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AMERICAN aircraft modeler

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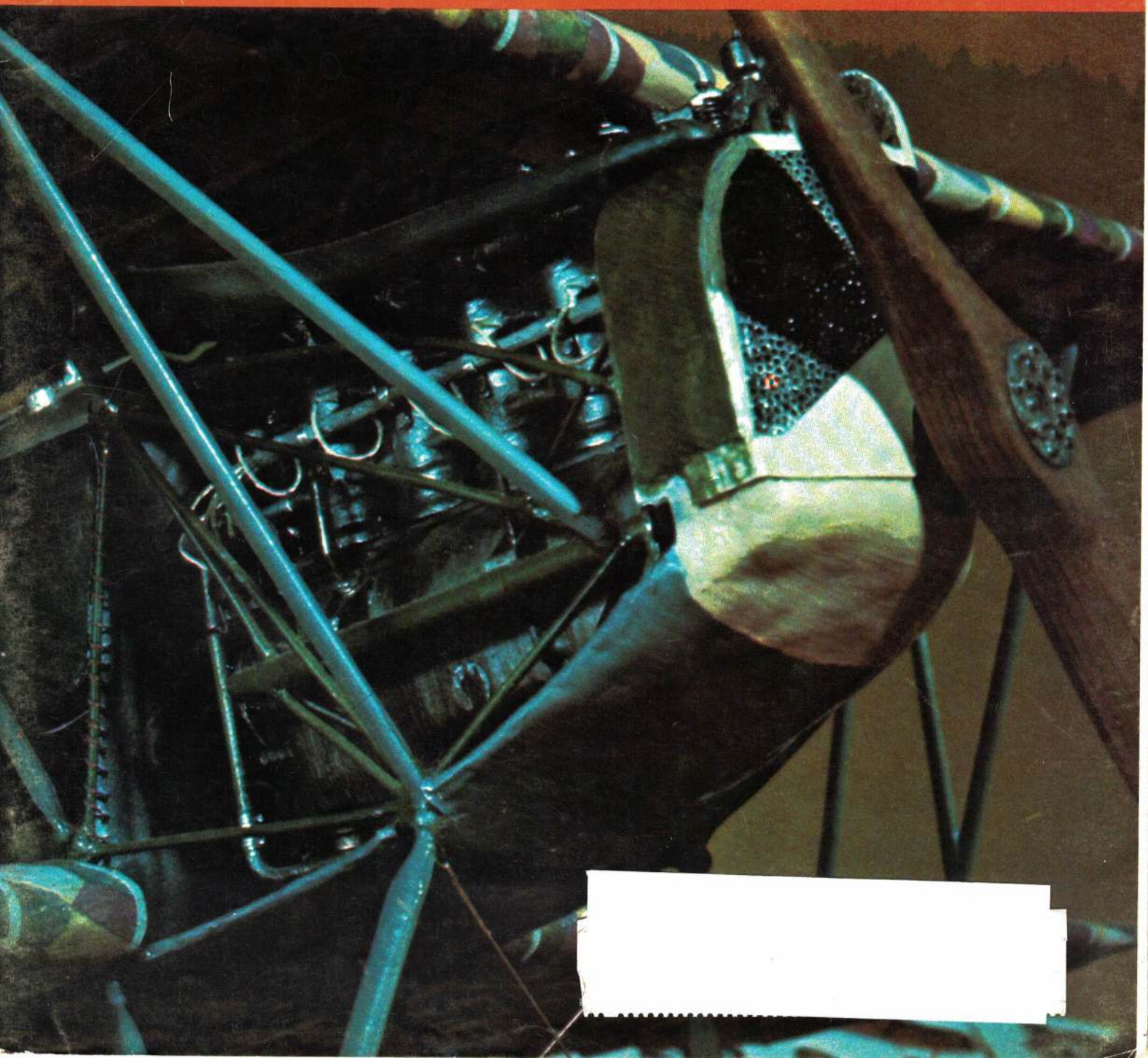

