 0°, unless, as I said before, you have an airplane that calls for a different setup. In such a case, the plans or building instructions for the airplane should tell you what the incidence settings should be.

The Robart Incidence Meter has two reference points of measure, a bubble, much the same as a carpenter's level, and a jeweled movement meter. The ends of the incidence meter are slide adjustable so you can check any surface up to 16 inches with the standard bar and 36 inches with the optional extended bar. You simply determine the width of the surface to be measured, set the meter ends accordingly, and slide it onto the wing or stab. If it reads on either side of 0, you have a correction to make. Also, if you check the wings in several points along the span, you can detect any warps it might have. As you can also see in the photographs, you can use the incidence meter to check your engine's thrust line, which in this case was also 0. If the thrust line of the engine and the incidence settings of the wing and stab are okay, you're almost home. The last thing to check is alignment of the wing and stabilizer with regard to the fuselage. If either one is off just the slightest bit, again, you'll have trouble.

To align something you must have a reference point. Since the fuselage is the item you build around, it's the most likely candidate. If it's straight, mount your wing in place. The first thing to check is that the wingspan on either side of the fuselage is exactly the same. Also check the horizontal stab.

Now, looking at the front of the airplane, sight down the length to see that the stab is exactly horizontal with the wing and that the fin is vertical. Also, make sure that the fin is straight with the vertical centerline. If all of these things are okay, the last alignment check is called triangulation.

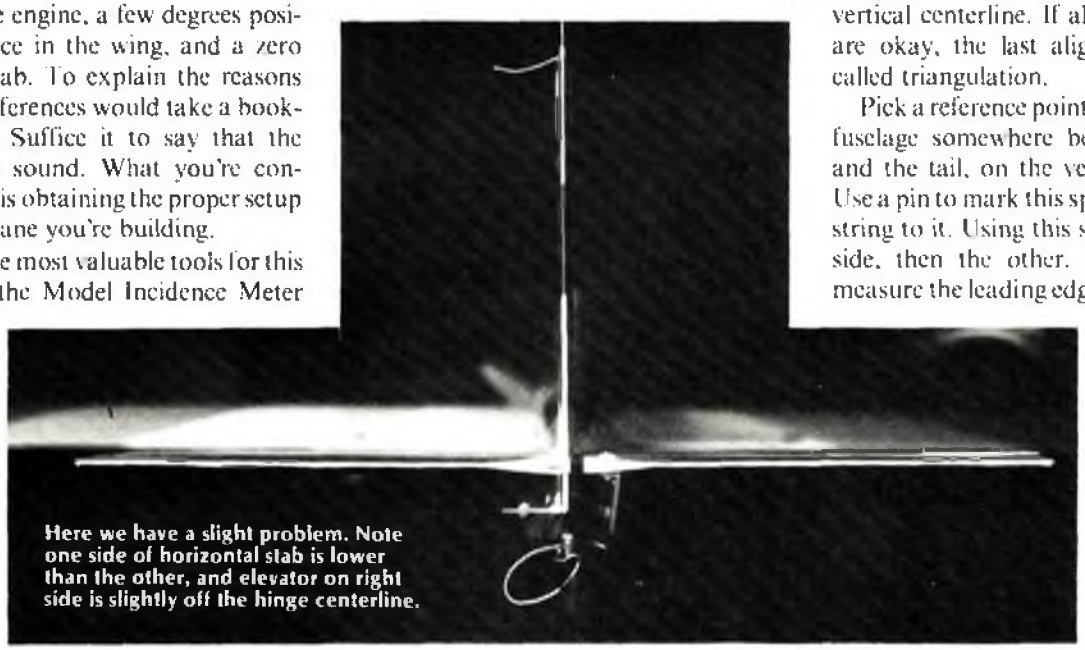
Pick a reference point on the top of the fuselage somewhere between the nose and the tail, on the vertical centerline. Use a pin to mark this spot, then attach a string to it. Using this string, check one side, then the other. For example, I measure the leading edge of the left wing at the tip. I then swing the string over to the right side and check the same point. It should be exactly the same. You can check any point you wish this way.

The last point in the balance department is to check your model after it's covered and all the equipment is installed. An off-set engine (like on the Super Hots), a battery on one side of the fuselage, or even a servo will have an effect.

Flying models is a lot of fun, and the fun is even greater when they fly well. I hope these tips will help you have the best flying airplane at the field!

**The following is the address of the company mentioned in this article:*

Robart, 310 N. 5th St., St. Charles, IL 60174. ■



Here we have a slight problem. Note one side of horizontal stab is lower than the other, and elevator on right side is slightly off the hinge centerline.

A kit that brings full-scale clos

The GLASAIR

by DAN SANTICH

QUESTION: What vehicle that you know of goes over 200 mph, gets nearly 30 miles to a gallon of gas, and can go for a thousand miles without a pit stop?

Answer: the Glasair.

In the days of high-tech, multi-corporation mergers, and computer-operated industries, a man named Tom Hamilton is out to prove something. Just as innovators like Howard Hughes, Bill Lear, Igor Sikorsky, and Donald Douglas paved their own path in aviation history, so has Tom Hamilton.

First introduced to the public in 1979, the Glasair was an instant hit with aviation-minded people all over the world. Here was something that was practical, good looking, reasonably priced, and, best of all, it was something they could build by themselves. That's right, the Glasair is a home-built.

When you think of home-builts, you think of fabric, stitching, welding, bending, fitting, rigging, and the hundreds of other tasks necessary to get one in the air. Guess what? The Glasair is a kit not unlike our current almost-ready-to-fly (ARF) models. It has a pre-formed, fiberglass composite fuselage, formed cowl and canopy, retractable or fixed landing gear, all accessories, and even includes glue. When the pieces of this kit are laid out, they look exactly like one of the better model airplane kits on the market. The only difference is that the parts are bigger. In fact, when

Specifications

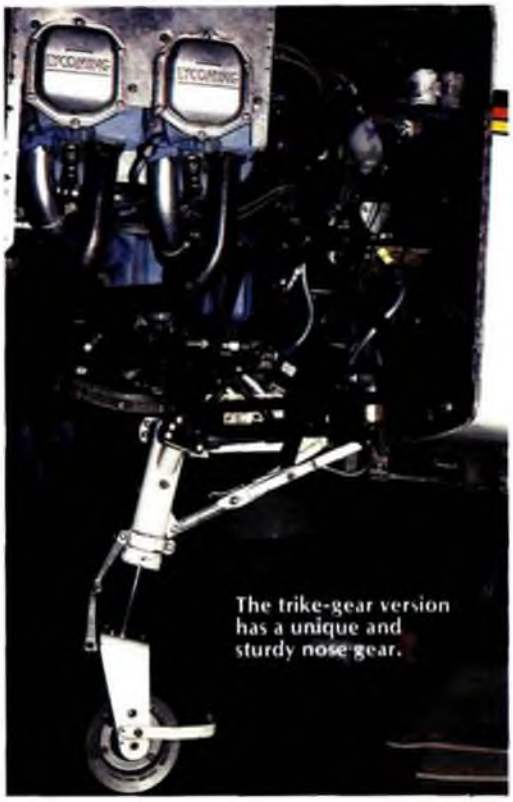
Wingspan: 23 feet, 3 inches
Wing Area: 81.2 square feet
Length: 18 feet, 7 inches
Engine: Lycoming O-320
Gross Weight: 1,600 pounds
Price: $19,500

Not that different from your ARF model airplane kits, this one is just bigger.

to modeling.

you look at the contents of this kit you get a very strong urge to get out your Hot Stuff and sandpaper.

The fuselage shell consists of two halves and a belly panel that you glue together. You have to cut the fiberglass for the cockpit opening and canopy, just like on a model. The wing shells are already formed in contour and you simply place the full-length, all-fiberglass composite spar on the bottom half, install the control linkages, webs, and wing lights, and glue on the top. I suspect that if Hamilton ever decided to make a model of this airplane, all he would have to do is reduce the size of the pieces.



The trike-gear version has a unique and sturdy nose gear.

If you really put yourself into this kit, you can have it flying in no time. The factory estimates the average building time to be 1,200 hours. If you work 8 hours a day on it, you can roll it out in only five months. I know of *models* that take that long to build!

What makes this airplane so unique, aside from its good looks, is the way Stoddard-Hamilton* has put the kit together. A tremendous amount of effort was obviously devoted to its planning. Not only are all the parts absolutely top notch, the building instructions are so comprehensive and easy to understand, that no stone is left unturned. If you have a question, they've already thought of it and have answered it for you. Step-by-step procedures are photographically sequenced and have supporting illustrations. Even with that, if you run into difficulty, Stoddard-Hamilton is as close as your phone.

Several versions of the Glasair can be built from the same basic fuselage and wing. You can have a fixed landing gear with a trike setup, a fixed two-wheel tail-dragger, or a retractable trike gear. The retract mechanism used is entirely unique and operates off of a hydraulic pump that is electric driven. This system has proven to be a very reliable setup and also simpler for the builder to install. In addition, the retract gear version only adds 27 pounds to the airplane's weight, but increases the top speed and range considerably.

The powerplant used for the Glasair is the Avco Lycoming, and four different versions can be used, up to the IO 360. They are normally aspirated engines; however, engines with turbos have also been used with great success.

The fuel capacity is 42 gallons and 100/130 octane fuel is recommended, although 80/87 fuel is recommended for the 150-hp version. The Glasair has two fuel tanks: one main tank in the wing and a smaller tank in the aft surface of the firewall. They are both "wet" design tanks, meaning that they are built right into the fiberglass structure itself.

(Continued on page 92)

Construction

Glasair

One of the hottest selling lightplanes can be yours in this ¼-scale scratch version.

by RON SEBOSKY

Type: Sport Scale
Scale: 3.94 inches = 1 foot
Wingspan: 71 inches
Wing Area: 781 square inches
Weight: 9 pounds
Engine: O.S. FS-90
Channels: 5

I RECENTLY picked up a magazine called *Kitplanes* and started reading about the Glasair RG and TD. Stoddard-Hamilton, designer and manufacturer of the Glasairs, called them a "fast pair of glass slippers." I noted that the Glasair was designed to be a high-speed, minimal-power aircraft and still have excellent low-speed characteristics. I read on.

It's a two-seat aircraft that cruises at about 200 mph and can attain speeds in excess of 250 mph. It's capable of climbing vertically, is very maneuverable, and has excellent stall characteristics. These are also ideal R/C characteristics, so I decided to build a ¼-scale Glasair. This is a two-seat aircraft that can be built with trike gear or as a tail-dragger.

Wanting to build as light as possible, I elected to build the TD version. It's hard to build an R/C aircraft by

looking at a picture in a magazine, so I wrote to Stoddard-Hamilton and told them of my ambition. Boy, did I get a response. They sent me everything I asked for and offered to help me in any way they could.

CONSTRUCTION. The Glasair TD model isn't a difficult plane to build. If you are good at forming cowls, canopies, and wheelpants, you'll have no trouble whatsoever with it. If you aren't, Fiberglass Master* has them.

The construction procedures will carry you through in the same fashion that I built the original model. The rear portion of the fuselage is built first, then the top portion is built onto it, using the top view of the plan. The rear fuselage is built one side at a time by splitting the formers down the middle and building on the side view of the plan. The wing builds very easily by following the step-by-step instructions.

You can choose your own method of fastening the wing to the fuselage; I elected the spring-loaded method. Most builders use bolts, which is fine.

Use the lightest wood you can and add lightening holes wherever you feel you can without jeopardizing strength.

The design originally called for a Fox 78 but I modified it for an O.S. .90 four-stroke engine from Great Planes Model Distributors*. I did this because my loving wife gave me the O.S. .90 for my birthday.

The cowl is of 6-ounce fiberglass cloth and K&B Superpoxy, reinforced with another layer of 6-ounce cloth on the inside. Believe it or not, this turns out to be very strong and light. You might have noticed a slight difference in the cowl shape, and there are two reasons for this. One is to allow larger air-intake holes so there is better cooling of the engine. The other reason is my inability to locate a 3¼ spinner, so I went with a 3-inch spinner.

To begin building, assemble the elevator by cutting E2 and E1 to the pattern of E1 and pinning it to your workboard. Glue the ribs in position and add gussets as desired. Do the final shaping of the leading edge after the 1/16-inch sheeting is in place. The part of the stab that was face down will be the top of the stab when mounted on the aircraft.

To assemble the rudder, cut R21 from ¼-inch stock. Taper it from R1 to R6. Use the piece that you just cut off and glue it to R21 at R2 through R0. Pin R22 to the plan and glue gussets to R22 as indicated.

When the glue is dry, place a ⅛-inch shim under R22 at R0. Place a 1/16-inch shim under R22 at R5. (These shims will act as jigs for aligning R0 through R6.) Use the same technique for R23, R24, and R25.

Pin R8.5, R11, and R25 to the plan, and glue them together. Glue the leading edge to R11 and R8.5. Put a ⅛-inch shim at the leading edge of R9. Glue the remaining ribs in place. Add 1/16-inch vertical braces for strength and sheet with 1/16-inch balsa. Sand to shape.

When building the fuselage, don't hesitate to reinforce anything that you feel might need it. Use triangle stock at all glue joints on all formers. You can delete F11 and use stringers (6) in its place. This makes a strong structure.

Cut out all formers and other fuselage parts. Split the formers down the middle. Build the back portion of the fuselage from F6 to the rear on the side view of the plan. Add triangle stock and T-braces as you build. Remove this assembly from the plan and build the other side onto the half you just

(Continued on page 28)

Sebosky, the Glasair, and the moment of truth. Note his shaking knees.

Tech Tips!

Fine-Tuning Props

by F.C. RISTEEN

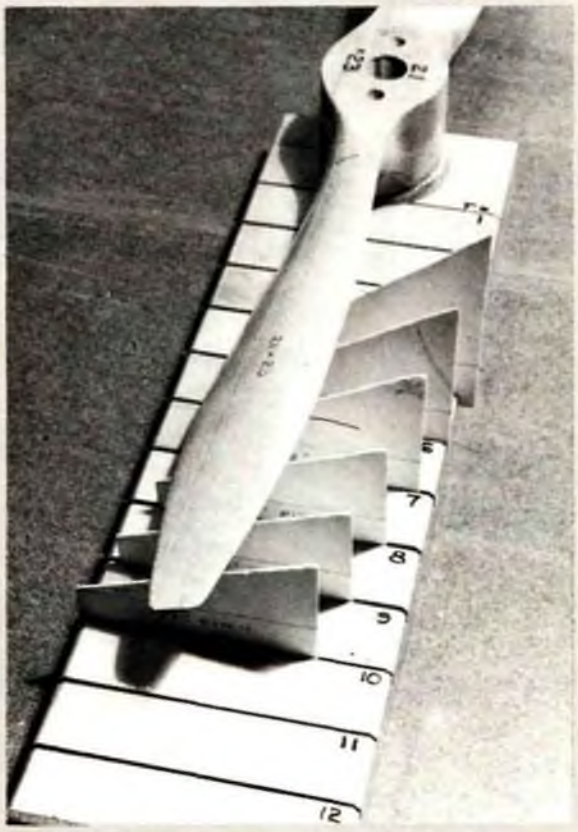
THE ADVENT of the great variety of chainsaw-derived engines, big four-strokes, and gear drives has kept life interesting for propeller manufacturers. They've burned a lot of midnight oil gearing up to produce a whole slew of new, larger propellers. By and large, they've done a good job, but there are still gaps in the available selection, particularly in sizes required for the cleaner, faster models. These are models such as the Turnaround Pattern ships and high-performance ¼-scale models requiring higher-than-normal pitch propellers for best performance.

I've been involved with larger models since 1975, particularly in the 12 to 20 hp and 200 mph-plus speed range required for military missile targets. I spent many hours calculating for special propellers, and a lot of good straight-grained maple was wrought into dozens of propellers of up to 24-inch diameter and 30-inch pitch.

More recently, the need arose for smaller propellers in the 11- to 15-inch diameter range, but with higher-than-normal pitches. Like most people, I have an aversion to work, particularly when it's not absolutely necessary. I wondered whether stock, lower-pitch propellers could be modified to higher pitches by steaming and twisting the blades near the hub.

The conventional dogma on propellers made this approach appear less than desirable. Simply cranking the entire blade to a higher angle would result in giving excessive pitch to the blade tips. Therefore, you would have to also steam and twist the entire blade to a completely new shape, a somewhat more tedious procedure, but still probably less work than making propellers from scratch. This immediately posed a question: What degree of accuracy is really necessary in maintaining a constant pitch over the entire blade?

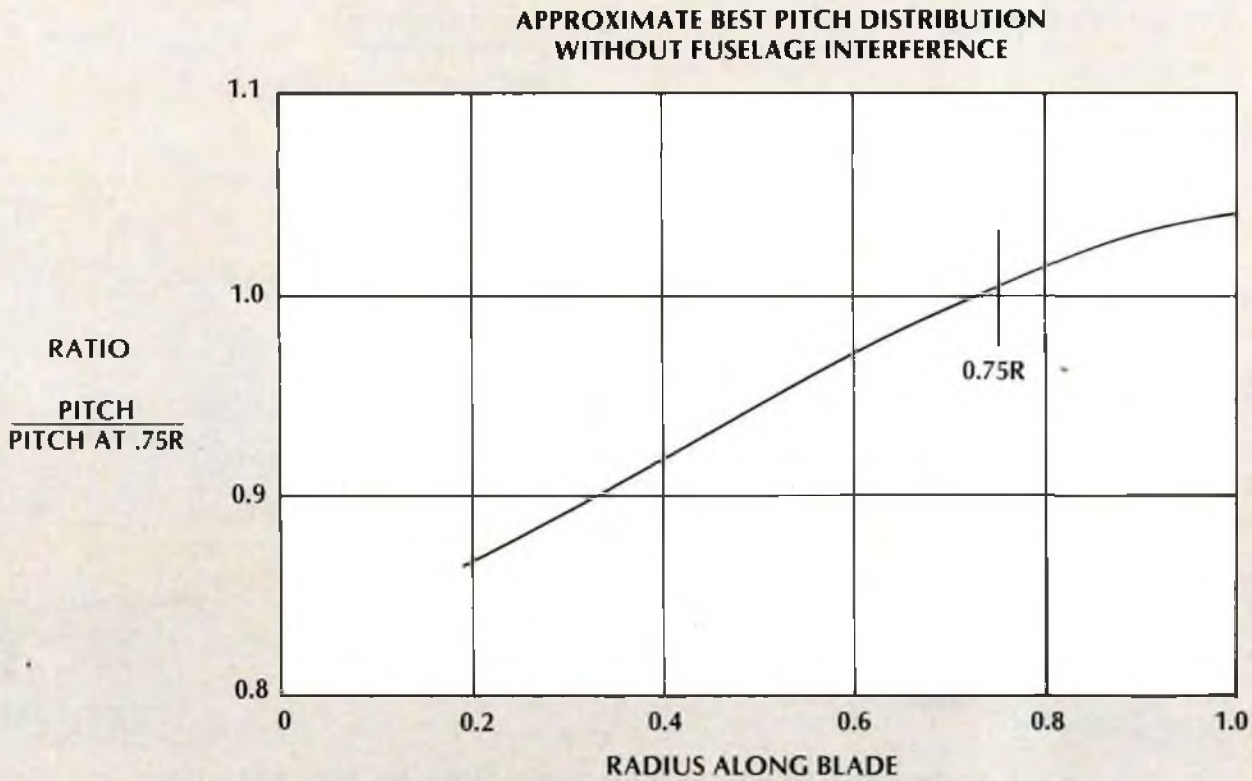
I dug into my aeronautical technical library and found that I wasn't exactly the first to ask this question. Tests going back to the 1920s shed some light on the problem. The older tests were particularly interesting as they had been conducted at Reynolds Numbers (a function of blade chord and speed) typical of our model propellers. These tests showed that rather large deviations from uniform pitch were relatively unimportant. In fact, propellers having considerably greater pitch at the tips rather than near the hub were actually slightly more efficient than those having a uniform pitch all along the blades. This, of course, has been put to good use in adjustable and controllable pitch propellers. These have a constant, "true" pitch along the blade at only one blade angle setting, but are quite efficient over the entire range, particularly at the higher pitches used for cruise. Lower noise levels also tend to result from higher tip pitch, an important consideration for those attempting to meet the new AMA noise regulations for Pattern.



This prop-pitching gauge gives accurate pitch measurement at various blade locations.

I decided to test this with a few model propellers by comparing in-flight performance of props having constant pitch along the blades with others having up to 50% higher pitch at the tips, and could detect no difference. For comparison, I assumed the pitch at 75% of the distance from the hub center to the tip to be the nominal pitch. I also trimmed the tips as required to get correct static rpm.

I changed the pitch by completely scraping off the finish on the blades between the hub and about 2 inches out from the center, mounting the props in a jig, and twisting each blade an equal amount higher in pitch. I then steamed the center portion of the prop for about five minutes, and put the prop in the oven for about an hour at 200° F. I knew the props would lose a small percentage of the increase in pitch when they were removed from the jig, and I allowed for this in the initial re-pitching.



The above graph was a result of tests conducted in England where the 75% radius location yielded nominal pitch reading.

I then gave the props my usual final rework, consisting of a general cleanup of the airfoil shape and slight thinning of the tips, and, of course, balancing and refinishing.

The graph shows the results of a series of tests conducted many years ago in England in an attempt to determine the optimum pitch distribution. The tests were conducted using a wind tunnel at Reynolds Numbers typical of model aircraft practice, and showed that approximately 20% higher pitch at the tip than the inner portion of the blade would yield the best efficiency. Fuselage interference tends to increase the slope of the curve, requiring even lower pitch near the hub, depending on the shape and width of the fuselage.

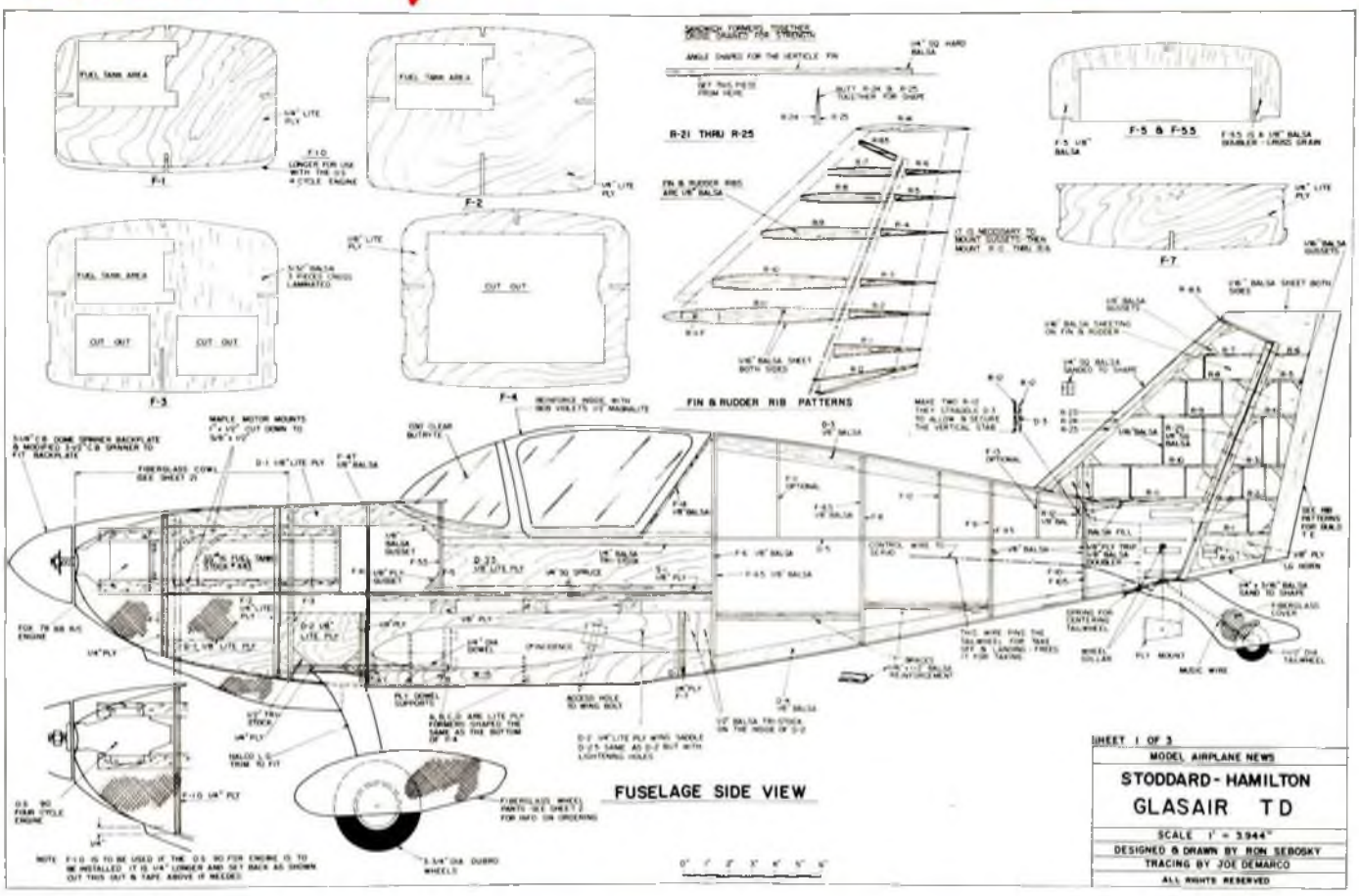
In one test, a propeller with a uniform pitch of 0.7 times the diameter with movable blades was increased in pitch to 1.6 times the diameter, and still slightly outperformed a propeller built with a uniform pitch of 1.6 times the diameter.

Why this is so is not clear from simple propeller theory. The relatively complex airflow through a propeller, with its various non-uniform radial and tangential components, in addition to the normal flow parallel to the axis, must be responsible in some way.

The hard-pressed propeller manufacturers will probably catch up before too long and begin producing more higher-pitched props, but in the meantime, the re-pitching procedure is relatively simple, and it works! ■

Adjusting equal pitch to both blades can be accomplished with such a jig as this. See text.