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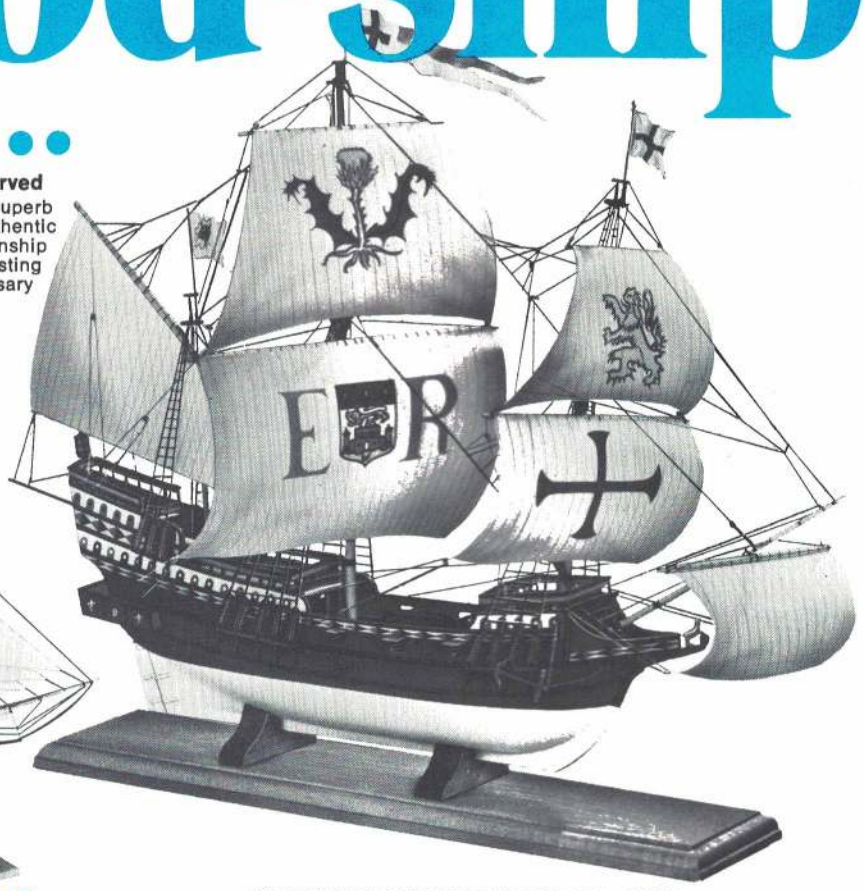

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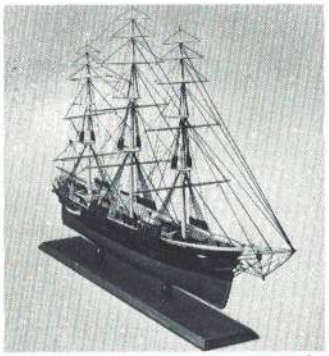

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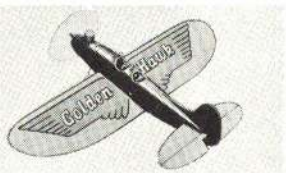

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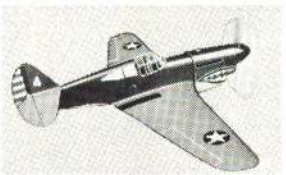

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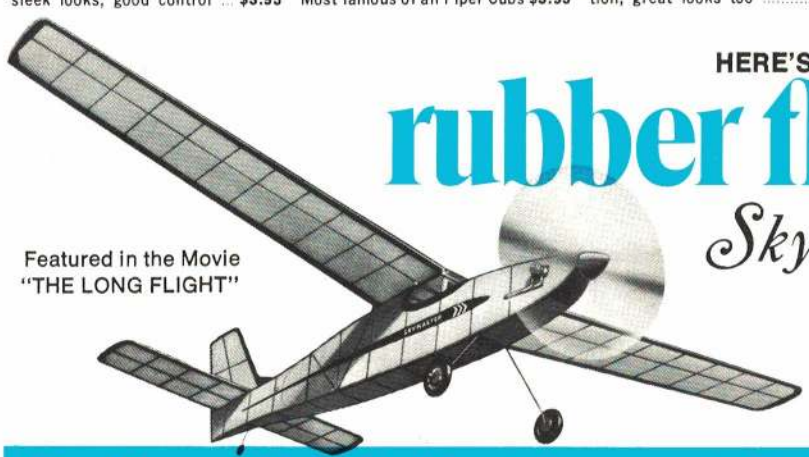

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AMERICAN aircraft modeler

COVER PHOTO: Duane Somers' completely detailed display D-VII is scratch-built from balsa, pine, wire, and epoxy (scale: 3/4" to 1'). Lozenge-patterned silkspan covering done with water colors. Transparency by Frank Pierce.

WILLIAM J. WINTER — PUBLISHER EDWARD C. SWEENEY, JR.—EDITOR
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If it couldn't outclimb its opponent, the P-51 would outturn him. If it couldn't outturn him, it could outdive him. If it couldn't outdive him, it could outrun him. Result: a performance record so outstanding, the Mustang is still being made today!

IT WAS IN the CBI Theater, in 1944. This Mustang pilot (name unknown) was escorting a flight of B-25's to the target when he mixed it up in a dogfight and got hit in the tail. It was time to say goodbye to this P-51: the pilot jettisoned the canopy and started climbing out. He had one foot on the wing when he saw a Japanese Tojo coming head on. He leaned back into the Mustang Cockpit and squeezed off one last burst from his fifties — slid off the wing and parachuted to earth. The Tojo wasn't so lucky. It blew up. This is known as "a P-51 shooting from the hip."

In Europe the word was this: a Mustang could outturn, outclimb, outdive, and — if necessary — outrun just about anything the Axis powers could put into the sky.

For instance, on outturning: Captain Louis Norley caught an FW190 and chased him down to 3,000 feet. The German did a tight climbing turn to the left but Norley dumped 20 degrees of flaps and turned inside him. As the Focke-Wulf rolled over and headed for the deck, Norley jumped right on top of him. Two short blasts and the German was out and grabbing for his ripcord.