 (Continued from page 23)



FULL-SIZE PLANS AVAILABLE...PAGES 116, 117

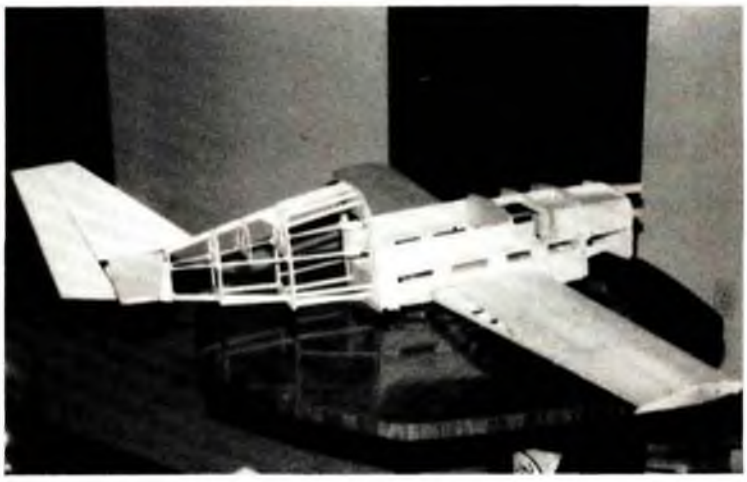
removed.

You're now ready to build the front end of the fuselage. Use the top view of the plan.

Start by pinning the aft portion of the fuselage to the top view of the plan. Be sure F6 is at a 90° angle to the building board, and be sure to choose the proper former size for F1 and the engine you intend to use.

F1 and F2 are slightly smaller than F3, so that the cowl will overlay them and meet flush with the fuselage sides at F3. Be sure to reinforce F1, F2, and the engine mounts with lite-ply. (These reinforcements are not shown on the plan, use your own technique.) Sheet the fuselage with 1/32-inch balsa. The completed fuselage will weigh approximately 1½ pounds.

Cut out the wing ribs as a whole unit. Don't cut notches for spars or the ⅛-inch notch on the leading edge of the rib. Punch small holes where they are indicated on the rib. Put a round toothpick into these holes to hold the ribs for alignment while stacking them. This will aid later in sanding and shaping them. Once they are stacked evenly, pin the set of ribs together and sand to shape. After sanding, pin the ribs to the plan and cut out notches for the spars and cut the trailing edge off the ribs.

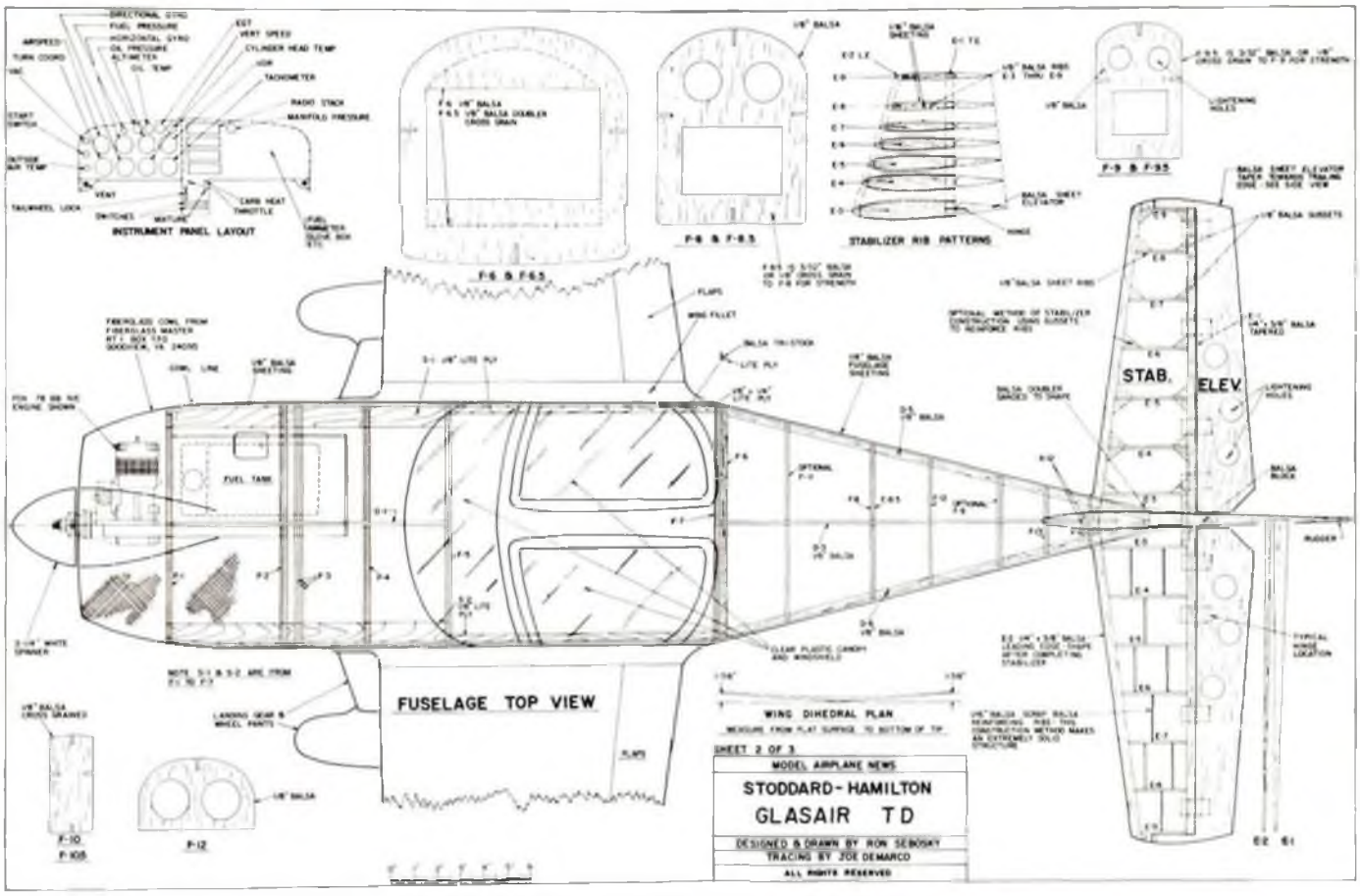


Framing at this stage begins the birth of an airplane.

Label each trailing edge accordingly (TE8, TE9, TE10, etc.) as you cut them off, because you'll need them for flaps. Don't shape the leading or trailing edges until the wings and flaps have been sheeted and temporarily pinned in place. The completed wing will weigh 1½ pounds.

Build the wing upside down. Pin the bottom spruce main spar to the plan. Glue W14 and W1 to the main spar. Align the ¼x½-inch balsa trailing edge with the bottom edge of W14 and W1. Pin and glue in place.

Glue the top spruce main spar to W14. Pin the wing jigs in place on W14 and W1, insuring that the top and bottom main spars are directly above each other (a 90° angle to the building board). Glue the ribs in place, starting with W7 and



FULL-SIZE PLANS AVAILABLE...PAGES 116, 117

Underside view of wing center section. Note spring-loaded wing dowels.

being careful not to bow the top spar. If installing the rib causes the spar to bow, verify that you have a straight spar, then fine-tune the rib by sanding or cutting the spar notch for correct fit.

Glue the top balsa spar in place after all the ribs are installed. Glue ⅛-inch square spruce down the middle of the flat side of the 1-inch shaped leading edge. Glue the leading edge in place—be sure it remains straight so that you don't have a bowed leading edge.

Add gussets, pushrods, and bellcranks and install the hard balsa shear webbing. Cut the main spar reinforcement from ¼-inch lite-ply. This will automatically give a 3° dihedral to each wing tip.

Cut W10, W11, W12, W13, and W14 on both wings to accept the ¼-inch plywood spar reinforcement. Glue the spar to one wing half. Elevate each wing tip 1⅞ inches and glue both halves together. Glue the trailing edges together, and the leading edges together. Put the wing aside until the fuselage is completed.

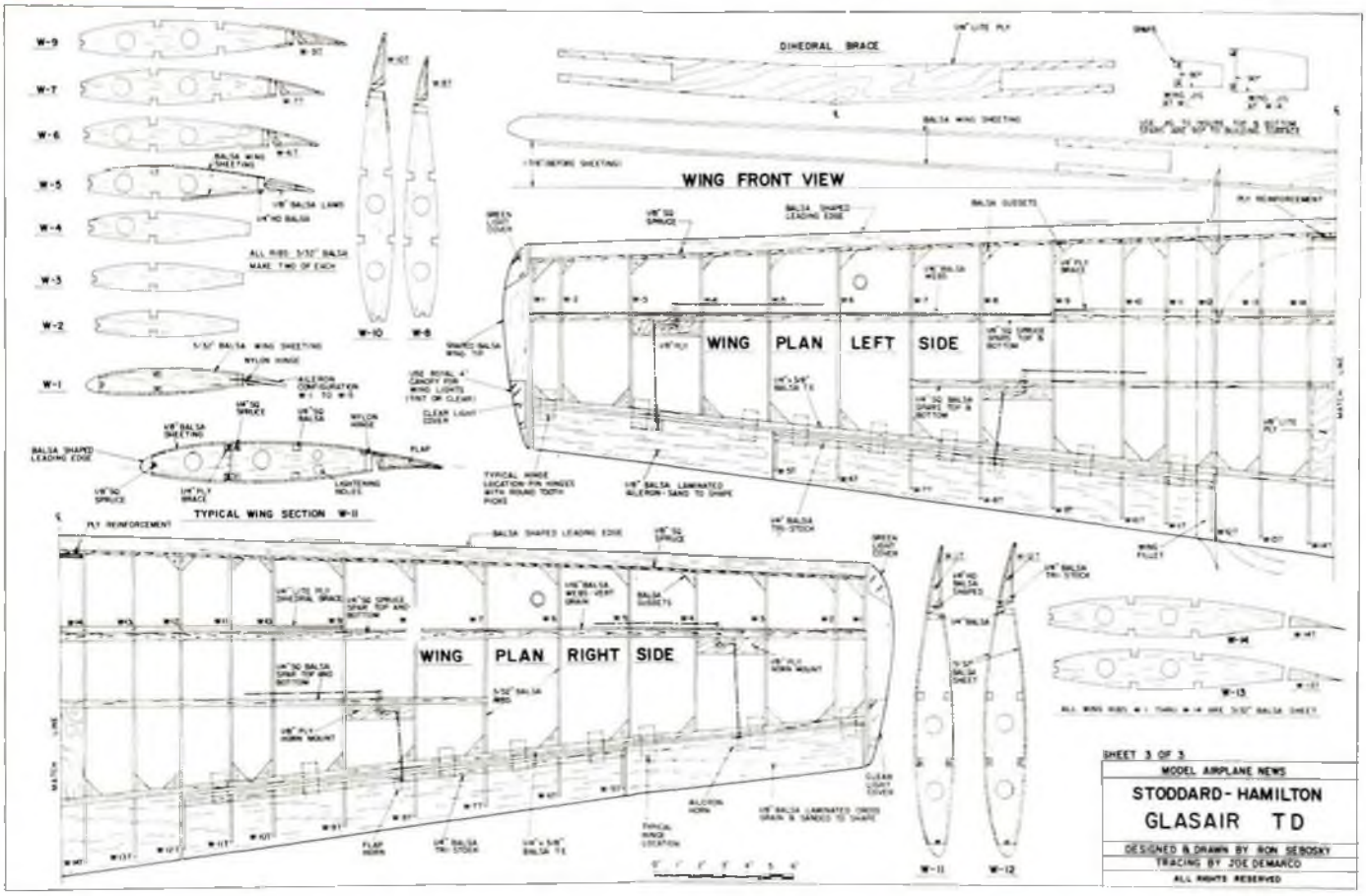
When the fuselage is complete, continue by sheeting the top of the wing with 3/32-inch balsa. Lay the wing into the wing cradle of the fuselage and build the undercarriage of the fuselage onto the wing. This has to be strongly built because it will be the part that attaches the wing to the fuselage.

Build the ailerons and flaps and sand them to shape. Temporarily attach the linkage and be sure that the surfaces function properly, then sheet the underside of the wing.

Use scrap balsa to shape the cowl. Cover the balsa cowl with EconoKote, wax (simonize) it, then cover it with auto body filler (about $9 a gallon can). This creates a mold. Remove the mold and balsa cowl and wax the inside of the mold. Lay up the cowl with K&B* epoxy resin and 6-ounce cloth. I used three layers of 6-ounce cloth and resin. Remove it from the mold and it's all done.

I tried two new (to me) covering materials and was dissatisfied. I then elected to go with the old standby, MonoKote. I would have preferred glassing the plane for a more realistic finish

FULL-SIZE PLANS AVAILABLE...PAGES 116, 117



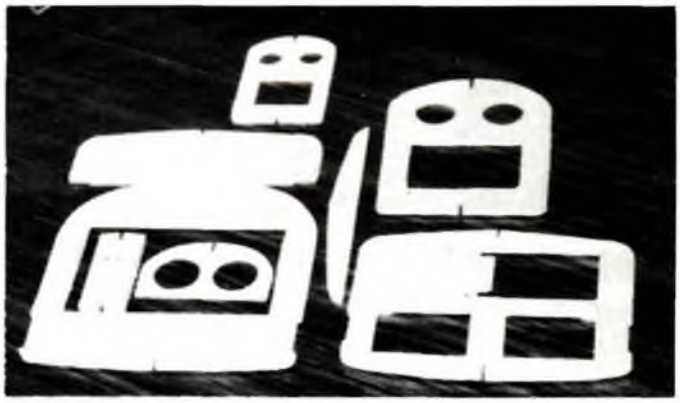
but I didn't want to increase the weight any more than I absolutely had to.

I primed the cowl, wheelpants, canopy support, and tailwheel with K&B Superpoxy primer and then sanded with 400-grit sandpaper. I painted them with Cheveron* paint for a matched finish. The overall look is good. I did trim stripping with MonoKote Metallic Blue and Sky Blue.

Construct the canopy by covering the cockpit area with plastic wrap. Roughly shape some wire screen (as used in a screen door) into the shape of the canopy and place the screen in position on top of the plastic wrap. This will be the foundation for the canopy mold. Mix up some plaster of Paris and cover the screen with a relatively thin coat. Let this coat harden and then apply more plaster. You now have a plaster of Paris canopy that weighs a ton. Place it in the oven and bake it for about 15 minutes at 350°. Place .030 butyrate sheet over the plaster mold and return it to the oven. Check frequently to be sure the butyrate is melting properly. Remove it from the oven and let it cool. You now have a canopy. You might want to build it in three sections as I did, and fasten these pieces together with Bob Violett's Magnalite. This works great and creates a fairly rigid canopy.

FLYING. The day of the first flight was fast approaching. I contacted Tom Miller, my test pilot, and Eddie Schinlever, a professional photographer, both of whom work for Piedmont Airlines, and we set up an appointment to meet at the flying field. At the field we went through a pre-preflight inspection and discussed flight characteristics that we might expect from the Glasair. The short tail moments, the small stabilizer, and

(Continued on page 93)



Above: Fuselage assembly begins with aft section. Right: Most fuselage bulkheads are cut from lite-ply.

Engine Review Round-Up

O.S. MAX-77VR-DF

by PETER CHINN

SPECIFICATIONS

Type: Air-cooled, single-cylinder, rear exhaust, two-stroke-cycle, with rear rotary disc valve and Schnuerle scavenging.
Bore: 26 mm (1.024 in.)
Stroke: 24 mm (0.9449 in.)
Displacement: 12.742cc (0.7776 cu in.)
Nominal Compression Ratio (full stroke): 12.5:1
Speed Control: O.S. Type 8B automatic mixture control carburetor
Checked Weights: 669 grams (23.6 oz) with heatsink head; 577 grams (20.4 oz) with conventional head
Mounting Dimensions:
Crankcase width: 42.0 mm
Length (from prop driver face including carburetor): 133.0 mm
Height above C.L.
(with heatsink head): 90.5 mm
(with conventional head): 81.5 mm
Bolt hole spacing: 52x25 mm
Manufacturer's Claimed Power Output: 3.9 PS (3.85 bhp) at 22,000 rpm (fuel and exhaust system specified).
Manufacturer: O.S. Engine Manufacturing Co. Ltd., Higashisumiyoshi-ku, Osaka 546, Japan.

U.S. Distributor: Great Planes Model Distributors Company, P.O. Box 4021, Champaign, IL 61820.

Ducted-fan enthusiasts looking for more power will find the new Max-77VR-DF of interest. It has 20% more displacement, yet still fits 65VR-DF mount.

LESS THAN three years ago in this series (June 1983 issue) we dealt with the then-new O.S. Max-65VR-DF ducted-fan engine that had been developed from the Max-65VR-M racing marine unit. Reflecting the continuing evolution of high-performance ducted-fan scale models, the O.S. factory has now discontinued the 65VR-DF and replaced it with a still more powerful model, the Max-77VR-DF, dealt with here.

Ducted-fan buffs familiar with the 65VR-DF will have no difficulty in recognizing the 77VR-DF as belonging to the same family. Although scarcely any of its component parts are taken directly from the previous model (they are limited, essentially, to the conrod, disc valve and front ball bearing) the 77VR-DF follows the same basic layout as the previous model and, as one would expect, exhibits the extremely high quality manufacturing standards seen in companion model O.S. high-output two-strokes.

The Max-77 has a 19.9 percent larger displacement than the Max-65 and it would not be unreasonable to expect a similar increase in power output. In fact, O.S. is rating the 77VR-DF at 3.9 PS—the metric equivalent of nearly 3.85 brake horsepower—at 22,000 rpm, which

Special head for the 77VR-DF is in two parts. Quality is O.S. at its best.

Supplied with large heat-sink head, but can still use standard head.

is a further 18 percent improvement. The fuel used to obtain these ratings is not specified but, whereas fuels containing 0-30 percent nitromethane were recommended for the 65VR-DF, the manufacturer now acknowledges that the operator may wish to use 50 percent, or more, nitro with the 77VR-DF. Presumably, the factory performance claims, therefore, are based on the use of such fuels and with an optimized tuned exhaust system.

Outwardly, the 77VR-DF is recognizable by its large diameter "heatsink" type cylinder head fins and by its larger carburetor. As in the case of the 65VR-DF, the head is made in two parts: a flanged drop-in combustion chamber insert that is topped by a finned outer component; six 3.5 mm hex socket head cap screws being used to tie the assembly to the main casting. However, whereas the outer component of the 65VR-DF head is machined from a pressure casting with conventional tapered cooling fins and an outside diameter to match that of the cylinder fins, the 77VR-DF's heatsink head has a 15.3 mm larger diameter, is much deeper, with vastly increased fin area, and is machined from aluminum bar stock.

For use where the 77VR-DF's larger head—which also increases overall engine height by 10 mm (0.394 in.)—cannot be conveniently accommodated, the manufacturer states that the 77VR-DF can be fitted with a "Type B" head (i.e., the same as for the 65VR-DF). Obviously, this is contingent upon adequate cooling air reaching the head but, with this fitted, overall height is reduced to only 1 millimeter more than that of the 65VR-DF. It also reduces engine weight by some 3.2 ounces.

The new Type 8B carburetor is of the same basic design as the Type 7F fitted to the 65VR-DF but has a larger body. The new body accommodates a larger diameter throttle barrel, itself made necessary by the Type 8B's enlarged choke, now 12 mm, increasing the effective choke area to around 80 sq mm. As with the previous type, the throttle barrel is of aluminum with a specially treated hard surface, instead of the more commonly used steel or brass component. This avoids the "tail-wagging-the-dog" tendencies that can develop when vibration affects an excessively heavy carburetor.

Like all the high-performance VR series engines (and some VF and FSR models as well) the 77VR-DF has O.S.'s very successful variant of "ABC." As has been explained in the past, this features a special ultra-hard, non-electrodeposited composite cylinder plating having particularly good resistance to friction, wear and corrosion. The ringless aluminum piston is very precisely matched to the convergent cylinder bore so that piston-seal improves as the piston rises toward the top of its stroke and compression is increased, while frictional losses are held to the minimum. There is an oil retaining groove around the piston just below its head and the piston skirt is relieved below the 6 mm o.d. tubular wristpin. The wristpin is full-floating, but retained by wire circlips and couples the piston to a machined high-duty alloy connecting-rod, bronze bushed at both ends.

The one-piece crankshaft runs in NTN steel-caged ball journal bearings contained in a sturdy front housing that is tied to the crankcase with four 4 mm socket head cap screws. The shaft has a full disc crankweb with unsealed peri-

(Continued on page 82)

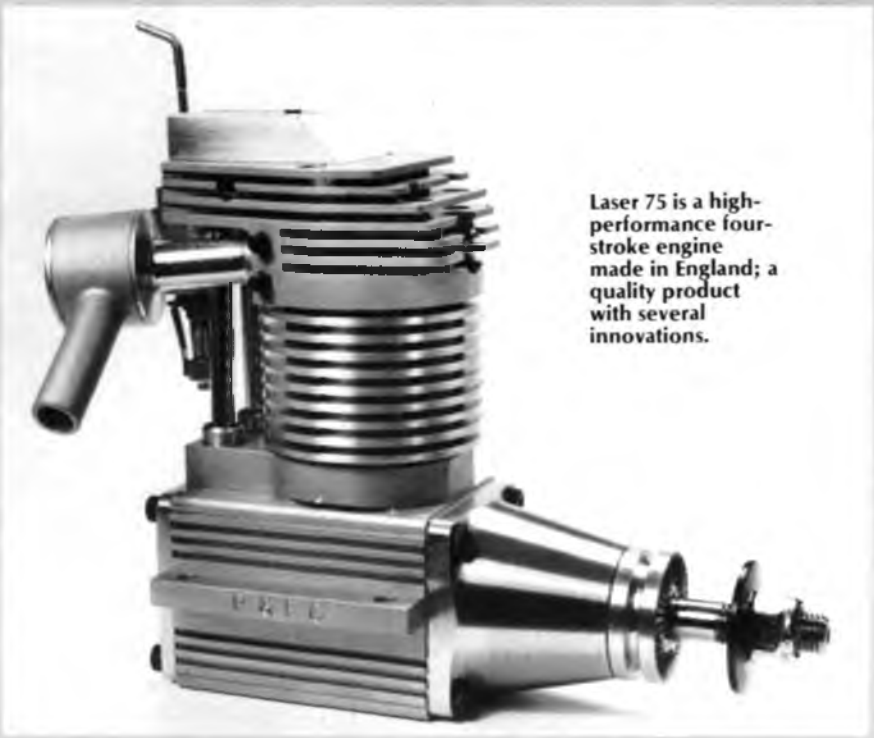
Front and rear end parts including big new Type 8B carb and counter-balanced disc.

Engine Review Round-Up

LASER 75

SPECIFICATIONS

Type: Air-cooled, single-cylinder, four-stroke-cycle, with pushrod operated overhead valves.
Bore: 1.040 in. (26.42 mm)
Stroke: 0.875 in. (22.22 mm)
Displacement: 0.7433 cu in. (12.18cc)
Nominal Compression Ratio: 9.2:1
Speed Control: Super-Tigre Mag type carburetor with automatic mixture control
Checked Weight: 706 grams (24.9 oz)
Mounting Dimensions:
Crankcase width: 40 mm
Length from prop driver face: 126 mm
Height above CL: 93 mm
Bolt hole spacing: 48.5x42.5 mm
Manufacturer's Claimed Power Output: Not stated.
Manufacturer: A.G.C. Ltd., London Road, Apsley, Hemel Hempstead, Hertfordshire, England HP3 9ST.



Laser 75 is a high-performance four-stroke engine made in England; a quality product with several innovations.

THE LASER engines are among the more interesting four-stroke motors currently available. Introduced in 1984, the first production model, the Laser 61, proved to be the most powerful 10cc four-stroke to date. Last year, it was joined by a bored-out "75" version, one of which was used by the noted English scale specialist, Brian Taylor, to power his winning Spitfire in the International Class R/C Scale event at the 1985 U.K. National Championships. It is with the 75 that we are dealing here. The manufacturer also offers a .90 and a 1.20 cu in. vee-twin. A .45 is about to be released and a 1.50 vee-twin is in the offing.

Laser components are made from bar stock. No castings, except for ST carburetor body.

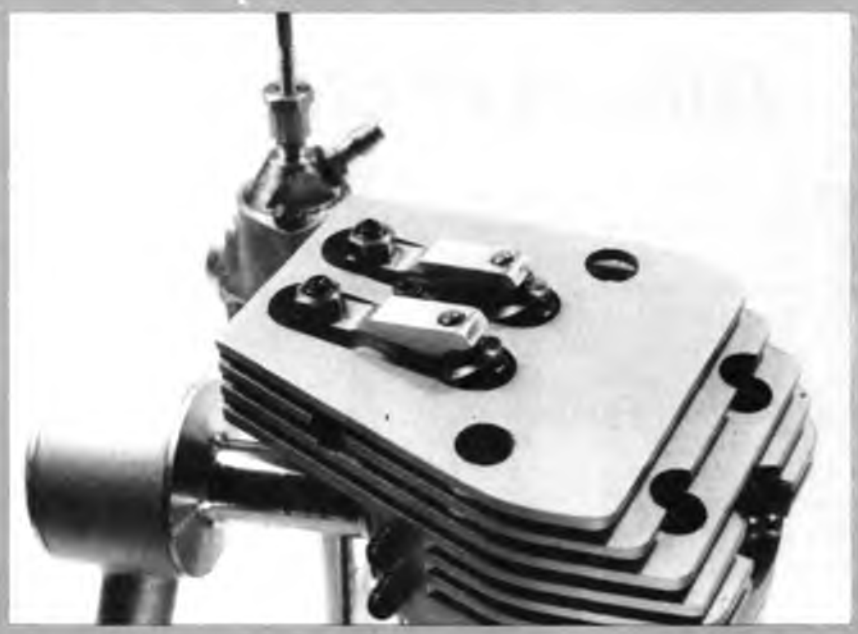
Lasers are "bar-stock" motors: i.e., those parts that are customarily produced from castings, such as the crankcase, front housing and cylinder head, are, instead, machined from solid material. Bar-stock engines are usually either one-off hand-built specials or, at the opposite end of the scale, small high-volume mass-produced two-strokes, made, like many of the Cox motors, on automatic machines. It is quite uncommon for relatively large engines to be produced in quantity in this manner and, to do so, the Laser manufacturer, A.G.C. Ltd., has turned to complex computer controlled machines.

"Quantity" is a relative term here. By the standards of the leading Japanese manufacturers, Laser production is small—just a few thousand engines per year at present, all of which are sold on a

direct factory-to-user basis. Until such time as A.G.C. is ready to expand and move into the high volume market, this will continue. A.G.C. has no dealers and no distributors and its advertising is almost non-existent. Lasers sell themselves. Word has gotten around, among four-cycle enthusiasts, that they are good and the demand for them keeps the factory busy turning out as many as it can. For modelers who like to visit a model shop and see what they are buying, this method of purchase is not so appealing, but it does mean that they get the engine at a lower price than they would otherwise have to pay.