On outclimbing: Lt. Joe Lang found himself in the center of a gaggle of 25 FW190's at 2,500 feet. He pushed the throttle to the firewall and pulled back on the stick. At 18,000 feet he went through a cloud bank and that was where he lost the enemy.

On outdiving: Lt. Col. Glen Eagleston got into a dogfight at 23,000 feet. The German rolled over and dived in an effort to shake the P-51. Says Eagleston, "I salvoed my wing tanks and went after him. He kept diving, but I knew I had the best ship and stayed right after him. He tried to pull out at 6,000 feet, but his ship wouldn't take it and he spun into the ground. I pulled out at 8,000 and glanced down at the airspeed indicator. I saw the needle quivering around the 700-mile-per-hour mark. And about that time, the wing tanks I dropped at 23,000 feet whizzed past, missing me by a mere foot or two."

And . . . outrunning: Lt. Clayton Gross got his P-51 to really show its stuff, to get him home to England. Gross was over Frankfurt on February 8th, 1944 and got involved with more Luftwaffe than he could handle. With his wingman gone and four FW190's on his tail, he pushed the throttle through the gate into "war emergency" — an extreme throttle setting which allowed absolute full-engine power, but would wreck the engine after 5 minutes in this mode.

Needless to say, the Mustang got Gross back to Merry England.

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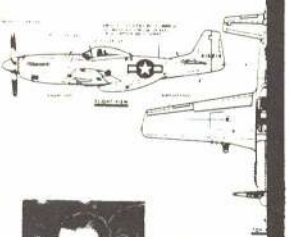

J. C. Meyer shot down the world's first (German) jet fighter.

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Editorial

Straight...and Level

Time for a change? Too much taken for granted?

BOB LOPSHIRE, a book editor and author of many years standing, is Public Relations Director of the Academy of Model Aeronautics. He'd blush at this, but Bob is a profoundly impressive, but soft-spoken, pleasant gentleman. A real modeler in the fullest sense of the word, he is a singularly well-equipped thinker, visionary but practical. It should not be surprising therefore that, in discussing a broad spectrum of problems and ideas, he would find a responsive chord in all of us, on one matter or another. He covers a lot of ground in relatively few words, so easily that one is hardly aware at first of all that he has said. In fact, what he has written—and probably never expected to see published—so intrigued the regular inhabiter of this soap box, that we have turned over the remaining space to Bob's eloquent discourse.

"As Public Relations Director for the Academy of Model Aeronautics, I spend many hours thinking about ways and means of promoting model aviation for the good of AMA members and modeling—promotions that will show the public what our hobby is all about and, in so doing, insure our obtaining, and keeping, permanent flying sites.

"All of us have had something happen which influenced us to take up modeling and to stay with it over the years. Although I began model building at six, it was really a visit to a county fair about ten that did it. Two high school seniors had rented a booth in a tent to 'sell' their hobby of model building to anyone who might be interested. Their main attraction consisted of a group of models they had built, the centerpiece a five-foot duplicate of a Travelaire, precisely modeled down to the last tiny fitting. I've spent the rest of my life trying to duplicate their efforts, even though I might be disillusioned if I were to see that model again today.

"So it was that, while haunting the scale cage at the 1970 Nats, I thought of those two boys, and it occurred to me that we in AMA have become blind to a most stimulating part, or parts, of our hobby, and that we had somehow gotten off on a weed-grown track which said that all scale entries had to fly. In so doing, we have eliminated the craftsmen who put hundreds of loving hours into the creation of scale airframes, scale (often working!) engines, and meticulous duplication of every single facet of their non-flying models. By not having these devoted scale purists in our ranks we could possibly be depriving ourselves of two important things—the opportunity to learn from them, and the all-important appeal to the public which their models would have if displayed for judging at the Nats.

"To go back to the idea of obtaining permanent flying sites, built and maintained by the government, the non-flying scale builders can help us achieve this by way of national attention drawn to their creations through the news media. I'm sure that the Smithsonian would be more than happy to participate in the program by way of an annual award in order to locate choice models for the Air Museum. The resulting publicity would do a great deal to help modeling in general.

"While on the subject of 'Pure Scale at the Nats,' I'd like to offer another suggestion in the same vein: the inclusion of professional model builders, to compete in a separate category, limited to their own ranks. The public today is highly aware of the plastic models of aircraft, but they are, for the most part, totally ignorant of how these easy-to-assemble little gems came into being. By creating a contest category for the professionals, we establish yet another more easily understandable link with the public to show the value of all aspects of modeling.

"Next, why not include model rocketry as a part of the Nats? Full scale rocketry and aviation have grown hand in hand, but the model end of both fields has gone off in diverse directions. When the public comes to our Nats, or even a local contest, why not show them a fully-rounded picture of aviation in miniature? Rocketry is the news today, aviation is not, so by exposing the public to both at the same time, we are able to show the fun aspects of both hobbies.

"Why not establish an event, open to all categories, for the most unusual flying model to appear at the Nats? The point of having such an event is that rather than toil within the limitations of the rule book, the minds of many would be stimulated, and a good deal of fun could be put back into our annual get-together. After all, ingenuity used to be the mainstay of the Nats, but we've seen too little of it in recent years. Because of close adherence to the rule book, so necessary for many reasons, the sameness of endeavor has become almost sleep-inducing.

"Too, some of the events are becoming so precise and so very much alike that even the modeler spectators are becoming bored! Take the RC pattern which has become boring for all but the contestants themselves, and even here we have a case of many giving it up in favor of fly-for-fun events—and therein lies a clue to a possible salvation for both the fliers, and the public who comes to see what we are up to.

"I'm not saying that we should do away with pattern entirely but, as a relief point, why not establish a free-style event which would allow a flier to show his mettle, to please the modeler spectators, and to give the public that old smell of imminent disaster that they so dearly love? Take the RC Team Selection Finals, (1970 Master's Tournament, Memphis) which was dull to the spectators until it had ended and Ralph Brooke then put on a demonstration flight and pulled out all the stops. The crowd, including the modelers, suddenly came to life. They loved it. Slam bang, go-for-broke flight—and it kept everyone on tiptoes until the final landing. Just about what we need to put the Nats back into business as a big crowd-pleaser for all concerned.

"Those are my thoughts. If you have comments on any, or all, of this, send them along to this magazine for a public airing. We may accomplish something—one way or another.". . .

William Winter

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Friendly modelers, Intl.

While flying at our field a couple of weeks ago, I was approached by a young man from Holland. He is the president of his club in Amsterdam and they are primarily interested in tow-line gliders and free flight (Wakefields).

He was interested in exchanging club decal stickers and I promised him I would try my best to obtain as many as possible from clubs of all types throughout the United States.

I would appreciate it if any members reading this letter would forward to me as many club decals as they can spare so that I may forward these to our foreign friend. He, in turn, will distribute them to other clubs in Europe.

It has just occurred to me: what a great sport this is, which enables us to befriend people all over the world, regardless of politics. It is one of the few common grounds left to us, and we should cherish it and make the best use of it. This gesture on our part will certainly help in that respect.

Mike Turo, Garden State Circle Burners, 43 Old Orchard Court, Cedar Grove, N.J. 07009

More on full-size plans

After some 25 years of interest in all phases of modeling, I believe that I can make the unqualified statement that *American Aircraft Modeler* is not only the best such publication available today, but all things considered, is probably the best that has ever been published. In particular, your thoughtful and intelligent editorials are outstanding; providing a clear insight into the rationale of the modeler, with the realization that modelers really are sentient beings.

My particular interest is scale rubber, designed and scratch. I arrived at this point after experiencing the full radio-control way of life. I did some thinking and have come to the conclusion that rubber scale is the branch of modeling which requires the greatest exercise of ingenuity and art.

I believe I have gotten more satisfaction from my hobby, and my sons are better able to participate in my modeling than if I were involved with the more complex RC systems. I design fairly large planes, as I have found that larger models generally perform better in the vacillating air conditions we have here in Belgium; they're also tougher and easier to trim.

I do think you should go back to the black-on-white presentation for plans and drawings. They are much clearer than the blueprints you have been using lately. Also, I suggest you look into providing full-size plans, a la the British *Aeromodeller*, printed on cheap paper and stapled into the centerfold. I can assure you that these are a tremendous incentive to purchasing this particular publication.

Bruce Johnston, Waterloo, Belgium

AAM has often considered "tipped-in" plans but production costs are excessive; in fact, this magazine once had such plans. Some of the foreign magazines could be printed for nearly a year for what it costs to produce one issue of a magazine like AAM, or its competitors—in this country.

—Publisher

Low cost, high quality

RC need *not* be expensive! After an absence of 20 years, I decided to go back to RC but was discouraged by the high cost. However, via some careful shopping through *AAM* pages, I enjoy Sunday flying again in almost any open field. Maybe the combo won't win contests but it is worth considering for low cost and high fun value.

The items can be duplicated from any issue of *AAM*. The single-channel RC system was used but guaranteed, priced under $20. Small flying areas and friendly neighbors required that a muffler-equipped 049 be chosen; price about $6. The plane kit is rudder only, high wing with tricycle gear for better landings; price is $5 plus paint.

For getting acquainted with RC, sport flying and low funds—this is a good way to go! Hobbies should not be expensive or complicated; maybe this idea will get some people who want to try RC into the swing.