There remains the question: what about service for overseas customers? We spoke to Laser designer Neil Tidey on this matter. He admitted that this did mean engines having to be sent to England for attention, but said that the engines had proved to be gratifyingly trouble-free, leaving crash damage as the main reason for engines being returned. With rapid airmail transit and a prompt turnaround at the factory, he feels that this is not a deterent, except for higher mailing costs.

The design and construction of the Laser 75 is an interesting mixture of the orthodox and the unusual. The engine is of the familiar pushrod-OHV type with twin side-by-side spur-gear driven camshafts at the rear like the Enya four-strokes. The crankcase and timing case, however, are made in one piece, rectangular in section and providing very well supported engine mounting by means of long ($2^3/_{16}$ inch) beam mounting lugs. The twin ball bearing crankshaft is carried in a sturdy front housing tied to the crankcase in the usual way by means of a flange and four socket head cap screws.



Cover removed to show rocker arms. Valves are inclined in efficient wedge head.

The most important part of any OHV four-stroke engine is its cylinder head. The Laser has parallel inclined side-by-side valves, which are not uncommon, except for the fact that the valve inclination is some 30° to the cylinder axis. The result of this is that there is a much less acute change of direction in gas flow between port and valve throat and, since the valve heads are parallel to the upper surface of the combustion chamber, a compact wedge-shaped chamber is made possible.

In (vertical) cross-section, the chamber is basically a right-angled triangle in which the hypotenuse opens into the cylinder, the long (upper) side contains the valve openings and the short (front) side contains the glowplug. There is a large segment shaped squish area to the rear of the chamber.

Such a combustion chamber shape is theoretically very efficient. It provides a

(Continued on page 89)

Crankcase rear end houses twin spur-gear driven camshafts. Note mushroom type cam-followers.

CONTROL TOWER

by CHARLIE KENNEY

FUTABA FP-6NLK

THIS MONTH it's back to business as usual. I have a brand new radio to review: the Futaba* Conquest six-channel system operating on channel 52, 72.830 MHz (green-red).

Featuring the Futaba competition G Series adjustable open gimbals, the Conquest gives the degree of precision found only in considerably more expensive Futaba sets. Available in both a six-channel and four-channel version, the systems are fully equipped with nickel-cadmium batteries. They have triple-tuned receivers and two choices of servos, the S28 or S33. As you open the styrofoam case and view all the neatly packaged goodies, the transmitter really jumps out at you. Constructed with black plastic and brushed aluminum panels, the stick bezels literally sparkle and the output meter commands your attention; it's large and easy to read.

Let me highlight some of the features of the system, then I'll discuss them in more detail. The Futaba FP-6NLK system I received included the FP-T6NLK transmitter, the FP-R7H receiver, four FP-S28 servos, an NR-4M airborne battery pack, a SWH-1 switch, and accessories consisting of servo mounting trays and hardware, frequency flag, charger, and extra horns.

TRANSMITTER FP-T6NLK

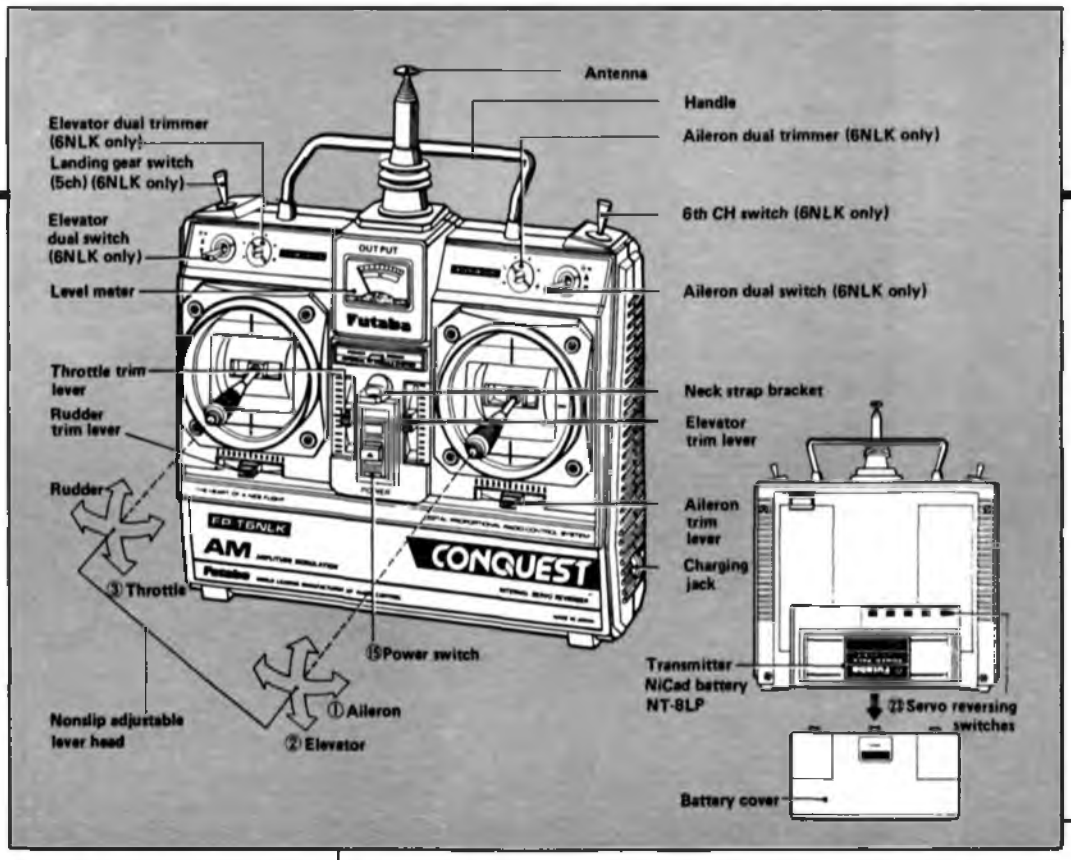
- Reliability is substantially improved by factory use of automatic insertion equipment to assemble the PC board.
- Each of the five channels has a servo reversing switch.
- Newly-designed G Series open gimbal sticks operate smoothly and positively. Spring tension adjustment of the stick allows for the optimum operating feel.
- Non-slip adjustable stick head allows adjustment of the stick length as desired (maximum ¼ inch).
- Transmitter has an RF PC board module style system.
- Case is functional, easy to handle, and has a good feel.
- Includes aileron and elevator dual rate functions.
- Square transmitter battery voltage/output level meter is easy to read.
- There's a good radiation efficiency and a husky 8-stage telescoping antenna.
- Transmitter can be hung from your neck by using the provided neck strap and bracket.
- Includes a built-in nickel-cadmium battery.

RECEIVER FP-R7H

- Receiver is a 7-channel, compact, lightweight, and rugged unit, which is virtually invulnerable to power supply voltage changes due to the new Futaba Custom I/C, IR-2501.
- Newly-designed AGC circuit minimizes interference.
- Fiberglass-reinforced epoxy resin PC board with through-the-hole plating improves vibration and shock resistance.
- Three-wire gold-plated mini block connector is compatible with all Futaba servos.
- The rugged case is fiberglass-reinforced.

SERVO FP-S28

- Skew type armature motor tracks movement of a trim control by even one click. It displays a performance near that of a coreless motor.
- New indirect drive potentiometer im-



proves vibration and shock resistance and neutral accuracy.

- Futaba low-power custom IC provides extremely high torque, narrow dead-band, and superior tracking.
- Fiberglass-reinforced PBT (polybutylene terephthalate) injection-molded servo case is mechanically strong and invulnerable to glow fuel.
- Strong polyacetal resin ultra-precision servo gear features smooth operation, positive/neutral, and very little backlash.
- Fiberglass-reinforced epoxy resin PC board with through-the-hole plating improves servo amp vibration and shock resistance.
- Includes a three-wire gold-plated 3p mini connector.
- Mounting the servo is simplified with a special grommet that has an excellent cushioning effect.
- Six special adjustable splined horns are available (four provided).
- High 48.7 ounce-inches (3.5kg-cm) maximum output torque allows use in almost any model.

In addition to the hardware data, the Conquest 6 has a six-page instruction manual describing each system element with many drawings and isometric views.

TRANSMITTER FP-T6NLK

Operating System: two stick, servo reverse, aileron, elevator dual rate switch, landing gear switch (channel 5) and switch (channel 6)
Transmitting frequency: 72 MHz band, 75 MHz band
Modulation System: AM
Power Requirement: 9.6V nickel-cadmium battery (NT-8LP), 500 mAh
Current Drain: 190 mA
Dimensions: 6.8x7x2.2 inches
Weight: 1 pound, 13 ounces

RECEIVER FP-R7H

Receiving Frequency: 72 MHz band, 75 MHz band
Crystal Replacement System: Frequency can be changed within the same frequency band
Intermediate Frequency: 455 KHz
Power Requirement: 4.8V nickel-cadmium battery, 500 mAh, common use with servo
Current Drain: 4.8V, 10 mA
Dimensions: 2.6x1.6x0.8 inches
Weight: 1.7 ounces

SERVO FP-S28

Control System: Plus pulse width control neutral 1.52ms
Operating Angle: One side 45° or more including trim
Power Requirement: 4.8V
Current Drain (idle): 6.4 mA
Output Torque: 48.7 ounce-inches
Operating Speed: 0.24 second/60°
Dimensions: 1.6x0.8x1.6 inches
Weight: 1.87 ounces

The transmitter, airborne system, and servo exploded-view drawings are particularly good. The heart of the Conquest 6 is the Mode II transmitter, so I'll start my review there.

At the top of the transmitter are two control switches. The left switch is for landing gear (channel 5). Switch position for direction of up and down gear movement is the user's choice. On the top right side is the channel 6 switch, center position is Off. This, for example, could be used for flaps. By pulsing the switch you can actually get partial flap settings or by holding the switch On, get full down flaps. Moving the switch in the other direction through the Off position will give you up flaps. An eight-section telescoping whip antenna is located in the center of the transmitter top and behind it is a convenient carrying handle.

Moving to the transmitter front and starting at the upper left is the elevator dual rate switch. Just to the right of the D/R elevator switch is the dial-calibrated (0-10) D/R adjustment. Clockwise movement of the slotted shaft reduces the throw when the D/R switch is On. Full clockwise movement is minimum throw. By turning the elevator D/R switch off, the elevator throw immediately returns to normal full throw. The elevator D/R control can reduce the servo throw to 40% of full throw (100%) centered about neutral.

Moving right, you'll find the rather large calibrated output level meter measuring 1-inch wide by ¼-inch high. It's very easy to see. The level meter is equally divided into calibrated red and silver sections. With a full charge, the indicator needle is three-quarters into the silver section. As the transmitter is used, the needle will drop. When it's close to the red side of the indicator, it's time for a charge. You may normally expect to get about 1 hour and 40 minutes from a fully-charged transmitter pack. Next is the aileron D/R adjustment control and the aileron D/R switch. It works just like the elevator D/R.

photos by SUE KENNEY

Back cover removed, RF board left, encoder right. Note 5-pin connector between boards.

Airborne system has all-up weight of 14 ounces.

Moving back to the left side of the transmitter is the rudder and throttle stick. The conquest radio series employs open gimbal construction like the G Series transmitters. Also as in the G Series, the stick is adjustable in length to about ¼ inch. In addition, the spring tension on the sticks can be adjusted to the flier's desired feel. Adjustment of elevator, rudder, and aileron sticks are accessed from the rear of the transmitter.

The throttle control is detented and both rudder and throttle have electronic trims, not mechanical. The rudder trim is at the bottom under the stick bezel and the throttle trim is to the right of the stick bezel.

In the center of the transmitter there's a neck strap bracket and under it is the On/Off switch. Incidentally, the neck strap is provided as an accessory. Continuing to the right is the elevator-aileron adjustable stick with electronic trims. Elevator trim is to the left and aileron is below the stick. On the lower right side of the transmitter (as viewed from the front) is the transmitter charging jack.

Moving to the transmitter rear side at the upper left is an access cover to the transmitter crystal. To remove the crystal, the cover is popped off and the crystal may be removed by its tab. Remember, if you change frequency, both receiver and transmitter crystals must be changed. At the bottom is the removable battery cover. The battery can be removed by lifting the right end of the battery upward. Spring clips are used to connect the battery to the transmitter electronics so there's no soldering to connect a new battery—a nice feature.

Located above the transmitter battery pack are the five servo reversing switches. Left to right, they are aileron, elevator, throttle, rudder, and landing gear (channel 5). Normal is left, reverse is to the right. To adjust the spring tension on rudder, aileron, and elevator, the transmitter back must be removed by unscrewing the four Phillips head corner screws. This will reveal two PC boards. The one to the left is the transmitter RF board and on the right is the encoder. They are joined by a 5-pin connector at the lower common side of each board.

To expose the aileron-rudder adjustment screws, the RF board must be disconnected by gently pulling it to the

(Continued on page 104)

The seven-channel receiver is very compact.

HOW TO:

by RANDY RANDOLPH

SPLICE NYRODS

The nyrod system is a very popular way to convey the motion of servo arms to control surfaces. Often the completion of a project will be stymied by the lack of a long enough nyrod to connect a vital surface. The photos show how to effectively splice inner nyrod and use those "too short" pieces to good advantage.

1.

2.

1. The tools and equipment you'll need are a 1-inch 2-56 bolt, diagonal cutters, and a grind stone or small file. The bolt is available at most hobby shops and good hardware stores.

2. Cut the head from the bolt. Instead of cutting all the way through at once, turn the bolt in your fingers and cut through a little at a time. This will eliminate a lot of grinding or filing in the next step.

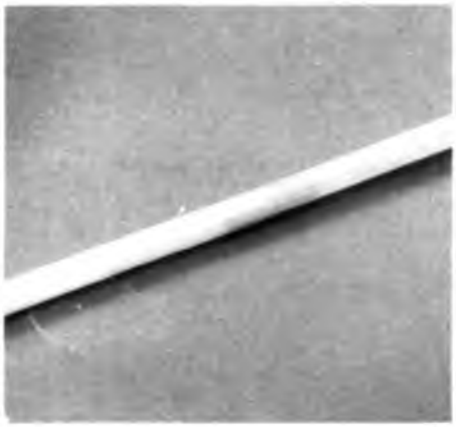
3.

4.

3. Remove any burrs or rough spots and slightly bevel the cut end to resemble the finished end of the bolt. A grinding wheel on a Dremel tool is the fastest way, but a small file will give results equally as good.

4. True the ends of the nyrod with a razor knife or sandpaper. The ends should fit tightly together, so trim and sand them until they are perpendicular to the sides of the nyrod.

5.



6.

5. Screw the prepared bolt halfway into the end of one of the nyrods, then screw the other nyrod tight against the first. It may be necessary to use a vise or a pair of pliers to hold the bolt when it is screwed into the first nyrod.

6. The completed splice. The bolt should extend into both pieces of nyrod about the same distance. A drop of cyanoacrylate could be used just as the two are joined, but I have never found it to be necessary.

GIANT STEPS

by DICK PHILLIPS

AFTER ALL IS said and done, the radio gear used in models is the heart of the whole process of flying them. In particular, the link between the receiver and the transmitter is what we depend upon to bring our models safely back to the ground on every flight.

The average modeler is generally not an electronics technician, and there isn't much he can do to assure the reliability of his equipment. Other than cycling batteries and doing a range-check before flying, the average modeler has to trust the quality of the radio gear to assure the safety of his model.

The easiest way to cycle batteries is to use one of the devices made for the purpose. I have an old Super Cycler still working and use it on my radios quite frequently in order to assure the reliability I want. In my part of the country, winter precludes most flying from about October through April or May, so I cycle each radio once a month through the idle period. From time to time I do the same thing in the summer with radios that aren't used much or are waiting to be installed in a new model. This regular activity keeps the battery packs where they should be and prevents any of them from going flat and reversing a cell.

Range-checking should be done before each flying session and the instructions that come with the radio should be followed in order to assure reliability.

The antenna is important, naturally, and it shouldn't be necessary to mention that you shouldn't change its length for any reason. Even the smallest alteration will affect the receiver's ability to pick up the signal from the transmitter. Despite the way most of us fly, pointing the transmitter antenna at the model is *not* a good idea. The shape of the signal radiated from a transmitter is a very large, three-dimensional heart, with the point of the heart aimed at the transmitter itself. The poorest signal is produced directly off the end of the antenna, so if you're going to point it at something, make sure that something isn't your model. You'll be making things difficult for the radio.

If you want the servos to be close to the surface that is to be moved, and you use long servo leads to achieve this, be sure to check that your radio isn't subject to interference from signals being radiated by these long leads. Some radios will not tolerate long leads and it'll be necessary to use either chokes, or something like Ace R/C's* Noise Trap to assure your receiver doesn't get "glitched" by its own signals.

Keeping the receiver antenna as far away as possible from such leads is also a

Built by Len Bossman, this F4B-4 is in planform. For more information, contact Dick Phillips.

good idea. The greater the distance between them, the less chance of problems.

The receiver antenna should be strain-relieved if it's to be anchored with an elastic band as most are. Prevent stress from being placed on the antenna where it enters the receiver case. Breaking off an antenna is liable to ruin your day. Most radio manufacturers provide some means of strain relief with the radio.

Ideally, the receiver antenna should come out in a straight line. This is rarely possible, but don't coil it back on itself or make a number of bends in it. Keep its length well extended for the most reliable signal reception. If you're flying a model that makes use of wire landing and flying wires, or wire drag and anti-drag braces in the wing, be aware that such an array of wires can contribute to weakening the signal to your receiver.

If metal wire is used for bracing on a biplane, I recommend running the antenna out the bottom of the airplane and back toward the tail, and then anchoring it (with a rubber band) to the outer tip of one side of the stabilizer. In this way, there is little possibility that any part of the wire bracing will ever be placed directly between the transmitter and receiver antennas.

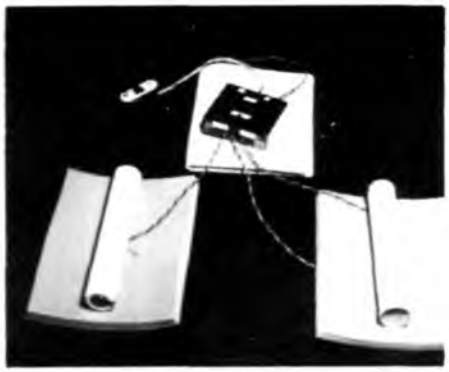
The same thing applies to any wire used inside the model. For example, if the rudder and elevator servo are mounted in the aft end of the fuselage, the receiver antenna shouldn't be run down the inside of the fuselage close to the extended servo leads. If wire pushrods are being used, the antenna should avoid them as much as possible. Anything made of a ferrous (iron, steel) metal can interfere with radio signals. Most radio equipment isn't highly susceptible to such problems, but there isn't any point in making it any more difficult than necessary.

Ram's Simple Cycler contributes toward the longevity of your batteries.

While I have yet to experience a radio problem from using long servo leads, I use Ace's Noise Traps on *all* long leads I install. There are other such items on the market, of course, and they should be considered any time you're using longer-than-normal servo leads in a large model. While everything might work well for you with a full charge and while the model's on the ground, it's worth the extra care to assure things will remain at their best on less than a full charge or when the model is some distance away.

The larger control surfaces and greater loads used can place a heavier-than-normal load on the receiver battery pack. In experiments some years ago, I found that my 500-mAh receiver pack was good for about three flights on my ¼-scale J-3. After that, it was getting pretty chancy to fly. The Cub was a fairly gentle airplane and didn't use up the kind of battery that a highly-aerobatic model would go through. Nowadays, I don't fly anything with less than 1,200 mAh on board, and I prefer to have double that. The use of RAM's* or Ace's redundant battery system gives me that kind of security. The use of double the battery, operating through a fail-safe system, inspires great confidence.

A great product, Ace's ChargeMaster is extremely versatile.



Ace also has a redundant battery airborne system.

Ram's redundant battery system uses two 4-cell packs with one in standby.

The AMA did some studies years ago which indicated that about 30% of all radio failures were battery-related. The addition of an extra battery pack on board is a small price to pay to virtually eliminate that almost ⅓ rate of radio failures. I've yet to have a battery fail in the air, but that hasn't inspired me with the confidence to remove the double batteries. If I ever do have a battery fail in the air, it isn't going to cost me an

airplane. I feel the extra costs involved (and they are moderate) are well worth the secure feeling they inspire.

All wire connections in your radio equipment should also be checked from time to time. I'm not suggesting you take the receiver and transmitter apart to see that all connections are good. The things you should check are the connections on the On/Off switch, servo lead connectors, battery lead connections, and all other connections which are accessible and which are under strain.

After any crash, however mild, you should go through your radio equipment to assure that no harm has been done which could later cause a problem. A few minutes spent closely inspecting your receiver, switch harness, servos, and battery packs may well save you some sorrow later.

Next month, I'll get into servo mounting, control runs, hinges, and other assorted good things to assure you'll have few problems in the air. Hope you're here then.

Dick Phillips, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Ace R/C, Inc., Box 511C, Higginsville, MO 64037.

RAM, 4736 N. Milwaukee Ave., Chicago, IL 60630. ■

RADIO CONTROL NEWS

by ART SCHROEDER

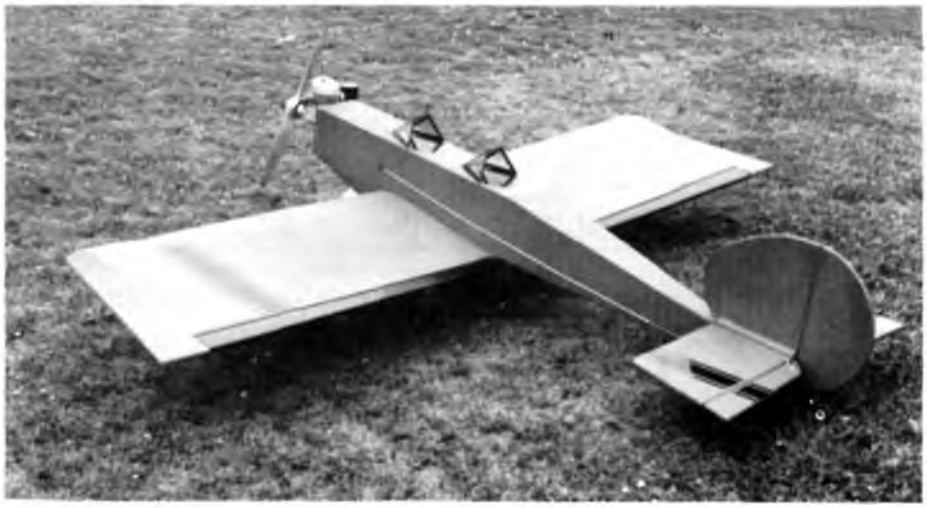
I'VE BEEN intensely involved with R/C vehicles in recent months as a result of my work on *Model Airplane News*' sister publication, *Radio Control Car Action*. If you haven't picked up your copy, I recommend you do so—you'll find the wonderful world of R/C cars as fascinating as that of model aircraft.

But, this isn't intended to be a "plug" for *R/C Car Action*—that publication can stand on its own! Rather, I want to point out some advantages I've discovered for aeromodelers when they build and operate R/C cars. That's right, I'm advocating R/C cars as a way to become a better builder and flier of model airplanes! Surprisingly, I've found that quite a few *M.A.N.* readers have already found cars to their liking.

How can R/C cars help with airplane modeling? First, R/C cars develop assembly skills all modelers must have and keep sharp. Cars come in kits with finely finished parts that must be accurately connected to other parts by screws, bolts, or adhesives—procedures applicable to any model airplane. Construction of an R/C car is simply an exercise in fitting part "A" to part "B"—an exercise that can stand constant practice.

Second, R/C cars are well-engineered and many of the design factors can be carried over to model airplanes—particularly in the area of linkages. I solved an engine throttle installation problem by using a linkage system I had first seen in an R/C car. Further, a number of fittings made for R/C cars are great for airplanes. Have you looked at some of the ball links and bellcranks used in R/C cars?

R/C car models are showing the way in the area of shock absorption. When will we see a true oil shock for aircraft models? The car folks have them and they work beautifully. The many oil-



The Midwest Big Stik with Davis Diesel converted Super-Tigre 2500 proved to be an eye-opener. Read text.

filled shocks I've seen for car chassis could be adapted to some styles of aircraft landing gear with good results.

But, it's when an R/C car is operated that an aeromodeler can really learn something. As model fliers, we operate an object in the sky trying to keep left and right in proper order. We lack orientation with the object (that is, we are not sitting in it so directional control becomes a problem). This is a problem for aircraft pilots and car drivers alike.

Therefore, if you spend some time running a car, you'll learn a good deal about flying a model airplane. The problems are the same and running a car can

Additional power, fuel efficiency, reduced noise, and cost savings are the benefits claimed from diesel conversions.

only improve your ability to recognize an airplane's position relative to left and right when it's coming at you or going away.

The nice part about all this is if you are using a car to learn orientation, all you can do is hit a curb when you make a mistake; probably not causing too much damage. When you use an airplane, you can end up with a new "kit!"

Do you want to become a better model airplane pilot? Okay! Put two plastic bleach bottles (about 2 feet apart) on a road. Run an R/C car about 100 yards away and, standing next to the bleach bottles, facing the intended path of the car, at high speed, run a straight course and pass between these two bottles. I wouldn't bet on your chances.

Let's assume you can do this (no cheating, no twisting to decide what is left and right); try six or eight bleach bottles in a straight line about 10 feet apart and run that car head on, sweeping between each "gate" formed by the bottles. If you can pass these two tests at high speed, you are already world class in model airplane flying (and car running).

If you can't, there is still something to practice and cars provide a painless way of doing so. And, as I said, it's hard to "crash" an R/C car. Give R/C cars a try and read *R/C Car Action*— you'll be glad you did.

Davis Diesel Revisited

Thirty-five years ago I won my first control-line contest with a Drone Diesel-powered ukie. Ever since then, I've wondered why the diesel has never reached the high popularity levels here as it did in Europe. The Drone was powerful even though difficult to start and a bit messy with exhaust. It was cheap to operate and it turned a very hefty prop. But, it died after a short period of popularity (primarily on the East Coast) and with it went the production of any American diesel as glow ignition, two-cycle engines became "the way to go."

A diesel, better said as "compression ignition" is a very simple internal combustion engine. All that's required for running is appropriate fuel (usually kerosene, oil, and ether) and a good flip. An electrical source, ignition components, and glowplugs aren't needed.