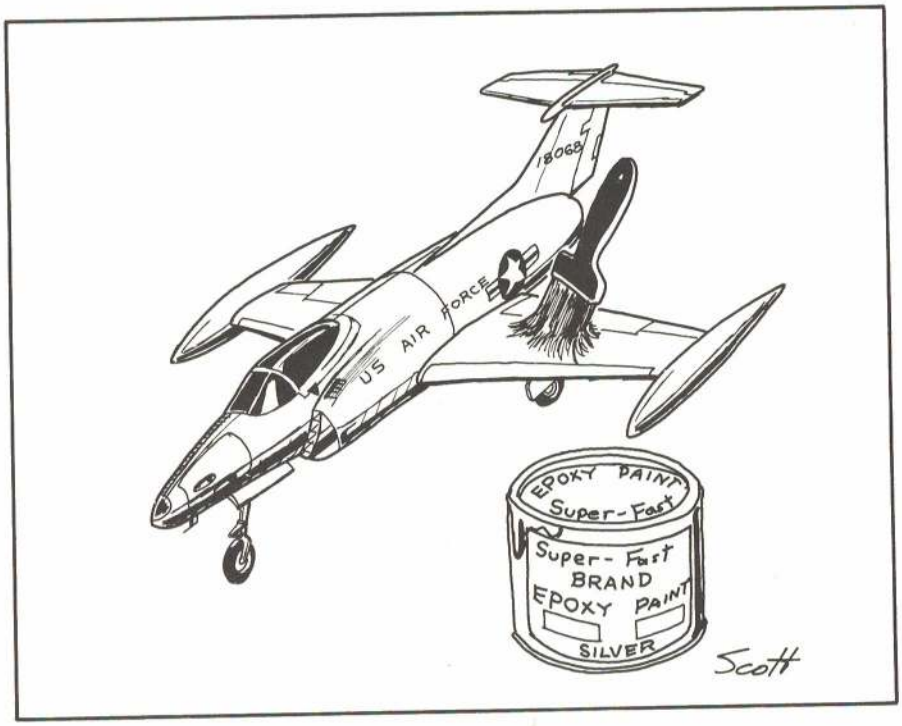
Chet Wolf, Bergenfield, N.J.

Addendum to the Natter

Regarding the Natter model—after being interested in the beast for nearly 20 years, I have discovered, quite by accident, that an adequate source of information and perspective drawings is now in print. Nothing in the publication conflicts with the three-views which I constructed from photographs, but it does provide much additional information.

The book is *German Secret Weapons —Blueprint for Mars*, by Brian Ford (Ballantine Books, 1969. $1.00). It devotes about ten pages to the Natter.

The most important thing shown is that the flat plate nose which houses the armament rockets was faired by a jettisonable plastic nose cone. I have always suspected this, but in none of the other references is such a fairing shown or even mentioned. The model as I drew it represents the aircraft in the attack mode, i.e., after the nose cone had been blown off. Since the sketches and photos show considerable variation, any modeler who wants to



For die-hards only!

There are still some of you around. You know a lot about modeling, yet you still cover your models the hard way—the old silk and dope method. Well, Top Flite's out to show you.

We happen to know that there's nothing better than Super Monokote. So we're going to send you a free sample just to let you prove it to yourself.

Then you'll believe us the next time we say Super Monokote with the "built-in-finish" is far better than silk and dope. It's easier. A lot faster. And it's actually less expensive. If you doubt us now, the least you can do is send in the coupon (or facsimile) and find out. But do it today, because this free offer is for a limited time only.

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YES, I'm a die-hard, but I might be convinced. Okay, send me my free sample of Super Monokote.

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(Please print) A

add the fairing is justified in using his own judgment as to its exact proportions.

Another interesting fact is that roll was apparently effected by differential movement of the elevators; at least in one drawing, the surfaces are labeled elevons. Noting the lack of ailerons, I had guessed that the rudder and sub rudder were used for this purpose.

Finally, I would like to record my admiration for the test pilot who was killed in the only attempt at manned flight of the aircraft. I had always wondered about the name of the man who had enough guts to strap that Roman candle to his back and push the button. The caption (in German) on one of the perspective drawings gives his name as Lothar Sieber and states that he was killed in the first attempt ever made to launch a manned rocket into vertical flight.

Bob Woods, Tucson, Arizona

Authors' defense

We got a big kick out of the varied reaction to our "Field Kit for a Free Flighter" as recorded in November's "You Said It." To clear up any possible confusion, we would like to give the following reply:

We build and fly free flight *exclusively*. However, some of our best friends are radio-control addicts.

Bill Hannan, Escondido, Calif.
Russ Barerra Lake San Marcos, Calif.

A vote for Ukie

I modeled and flew U-control for several years in the late 1950's and early '60's. I found during that time a great many other Ukie fliers and also felt that the magazines and literature were aimed toward a well-balanced modeling program. It seemed all facets were emphasized.

I just started to get back into the hobby since I have completed my education and have some time available. I was disappointed to find that in the last few years the emphasis has been placed more and more on RC and less on other areas of modeling. I'm sorry to see this because I feel it eliminates a large number of younger kids who don't have the money for RC.

I just moved into a medium-sized city and nowhere can I find another U-control modeler and when I called the RC club in town, they had no Ukie flyers at all.

I hope this letter will alert some of those RC fliers and potential RCer's to consider these factors: it may lead to a loss of one of the more important facets of modeling.

Richard N. Cheney (no address given)

Zilch the plans

Your magazine is the best model aero publication ever—and I have lived through the *Flying Aces* and *Air Trails* era. However (now you know you're in trouble!), nothing turns me off quicker than "full-size plans available."

The electric airplanes, super stunts and thermal screamers, ok. But please print the rubber scale beauties on several pages. Make this a policy, like you did with the Stormovik.

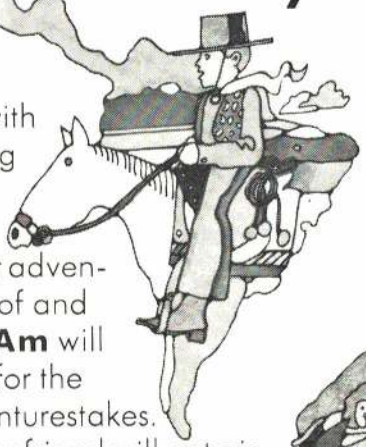
Milton Sheppard, Ward, Pa.

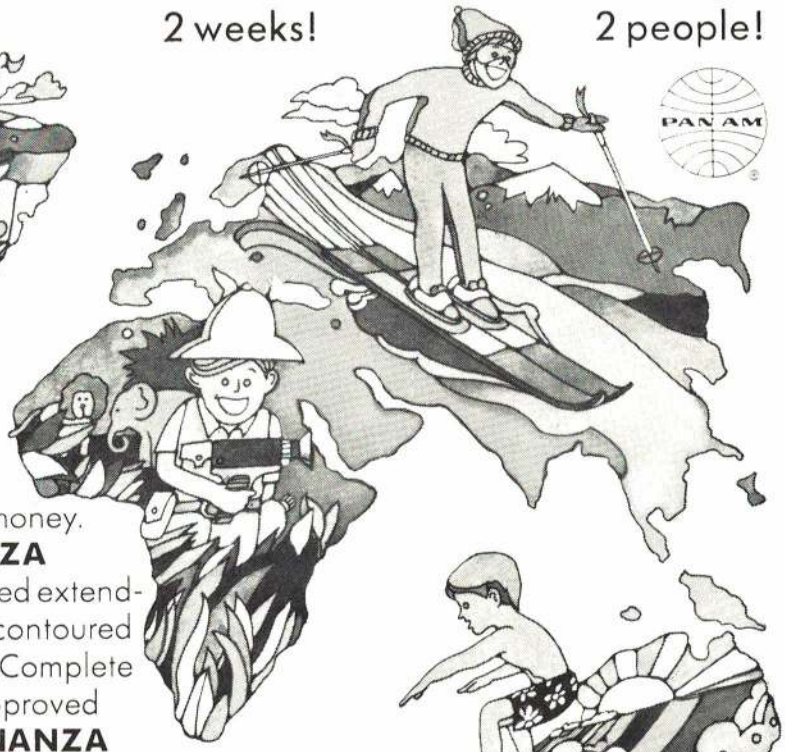
Wish we had the space!
—the Publisher

Enter Revell's Adventurestakes

Win your dream Adventure anywhere in the world via PAN AM!

2 weeks! 2 people!





FIRST PRIZE! Imagine exploring the mysteries of Timbuktu...riding with the gauchos...skiing the Alps...surfing the Bombora... imagine the wildest adventure you can think of and **Revell** and **Pan Am** will make it come true for the winner of the Adventurestakes. You and a parent or friend will get air fare, hotel and tour expenses paid for two weeks plus $100 action spending money.

OTHER GREAT PRIZES! 25 BONANZA MINI-CHOPPER BIKES! With chromed extended forks, riser handlebars, low contoured seat and chromed sissy bar. Complete with Bonanza/AIM Approved Safety Helmet. **3 BONANZA SNOWMOBILES!** The most advanced design machine of America's fastest growing sport.

12 TELEDYNE PACKARD BELL PORTABLE COLOR TELEVISIONS! 12 inch diag. Astro® model with exclusive Instant Color Purity. 600 SIX PACKS of REVELL KITS! 400 REVELL APOLLO MODEL KITS! 1,050 PRIZES IN ALL!

EASY TO ENTER! Send an end panel from any Revell model kit with your name and address on the back. (Or send a reasonable facsimile—the word "Revell" printed in block letters on a piece of 3"x5" paper with your name and address.)

EXTRA BONUS PRIZE! Every winner who uses an official entry blank will receive a FREE seven transistor radio with his other prize. Entry blanks are packed in every one of the 13 new Revell Kits marked "Adventurestakes" on the outside. Or get an entry blank on the Adventurestakes display at your Revell dealer. You can also get an official entry blank by writing Revell and enclosing a stamped, self-addressed envelope. **Get Your Stake In The Adventurestakes In Now!** Sweepstakes entries must be postmarked no later than May 30, 1971. Winners selected after Aug 1, 1971. Enter often! No purchase necessary.

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Revell

Revell, Inc., 4205 Glencoe Avenue, Venice, California 90291.