In any event, I rediscovered diesels a number of years ago as I tried to make my Eyelash design into a full-fledged multi-channel bird. Eyelash was a ½A version of the Eyeball, an in-line (engine thrust—wing—stabilizer) design for pattern. Power was a typical .049 Cox engine and it wasn't until I tried a Davis Diesel conversion of this engine that I made the project work. In this case, a conversion of a popular glow engine to diesel operation made an overweight idea viable.

If you haven't been looking, "Davis Diesel*" is a company that provides heads that will make almost any Schnuerle glow engine into a diesel. Such conversion involves no more than a replacement of heads on a given engine and a different kind of fuel (a change of fuel lines is also needed). The heads range from .049 all the way to the new Super-Tigre 2500 and 3000.

A few years ago, I converted an O.S. .61 FSR to diesel operation in an effort to make an overweight Skybolt perform. The airplane, as a result of far too much paint, flew like a log. With the Davis head, I was able to increase the propeller size by 3 inches while retaining the same pitch and it all worked. The airplane became a better flyer and I won a number of meets with it after the change.

Basically, when you install a Davis diesel head, your engine gains the ability to turn larger props, frequently in sizes that would be impossible with glow. Fuel requirements are substantially reduced and noise goes way down (a factor I had missed in my first experiences with Davis diesels).

I like all the advantages in diesel operation, but I believe the noise reduction is the one that any modeler ought to look at. Frankly, the noise level drops to that of four-cycle engines. Of course this is exhaust noise—prop noise remains as it would with any engine turning any given rpm. The noise reduction apparently comes from the fuel burn pattern of a diesel engine—such an engine simply doesn't have the explosive exhaust note of a methanol-fueled engine. In addition to that, a dieselized engine can use a very restrictive muffler without much power loss, which further reduces noise.

I've recently been flying a Davis dieselized ST 2500 in a Midwest Stik design. The engine conversion proved capable on any reasonable prop, easily matching glow operation. And it did that at lower fuel costs and substantially lowered noise levels. As it turned out, I was using the wrong fuel with much more oil than was needed, which affected the results. Bob Davis of Davis Diesel also feels the shape of the head interior needs some further work to really extract the engine's full potential. I expect to continue looking into this big diesel and I'll report further in the future.

Is the diesel a perfect answer to our power problems? No, nothing is. They are a bit more difficult to start but, when the technique is learned, they become as easy as most engines. An electric starter snaps them right off. They also tend to exhaust more oil than glow. This can be solved by using a long tube to route exhaust away from the airplane. Actually, more recent fuel formulations with reduced oil and clean-burning kerosene have reduced the mess in diesel operation.

A Davis Diesel converted "60" would make a near perfect powerplant for Turnaround pattern. The engine can

(Continued on page 106)

FOUR-CYCLE FORUM

by ELOY MAREZ

THOSE OF YOU who attended the 1983 World Engines Four-Cycle Rally or the 1985 Hobby Shack Four-Cycle Fly-In have had the pleasure of seeing West Germany's Helmut Dressendorfer in action. Helmut is the Kavan factory flier, and his skill and precision with his FK-50-powered scale airplanes impresses us all.

One of his airplanes has not yet been seen in this country, quite possibly due to the size. The photo will not do it justice in that respect, so after you get through admiring it, you'll have to read the specs. It's just a Cessna—but what a Cessna! The 310 is also Kavan FK-50-powered, two of them, of course. It spans 14.75 feet, with a working wing area of 4557 square inches; that doesn't include the portion covered by the fuselage. The latter is 9.8 feet in length and even the horizontal stab would make a decent wing for a lot of airplanes. It's 5.58 feet in length and 15.75 inches wide at the center.

The weight of this behemoth is 75 pounds, and I understand that the FK-50s handle it quite capably, as I'm sure Helmut also does. I don't know all the details, but I remember hearing that Germany has some rather stiff laws governing the flying of these large models, which can be done at certain fields and under certain conditions. Anyway, it's an interesting airplane and I thought you would enjoy seeing it. Imagine *two* FK-50s on a low pass...

Newcomers

Newcomers are always with us, and welcomed by us, as they are the only way we can continue to further the hobby. Unfortunately, they sometimes seem to be forgotten in our high-tech world, but imagine how confusing and even intimidating things must be for the rank beginner. The subject is raised in the following letter from Dawn A. Ashbaugh of Leechburg, Pennsylvania, who, while not exactly a rank beginner, knows when to ask for assistance. She writes:

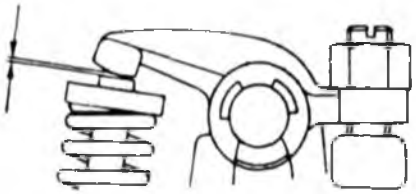
"I am relatively new in the R/C game—approximately three years. I've found your 'Four-Cycle Forum' articles very interesting. Up to now, all of my aircraft were powered by two-cycle engines. I recently purchased a Sig Piper J-3 71-inch kit. After reading some preliminary articles on four-cycle engines I decided to purchase an O.S. Max FS-40 to power it. Every article I've read recently indicates numerous extras used in conjunction with four-cycle engines, i.e., choke systems, spark retard systems, fuel systems, etc. I'm becoming 'gun shy' about using this type of engine. Would you please advise me or refer me to a source so that I can determine if I have the correct size engine and what add-ons/extras it needs."

Dawn, your questions aren't new, nor are they unknown to, or ignored by, the majority of kit manufacturers. As you may have noticed, more and more of them are now rating their kits for both two- and four-cycle engines. Not that it's that simple for them either, as the four-strokers are getting more powerful with every generation. But power isn't the only difference, and I'll discuss some of the considerations here to help you get your plane in the air.

Basically, a two-cycle engine will develop more power than a four-cycle of

Dressendorfer's Cessna 210 is BIG! Span is over 14 feet and weight is 75 pounds. Uses two Kavan FK-50s.

equal displacement. There are too many engines of both types to make a direct and exact comparison, but as a rule of thumb, to get close to the same performance in the air, you should increase the displacement of a four-cycle by a factor of 50% over the two-cycle recommended. That is, a model which calls for a .40 two-cycle should have a .60 four-cycle installed.



Typical valve adjustment takes place between arrows.

There are some weight and size differences which must be taken into account. The former can really shake you at first glance, if you look only at the weight of the raw engine. But after you add the accessory weights, the large muffler and fuel tank required for the two-cycle against the small silencer and smaller fuel tank requirement for the four-cycle, things start to even out. On the subject of fuel tank capacity, you'll find that you can generally go down one or even two tank sizes and still get close to the same flying time. Though the weight differences then come close to disappearing, it's still a good idea to not permanently install any of the radio equipment until you are able to fully assemble the airplane to check for the recommended center of gravity. Being able to shift the radio equipment might save you from having to lug around some non-contributing weight somewhere in your model.

Since the displacement is larger, the physical size will also be larger. This may require some modification to the nose of the model; four-cycles tend to be longer overall and have carburetors and exhaust stacks in unusual places. You won't be able to set the rear of the cylinder as close to the firewall as you can on a two-cycle engine. There are a number of extra-length and even pre-drilled motor mounts now available for four-cycles. For example, J'Tec* has them available for your O.S. 40 and for the O.S. .61. All are designed and produced by the well-known John Tatone, a pioneer in this field.

Mounting the engine farther away from the firewall, and the fact that they only fire every other revolution will tend to increase the vibration level of an improperly mounted four-cycle engine. Therefore, it's better to install a substantial firewall from the beginning, increasing the thickness by one size if the original appears a little thin, and adding some triangular wooden bracing to the joints.

The greater fuel economy mentioned earlier, and the fact that four-cycles have a slightly better fuel draw, bring a benefit to the engine installation. The tank is smaller, and the location isn't quite as critical as it is for two-cycles. You can then place the tank a little farther back or a little lower to ease the installation process.

As for running the four-cycle engine, there are some differences, but nothing that one who's on a first-name basis with two-cycles can't handle. Let's first clear away the terms that are confusing to you.

The choke system is nothing more than the mechanical equivalent of putting your finger over the intake to draw some fuel into the fuel line and into the engine. It has been added to many four-cycle engines because the physical configuration makes it difficult to use your finger in that manner. They are all operated by a spring lever and are spring-loaded in the open position. It's important to install things so that nothing impedes the operation of the choke lever, as closing it with the engine running or while it's being cranked with an electric starter would draw an excessive amount

(Continued on page 113)

Hobby Horn

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S.T.A.R.S. RALLY

by GEORGE PRIVATEER

FOR THE EIGHTH consecutive year, the Southern Tier Aero Radio Society (S.T.A.R.S.) held its annual Scale Rally in July. This year's dates were July 6 and 7, 1985. As in the past, the mayor and common council of the city of Olean, New York, closed the Municipal Airport to full-scale aircraft for the two days. This year's event was dedicated to former S.T.A.R.S. member, Woody Clapp, who passed away two years ago.

The annual S.T.A.R.S. Scale Rally has been growing larger each year, until it has become one of the largest of its type in the eastern U.S. In 1984 there were 124 registrants, with close to 150 scale aircraft. This year, by noon of the first day, there were 118 registrants and at the close of the day's flying, a total of 144 registrants had signed up, the greatest number ever.

Although giant-scale aircraft now comprise over 90% of the aircraft involved, no aircraft, regardless of size, has ever been denied. The Rally emphasizes scale, not size of scale.

The first day of flying turned out to be cool, with a moderate wind and a completely overcast sky that threatened to rain at any moment. Nevertheless, the registrants went to flying with a vengeance. The Rally used the airport's main runway, creating two flight lines with four stations each. In spite of the high number of entrants, it seemed that the frequencies were distributed enough for most fliers to get in three flights for the day.

Around 3:30 p.m., the rain that threatened fulfilled its threat, but the only damage done was to delay the

(Continued on page 74)

View of pit area above shows a variety of different aircraft entered. Eltscher photo. Left, Ivan Moore came from Ontario with his big Laser. Bush photo

Joe Wcela with a scratch-built Ziroli Corsair. Bush photo.

Ed Zindle with his Violett A-4 Skyhawk II. Bush photo.

Top Flight

ELDER 40

by TOM BURDIN

Turn some heads with shades of a classic from the Dawn Patrol era.

I WAS ALL SET to buy the original Top Flite* Elder and front it with a four-cycle engine until I saw the .40-size model. The newest version was designed with the four-cycle engine in mind and since I'm crazy about the combination of vintage looks and four-cycle power, the new kit found a home with me immediately. Although not a scale model of any aircraft flown full-scale, its appearance is right out of the early years of powered flight.

When my kit arrived, I was instantly impressed with the quality of the material. The die-cutting was clean and all of the cuts were to the ends of the pieces. The wing ribs and other die-cut parts fell out with just a gentle nudge. Even the ¼-inch balsa and the plywood were cleanly die-cut. There is a generous supply of hardware in the kit, including pre-formed landing gear. All in all, my first impression was a good one.

With the two full-size plan sheets spread out on my workbench, I picked up the 15-page instruction manual to see what I was getting

Type: Sport
Wingspan: 65 inches
Wing Area: 783 square inches
Weight: 65 ounces
Length: 48 inches
Engine: O.S. FS-40
Channels: 4

All construction sequences for the kit are well illustrated and explained.

into. From the clarity of the written instructions and the drawings, I knew this was going to be a fun project. All the major steps were spelled out and the special instructions were clearly noted.

CONSTRUCTION. The tail group is very straightforward with building easily accomplished on a flat building surface. I used Pacer's* Zap throughout this stage with very good results.

The wing construction is again simple from the building aspects. The only time-consuming part is the cutting and chamfering of the diagonal ribs.

The wing is wide at 12½ inches and is a basic Clark-Y airfoil, curved up slightly at the leading edge. The leading edges are sheeted back about 1 inch top and bottom, with the ¼-inch bottom sheeting being used to carve in the curvature. The top and bottom are then cap-stripped front to back. Every other rib is a half rib running back only to the top and bottom spars, which are staggered. This construction provides not only a very sturdy assembly, but also a marvelous skeleton for the vintage look when covering is applied. The full-span ailerons are provided as standard aileron stock.

The fuselage provides the most unusual construction features of the entire kit, and it is this part that calls out the modeler in you. The rear portion is an open-type construction, so there is no reliance on the surrounding balsa sheeting for strength. Manufacture this open framework out of the ¼-inch spruce provided. Be sure to make very accurate cuts on the wood in order to assure a good butt joint between the longerons and the cross members. I strongly recommend the use of a Dremel table saw to assure that the cuts are square and consistent. I again used Zap for the adhesive.

Assemble the two halves of the fuselage on top of one another to assure that they are absolutely identical. Joining of the two halves is easy because the top of the fuselage is flat at this stage of construction and the assembly can be produced accurately by building over the top view on the plan. I used 5-minute epoxy here and also in the firewall, wing mount, and landing gear attachment areas.

The cowl is an area that will test your skills, as you must wrap 1/16-inch sheet around some very tight, compound curves. It would be nice if someone would make a fiberglass cowl for this, but it would require some changes in the structure to accommodate it.

(Continued on page 110)

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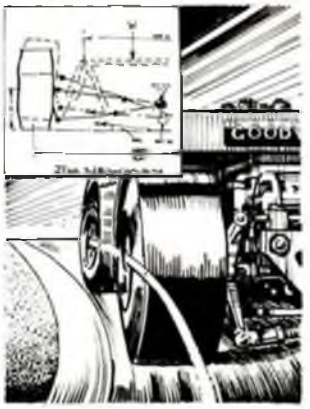


INSIDE TRACK

by MIKE LEE

MOST DRIVERS find that the subject of tires is one that really separates the hackers from the drivers. But, being that most all of us fit this description once in a while, it's good to understand what tires do on the track.

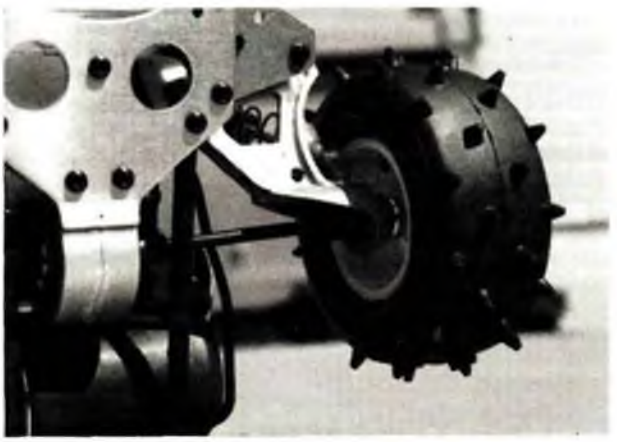
Basically, they allow the transfer of motion from the car to the track surface in order to create forward propulsion. The tire is made to make the absolute best of the amount of motion available and transfer that motion to the track surface with as little friction and loss of traction as possible. So, some general requirements of the tire are in order.

First, the tire must maintain contact with the ground. Suspension helps with this, but speaking strictly for the tire, it must be perfectly round and true. This will prevent the tire from losing contact by eliminating hop from an out-of-round tire. Amazingly, many cars have this disease and the driver doesn't even know it. To diagnose this problem, look for the symptoms. On the road course, the car will display wheel hop even though it's past the heavy acceleration stage. Minor cases will cause the car to make slight turns as if the radio was being glitched. Normally, a minor case will really show up in a turn where the car suddenly wanders out of the turn, even though the turn was negotiated fairly slowly. More severe cases on the road will cause the car to bounce so badly that it's virtually undriveable at speed.

You can check the true of the tire by simply running up the motor and viewing the tire while it's on the car. Keep a careful eye on the tire as it turns, and look for high and low spots. If the motor runs at high speed, the car may even shake due to the tire being off balance. At this point, you should also check the axle to make sure that it isn't the axle that's bent, instead of an out-of-round tire.

Should you detect an out-of-round tire, you can correct it very simply by sanding the tire down. This is done by using a very straight and flat object, such as a piece of sheet metal that is hard and unbendable, and gluing fine sandpaper to the surface of the object. Once this is done, place the car on a flat surface upside down with the tire still mounted. Run up the motor and allow the sandpaper to rest against the tire while it's turning. Make sure the sandpaper is exactly flat on the tire and perpendicular to the sidewall of the tire. After a few seconds of sanding, reinspect the tire. If done correctly, the tire should now be very true and flat on the tread surface.

Off-road people have a bit of a different problem. The car is usually rocking



A good tire for use where there is low sand content and lots of mud.

Off-road jeeps going at it. Choosing the proper tire helps win races.

and rolling so much that detecting an out-of-round tire on the track is difficult. This is compounded by the fact that even if you did detect an out-of-round tire, the rubber on off-road tires is very hard compared to road racers and wouldn't take to the sanding trick described above. In the case of a bad off-road tire, "when in doubt, throw it out!"

In the traction department, getting the tires to work in the corners is the key. There are many different rubber compounds available from tire manufacturers to take care of most track conditions. These tire compounds are classified simply by hard, medium, or soft rubber. The rougher the track, the softer the rubber you use to get more bite. The smoother the track, the harder the compound you can use and you end up with better mileage per tire. Don't forget, there is no free lunch, even with tires. If you use a soft rubber, the tire will wear faster. Harder rubber lasts longer, but has less traction. Choose them carefully.

Almost all serious road-racing drivers use some type of dressing on their tires before putting them on the road. This is usually a liquid treatment applied directly to the rubber compound to make the rubber softer and stickier. There are commercial versions of the traction compounds, and many home-brewed versions. One of the most common home-brewed versions is simply Oil of Wintergreen and glycerine. The mix of the two ingredients is 25% Wintergreen and the rest glycerine. Apply this compound to the sponge rubber of your tires and work it in evenly. The result will be a tire that resists any kind of sliding in any direction. That's what you want.

For the off-road bunch, there aren't any magic potions that can be poured on the tires to make them bite harder into the dirt. Instead, there are bigger and more aggressive knobby tires. Here again, the driver must choose carefully.

In the off-road scenario, traction conditions vary from track to track, and even from hour to hour. A lot depends on the track soil and the amount of water applied to the track during the racing. If the track has little sand content, you can bet that you'll have plenty of mud to contend with, and therefore you should run tires that will resist mud build-up inside the treads. A widely-spaced knobby tire with deep spikes for the rear and wide-ribbed tires for the front should do well. The addition of Armour-All to the front tires will help them to resist mud build-up, but only for a short time.

On dirt tracks that have substantial amounts of sand in the soil, a more closely spaced knobby tire for the rear and a standard rib or tight knobby for the front will do just fine. The sand in the soil allows any water to run through it faster, and there is normally less mud to mess with. Also, sand doesn't stick well to the tires and pays off with better traction. Whatever the track soils contain, be aware of them when you race. It could give you an edge on the competition if you put the best tire for the conditions on the track.

Front ribbed tire for off-road use. Good for tracks which have little mud and a fair amount of sand.

News

As most of you know, just a couple of years ago the only car to have in order to win a race in two-wheel drive was the famous Cox Scorpion. It won more races every weekend than the President could muster in votes on election day. Since the advent of more advanced cars, in particular the Associated RC10 off-road car, the Scorpion has slowly but surely lost some of its sting. But, don't lose faith, because according to John Elliott of Cox*, the Scorpion will be back and in better form than ever. I can't give you any details, but stay tuned right here.

That's it for this month.

Mike Lee, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Cox Hobbies, Inc., 1525 E. Warner Ave., Santa Ana, CA 92705. ■

Type: Sport Scale
Span: 56 inches
Area: 550 square inches
Weight: 5-7 pounds
Channels: 4
Engine: .29-.40 two-cycle, .46-.61 four-cycle

Craft-Air RV-4

The versatile RV-4 kicks off the all-new Master Craft Series by Craft-Air. The Master Craft series is aimed at the intermediate to experienced discriminating modeler who expects such things as high-grade balsa, and machine-cut parts. The RV-4 is designed to fly as good as it looks and to easily accommodate two- and four-stroke engines.

Designed for either two- or four-stroke power, this scale ship was a blast.

by CHRIS CHIANELLI and STEPHEN SCOTTO

THE FULL-SCALE RV-4 is built from a kit in a home workshop. Sound familiar? According to Van's Aircraft Company, it combines standard materials with careful design to produce an affordable, easy-to-build, no surprises, high-performance aircraft. Take that last sentence, underline the "high-performance" part, and you'll begin to understand the excitement and the challenge of this compact beauty of a kit from Craft-Air*.

Measuring out at about 1/5-scale, the Craft-Air version of the RV-4 is designed to accept .40 two-stroke or .60 four-stroke engines. For a head-to-head comparison, we built both versions. An Irvine .40 side-mounted with a J'Tec Pitts muffler drove one ship, while an inverted Saito .65 did the honors in the stroker.

The kit comes with the two things I like most: lots of precisely cut balsa and

Suitable for two-strokes or four-strokes, the Craft-Air kit adapts easily to both.

Having lines of a pylon racer, the RV-4 is surprisingly docile.

color photos by LOUIS V. DeFRANCESCO JR.

ply parts and an extensive hardware pack complete with ABS wheelpants and humungous cheek cowls. The fuselage is a sturdy box built up over a ⅛-inch balsa crutch. The wing is an all-balsa D-tube design sheeted with 1/32-inch balsa. Tailfeathers are ¼-inch balsa sheet. The plans and instructions are printed on one rolled sheet and give details for both the two-stroke and four-stroke versions.

Like the full-scale plane, this is the kind of kit a real builder can sink his teeth into. It demands care and patience, but it will reward you with a great looking scale model. The best part? It flies like the plane you've always wanted.

CONSTRUCTION. Construction begins with the fuselage and requires a little pre-planning and preparation. This consists mostly of marking the fuselage side for bulkhead, landing gear mount, and wing mount plate locations. If you choose to go with four-stroke power, this is the time to locate the firewall. Hold your engine next to the plans with the thrust plate of the engine lined up with the thrust plate location shown on the plans. Mark the rear of the engine on the plans, being sure to allow enough room for the four-stroker's carb, pushrods, and other such stuff hanging off the rear. Don't

(Continued on page 72)

Craft-Air RV-4 will dress up any flight line.

The appealing lines of the RV-4 plus excellent flight characteristics make this model a winner.

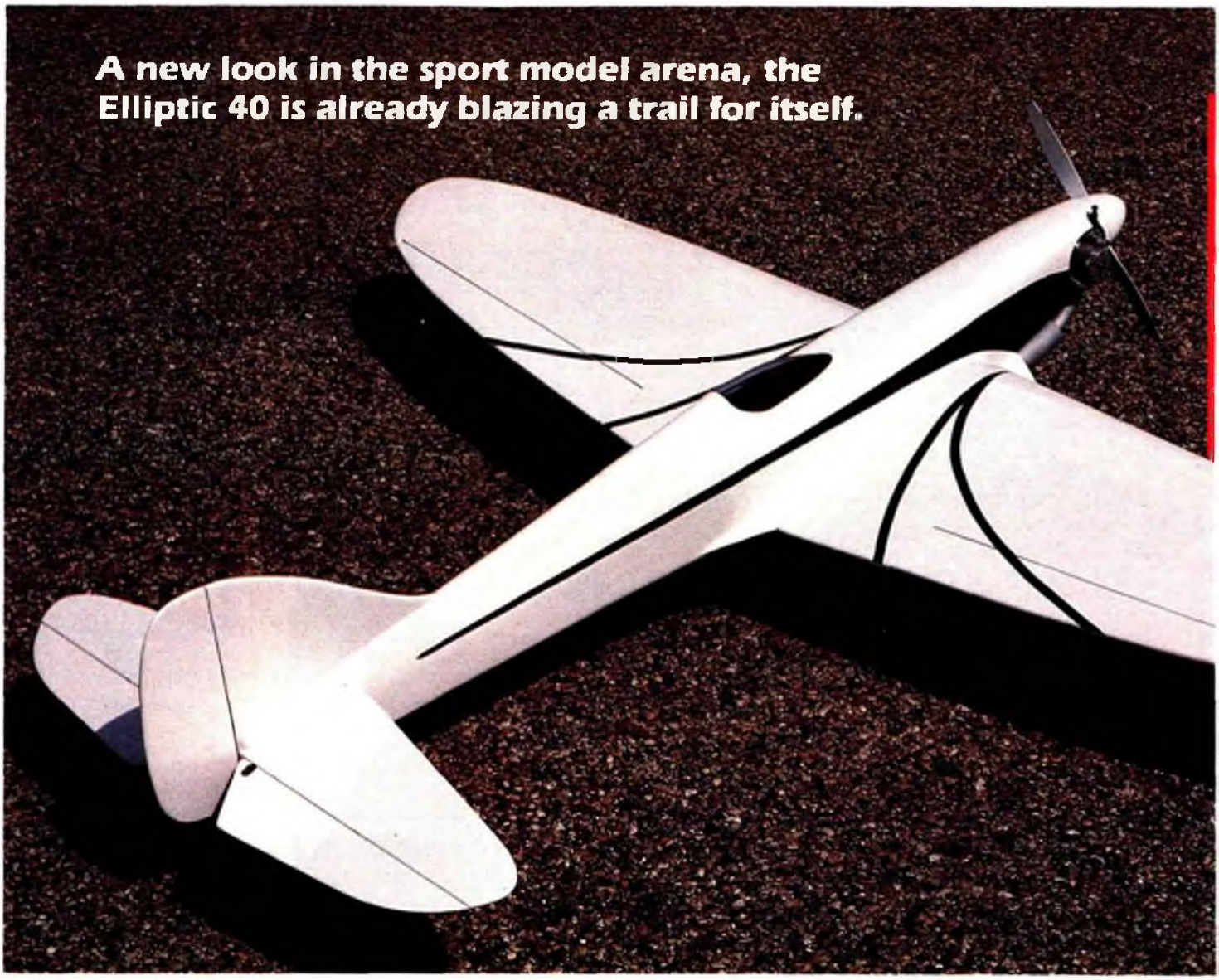
Construction

ELLIPTIC 40

by ALEX BOUKNIGHT

Type: Sport Fun-Fly
Wingspan: 58 inches
Wing Area: 653 square inches
Channels: 4
Engine: .40 to .51 two-cycle
.60 four-cycle
Weight: 5½ to 7 pounds

DOES AN airplane have to be ugly to fly well? My friend Paul Wood and I have been pondering this question for some time now. Most of the aerobatic airplanes I've seen have been designed with the emphasis on functional aerodynamics and ease of construction, with the aesthetics of the ship somewhat of an



A new look in the sport model arena, the Elliptic 40 is already blazing a trail for itself.

afterthought. Could an aircraft be designed with good flight characteristics and pleasing lines? Could we achieve this goal using standard construction techniques? These questions brought us to the design of the Elliptic.