1970 RC GLIDER NATS

On the Scene

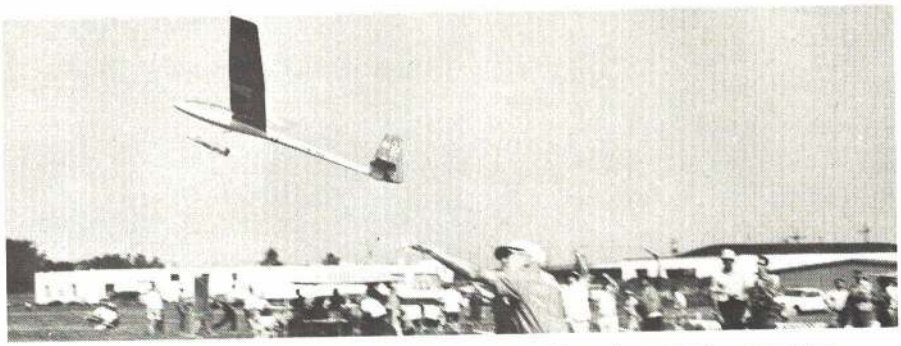
The Objective: To fly by thermals from winch launch for exactly 15 minutes and land in a 15-foot circle.

HOWARD McENTEE

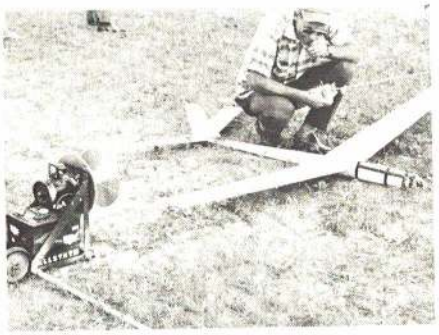
LONG MONTHS OF PLANNING by Dave Burt and Dan Pruss culminated in a most successful RC Soaring meet, held at St. Charles, Ill., some 40 miles from Glenview Naval Air Station. The meet was scheduled for the first two days of Nationals Week, when the main RC Nats activity was Pylon eliminations. Since RC'ers from every part of the country came to Glenview, it was hoped many would tote along an RC glider for this special extra event.

With rapidly-growing RC glider activity all over the country, it's time to consider adding this event to the regular Nats schedule. Though sanctioned by AMA, this particular glider meet had no official AMA support, aside from considerable mention in AMA publications.

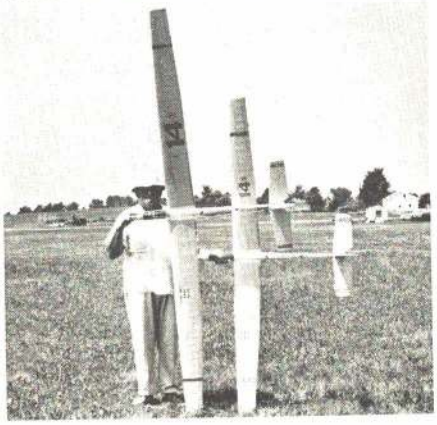
(Continued on page 64)



Howard McEntee releases a Graupner Cirrus, one of the finest thermal-riding RC gliders.



Bob Robeler's Kirwi has propless engine in nose. Dave Burt's compact winch.



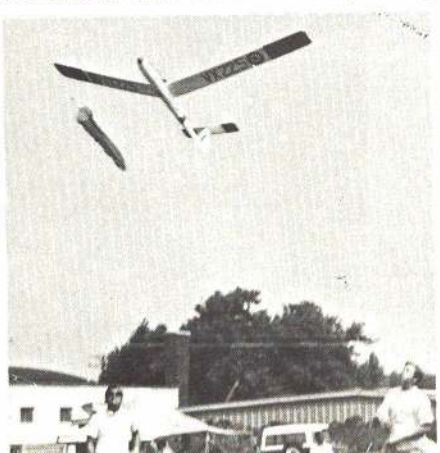
Sam Crawford placed fourth in each event with standard and short-winged Cirruses.

Bob Andris was second with scale English model. Swept-forward wing, T-tail.

Lower left: Andris' scale model heads aloft. Like many others it features an all-moving stabilator. Note nearness to houses, etc.

Lower center: Name of model on stabilizer is E Z Juan. Design by Le Grey is to be kitted by Jerry Nelson, who holds it.

Above: Mark Smith shows his technique for spot landing. He won Class A with original design.



Carl Lorber's fairly conventional model with the new Hartman glass fuselage.

CARL GOLDBERG

THIS MONTH IN THE SPOTLIGHT

CG MINI-LINK

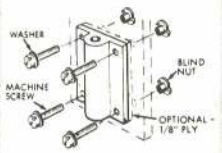
I think a lot of modelers are going to like our new MINI-LINK. It's strong enough to hang 3 big 7 lb. ships from it. But it's small enough to look right on the new small models. Made of tough nylon, so you can use it anywhere because it makes no electrical noise. MINI-LINK comes with a long, strong rod (needs no connector) and has a mini-price—29¢. See your dealer for it.