The version presented here is the .40-size of our design, a size popular with most sport fliers. The .40-size ship offers the best compromise between fuel economy and flight performance; big enough to see the flight attitude in the air during maneuvers, yet small enough for easy storage and transport. The key to any good flying aircraft is to keep the weight down, which reduces the wing loading and gives better vertical performance. This size aircraft coupled with a hot .40-.45 two-cycle engine will give you plenty of performance and meet the light weight requirements desired. Adding a pipe only increases the effect. If you are a four-cycle fan, a .60 four-cycle will give greater torque at a lower rpm and swing a larger prop. Some modification to the fuselage will have to be made to accommodate the added weight of this engine to get the CG in the right place.

The obvious starting point of any design is the wing and what better way to get away from the straight-style wings than with the ellipse. This shape is pleasing to the eye and offers some real advantage in terms of aerodynamics. The elliptical wing produces a constant downwash at all speeds and near perfect load distribution over the entire surface area, something not easily achieved by any other platform shape. The effective angle of attack is the same along the entire span. There is a simultaneous stall over the entire surface with no tip-stalling tendencies. This reduces induced drag and the tip vortex effect. An 18% airfoil section was chosen to give a high lift coefficient and a constant airspeed through maneuvers.

The problem was how to build this desirable shape with simple construction techniques. An all-balsa wing was chosen to have the lightest weight possible, without sacrificing the strength requirements of an aerobatic aircraft. It uses the standard open-frame with ribs and partial sheeting used on most model aircraft today. Since most of the curve in the ellipse is at the tip, the tip block does most of the shaping. The leading edge is deceiving in that there is only one break to achieve the curve. The rear of the wing gets most of its curve on the trailing edge of the aileron, which is made of an easy-to-shape thin pine strip. One servo in each wing panel drives each aileron individually, which gives precise control with no slop in the linkages and is easier to install than torque tubes. This cuts down the chances of flutter on the control surface. The two servos are connected with a Y-chord and run off of the aileron channel of the receiver. The weight difference between two servos versus one and the savings of not using the torque tubes comes out about even.

The fuselage uses the standard box-type construction rather than the built-up type to achieve the curved contours. The trick is to use thick top and bottom

(Continued on page 68)

Southwest

JET BLAST SPECIAL by RICH URAVITCH

Houston, Texas, is more than a NASA baseplate, it's home for one of the best jet rallies going!

THIS WAS the third year for the Southwest Fan Fly, and although attendance appeared to be down, a lot of interesting things were on hand. The flying was strictly a no-pressure, do-it-when-you're-ready *fun-fly* type, which is finding more and more widespread acceptance throughout the hobby. CD Ed Clayman added a bit of spice by throwing in a few "sporting" competitions to those so inclined, including Most Vertical Rolls won by Dave Muddiman, who performed five with his Kfir C-2, and Fastest Two-Way Average handily grabbed by Hugh Jones flying Tom Sewell's F-20 I mentioned a couple of columns ago. This Dynamax/Rossi rocket did 145.45 mph! It also let its designer/builder go gome with the Best Technical Achievement Award. It was well deserved too, when you saw functional leading edge slats and trailing edge flaps working to make the scale area wing produce lift. This nifty little airplane looks like it might be a forthcoming kit, and I wouldn't be surprised to see it join the Jet Model Products F-4 and Starfire.

This year's event was smaller, but certainly not in interest.

Voted Best Overall was the show performance of the "Cloud Dancers" team, flying their matching Jet Hangar Hobbies Kfirs. As I've mentioned in the past, the routine just keeps getting better. The CD's Award went to Jim Barrett, who brought his BD-5J from Louisiana. I first saw this machine fly last year at the Lockhart gathering and thought even then that it really was a great choice as a sport fan airplane. Jim has fine-tuned the design and it flies super.

Rick Alter from Sioux City, Iowa, arrived loaded for bear with an F-15, an F-20, and an F-86, all from Byron kits. The Eagle is impressive from a pure size standpoint and flies quite smoothly, as does the Tiger Shark. My personal observation was that both these airplanes were flying with considerably more "authority" than I had seen them display as prototypes, so I've got to assume that the usual developmental bugs have all been worked out.

Some of these bugs also found their way over to Bob Violett's Sport Shark design, which just goes to show you that even the big guys have their share of problems. Half of Bob's stabilator (flying stab) parted company as the Sport Shark cooked along at what appeared to be Warp 3, resulting in the airplane rolling itself into a little ball in the grass. The takeoff acceleration appeared to be exceptional, perhaps the best there. Bob's new Viojett fan unit seems to work quite well; I'd like to hear some reports from you guys once you start using them. Latest word is that the production kits of the Viojett Sport Shark will feature a conventional

Ed Couch's beautiful Lockheed F-80 on far left was built from the Sterner kit. Lynn McCauly's F-104 Starfighter, left, used Dynamax fan unit. Very visible F-80 from Sterner kit, this one by Tom Perry.

Fan Fly '85

stabilizer/elevator system rather than the full-flying stab that is a lot more complicated and not really necessary, especially on a non-scale aircraft. Lots of Dynamax units were on hand, which no doubt pleased Tom Cook who flew his Starfire regularly throughout the three days. Must have been the year for elevator problems as Tom lost/broke/stripped/disintegrated a clevis on half of *his* elevator, which caused a very visible flutter. Fortunately, the airplane remained controllable and Tom landed without further incident.

Among the other "happenings" at this affair was a female participant. Dawn Buckley of Grand Rapids, Texas, flew a Byron MiG quite well indeed, and *in spite* of the fact that she had Ed Couch helping her.

Couch himself showed up with his outstanding FJ-3 Fury and an equally pretty but not quite finished Sterner F-80. Gerald Weltzheimer of Midwest City, Oklahoma, liked the HOB F-86 so well, he built and brought *two* of them! The one he flew had an RK-20/O.S. .25 package.

Noreen and Harry Wood of Long Beach, California, frequently had their hot-rod Tommy Cat airborne, in addition to a Byron F-16 equipped with a smoke system. It was neat to watch, but appeared to lose a significant amount of thrust when the smoker was turned on.

Art Johnson showed up with his beautiful F-100. This airplane has the most unique sound I've ever heard from any ducted-fan airplane. On one particular flight, Art really got it all together and that airplane looked as realistic as any I've seen recently!

Bob Fiorenze, right off his win at the Nats, travelled all the way from Brook-

One of three Kfirs flown by the Cloud Dancer show team.

Southwest Fan Fly '85

Byron's MiG 15 was popular among the contestants.

lyn, New York, to dazzle the troops with his tried-and-true A-4 Skyhawk. Mike Kulczyk's Gloster Meteor, now finished in "proper" British camouflage, performed briskly with its RK-20 units really singing.

Mike Krizan unveiled his new A-10A with a fiberglass fuselage pulled from Lynn McCauley's wood version of a couple of years ago. If anything, this bird is overpowered with its K&B 7.5/JHH Turbax packages, as it flies much more rapidly than scale.

Chuck Daley, a professional cinematographer from Louisiana, was on hand with what had to be a zillion dollars worth of hi-tech video equipment to produce a documentary on the ducted-fan activity, which he plans to make available to modelers and public television. Watch for more information.

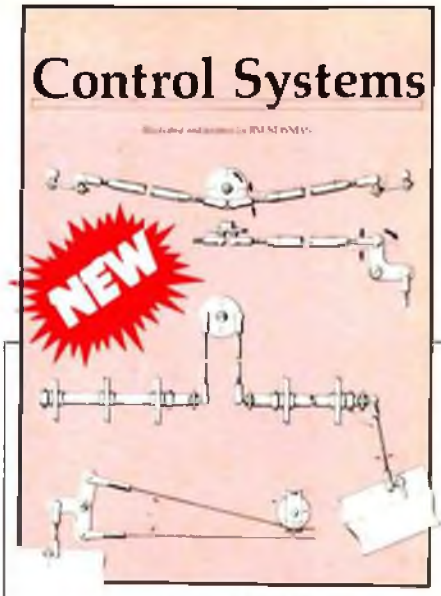
As I mentioned earlier, this year's event was smaller in participation, but certainly not in interest. I was invited to a meeting held by the hosting organizations to discuss plans for next year's event and other items of interest to fan fans. Among these was the talk of forming a national ducted-fan organization. The purpose, in addition to the obvious, would be to have regional get-togethers to allow more modelers to participate in their local areas. Sounds like a great idea to me, let's hear your views. The location for the 1986 edition is now shaping up to be the Dallas/Fort Worth area, with Ed Couch getting things underway. I'll let you know more as soon as the plans are solidified.

Bob Violett's Sport Shark housed Viojett/K&B installation.

Below: Noreen and Harry Wood with their smokin' Byron F-16. Right: Tom Cook observes while Art Johnson and Bob Walter scrutinize his airplane.

Above: Snout's-end view of Violett's Sport Shark shows minimum frontal area. Right: Note tiny wings on Tom Sewell's F-20.

This year's fly-in, like its predecessors, was an absolute ball for participant and spectator alike: the poolside gatherings after a day of flying, the ranch-style Texas-type barbecue dinners, and endless hours of hangar flying. I'm really looking forward to next year. Hope to see you there! ■



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(Continued from page 63)

ELLIPTIC 40

Although the Elliptic 40 has pylon racer lines, don't let that scare you as it's a docile airplane.

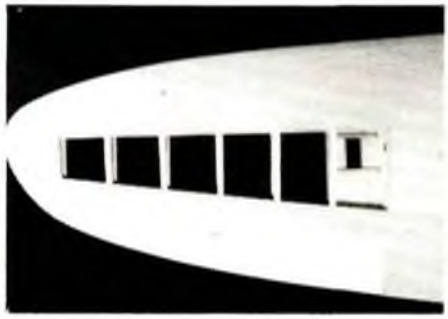
sheeting with large corner triangles. This allows you to sand the contour you want and retains the mass necessary to dampen the engine vibrations. The rounded contour makes the fuselage clean aerodynamically and produces low parasitic drag figures. This method builds strong and light—and allows you the freedom to make it as round as you like—while keeping the construction simple. The tailfeathers are sheet balsa with ply plates for the control horns. Long nose and tail moments give the aircraft a smooth feel through maneuvers instead of the twitchy feel you get with a short-coupled plane.

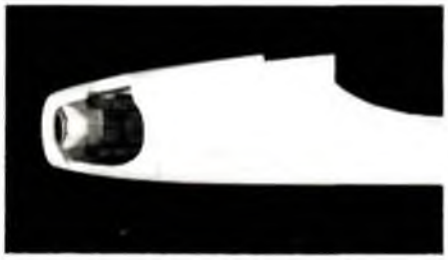
As I mentioned, the plans were drawn for a .40-.45 two-cycle engine, but modifications can be made to accept a .60 four-cycle. Simply stretch the tail moment—the distance from bulkhead 4 to the tail—3 inches, to accommodate the heavier weight of the four-cycle and to get the CG in the right place. Keep the backplate of your spinner in the same location so the mass of the engine is at the same balance point. This could involve moving the firewall aft to compensate for the carburetor mounting on the rear and the longer engine mount beams.

All of the incidence lines are set at 0° to give the same performance in the standard attitude and inverted flight. The right thrust will have to be varied depending on the engine and prop you use. The wing is flat on the top, with the dihedral built into the bottom surface because of the taper. I think you'll find this design very easy to build and you'll end up with a finished product you'll be proud of. I had a lot of fun building the prototypes. Well, let's get started.

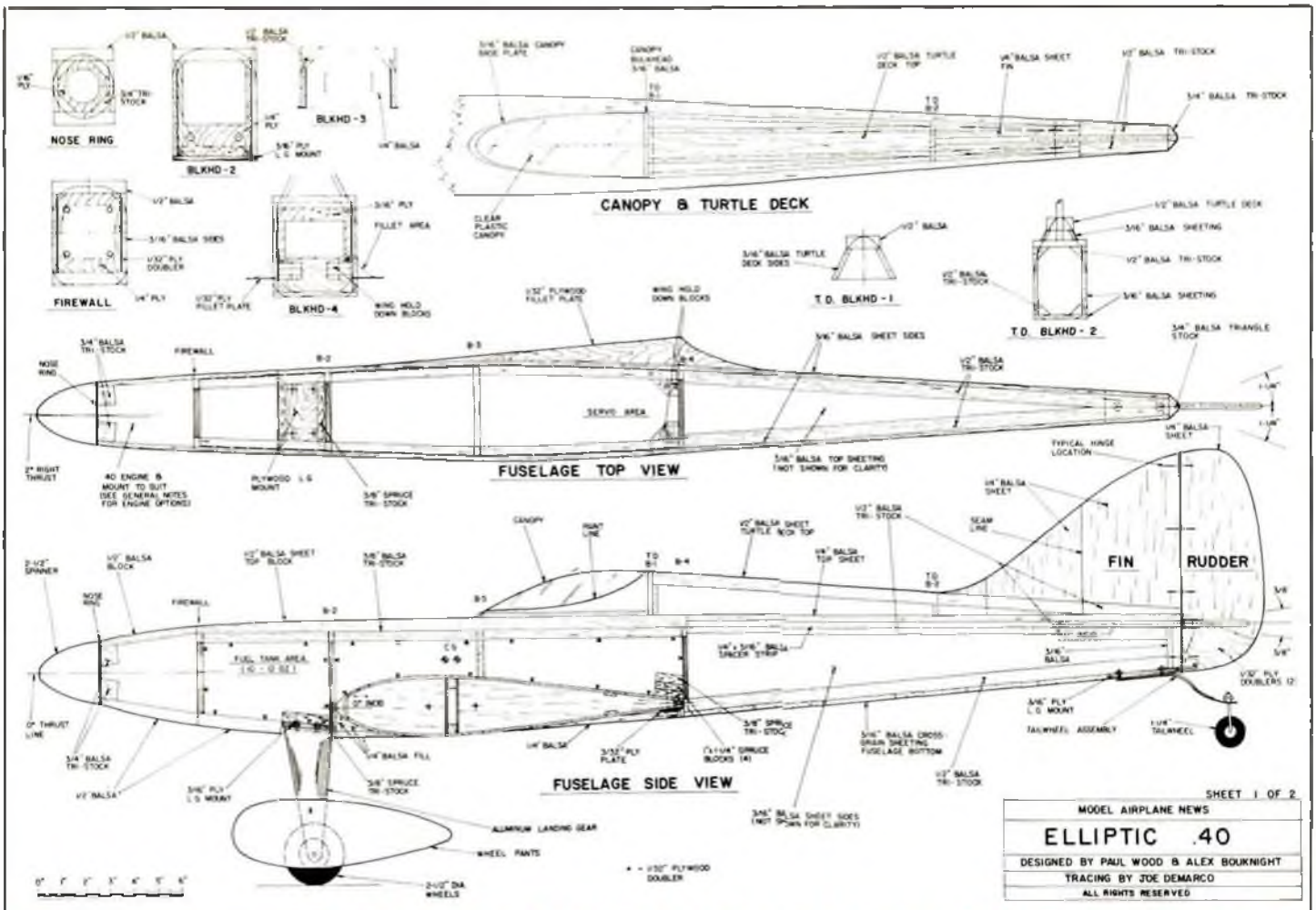
CONSTRUCTION. The best way to begin this project is to cut out all of the needed parts before you begin the actual construction, so that it will build just like a kit. Take your time during this phase. The more accurate the parts are, the better your glue joints will be, and less glue means less weight. Save the wood scraps because you can make other parts from them. For example, the wing sheeting scraps make the center section sheeting.

(Continued on page 68)

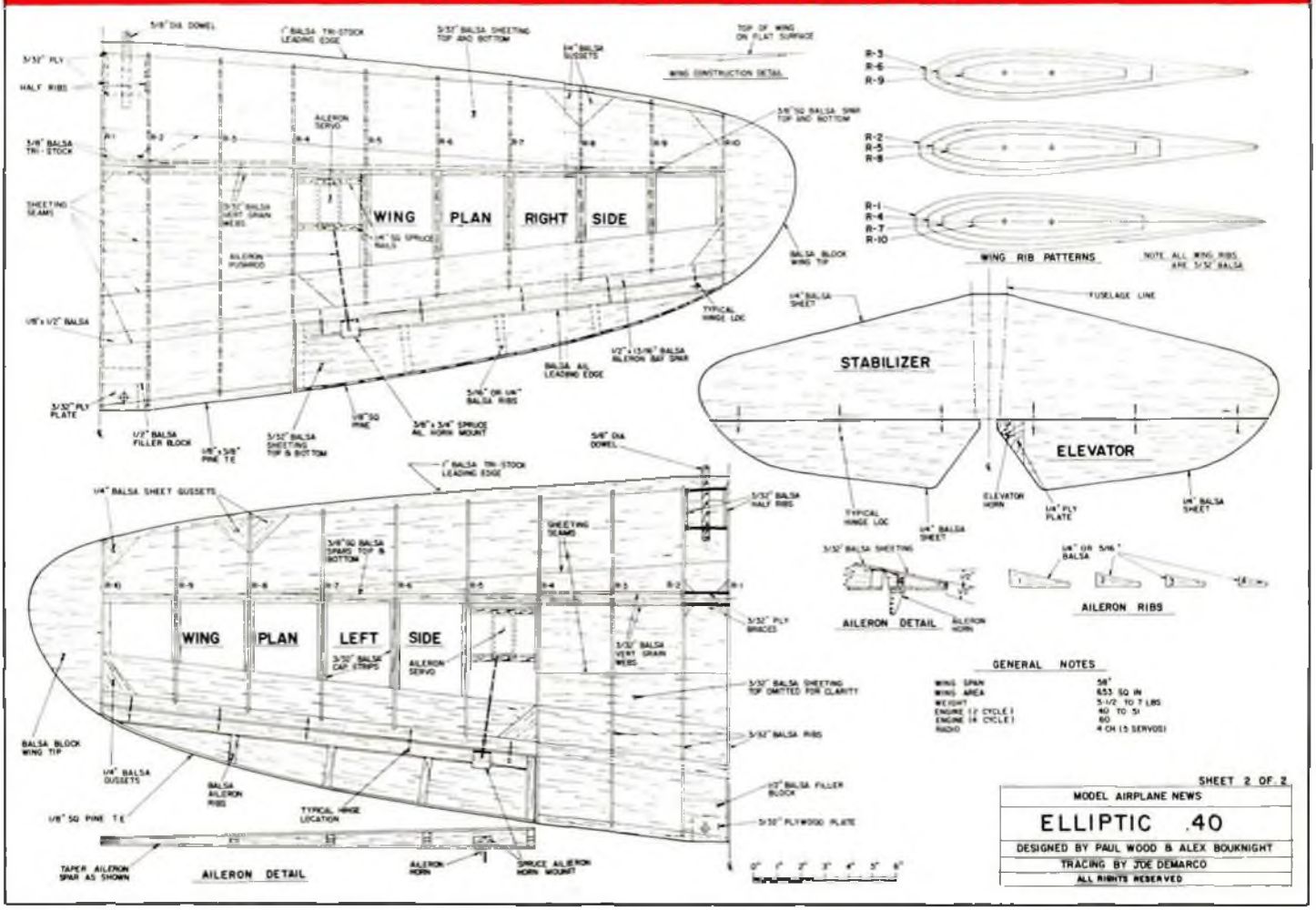




Construction photographs above show no secrets, just good techniques.



FULL-SIZE PLANS AVAILABLE...PAGES 116, 117



GOLDEN AGE

(Continued from page 14)

I checked the radio for flight by following the instructions. There was ¼-inch rubber for escapement power instead of the specified ⅛-inch, effectively locking the mechanism and preventing operation. There was no leeway with early equipment — you *had* to do it right!

On hand-launch my Bug's first flight was dramatic. It immediately climbed into a neat wing-over and nearly took my head off on the way back down! The postmortem revealed a badly warped wing and an aft CG. This was not C/L!

I wanted to fly, not continuously rebuild. How could I get some assurance with an unknown model? I found a high railroad embankment and resorted to the time-honored "test glide." The height not only allowed a trim check but also a test of the radio response. Even today this might be a good idea with some models.

After that I was flying and thrilled to death. The routine was evening flying until dark, day after day. One evening I stretched the flying too late and lost sight of the Bug in the dark. It was an eerie feeling, hearing the engine drone on and not being able to see where it was. It was no big problem, I found it the next morning, less than a mile away, but in the process I learned about the RK-61 tube. Unlike transistors, those gas tubes wore out quickly with use and the overnight operation spelled the end for mine. The RK-61s also varied in characteristics, they were not always directly replaceable in the Aerotrol. I never could get my receiver working again and that led to a more reliable and different type of radio and a new model, but the Aerotrol Bug had taught me much.

When some modern R/Cers hear the word "escapement," their brow furrows. With the seeming simplicity of the servo, one wonders why any other form of actuator dominated in R/C. The fact is that the needed miniature motors were just not available at that time, so escapements were the actuators, developed in one style after another. Finally, Howard Bonner's neat and reliable devices took over the market (see display). Those electro-mechanical gadgets were simplicity itself. A 2-foot length of ⅛-inch rubber provided the energy to rotate a crankshaft, which in turn moved and positioned the control surface. The crankshaft was indexed by a cog lever, which was activated by a battery-powered solenoid. The solenoid's switch was the receiver relay, which responded to the transmitted signals. Very light and dependable, the escapement filled the need nicely.

The accompanying display describes the various Bonner types. By far the most popular was the "Compound" version, which was a revolution to R/C, on a par with the four-cycle engine of today. For the first time, with only a single-channel radio, the greatly needed second control was available and reliable. Some astute R/Cers were able to "cascade" these compounds and have further controls. Just imagine the "beeping" that was required and involved!

I hope you don't think that the "Golden Age of R/C" is just a history lesson. The history is important for sure, but the real objective is to enjoy the models of that time today! The Rudder Bug is just one example of the fine designs that would be interesting and

(Continued on page 74)

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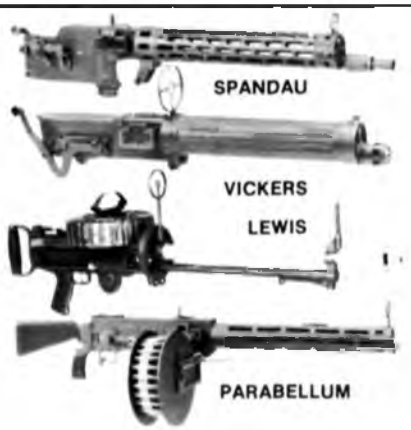
MACHINE GUN KITS



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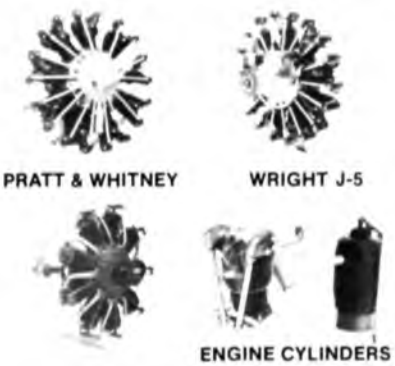
ENGINE KITS



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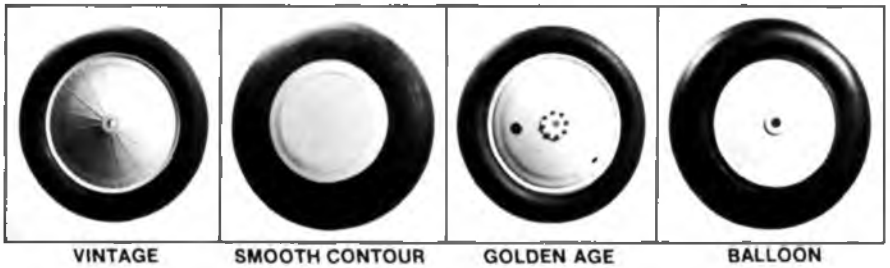

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(cont'd. from p. 61)

RV-4

forget the engine mount if you decide to use a metal mount in lieu of the wooden beams provided. Mark the firewall location on both fuselage sides. Don't cut off the fuselage projecting forward of the firewall.

Assembly begins with the ⅛-inch crutch which is glued together and marked for the location of the formers on the bottom and turtledeck formers on top. Attach all formers and flip this assembly on its side. Glue both fuselage sides to the crutch between formers A and B. Don't pull the sides together at the tail just yet. Add the firewall, wing mounting plates, and landing gear plate. I used Pacer's Flex Zap to nail on these high-stress parts. Using good gluing techniques and tri-stock reinforcement provides rock-like strength and really speeds assembly. Add the ⅛-inch tank compartment side and top pieces. Starting at former B, glue the fuselage sides to the crutch. Install your pushrod guides and sheet the fuselage bottom aft of the wing. Add the turtledeck formers, turtledeck and cockpit side sheeting.

The cowl is built up from pre-shaped balsa pieces. Mount your engine, and tack-glue the ply spinner ring to the backplate of a 2¼-inch spinner. Set some waxed paper to the front of the fuselage to prevent making the cowl and fuselage one piece. Cut the pre-shaped balsa to correct length and Zap in place.

At this time step back and take a good look at the plans and the picture on the box cover. Take a large sanding block and coarse (50-grit) sandpaper and start sanding. Cut until you have freed those beautiful lines from the blocked out fuselage and cowl. When this is done you'll have completed most all of the difficult construction. From here on in, assembly is straightforward.

The wing is built over the plans, using a system of lines drawn on the ribs and leading and trailing edges to assure alignment. The aluminum landing gear legs must be carefully set up to assure good ground handling. Measure each leg to the nose and tail to determine the location. Our models were covered with MonoKote and trimmed with Pactra Formula U Paint. It looks great and matches perfectly. The canopies were tinted in a bath of Rit dye.

Radio installation is standard. There's so much room in the radio compartment that you might get lost in there. Both versions easily balanced out without any extra weight. The two-stroke version came in at 5 pounds, 8 ounces with a wing loading of 22.6 ounces per square foot. The four-stroke version weighed 5 pounds, 14

(Continued on page 93)

Notice at left that the firewall for four-stroke Saito .65 is recessed to achieve balance, not necessary with lighter two-stroke on right.

Spectacular

Vertical Climb of the Giant Scale Almost-Ready-To-Fly RV-3

From take-off through realistic aerobatics to power-off landings, beginners and seasoned R/C fliers agree... nothing has the smooth graceful flight of the RV-3. And, it's the first giant scale A.R.F. that truly is almost-ready-to-fly. No sanding. No painting. Assemble within 20 to 30 hours including engine and radio installation.

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GOLDEN AGE

(Continued from page 70)

more enjoyable with our modern equipment.

I want to lay the groundwork so that this feature can progress along intelligent lines, but I need historical facts, good black and white glossy photos, information, and sources to continue, so let's hear from you. So far the reaction to this "clearing house" on OT R/C is very enthusiastic, and with the help of some of these people I've accumulated a basic information library. Hopefully this will grow as you readers begin to participate.

Does anyone know who was first in R/C. I've been researching the subject and none of the "oldsters" I've contacted is really positive about it. So what you might have, or can recall, could just be the "missing link" needed to tie it all together.

Ready to fly? Don't forget to wind the escapement rubber!

Hal "Pappy" deBolt, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

S.T.A.R.S. RALLY

(Continued from page 50)

barbecue chicken dinner.

After dinner, S.T.A.R.S. inaugurated its first model airplane auction. Frank Anderson of Mississauga, Ontario, and former president of MAAC graciously volunteered to be auctioneer. In a little over an hour's time, the entire inventory was auctioned off—planes, engines, tool boxes, and other assorted items. It looks like an auction is going to become a standard feature at our future Scale Rallies.

(Continued on page 81)

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PRODUCT NEWS

EXPERT FM SERIES RADIO

World Engines (8960 Rossash Rd., Cincinnati, OH 45236) has a new line of FM (1991 type) radio control systems. This 4-channel transmitter features ratcheted electronic trims, adjustable stick length and tension, servo reversing, plug-in RF module, nickel-cadmium battery pack, and more. The dual conversion receiver has a plug-in crystal and locking connector system. Monolithic IF filter, squelch circuit, IC IF amplifier, and a voltage regulator. The flight pack also includes two S-25 servos, a switch, nickel-cadmium pack, and charger for transmitter and flight pack.

DUMAS #2030 CHARGER

Dumas Boats (Dumas Products, Inc. 909 E. 17th St., Tucson, AZ 85719) has introduced a new fast charger with a built-in timer for foolproof charging of electric-powered boats, cars, and airplanes. The Dumas #2030 charger is designed to recharge the most popular nickel-cadmium battery packs. Batteries can be fully charged in 15 minutes and the circuit shuts off, preventing overcharging and damage. This charger is available from hobby dealers.

VOSPER HOVERMARINE KIT

Altech Marketing (P.O. Box 286, Fords, NJ 08863; 201-572-5792) and Billing Boats announce the new Vosper Hovermarine Coast Guard boat kit. The "hover" principle was used on full-scale models so that the crew could bring the ship close to shore without running aground. The 1/30-scale kit comes with full fittings, so there are no extra parts to buy. The Vosper Hovermarine Coast Guard Boat kit is suitable for conversion to radio control as well, so you can build this kit as you please. The boat measures 23.6x8.2 inches. For more information, see your local hobby dealer or contact Altech.

B-17G FLYING FORTRESS

Guillow (Paul K. Guillow, Inc., Wakefield, MA 01880) has introduced their newest giant scale balsa kit, the B-17G Flying Fortress, the most famous of all aerial bombers of World War II. The 1/28-scale model has a wingspan of 45 inches and is designed for twin .049 U/C flight or Build 'n Show display. Finely detailed plastic gun turrets, dummy engines, rugged landing gear, and sturdy inter-locking wing fuselage are included. Designed with either fixed or movable flying surfaces, this superbly manufactured kit includes decals for the B-17 Thunderbird depicted in the giant mural at the National Air and Space Museum in Washington, D.C.

TOWER HOBBIES CATALOG

The 1986 catalog is now available from Tower Hobbies (P.O. Box 4021, Champaign, IL 61820), the world's premier supplier of the finest radio control models. There are over 8,000 items listed from over 200 manufacturers. This 264-page catalog includes special reference sections like fuel charts, prop charts, accessory completion guides, and engine mount charts. There is also a special section called "Welcome to R/C," which includes information on getting started in the hobby. The catalog is available from Tower Hobbies for $3.

KADET SENIOR

Here's a different type of R/C beginner's aircraft that doesn't require the full-time presence of an instructor. The Kadet Senior from Sig Manufacturing (Montezuma, IA 50171) combines the famous Kadet-style controllability with the easy-going flight characteristics of an old-time R/C-assisted free flight. At approximately 6 pounds, the wing loading is only 12 ounces per square foot. The Kadet can be powered by a .29-.40 cubic inch glow or by a .35-.45 cubic inch four-stroke. Wingspan is 78 inches, length is 62 inches, and wing area is 1,150 square inches. This kit is ideal for novice or expert.

Descriptions of new products appearing on these pages were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee of performance or safety by **M.A.N.** When writing to the manufacturer about any product described here, be sure to mention you read about it in **Model Airplane News**.

21CX GM BUGGY ENGINE

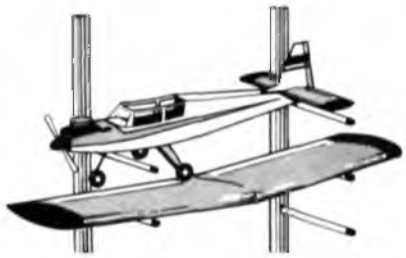
Altech Marketing (P.O. Box 286, Fords, NJ 08817) and Enya Model Engines are proud to introduce the Enya 21CX GM Buggy engine for ⅛-scale gas buggies, which desperately need the power of a .21 Schnuerle engine. With 0.8 hp and an rpm range of 3,000 to 27,000, the 21CX GM is bound to be a real mover! This buggy engine comes with a die-cast heat-sink head for greater heat dissipation, an AAC (aluminum piston, aluminum cylinder, chrome liner) setup for maximum power output, and a one-piece crankcase for toughness. The GM stands for the wide intake R/C carburetor on the engine, which features a mid-range mixture control as well as the typical high and low end adjustments so your buggy can get more power to the wheels at any rpm.

ACE R/C 4-60

Ace R/C (116 W. 19th St., P.O. Box 511PR, Higginsville, MO 64037) has another winner with the 4-60, specifically designed for four-cycle engines. With a span of 70 inches, the 4-60 is an easy-to-build sport model and has good, solid, and predictable flight characteristics that don't rely on speed to achieve performance. Area is 840 square inches, weight is 7 pounds, 2 ounces, and wing loading is 19.4 ounces per square foot.

FOLLAND GNAT "JET"

Hobby Lobby (5614 Franklin Pike Circle, Brentwood, TN 37027) announces a new product: Klaus Krick's Folland Gnat "Jet." Krick's semi-scale Folland Gnat is a new approach to the problem of simulating jet-powered flight with an R/C airplane. This 1:6 semi-scale model of the RAF jet trainer has a very light wing loading to assure that it will fly with a reasonably good rear-exhaust speed .40 engine. The Gnat has a huge air intake in the underside to overcome the drawbacks in model "jet" flight. This huge intake also doubles as easy electric starter access to the engine. The kit includes a 5-blade, 5-inch diameter fan prop. The airframe is lightweight stick and bulkhead type construction with a unique fuselage jig that is made from the leftover diecuts for the fuselage bulkheads. Wingspan of the nearly delta type wing is 48 inches and wing area is nearly 700 square inches. For more information write or call Hobby Lobby at 615-373-1444 and ask for new catalog #7 (Fall-Winter '85-'86). The catalog is free.



WING-N-FUSELAGE RACK

The Wing-N-Fuselage Rack from Du-Bro (480 Bonner Rd., Wauconda, IL 60084) is an easy and safe way to store your airplanes and keep them free from damage. It's a must for every modeler's home. It has a track system for easy adjustment and includes five pair of anodized aluminum rods and three feet of track.

KYOSHO AUTO CHARGER

The Kyosho Auto Charger is a versatile, easy-to-use unit that will quick-charge virtually any nickel-cadmium battery in the 4.8-7.2V, 100-4,000 mAh range. An adjustable current output knob allows setting it for quick-charge, trickle-charge or anywhere in between. The Auto Charger has a built-in ammeter and voltmeter, which allow precise monitoring of charge rate and voltage. Overcharging is not possible with the Auto Charger, as a voltage peak detection sensor determines when the battery has reached full capacity and then shuts the unit off. This unit comes complete with aligator clips (it requires a 12V DC power source) and features spring type output terminals for hook-up to almost any battery. The Kyosho Auto Charger is available at your local hobby shop from Great Planes Model Distributors (P.O. Box 721, Urbana, IL 61801).

THE COIL WINDER

K&S Engineering (6917 W. 59th St., Chicago, IL 60638) presents the Coil Winder, a tool that produces coils in 5/32- and 3/16-inch diameter music wire. The Coil Winder is easy to use and produces professional looking results. It's a handy tool for modelers and gives the user the freedom to customize landing gears, steering arms, springs, or any wire project. A step-by-step instruction sheet accompanies each tool.

SOARING NEWS

by guest columnist SEAN WALBANK

The British are coming, the British are coming! This month's edition of "Soaring News" is a bit different indeed. Model Airplane News *is pleased to present Sean Walbanks' report of the 1985 Soaring Event at the U.S. Nationals. Mr. Walbank is the Soaring Editor of the English model publication* R/C Model World *and resides in England. His view of our "Yankee Nats" is refreshingly different and yet homogeneous to soaring around the world. We all have a common interest, but perhaps a different way of expressing it. Here are Mr. Walbanks' observations:*

BEFORE I START, a brief note to explain why there's a "limey" doing the Nats report for *M.A.N.!* Given the opportunity, Jim Gray, your regular soaring correspondent, would have been only too happy to cover this most prestigious event. Unfortunately, for a variety of reasons, Jim wasn't able to make it, even though Chicopee, Massachusetts is virtually "on his doorstep." I happened to be staying with Jim and was entered for the Nats, so it seemed logical that I do the report.

In all honesty this isn't really a true report because it would be almost impossible to do a "blow-by-blow" account of each and every flight. I was also flying in all three classes and, as any contestant knows, this doesn't leave you with much time to complete detailed notes on everyone else. Instead, what follows are just some personal impressions and some of the highlights of a great event.

And big it was, too! With nearly 100 competitors in each class (Unlimited, Standard, and Two-Meter), CD Jeff Troy and his excellent, hard-working group of volunteers were faced with well over 600 launches every day. It's not a task that many would face with equanimity, but the Valley Forge Signal Seekers (who supplied the manpower) managed to carry it off with remarkably

Our guest author, England's Sean Walbank, shown here at the U.S. '85 Nats.

little fuss over the full three days of flying (two rounds were lost on one day due to heavy rain). Certainly there were some problems with the winches and retrieval lines (all supplied by Davey Systems), and it did take a long time to get through each day. I feel rather strongly that you're only in a position to criticize what are effectively minor irritations only if you are personally prepared to give up at least a week of your own time to help other pilots enjoy themselves and also if you *never* make any mistakes yourself.

I think one of the best aspects of the Nats is that it's an excellent social occasion. Virtually all the well-known "faces" in soaring had gathered from all corners of the country so the event provided a great opportunity to catch up on the latest gossip, see what new designs were available, and whether any "quantum leaps" had been made in soaring technology.

For the kit manufacturers, the Nats is always important because it provides a format where a large potential market can see and compare the various kit designs in action. Under these circumstances you might expect the attitude of the top contestants and the representatives of the companies to be very "hard nosed." This wasn't so, however, and it was refreshing to note the cooperation and friendliness that existed between them. This isn't to say they weren't trying their hardest to win or to convince others that theirs was the *only* kit to buy, but it was a regular occurrence to see members of the Top Flight, Dodgson, and Larry Jolly Model Products teams helping each other. Possibly the fact that the gentlemen concerned are *soaring* pilots might have something to do with it!

As I mentioned earlier, the soaring Nats provides an opportunity for new ideas to be exchanged. As an outsider, it was obvious to me that certain designs tend to have their advocates in different parts of the country. The North West for example, is definitely "Dodgson Country" while Florida fliers tend to favor Leon Kincaid's Scooter series. In between comes Airtronics with the ubiquitous Sagitta and new Cumic, and Larry Jolly's Pantera and Meteor. Add to this heady mixture the Prophet (Davey Systems), the Paragon (Pierce Arrow), and a whole bunch of own-designs and you can see how the Nats acts as a focal point for cross-pollination of ideas and concepts. This is very important for encouraging further progress in our sport.

The only new thermal kit on show was Airtronics Cumic. "Team Airtronics" suffered from some radio interference but the model did enough to show that it will be very competitive and will therefore be another winner for the company. Bob Dodgson also had his latest model, the Pivot, but it's designed for hand-launch and slope flying even though he had it as his back-up Two-Meter ship! I'm sure Jim will have more to say on this design in a future column.

Inevitably the weather caused some problems. The site itself was excellent, with lift to be found in a variety of locations, but the organizers weren't able to do much about major wind shifts in

the middle of the day, which meant that all the winch lines had to be relocated. This happened at least twice and a major storm washed out the second day.

And what of the flying itself? Well, all three classes were flown and, given the large numbers of competitors, Jeff Troy decided on a 7-minute precision duration task with a "simple" in-or-out landing—so simple that a great many experienced pilots managed to miss the circle completely! With 100 points at stake, this was a costly error to make.

In Two-Meter one of the pre-contest favorites, Larry Jolly, suffered an early shock when the winch retrieval line snagged on his transmitter and yanked it out of his hand. His model recorded a time of 17 seconds and Larry reckoned that his transmitter probably flew longer! Not unnaturally, the strong winds of the third day had the greatest effect on the Two-Meter class. With all due respect, a Gentle Lady is not the ideal choice in these conditions. So it came as little surprise that the top three pilots flew aileron-equipped machines. First was Tom Brightbill who flew a Dodgson Pixy, second was Terry Edmonds with his beautiful original design model, and third was Helmut Lelke and his Heidi. This model was undoubtedly *the* plane at the Nationals and I'll have more to say about it in a moment.

Helmut Lelke did well with his Heidi, which was the plane to beat.

Electronics in Lelke's Heidi included electrostatic sensors.

Standard class could well be termed as "Jolly's Revenge." Having blown his chances in Two-Meter, Larry really concentrated in Standard and finished up by dropping only *four* points in all six rounds. Superb flying also netted him the Hi Johnson trophy for the best individual performance of the event. Larry flew one of his own kits, the Pantera. Second was William Wegner and I have to confess that I can't recall either William or his plane in action! As a result I'm obviously unable to say much about his performance except to point out that to come in second with such a distinguished field required more than just luck. Sorry about that, William. Third place was netted by Terry Edmonds again, this time flying his Callisto—a light, F3B-like machine that performed very smoothly. Fourth place is also worthy of mention as it was taken by Helmut Lelke, still flying his remarkable Heidi.

For many, placing in Unlimited represents the ultimate achievement at the Nats. This class had the largest number of contestants and the greatest diversity of designs. Therefore Terry Edmonds' first place rounded off what was, for him, an excellent Nationals. It also made him the highest overall point scorer and

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winner of the Lee Renaud trophy. From what I saw of Terry's flying, he leaves nothing to chance. All his models are immaculately prepared and he goes out to the flight line with both himself and his timer/helper aware of exactly what is required to win. Knowing his models, plenty of practice, and a wealth of experience all combine to produce a winning formula. This year it was called Terry Edmonds. The Helmut/Heidi combo took home the second place spoils. At one stage in the proceedings it was entirely conceivable that Helmut would walk away with first place in all three classes but this wasn't to be. Nevertheless, a second, a fourth, and a third place, all with the same Two-Meter model, were quite an achievement. Third was "Mr. Airwolf" Larry Jolly flying his Meteor design. Judging by the covetous glances that this kit was being given by other competitors, it's a design that's going to feature in a large number of competition results next season.

In any competition report I've read, it has always been the descriptions of the models that held my interest and I'm hoping you feel the same way as there were a couple that were definitely worth describing.

The first was Terry Luckenbach's glorious ASW 20. Regular contestants in East Coast soaring competitions have been coming across Terry's ¼-scale (well, near scale) rendition of the ASW 20, as it has often been the plane to beat. I'm talking about regular thermal competitions here, mind you! Admittedly, the wing planform has been changed a bit (tip chord widened, etc.), and a modern Eppler 214 airfoil incorporated, but nevertheless it's a far cry from the traditional U.S. "gas-bag" thermal soarer. Terry didn't fare too well this time but the model was a constant source of attention and admiration, and he did have the consolation of winning Scale with the same plane on Saturday. If you get a chance to see this model, do so; then you'll see what real craftmanship is all about.

Helmut Lelke and his Heidi are a combination that will be discussed by soarers for some time. The plane looks fairly ordinary. The Two-Meter wing has a constant chord, uses the Eppler 205, and has no dihedral. Control functions are elevator, flaps, and ailerons (no rudder, just a fixed fin). The whole package is covered in dark blue Mono-Kote. It's the sort of model you might expect to see on the slope but certainly wouldn't back to place in the top five in all three classes in the Nationals! Closer examination, however, reveals one or two "extra" features. The most obvious of these are the pieces of copper tape wrapped around each wing tip and by the elevator. Here lies part of the secret of its success.

Based on experiments by Maynard Hill in the 1970s, Helmut has designed a system with both pitch and roll controls regulated by changes in the earth's electro-static field. Now I'm no scientist so I'm not going to even try to explain the actual workings of the electronics, but what happens is that as soon as the plane deviates from its course (as set by the pilot and his transmitter), it's instantly corrected without the pilot having to do anything about it. This is especially advantageous when the model is a great

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distance from the pilot as there is no requirement for any visual feedback when turbulence (or lift) is encountered. Providing the plane has been trimmed out correctly beforehand, it just continues to fly in the most efficient manner possible. Helmut isn't the only one who has been carrying out experiments in electro-statics; there is even a commercial unit put out by Ben Thomas called the "Co-Pilot" but unfortunately I didn't get a chance to see this unit in action at the Nats because the only plane that was using it folded a wing on launch.

There was no doubt that the system worked for Helmut, but I think it would be misleading to say that it was the sole reason for his success. He's been flying the design for a number of years and I believe this is why he did so well. Under any circumstances, the combination of a good (in Helmut's case, very good) pilot flying a plane he knows well is going to be very hard to beat. Having the latest gadgetry on your model is no guarantee of instant success, in fact, it's often a positive hinderance! Nevertheless, I can see systems such as Helmut's and Ben Thomas' being the subject of considerable debate—they represent progress but is it in the direction we wish soaring to go?

I found the Scale event on Saturday rather disappointing with a grand total of *five* entries! Perhaps it's time to reconsider the rules and see if it's possible to encourage a few more people to give scale a go. Of the five entries, the top three were in a class of their own. Terry Luckenbach won with his ASW 20, Ed Whyte and his well-known Schweizer TG3-A came in a close second, and third was Jeff Troy who was able to relax and get some flying in with his SG-38 primary glider. Scale was certainly a low-key event, held in perfect weather, but I would have loved to have seen more entries.

Each person who went to the Nationals will have come away with his or her own collection of memories, but I'd like to finish off this report by sharing some of mine. There were the low points, but there were also many highs. The friendship of fellow competitors; the enthusiasm and helpfulness of the volunteers; the amazing Windsong of Jim Thomas, built (to an immaculate standard) in the week prior to the Nats as his regular model had crashed; F-111s from the nearby airbase appearing to circle in the same thermals as the models; the exuberance of Floridian Bob Wilkosz any time his model came anywhere close to making the landing circle; and the grace and beauty of Ed Whyte's TG3-A circling in lift. All these and many more will remain etched on my mind for years to come. The final highlight must be that of young Alex Bereczky who was presented with the Sid Axelrod award at the awards banquet. It provides some scholastic aid to the younger flier and it's awarded to the pilot whose flying skills, craftmanship, and personality reflect all that is best in soaring. Alex is a very worthy winner.

Next year's Nats is scheduled for Lake Charles, Louisiana, where, it is rumored, the locals enter mosquitoes in the Two-Meter class! I enjoyed myself so much this year that I might even be tempted to return again in '86! See you there? ■

S.T.A.R.S. RALLY

(Continued from page 74)

Saturday evening the annual bonfire with food and refreshments was held for those fliers and their families who wanted to take part in one of the most important activities in attending an event like this—shooting the breeze and talking over the day's events.

On Sunday the weather was just as threatening, only this time there was a persistent on-again, off-again drizzle. In between "drizzles," many fliers were undaunted and wanted to get another chance to fly. And fly they did, but in lesser numbers than the previous day. In spite of the weather, 5 more fliers came up for registration, making the grand total 149 entrants. We wondered how many more would have signed up had the weather been better, but it was still the biggest event in our short history.

S.T.A.R.S. Inc. is not a large club, with only 31 members and their wives who help out with the affair. Each member is "active" and more than willing to pitch in. The work details in preparing for the event are soon filled and quickly completed. It is a total cooperative event with a lot of hard work, as some of you who put on your own rallies will attest.

S.T.A.R.S. Scale Rallies have held to the concept that they should cater to the "Sunday flier," by far the largest component in either AMA or IMAA. We have no competition whatsoever, no prizes, and no exorbitant registration fee. In fact, not only are there no fees

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S.T.A.R.S. RALLY

involved, but each registrant, whether he wished to fly his ship or display it, received a free barbecue dinner ticket.

This attitude and procedure could not have happened were it not for *Model Airplane News*, who has sponsored our Rally for the past three years. Without their sponsorship, the event could not be as successful. Their willingness to aid the cause of model aviation is deeply appreciated.

More fliers attended and more fliers flew than ever before, pointing to the success of our Rally. And what could be more pleasant than to have fliers say they enjoyed our event and considered it one of the best.

Plans are already in the works for next year's affair. Tentative plans are being set for Saturday and Sunday, July 12 and 13. Hope to see you there! ■

O.S. MAX-77VR-DF

(Continued from page 33)

pheral counterbalancing slots either side of a 6.5 mm diameter crankpin. The bearings are ⅜x⅞ inch at the front and 12x28 mm at the rear. The crankpin has the usual integral spigot for driving the rotary-valve and the front end of the shaft, which has a standard 5/16-24 UNF thread, is full length, rather than shortened.

The backplate and rotary-valve assembly features a counterbalanced hardened chrome-molybdenum steel valve disc running on a 5 mm dia. hardened steel pin that is retained in the backplate with two headless setscrews in tandem. The valve disc uncovers the wide and well-shaped inlet duct at 35° ABDC and closes it again at 58° ATDC for a total induction period of 203° of crank angle.

The cylinder has, of course, the usual Schnuerle-plus-third-port scavenging system. The unbridged exhaust port is open for 168°, there is a 19° blowdown period before the angled side bypass ports open, and the upwardly inclined third port, at the front, opens 3° later for a 124° period. Geometric compression ratio checked out at 12.5 on the engine examined, reducing to an effective 8.25 with the exhaust port closed. The combustion chamber features a 5 mm wide, slightly sloped, squishband, surrounding a 16 mm diameter, 5 mm deep bowl.

(Continued on page 86)

OFFSHORE

by JOHN OIAN

SEVERAL MONTHS back I was reminded by one of our readers that there are other forms of R/C boating than just the gas-powered racing types. Well, I found out just a couple months ago about a group of scale electric boaters who run in my own hometown of Orlando, Florida. One Sunday afternoon I stopped by the lake they use and, lo and behold, there were close to a dozen scale boaters quietly (literally) plying their trade. Included this month are some pictures of a few of the boats they were running.

Steve Griffon was there with a model of the HMS Amazon. The model is scratch-built from ABS vacuum-formed pieces, which I believe were also home-brew.

Rick Frazee brought his 16-year-old model of the American Scout. The longevity of some of these models is amazing, and is quite a contrast to the usually short lifespan of a competition power model, but before I get a rash of letters telling of ancient racing boats, let me say I do realize that there are a few out there. I even have a couple myself, but show me an old racing hull in good shape, and I'll show you one that probably did not run all that well. Rick's Scout, by the way, is from a Sterling kit.

Ken Hills' and Steve Griffon's tugs earn their keep.

Ken Hills was having fun with his Hartman Tug. The boat has a fiberglass hull and superstructure and is powered by twin in-line Dumas motors.

Ken Hills' Hartman Tug is powered by Dumas electric motors. See text.

Note the scratch-built coal barge by Ken Hills being maneuvered by Ken's scratch-built tug Diane (in the background) and Steve Griffon's formed ABS tug (in the foreground). This was good practice for them as a little later Ken was "allowed" to rescue an electric VCC Sport when it decided to stop in the middle of the lake. I guess hatch covers really do have a purpose other than just for show.

The only reason I found that this group of boaters existed was by seeing a flyer in one of the local hobby shops. This brings me to a very important point. If you want people to know what you are doing, advertise! We boaters tend to engage in our sport in some of the most out-of-the-way places I've ever seen. Then we complain that the only people who know about us are hunters and the occasional pair of teenagers. This could all change if we would only do two simple things: leave flyers with directions (a map) to the local running site, and use the "what's happening" section of the local paper to advertise (usually free) the club's activities. You'll be surprised how many new people you'll see.

Hobbypoxy Color Scheme

While on the subject of scale boats, when you get to the stage of thinking about your color scheme, consider the Hobbypoxy* line. They have a long list of scale colors that can be mixed using their paints, along with various formulas needed to mix them. Most of the colors I've seen have been for aircraft, but I believe boat colors might be similar.

Keep Those Props On!

Have you ever lost a prop due to the

HMS Amazon by Griffon was scratch-built.

Rick Frazee's American Scout is 16 years old.

prop nut coming loose? I have and it's a very frustrating, not to mention expensive, experience. It seems you only lose the good ones. I've got some bad ones I can't even throw away—so here are a few hints to prevent the problem. The first method we usually try when attaching a prop is to use a single nut snugged against the prop. This is the surest way to add a prop to the collection on the lake bottom. A few better methods are to put a little hot melt glue on the shaft threads and heat this with a match or lighter before you tighten the nut. This will hold the nut securely and you won't have to tighten the nut against the prop (a bad idea). The nut can also be easily removed at a later date.

You can also use two nuts jammed against each other, rather than against the prop. This method can work well but it can also be a little bulky on smaller models. If you use a shaft without threads, merely slip a ½- to ¼-inch piece of tight-fitting silicone fuel tubing over the *clean* shaft behind the prop. Just make sure that you have at least ½ to ¼ inch of smooth shaft behind the prop. This method might sound like one of the least secure, but it's probably one of the best.

Hot Stuff for Quick Building

Want to build faster as well as run faster? Try Hot Stuff from Satellite City*. Tack the parts together with Hot Stuff. The easiest way is to use the thick Super T variety and set it quickly with accelerator. Then, when all the parts are together, cover the joints with a coat of epoxy. Be sure to use the epoxy on all joints, as cyanoacrylate will eventually break down under high moisture conditions. This method is also excellent for attaching fiberglass cowls to mounting plates. Use microballoons in the epoxy to form a ready-made fillet. If you use alcohol, epoxy paint thinner, or even water on your finger when you form the fillet, you'll only have to sand it lightly before painting.

Dual Cable Steering

If you run an outboard, dual cable steering is really the way to go for positive control. To be successful though, there are a few rules you need to follow. The most important is that the connection points to the motor *must* be on a straight line running through the pivot point of the motor and this line *must* be parallel to the servo arm. The distance between the attachment point on the motor should be close to the distance between the servo arm attachment points. Any deviation from the above will result in increased strain when the motor is turned, with the first point being the most important.

John Oian, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

Hobbypoxy, Pettit Paint Company, 36 Pine St., Rockaway, NJ 07866.

Satellite City, P.O. Box 836, Simi, CA 93062. ■

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O.S. MAX-77VR-DF

(Continued from page 82)

One final point regarding installation. With the Max-65VR-DF, the carburetor could be relocated below the shaft axis if more convenient. This was possible because the backplate could be inverted and the crankpin spigot engaged with the opposite drive slot in the valve disc to preserve the correct valve timing. This is not possible with the 77VR-DF because its longer stroke brings the piston skirt too low to allow a sufficiently deep clearance slot to be milled in the backplate when this is inverted.

However, it is still possible to rotate the complete carb body to any convenient angle in the backplate boss, where access to the needle-valve makes this desirable. As with most O.S. engines, the needle-valve knob is drilled and fitted

(Continued on page 89)

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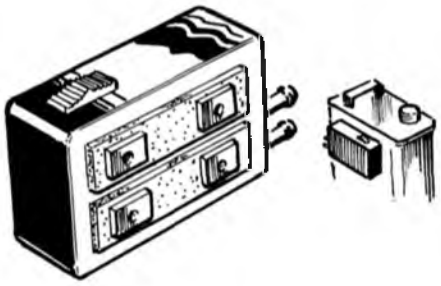
HINTS & KINKS

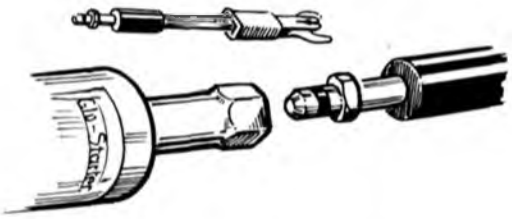
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



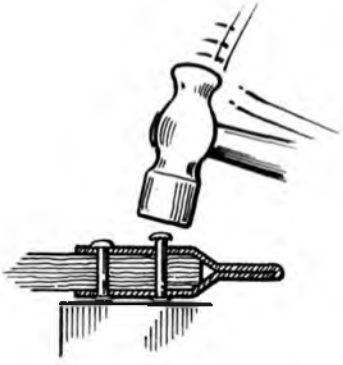
Small rectangular magnets from Radio Shack can be attached to a fuel pump with double-sided adhesive tape. This enables the pump to be quickly moved from can to can, yet will be held securely. Self-adhesive magnetic strip, also from Radio Shack, can also be used.

Stan Zdon, Coon Rapids, Minnesota



Your Cox glowplug clip can be readily adapted to your glowplug nickle-cadmium battery as illustrated. Use a small phono plug (Radio Shack) and solder a nut on, above the insulating band. The nut should be the same size as a glowplug body. Connect the adaptor to the Cox clip with a short length of stranded wire.

Don Van Voorst, Sioux Center, Iowa

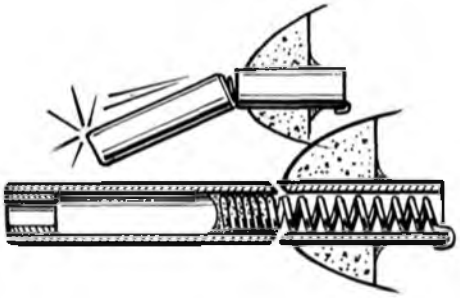


On very large models, items such as strut end fittings should not just rely on adhesives, but should also have a good mechanical fastening. Satisfactory rivets can be derived from brass nails (check your hardware or craft store). Leave 1½ diameters to allow for head forming. Yet another good source of rivets is aluminum nails used for siding.

Roy McGuckin, Fairport, New York

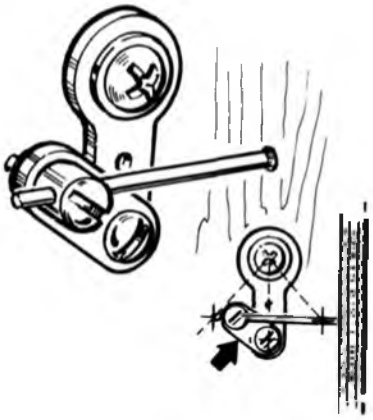
MonoKote, sandwiched between two index cards, can be cleanly paper punched to yield neat circles which are then used to hide the ends of hinge toothpicks.

Roger Hallum, Wilmette, Illinois



Guns on scale models are most vulnerable to knocks and bumps. Cut the gun barrel tubing and glue a spring into the front (protruding) section. Pull the spring through the rear section and hook end as shown. Note the bevel and countersink on the ends of the tubes. This aids in self-alignment as the barrel springs back.

Ole Runkvist, Prince Albert, Canada



On many four-cycle engines the carburetor comes so close to the firewall that the throttle rod binds severely at the half-throttle position. To eliminate binding at any position, attach this simple pivoted drag link cut from a nylon bellcrank. See arrow. The pushrod remains horizontal at all throttle openings, while the drag link is free to swing up or down. Use a Goldberg or Du-Bro pushrod connector. **Note:** You will find that even stranded steel cable will not eliminate binding.

Jim Leslie, Sun City, Arizona

O.S. MAX-77VR-DF

(Continued from page 86)

with a setscrew to facilitate the addition of a control extension. Alternatively, the engine can be equipped with the optional O.S. IFC (In-Flight Control) needle assembly, enabling mixture to be adjusted from the transmitter via an extra servo.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

LASER 75

(Continued from page 35)

short flame path travelling from the ignition plug to the thin end of the wedge, where squish turbulence minimizes the risk of detonation.

The Laser features a highly conventional piston in which (in the interests of reduced frictional loss) only 43 percent of an already very short skirt actually remains intact. The piston is not, however, of the traditional slipper type—which has much of the skirt cut away fore and aft, leaving it complete only in the plane of the conrod swing to cope with side thrust. Instead, the Laser piston is spool shaped: the upper land, 0.166 in. deep, carries the single compression-ring, leaving a lower land, 0.135 in. deep, to resist side thrust.

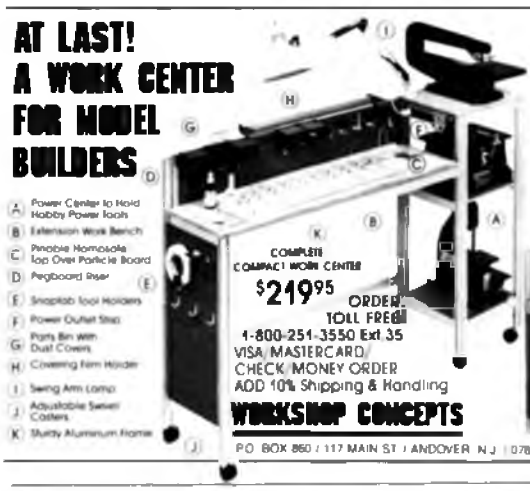
The Laser is equipped, as standard, with a Super-Tigre Mag type carburetor on a short 7 mm i.d. intake pipe which plugs directly into the cylinder. It can be rotated to whatever position is most convenient to the owner, as can the exhaust muffler also supplied. The engine itself may be mounted upright, inverted or sidewinder.

The recommended fuel for the Laser 75 is a straight 80/20 mixture of methanol and castor-oil. Suggested prop sizes range from 12x6 to 15x6. The manufacturer does not make specific performance claims, but there seems to be little doubt that the 75 produces well in excess of 1.0 bhp. This is something that we plan to check and report on in due course.

In their first year of production, Laser engines were sold to modelers in more than twenty different countries. There is usually a waiting list for them. Anyone interested in obtaining one of these

(Continued on page 90)

AT LAST! A WORK CENTER FOR MODEL BUILDERS



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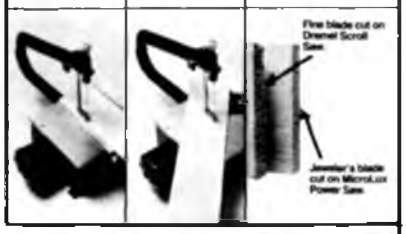

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ACE R/C

LASER 75

motors is advised to check with A.G.C. Sales Ltd., at the address given at the beginning of this report. The cost to U.S. customers will be somewhat higher now, than was the case a year ago, due to the recent fall in the value of the dollar. Currently, the price of the 75 in the U.K. is 130 pounds Sterling which is about $190 at the time of this writing. This is subject to a tax deduction on engines sold outside the U.K., but does not include postage.

Peter Chinn, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897. ■

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FULL-SIZE GLASAIR

(Continued from page 21)

What about performance? The top speed of the Glasair RG (retractable gear version) is, get this, 256 mph! Now that is stepping out. It has a rate of climb not unlike a rocket at 2,700 fpm, and yet a landing approach speed of only 80 mph. The flaps-down stall speed is a very mild 59 mph, it has a service ceiling of 19,000 feet, a red line of 260 mph, a positive 9G and a negative 6G ultimate load limit, and an extended range capability of 1,550 miles with 13-gallon wing tip extension tanks. That's what's known as having "legs"! The baggage capacity is 80 pounds and is large enough for you modelers to stash your planes in. Try this: fly into an airport, taxi up to the gas pumps, pull out your model of the Glasair, and tell the guy to fill it up!

There are many great features incorporated in the design of the Glasair, not the least of which is the structure itself. Because it's almost entirely fiberglass composite construction, the maintenance on the basic airframe is practically nil. By fiberglass composite, I mean that the skin is layered with a gel coat, glass cloth, a urethane foam center, and then the cloth again and more gel coat. The resin used for the fiberglass is a vinyl-ester compound which isn't prone to stress or vibration fatigue. The controls of all the Glasair versions are the same. They utilize push-pull tubes with Teflon bearings and have a silky smooth feel at all airspeeds, the mechanical advantage being given to the pilot.

The cockpit layout of the Glasair has the instrumentation dedicated to the pilot and his attention, unlike many airplanes that have dials and gauges all over the place. A dual stick control setup is used and is ideal for giving flying lessons or alternate control on long cross-country flights. The panel itself is large enough to house nearly any instrumentation or navigation system you could want, full IFR (instrument) or basic visual, take your pick.

The two seats, arranged side-by-side, sit low to the floor much like a high-performance sports car. In fact, the fold-over side windows are reminiscent of the famous gull-door Mercedes 300SL. But that isn't the only thing. According to anyone who has flown the Glasair, you strap it on and go for the ride of your life! It is indeed a very aerobatic airplane, as demonstrated quite vividly at Oshkosh, with smoke and all.

So far, Stoddard-Hamilton has sold over 700 kits of the Glasair and another 750 are on order. As of right now, there are over 150 of them already flying, which says a lot since the kit has only been out for such a short period of time. Will it ever come in a ready-to-fly version? They won't talk about that, but don't rule it out. I have a feeling that we are going to see a lot more of Tom Hamilton's genius in years to come.

For a man who is only 33 years old, you can bet he has a lot more things up his creative sleeve. Large corporations have all kinds of advisers, researchers, and formulas to help them decide on a product, make it, and market it. And as often as not, they fail. Tom Hamilton had a simpler method. He took his

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product to the people, to the pilots who would fly it. Tom listens to people. He learns from them, and then with his own creativeness, develops something even better than they had imagined. If my crystal ball is correct, we are going to see a lot of Tom Hamilton and his work, and we will all be the better because of it.

**The following is the address of the company mentioned in this article:*

Stoddard-Hamilton Aircraft Corp., 18701 58th Ave., N.E., Arlington, WA 98223. ■

CRAFT-AIR RV-4

(Continued from page 72)

ounces with a wing loading of 24.17 ounces per square foot. There's very little difference.

FLYING. Now it's time to go out to the field with your new bird. Stand back and modestly accept the praise of your fellow modelers. Push the wise guy who looks for every flaw behind the impound. Get the pin and test the engine and radio range.

The day of our test flight was probably the last nice day the Northeast had in 1985. The temperature was in the mid-40s, skies were blue, and a gentle breeze helped slow down models on final. When the planes were taken out of the van, we were surprised by how much the other modelers were taken in by the appearance of the RV-4s. The events of the day proved that the RVs fly as well as they look.

Taxiing was positive in the light breeze and both planes responded well to ground controls. When power was applied, both planes took off "right now." Some rudder had to be used to correct for the swing generated by these powerful engines.

Both planes left no doubt that they were designed to fly. After the initial trim passes we tried straight flight, outside loops, snaps, and a host of other maneuvers. Control was almost unbelievably positive. Straight flight was hands-off. Outside loops showed no signs of falling off or corkscrewing. Entry and exits from snap rolls were predictably crisp. While both versions were fast, the two-stroke had an edge in speed. The four-stroke displayed its power in vertical flight as it showed little tendency to slow. In spite of all its aerobatic agility, the RV-4 retained good lateral stability and slowed up as well as any low-wing trainer.

Craft-Air has managed to design a beautiful-looking, great-flying, stand-off scale model that is designed to accept two- or four-stroke engines, without compromising itself for either application.

**The following are the addresses of the companies mentioned in this article:*

Craft-Air, 20115 Nordoff St., Chatsworth, CA 91311. ■

MODEL GLASAIR

(Continued from page 30)

high wing loading indicated a fast flying super-sensitive aircraft. Tom said he had flown aircraft that were even heavier that had similar characteristics and he got them back in one piece. After hearing this, I had the feeling that I had come up with what might be more than anyone

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My sincere thanks to Chip, Don, Jim, Dave, Tony, Chris, Guy, Frank, Rich, John, Gary, Bob and Ron from Mud Puddle, Wash. along with all the guys who make our models look GREAT!

WING SPAN: 66½ IN.
WING AREA: 792 SQ. IN.
WEIGHT: 7 TO 8 LBS.
REC. ENGINE: ENYA 1.2R
REC. PROPELLER: 12½ X 12, 13 X 12

WING SPAN: 68 IN.
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really wanted to handle. The day we choose to fly was Saturday.

Friday evening, my friend Mike Wright and I went out to the field with two brands of four-stroke fuel and a dozen propellers of different sizes and pitches. Mike is pretty good at fine-tuning engines. After some experimentation, we found that Red Max fuel and a Zinger 13x10 prop produced the maximum thrust.

About 35 people showed up at the field on Saturday; both to have a family picnic and to watch Tom fly the Glasair. Tom set up for the first flight.

The plane started down the runway and swerved sharply to the left; the left wheel had come off. I put it back on and started the engine for attempt number two. The prop flew off. Attempt number three was a success. The Glasair rolled down the runway straight and true. Tom gave it a bit of up elevator and it broke ground. Not wanting to push the plane too hard on this first flight, Tom kept the climb-out gradual and realistic. He added a bit of up elevator to accommodate a heavy nose and some right aileron. The plane flew rock steady at high speeds and did not have any tendencies to snap at low speeds. You can slow this baby down to a crawl without using the flaps and it is still very stable. If you have a four-channel radio, build the plane without flaps, and you'll still have a superb flying machine. The O.S. .90 four-stroke is a good engine but a 1.20 would give vertical performance.

I've flown the Glasair several times now and I think it is the greatest scale plane I've flown to date. I hope you like it as much as I do.

**The following are the addresses of the companies mentioned in this article:*

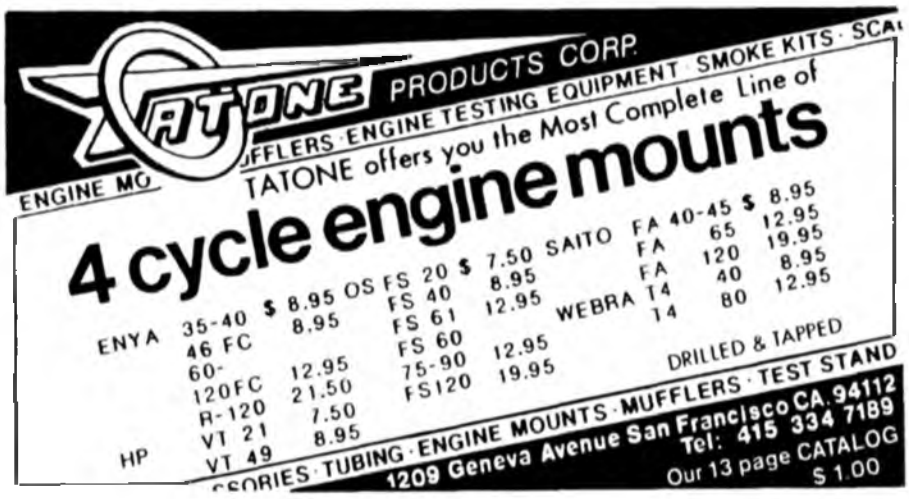
Fiberglass Master, Rt. 1, Box 460, Goodview, VA 24095.

Great Planes Model Dist., P.O. Box 4021, Champaign, IL 61820.

K&B Mfg., 12152 Woodruff Ave., Downey, CA 90241.

Cheveron Hobby Products, P.O. Box 2480, Sandusky, OH 44870.

Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708. ■



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Weight: 10-10.5 lbs.

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ELLIPTIC 40

(Continued from page 69)

Begin the construction process with the wing, and you'll need a wing jig. I suggest the A-Justo-Jig which allows you the flexibility to construct both wing panels at the same time. Another option is a simple jig offered by U.S. Eagle* that builds one panel at a time. These instructions are sequenced for the A-Justo-Jig. This wing has no wash-in or wash-out and a jig insures that accuracy. The key to good construction is to build strong and light. I used Satellite City's* Hot Stuff Super T glue for the majority of the wing, except the sheeting, where I feel aliphatic resin works better. The holes drawn on the ribs show the jig rod locations. Make sure that the jig is secured to the work surface and that the rods are parallel. Adjust the dihedral so the top surface is flat on the top. This will give you the correct dihedral on the bottom surface due to the taper.

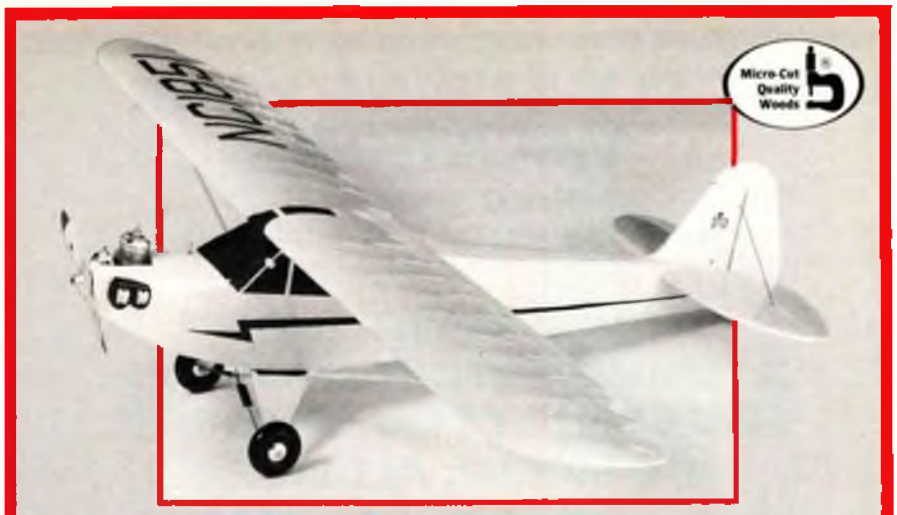
Thread the ribs 2 through 10 on the jig rods with the spacing shown on the plans. Pin the leading edge and the top spars in place. Saw partway through from the rear to bend back at the curve on the leading edge. Study the plans and make the aileron bay trailing edge, one left and one right, and pin in place. Add the top and bottom aft spars, and the pine trailing edge, and glue the parts together.

Cut out the balsa gussets and glue in place. Epoxy the two dihedral plates to the top main spars. Move the jig rods out slightly so that rib 1 can be put in position. Glue the two No. 1 ribs together and cut into two parts as shown on the plans. Glue to the dihedral plates. Add eight triangle support pieces to the center section. Epoxy the front dowel-rod plates to the leading edge. Glue four half-ribs to ribs 1 and 2, then epoxy the rear dowel-rod plates. Cut the wing bolt filler blocks to fit the rib contour and glue in position.

Trim the edges and glue together the sheeting pieces on a flat surface. Temporarily hold in place and mark for the cut lines. Carefully fit and trim until you get a good fit, and glue in place. Continue until the entire top surface is sheeted, including the cap strips. You may want to add the servo rails and rib doublers at this time.

The wing is now strong enough to remove from the A-Justo-Jig. Add the bottom main spars and glue in place. Cut to fit and glue the vertical grain webbing. Drill or cut out for the servo extension wires through the ribs. Install these cords at this time. Just to be safe, test the radio and these cords before you sheet over them. Finish the entire bottom section of the wing as before. Sheet only the bottom side of the servo bay. Cut a hole in the top center sheeting to route the Y-cord to the receiver. After sanding the sheeting flush with the tip ribs, glue the tips in position. Sand the entire wing to finished shape.

Construct the ailerons upside down on a flat work surface. The aileron leading edge is probably the hardest piece to cut out because of the taper, so study the plans carefully and make one left and one right. Glue the aileron leading edge to the top sheet. With the top sheet pinned to the work surface, use pins on each side of the pine trailing edge to hold it in place while gluing. Use an excess length of the pine stick as leverage to bend the shape. Let it dry completely. Add the aileron ribs and control horn block. After sanding for a good fit, complete by adding the bottom sheeting. Sand to fit the aileron bay of the wing. Temporarily fit it to the wing with hinges and finish sanding to wing contour. Sand a taper to the leading edge of the aileron so that it has freedom of movement at the hinge line; study the plans for detail.



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IN SOUTHERN MAINE

ELLIPTIC 40

Edge-glue the fin pieces together on a flat work surface. Epoxy the ply plates to the rudder. Temporarily install the hinges and sand the fin and rudder to final shape. Apply the same process to the stabilizer and elevators.

Mark centerlines on the firewall, bulkheads, main gear plate, and inside of the top block and top sheet. Cut the corners off the bulkheads to allow for the triangles which are used to achieve the curved shape on the fuselage. Drill pilot holes for the wing dowels in bulkhead 2. Plan your radio and tank installation and cut away the necessary clearance from the bulkheads. Lay out your mount installation on your firewall and drill the necessary holes. Be sure to allow for the necessary right thrust and offset your mounting holes to have the nose of the spinner on the centerline. Fuel-proof the firewall and epoxy in blind nuts. Use the same technique on the landing gear plate.

Glue spacer strips to the fuselage sides. Add triangles to the inside of the sides; make one right and one left. Glue ply doublers in place using epoxy. Epoxy the firewall, bulkheads 2, 3, 4, to the top block. Make sure that everything is 90° and square. The slow-drying epoxy gives you more time to get the alignment right and is stronger. When this is dry, add the sides and tail post to make one unit. Take your time and get the alignment right. A straight fuselage is much easier to fly than a crooked one.

Epoxy the wing bolt blocks together, and taper to fit against bulkhead 4. Add triangles and epoxy in place. Trim the wing to fit between bulkheads 2 and 4. Fiberglass the center section of the wing with glass cloth and resin or Hot Stuff. Mark a centerline on the wing bolt plate and cut partway through to make a bend to match the lower surface dihedral. Epoxy to the wing. Align the wing from the tips to the fuselage tailpost. Sand the wing saddle until you get equal tip height from the workbench. Set the fillet plates in place for spacing and mark the leading edge of the wing through the pilot holes in bulkhead 2 for dowels. Check the wing' incidence to be sure you have 0°. Remove the wing and drill for dowel holes. When the wing fits everything accurately, glue the dowels in place. Drill undersized holes through the wing and the wing bolt blocks. Tap for a ¼-20 wing bolt. Protect the wing with waxed paper and glue the fillet plates to the fuselage. The wing will give the exact contour and help hold the plates until they're dry.

Fuel-proof the tank compartment. Make up your pushrods for the elevator and rudder. Add your antenna tube if you plan to run an internal installation. Cut to size and epoxy the spruce gear triangles and add the main gear plate. Fuel-proof and add the tank bottom block.

Build the nose cowl separate from the fuselage, and use a square to get all sides 90°. Add the triangles to the inside corners and let dry. Attach a full sheet of sandpaper to a flat surface and sand the firewall side of the cowling until it fits flush with the fuselage front. Permanently mount your engine mount at this time. The mounting bolts will be hard to reach after the cowling is glued in position, so make sure the bolts are tight.

(Continued on page 98)

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ELLIPTIC 40

(Continued from page 96)

Nothing can spoil your day more than losing your engine in mid-flight. You might want to drill your pilot holes for the engine mounting screws before you install the mount. Using the engine as a guide, cut out the cowling so that you can remove the engine through the cut-out. Sand to length to fit the engine and glue the nose ring in place. When you're satisfied with everything, glue the cowling to the nose of the fuselage. Using the spinner as a guide, sand the entire nose area to a streamlined shape. Fuel-proof the entire inside area of the cowling.

Epoxy blind nuts to the inside of the ply tail-gear plate. Epoxy to the fuselage. Lay out your rudder and elevator servos and use pushrods to determine the exit holes needed in the fuselage. It's much easier to lay this out now before the area is sheeted. Nyrod pieces make nice exit holes if they are glued in and then sanded flush with the side. Add cross-grain sheeting to the bottom rear section of the fuselage. Construct the wing belly pan and sand the entire bottom contour of the wing and rear fuselage to a nice flowing shape. Cut out for wing bolt holes.

Construct the turtledeck separately from the fuselage with top, sides, and ribs. Sand the bottom surface flat and glue to the fuselage. Using the fin for spacing, glue the fin support blocks in position. Remove the fin before the glue sets. Set the canopy in place and mark the outline. Glue the canopy bulkhead and the canopy baseplate in place. Sand the entire fuselage, avoiding the canopy area.

Check the alignment and glue the stabilizer in place. It should be at 0° incidence and 90° from the centerline. Glue the fin in place and check for 90° from the stabilizer. The fin should aim directly down the centerline of the fuselage.

Use balsa triangles to begin filling the fillet area. Use your favorite filler to finish the process. I used Model Magic* Filler and it seems to work very well. You may want to treat the entire area with a thin layer of Hot Stuff before you start so that when you sand to shape, you don't end up with as many gouges in the adjacent wood surfaces.

Trim the canopy at the bottom to fit the turtledeck and fuselage. Finish the interior of the canopy area as you like and glue in place. Use filler to fill all of the seams, fillets, and any other areas that need work. Cover and tape off the canopy if you plan to paint the fuselage. Give the whole model a good final sanding.

I chose to cover the wing with Mono-Kote and paint the fuselage and bottom center section of the wing. I sealed the wood with two or three coats of resin, sanding between each coat. I then applied three coats of K&B primer, sanding between each coat. The secret is to sand off almost all of the material so that you are sealing the surface imperfections and removing most of the weight. It takes lots of work but sanding is good therapy and makes for a good finish. I then sprayed the base and trim color coats, and sprayed the trim colors on the wing.

Build the wheelpants per the instructions. Install the remaining hardware, engine, fuel tank, radio gear, landing gear, and tail gear. Check for proper control surface movement; both in direction and amount of throw. The throws given on the plans are good trim flight settings. They are not too sensitive and yet offer enough movement to get you out of trouble if necessary. Adjust to your personal taste after the trim flights. Check the CG location and shift the gear

(Continued on page 100)

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ELLIPTIC 40

(Continued from page 98)

as necessary to start with the correct location, which is over the main spar. You may want to change this position after the first few flights, since CG location is a matter of personal preference. If you're fairly new at this, you may want to decrease the throws slightly, and use the forward portion of the CG range for more stability. Seal your aileron hinge gap with MonoKote to increase the effectiveness of the control surface.

I mentioned that I got a wing jig ($8) from U.S. Eagle, and they also sell .040 ASA wheelpants ($7), and an .030 canopy ($5).

FLYING. Now comes the fun part, the flying. You've spent the time and effort to build a beautiful aircraft, so take a little extra time now to check everything out now before you fly. Be sure that your engine is completely broken-in and properly adjusted. Pressure-test your tank for leaks. Do all the necessary radio tests, range checks, etc. You don't want to plant your new pride and joy about a foot in the good Mother Earth. If there is any kind of problem that needs fixing, fix it now before you fly. The problem will not magically go away in flight.

You'll find the ground handling for this tail-dragger nice, due to the height of the tail, with no tendency to tip over. The rudder is effective on takeoff and a little right input is all that's needed to compensate for the torque effect. Use a shallow climb-out and gain enough altitude to trim for straight-and-level flight. Pull the ship into a straight, vertical climb to check the right thrust. It should pull straight up without much rudder input for 4 or 5 seconds. If not, adjust your right thrust or change the pitch of your prop to give a nice straight vertical climb. As an example, 2° right thrust seemed to be about right for a Super Tigre .45 ABC (from Great Planes Model Distributors*) with a 10x6 prop. Try some inside and outside loops. Adjust your rudder and aileron trim to give nice straight tracking through the loops. Try some inverted flight. It should track as straight either way.

The aircraft exhibits very nice slow speed characteristics and has a very slow stall speed. Make several slow speed passes to get the feel of the landing approach. Fly a shallow approach because the ship is so clean aerodynamically that it will not bleed off airspeed

(Continued on page 104)

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ELLIPTIC 40

(Continued from page 100)

very fast. Just cut the power a little before you're used to doing so and let her lose altitude. Make a nice slow flair before touchdown. Make all of your trim adjustments to give a neutral setting in your transmitter. If you want a more crisp snap or spin, shift the CG slightly aft, a little at a time.

After you get used to the flight characteristics, try any maneuver you like. It will fly them with a slow grace and constant airspeed. Fly safe and enjoy!

**The following are the addresses of the companies mentioned in this article:*

U.S. Eagle, Inc., P.O. Box 1902, Greenville, TX 75401.

Satellite City, P.O. Box 836, Simi, CA 93062.

Model Magic Products, Inc., P.O. Box 19784, St. Paul, MN 55119.

K&B Mfg., 12152 Woodruff Ave., Downey, CA 90241.

Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820. ■

CONTROL TOWER

(Continued from page 38)

left. Only the connector holds it in place when the back is off. With the elevator stick mechanics in view, the two upper left Phillips head screws are for adjustment, elevator on the left and aileron on the right. For rudder adjustment, note the two 3/16-inch diameter holes about one-third up the decoder board on the right side. The rudder adjustment screw is under the left hole. For all stick adjustments, clockwise movement makes the feel softer, counterclockwise stiffer.

The first thing that struck me about the receiver was its size. It measures only 2.6x1.6x0.8 inches and contains receiver, decoder, and an 8-plug receptacle. Futaba advertises that the receiver is triple-tuned, however, only one crystal is evident so some additional filtering was being done. Lacking a schematic, I called Futaba and they indicated that three filters are employed to provide enhanced signal purity.

The servos employed with the FP-T6NLK are the S-28s with a hefty 48.7 ounce-inches of torque, plenty for most moderately-sized aircraft.

I'd like to discuss the Conquest 6 accessories. First is the FBC-8B charger, which charges the 9.6V, 500-mAh transmitter battery and the receiver 500-mAh 4.8V battery at 45 mA, together or

(Continued on page 106)

CONTROL TOWER

(Continued from page 104)

individually. Charging time is nominally 15 hours.

Next is a color-coded frequency flag and mounting holder. A transmitter neck strap is also provided, as are two servo trays, one for three servos plus an On/Off switch and the other for the aileron servo. Lastly, there are a total of four splined horns, two with arms (4 and 6) and two wheels (1⅜-inch diameter with no holes and 27/32-inch diameter with holes), and finally a switch mounting plate.

I think Futaba has another winner with the Conquest 6. It's well made and packaged. It has many features found on considerably higher-priced sets, yet lists for about $280. I enjoyed this review and look forward to bringing you the Conquest 4 in a future column. See you next month.

Charlie Kenney, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following is the address of the company mentioned in this article:*

Futaba Corp. of America, 555 W. Victoria St., Compton, CA 90220. ■

R/C NEWS

(Continued from page 47)

turn a large, high-pitched propeller and should meet FAI noise level restrictions. Certainly the diesel remains a fertile area for experimentation; it will be interesting to see who becomes a winner with this type of engine.

Another Better Mousetrap

Every so often I find a product that's so unique and so perfect for its intended purpose that I tab it as a "better mousetrap." Of course, this is based on the "old-hat" expression, "If you build a better mousetrap, the world will beat a path to your door!"

Over the years I've placed such an appellation on Dick Remington's "Headlock" glowplug connector (it's even better today), cyanoacrylate glues in general, Bob Jones' Snap-on wing feature, Master Jig, and others. Most recently, I found another—Du-Bro's Kwik-Fill Fueling Valve.

Very often, a company in the business of providing marvelous kits and accessories tends to be taken for granted. We modeling consumers have a propensity for thinking, "That was great, what do you have for me today?" Such is the case with Du-Bro*, a company that has provided more than one way to make a modeler's life easier over the years. Just think, Du-Bro gave us the clevis (who can get along without that little device these days?), the first kitted helicopter (forgot that one, did you?), the Seabird (an ARF flying boat that would still be a saleable model), accessories that included hinges, horns, and cables; nuts, bolts, and other fittings; fuel pumps that work; glowplug clips; giant-scale hinges and accessories; and the fantastic ball links in both normal and giant size. It may be impossible to complete a model airplane these days without using at least one Du-Bro product.

Du-Bro's latest "better mousetrap" is none of the above. It's new and very, very clever. Not only that, it solves an old problem in a way that is simple and direct.

Du-Bro's Kwik-Fill Fueling Valve is simply a device that permits fueling of a tank in a two-line system without removal of any fuel lines from carb inlet or any other place. The operative word is "two-line." Whenever you can use two fuel lines (one for vent and one to carb) you eliminate 30% of your fuel delivery problems.

The main valve goes into the delivery line to the carburetor. When the actuating tip installed on your pump delivery line is inserted into the valve, the carb is shut down automatically and fuel is pumped to the tank. When the tip is removed, the carb is automatically reconnected. The entire system is neat, clean, and without any flaws apparent to me.

I used Du-Bro's new device on my recent Byron Zero. The main valve was mounted on a piece of phenolic that, in turn, was mounted to the engine by bolting to an unused mounting point on the Quadra 82 engine. For scale effect, the refueling point is all but invisible. I highly recommend this Du-Bro product that probably answers tank fueling problems for all time—it's that good.

That's it for this month. I hope you've been building this winter because spring isn't very far away and I'd sure like to see you on the flying field when the weather improves.

Art Schroeder, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

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TOP FLITE ELDER 40

(Continued from page 55)

I added a few extra pieces of support wood around the cowl to give a firmer base for my planking. I also added a roof over the fuel tank compartment to avoid the need to fuel-proof a rather awkward area in the fuselage.

The Great Planes Model Distributors* O.S. Max FS-40 that I chose for a powerplant fit well in the Dave Brown glass motor mount furnished with the kit. No additional modifications were necessary, since the mount was the long style and provided sufficient clearances front and rear.

A final note on the fuselage: the open framework in the rear of the aircraft is mostly of the butt joint construction as I've already noted. Included in the kit is 1/16-inch plywood material from which you construct joint caps for the butt joints. You might be tempted to consider this an additional detail, but it's quite the contrary. The strength of the butt joints is significantly enhanced by the cap pieces and I wouldn't try to fly the aircraft without them. They require some time to cut and glue, but the structural integrity is required, so do it!

The main landing gear is pre-formed out of 1/8-inch wire, but I found that a few adjustments were necessary to fit it to the fuselage. Mount the wheels to the gear, along with whatever collars you choose, in order to assure that there will be enough room on the axle. Do this prior to soldering the two parts of the gear together. I used silver solder for this job and assembled the rig while it was attached to the fuselage to assure alignment and fit. I did substitute Du-Bro* nylon landing gear straps for the steel units provided in the kit, because I don't like the radio noise that steel-to-steel can produce. Produce the tail skid in the same manner and then epoxy it to the rear frame. All in all, it's a classic undercarriage. A little bit of toe-in to the front gear completes the construction. A pair of Williams Bros. vintage wheels provide the final touch, although some of the real wire wheels would look just swell.

The finishing of this kit will be a joy for any modeler who likes a marvelous looking aircraft. Take your choice of color schemes and decorations. Flying wires, guns, insignia, pilot, windshield—you name it and it fits on this versatile design. I chose a conservative scheme employing Top Flite's new Tan MonoKote. The highlights are in red, white, and blue, and checkerboard, all from Top Flite's MonoKote collection. The variety offered in MonoKote will allow you to do almost anything you wish.

The wooden parts provide a bit of a challenge in that I would have liked to stain the wood and fuel-proof it with polyurethane. This was not to be as the glues used eliminated the possibility for a consistent stain pattern. Instead, I used some R/S Perfect Flat Earth tone, which is a nice match for the Tan MonoKote. I finished the inside of the cowl in Flat Black from the same company. The ample room inside the fuselage made the radio installation a snap. Four channels are needed, and again I encountered no problem in the installation.

I balanced the aircraft as shown on the plans, with the fuel tank empty. This point is at the 1/4 chord line on the wing, as you might expect. Keep this in mind as you install the radio equipment, since the nose moment is very short and you don't have a lot of options to add weight. I made the usual range checks and tuned

(Continued on page 112)

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TOP FLITE ELDER 40

(Continued from page 110)

the engine to the fuel tank location, which could not be more perfect.

FLYING. At the flying field, the first thing I noticed was the ability to control taxi maneuvers on the ground since there is only a skid at the rear. I made the first taxi tests on a paved runway, but the machine controls poorly in a taxi mode on pavement. I don't know whether this is from rudder blanketing from the large wing and tall landing gear or simply not enough rudder, but I'm sure that a controlled taxi is not possible without the installation of a tailwheel.

Next I tried to taxi in the grass. Straight ahead taxiing was possible but turns were not. In short, this model can ground-loop on the runway or go straight in the grass, but no reasonable combination could be achieved for the flier who enjoys driving out to the runway and driving back from the landing. Remember, the early full-scale aircraft could not taxi either, and had to be lead to the runway. Only the advent of the movable skid or wheel at the rear of the fuselage allowed controlled taxi. This is a period model, and in that respect it is very much in fashion.

So I walked it out to the runway and prepared for takeoff. If those early aircraft could take off, then so could I. As it turned out, the takeoff was a breeze. The model tracked straight down the runway and when the tail came off the ground, I had good control of the yaw axis. Subsequent takeoffs in the grass proved that the shorter the grass, the better. The O.S. FS-40 four-cycle engine swinging an 11x5 wooden prop and fitted with an exhaust pressure fitting is not quite enough power to bring this large aircraft out of thick, heavy grass. I made a significant improvement when I removed the exhaust pressure fitting device.

The narrow Williams Bros. wheels did not help matters either. If you plan on doing a lot of heavy grass takeoffs, consider a larger mill such as the Enya 46 four-cycle or the HP 49 four-banger. These engines have a little more beef and would allow you to operate out of most lush pastures.

Once in the air, the control was very docile—that is, after I changed the center of gravity. I found that the point shown on the plan should be listed as the rear limit. With the CG at that point, the elevator was just on the borderline of providing neutrally stable flight in the pitch mode. The aircraft tended to stay in the pitch attitude selected, rather than return to the trim position. With the CG ½ inch forward, the flying was a dream. Now don't think that this beast is a fine acro ship or a real buzz bomb, it's not and wasn't intended to be. It is a fine airplane to show off good craftsmanship and scale-like flight characteristics.

All in all I'm very pelased with the model. It's a good buy for the money and I think that it lived up to what I expected

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If you're listening, Top Flite, I'd like to see the next size larger Elder. A .90 or 1.20 size would be just super!

**The following are the addresses of the companies mentioned in this article:*

Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616.

Pacer Technology & Resources, 1600 Dell Ave., Campbell, CA 95008.

Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084.

Great Planes Model Dist., P.O. Box 4021, Champaign, IL 61820. ■

FOUR-CYCLE

(Continued from page 49)

of fuel and possibly lead to some damage.

The retard system is only used on engines that have a spark ignition system. It's intended to make such engines idle and throttle better. You'll want to consider the use of spark ignition later on in your four-cycle career, especially on the larger sizes but, initially, stick to glow for simplicity's sake.

I've mentioned some of the fuel tank requirements; the fuel itself is a matter of some controversy among fliers, engine makers, and fuel suppliers. You can use normal low-nitro model engine fuel, especially during the break-in and familiarization period. The so-called four-cycle fuels differ because they have a lower oil content. This doesn't seem to bother the engine as long as it's not run over-lean, something to remember in *all* cases with *all* engines. Actually, except for the case of a too-lean run, I think there are other fuel-related considerations more important than the difference of a small percentage of oil in the mixture. More about that later!

There's little new to expect or learn when starting and running your new four-cycle engine, and there's nothing extra in the way of equipment. You've got to light the plug and turn the prop! The only caution is that after choking, be sure to turn the prop over manually a couple of times to be sure you haven't drawn too much fuel into the combustion chamber. Holding the prop securely, and with the plug battery on, you'll usually feel the kick of ignition as on the two-strokers. With the throttle about ¼ open, hit it with the starter and go. If you prefer hand-starting, that too is possible and most of the four-cycle engines start readily by snapping the prop backward against compression.

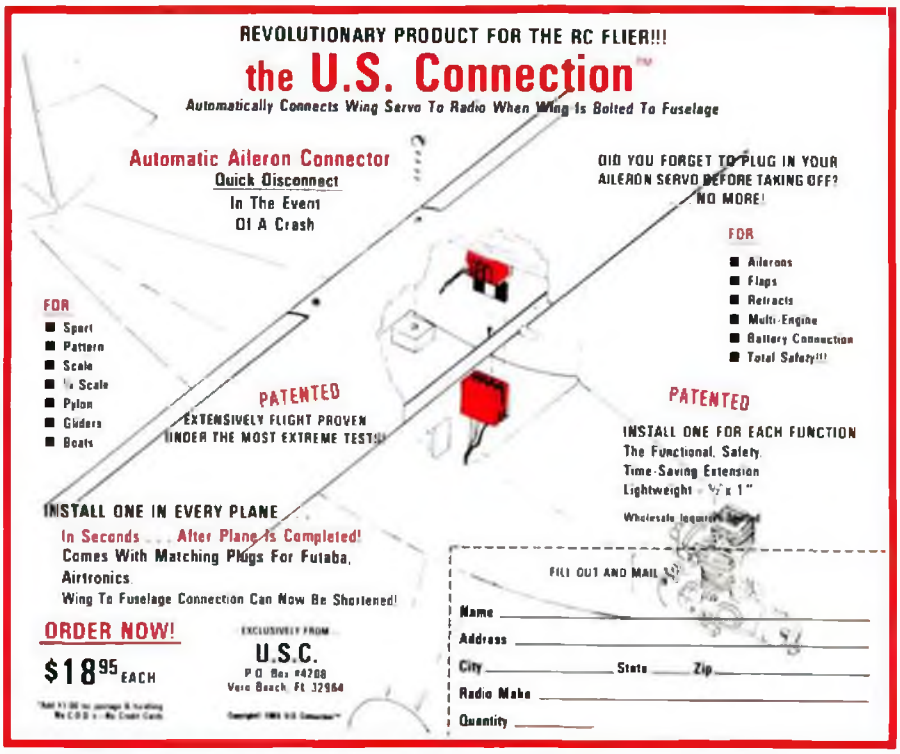
Now that it's running, give it time to warm up before opening it up to full throttle. Now comes the only critical part—too many newcomers to the four-cycle world insist on twisting on that needle valve, trying to get the engine to reach the sound their ears expect from a properly adjusted engine. It won't; it's a completely different pitch of sound. As the needle valve is adjusted past the proper point, the engine will first start to slow down and then die, and maybe even backfire and throw a prop, which is a good reason for doing all of your engine adjusting from the rear. Until you get used to the distinct sound, it's good practice to use a tachometer to set the needle, and let it go a little rich. You aren't going to lose a lot of thrust by taking off with a few hundred less rpm and you gain engine life.

Now back to that business of the fuel. The fuel mixture isn't drawn into the crankcase first, as in the two-cycle engine, but goes directly into the top of the combustion chamber through the intake valve. The lubrication to the bottom end is done by the seepage of oil past the piston and into the crankcase. The fuel residues form acids, which are also formed in two-cycles, but which get blown out by the crankcase pressure. In the four-cycle engine, this acid and oil accumulation is passed out through the nipple fitting, which is found somewhere on the rear crankcase cover of the engine. But enough remains to do harm, primarily to the steel engine bearings. To alleviate this, it's best to run the engine at full throttle for half a minute or so after the last flight of the day, and also to inject some after-run oil both into the top of the engine via the spark plug hole and into the bottom via the crankcase breather. This is always important, but more so if the engine is to be stored for a long period of time. In fact, to be on the safe side, as much as I recommend against unnecessary dismantling of engines, in the latter case I'd even remove the rear crankcase cover, flush the engine out thoroughly in solvent (kerosene is good), and drown it in oil before putting it away.

A good after-run oil is available from Pacer Technology*, and is called just that, "After-Run." A few squirts of it into the crankcase breather at the end of a day's activities will effectively take care of your corrosion problems.

Now for the maintenance, the best advice I can give you is: if it ain't broke, don't fix it! Avoid "tinkeritis." The only thing that you need to do now and then is to check the valve clearance. It's a simple process—one time around makes you an expert. All engines come with the proper

(Continued on page 115)



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Congratulations to Lt. Col. D.C. Hibbard USAF (Ret.) of Newbury Park, California, for correctly identifying our mystery aircraft. Other correct entries were received from Jack Hiner, Bruce Johnson, Marshall Smith, Brian Fuller, and Frank Beatty.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the Month

The Suburban Aeroclub of Chicago (SAC) is the *Model Airplane News* club of the month for March 1986. Formed in 1957 by some of the best modelers in the country, the club was to become synonymous with excellence in the hobby. In 1963 the club formally obtained a charter and modeling greats such as Carl Goldberg, Frank Purdy, Herb Bushey, Bob Baldwin, Frank Myers, Jimmy Greer, and many others were instrumental in this club's success.

The club's first flying field was a sod farm located at Volmer Road and Crawford Avenue. As is often the case, civilization closed in on them and the Cook County Forest Preserve District came to the rescue with a new location, a fact that should not go unrecognized. The Cook County Forest Preserve is one of the most supportive government organizations in the country for modelers, and it should serve as an example of the benefits that can be derived from such an association.

The membership is kept informed of the club's activities by a very informative newsletter called the "Dope Can." Editor Tony Sedlak does a fine job of finding entertaining and educational material to include each month. He does biographies on members past and present, tips on building and flying, historical bits on aviation, as well as a run-down on local hobby shops. Many different types of contests are hosted by this club during the year, so mark your calendar for their next one.

Model Airplane News is pleased to award two free one-year subscriptions to this club, which are to be given by them to their deserving junior members.

Congratulations!

Each month **M.A.N.** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **M.A.N.** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletters to **Model Airplane News**, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

FOUR-CYCLE

(Continued from page 113)

tools and the proper thickness gauge so that you can check or set your valves as necessary. More advice: if all else fails, read the instructions.

So much for installing and running of your new four-cycle engine. Now for the bad news—your O.S. FS-40 is going to be too small for your Sig Cub, which calls for a two-stroke .40 and is advertised at 5 pounds. You could trim off a lot of detail and weight and fly it, but it would always be marginal. I don't like to see Cub-like models flying at Mach 1.5 either, but there is a lot to be said for having enough power and speed for safe flight. You'd do best with a .60 four-stroker, or maybe even the HP-49, again keeping it light. But don't consider that FS-40 a loss; take a look at Ace R/C's* new 4-40, which is a sporty-looking mid-winger and looks like something the average modeler might chose as a home-built.

I guess there's nothing left to say except "Good Luck" and let's see a photo of that Cub when it gets done!

Eloy Marez, c/o *Model Airplane News*, 632 Danbury Rd., Wilton, CT 06897.

**The following are the addresses of the companies mentioned in this article:*

J'Tec (John Tatone), 164 School St., Daly City, CA 94014.

Pacer Technology, 1600 Dell Ave., Campbell, CA 95008.

Ace R/C, Inc., Box 511C, Higginsville, MO 64037.

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1930-1950 model magazines for sale. Low price. $1.00 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

THE BEST OF WYLAM, BOOK IV: Don't miss this W.A. Wylam classic. *Book IV* covers "The Stinson Story" and "The Curtiss Family." Book is $5.00, plus $1.75 for UPS shipment. *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

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VIDEO ON COVERING: *Model Airplane News* presents an hour-long, professionally produced, instructional video cassette on envelope covering by Dick Phillips. For beginner or expert, regardless of plane size. Ideal for clubs and hobby shops too! Each cassette is $39.95 (specify VHS or BETA), plus $1.75 postage and handling (foreign and Canadian orders, add $3.00). *M.A.N.*, 632 Danbury Rd., Wilton, CT 06897.

CAUDRON ¼-SCALE PLANS: rolled, postpaid, $22.50. SASE for info. Airmasters, 20026 Frazier, Rocky River, OH 44116.

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WANTED: July 1938 issue of *Flying Aces* magazine. George Lyle, 25762 Serenata Dr., Mission Viejo, CA 92691.

QSAA 1985 LAS VEGAS FLY-IN on videotape. Edited footage features over seventy aircraft. Running time: 78 minutes. $29.95 postpaid. Specify Beta or VHS. MasterCard and Visa welcome. Werner Kopp, 2973 Berman, Las Vegas, NV 89109; 702-731-5217 after 5:00 p.m. PST.

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Closing date for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run.

ADVERTISERS INDEX
MARCH 1986

Ace R/C 90
Airtronics, Inc. 4
America's Hobby Center, Inc. 58
Associated Electrics 87
Astro Flight, Inc. 112
Balsa USA 97
Dave Brown Products 93
Bru-Line Industries 95
Byron Originals 24, 25
Canadian Hobby Products 81
Cannon R/C Systems 96
Cheveron Hobby Products 112
Circus Hobbies 110
Coverite 91
Cox Hobbies, Inc. 53
Craft-Air 103
Davis Diesel Development 85
Du-Bro Products, Inc. 42
Dumas Products, Inc. 71
Electronic Model Systems 92
Fiberglass Master 79
Fox Mfg. Co. 56, 85
Futaba Industries ..... 3rd Cover
Carl Goldberg Models Inc. 6, 51
Gorham Model Products 41
Granite State R/C Products 92
Great Planes Model Mfg. 73
Dick Hanson Models 93
Happy Hobbies 98
Harry B. Higley & Sons 79
Historic Aviation Books 11
Hobby Capitol Distributors 95
Hobby Horn 49
Hobby Lobby International 8
Hobby Shack 82
K&B Mfg. 39
K&S Engineering 49
Lance Machining & Mfg. 74
McDaniel R/C 74
Micro-Mark 89
Midway Model Co. 92
Midwest Products Co. 95
Miniature Aircraft Inc. 31, 99
M.A.N. Books 67, 106, 119, 122
M.A.N. Classified 118,
M.A.N. Plans 116, 117
M.A.N. Posters 120, 121
M.A.N. Subscription 122
M.A.N. Wylam/Nye Drawings 107
Model Expo 42
Model Magic Products, Inc. 90
Model Rectifier Corp. ..... 2nd Cover, 3
NRI Schools 9
Octura Models Inc. 82
Off The Ground Models, Inc. 86
Pacer Technology & Resources 100
Penn Valley Hobby Center 98
Point Sebago 96
Polk's Modelcraft Hobbies 98
R/C Buyers Guide 100
R/C Car Action 105
Robart 14
Rocket City Specialties 81
Roush Mfg. 79
Satellite City 102
See Temp 98
Sheldon's Hobby Shop 86, 108, 109
Sig Mfg. Co. Inc. 75, 82
Sterner Engineering 104
Swanson Associates 112
T&D Fiberglass Specialties 79
Tatone Products Corp. 94
Technopower II, Inc. 80
Teleflite Corp. 56
Time/Life Inc. 19
Top Flite Models Inc. 59
Tower Hobbies 111
U.S. Connection 113
U.S. Quadra 49
Varicom Industries 101
Bob Violett Models 98
Williams Bros., Inc. 70
Windsor Propeller Co. 117
World Helicopters 94, 115
Workshop Concepts 89
Zenith Aviation Books 15