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

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

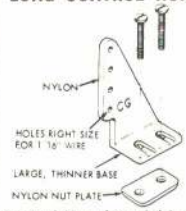
FITTINGS and ACCESSORIES

NOSE GEAR BEARING



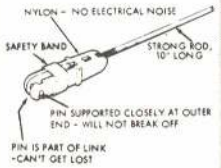
One-piece Nosegear Bearing mounts easily to firewall without alignment problems. If extra steering angle is desired, use ⅛" ply stand-off. Includes blind nuts, screws, etc. .....**60¢**

LONG CONTROL HORN



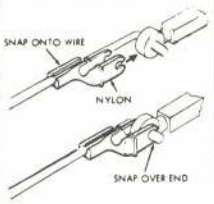
Control Horn has right size holes for 1/16" wire, and nut plate for simplest mounting to control surface. Horn is long for maximum range of throw; can be cut down. **50¢ for 2**

NYLON AJUSTO-LINK



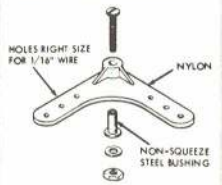
Ajusto-Link is used for adjusting linkage to control surfaces, throttle, steerable nose gear, etc. Nylon-tough and no electrical noise. Takes heavy load. ..... **29¢**

SNAP'R KEEPER



Quickest, handiest way to secure pushrod wire end to servos, horns, etc. Nylon can be squeezed together with pliers to work on wire under 1/16" diameter. .....**50¢ for 4**

AILERON BELLCRANK



Bellcrank has steel bushing of proper size, so crank can be screwed firmly in place without binding. No electrical noise — all metal parts are screwed tightly together. **50¢ for 2**

NYLON REINFORCING TAPE

Extremely tough. When applied with heavy coats of cement, it approaches fiberglass. Excellent hinge material. ¾" wide x 5 ft. .....**25¢**

SHEET METAL SCREWS

Sheet metal screws—like wood screws, but better. Sharp, clean, full-depth threads, hard and strong. Excellent for mounting servos, etc. Includes washers. **#2x5/16 20¢ for 10, #4x⅜ 20¢ for 8**

STEERABLE NOSE GEAR

Steerable nose gear with shock absorbing steering arm, molded one-piece nylon bearing. Includes blind nuts, screws, etc. **$1.95**

Falcon 56 Canopy	**75¢**	Skylark 56 Canopy	**75¢**	Falcon 56 Nose Gear ..	**50¢**
Sr. Falcon Canopy	**75¢**	Jr. Skylark Canopy	**25¢**	Jr. Falcon Nose Gear ..	**25¢**
Jr. Falcon Canopy	**25¢**	Shoestring 54 Canopy	**75¢**	Shoestring Land. Gear	**$1.50**

Falcon-Skylark Wing	**$7.95**
Sr. Falcon Wing	**....$14.95**
Skylane 62 Wing	**....$14.95**

CONTROL LINE and FREE FLIGHT MODELS

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Ranger 28

RANGER 21 — All die-cut balsa parts. 21" span beauty. **$1.98**

RANGER 28—"Pre-fab plus paper." 28" span, 2 colors. **$1.98**

SHOESTRING RACER — 18" span. All die-cut balsa. **$1.98**

CESSNA 180 — The champion of business liners, 21" span. **$1.98**

SPIRIT OF ST. LOUIS — A miniature duplicate, 21" wingspan. **$1.98**

FREE FLIGHT

½A Viking

½A BLAZER — Die-cut balsa, tissue, 40" span, for .049 engine. **$4.50**

RANGER 30 — Die-cut balsa, 30" span, for .010-.049 engine. **$3.50**

VIKING — 48" span, Hi-thrust, for .049-.051 engine. **$5.50**

½ A CONTROL LINE

Stunt Man 23

LITTLE TOOT — Sporty Biplane, for .049 engine, all die-cut balsa. **$3.50**

LI'L WIZARD — Shaped balsa wing, die-cut fuselage, 21" span, for .049 engine..... **$3.50**

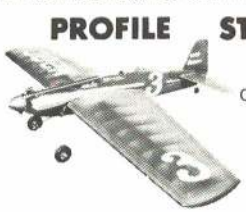
STUNT MAN 23 — Die-cut balsa, 23½", for .049-.09 engine. **$3.50**

P-40 FLYING TIGER — 18" span, all balsa pre-fab for .049 engine. **$2.95**

LI'L JUMPIN' BEAN — 21" span Favorite ½A stunt model. **$2.95**

SWORDSMAN 18 — Die-cut balsa, 18" span, for .020-.049 engine. **$2.95**

PROFILE STUNTERS



Cosmic Wind

SHOESTRING STUNTER — 42" Top stunt model for .19-.35 engine. **$6.95**

WITTMAN BUSTER — 40" Sharp stunt model for .19-.35 engine. **$6.95**

COSMIC WIND — 43" span, for .19 to .35 engine. **$6.95**

COMBAT & RAT

VOODOO — 36" combat-stunt for .19-.35 engine.
Single kit $4.50 Double kit $7.95

LI'L SATAN — 19" span, ½A combat-stunt for .049 engine. **$2.50**

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RAT RACING

SKAT RAT — Shaped wing and fuselage. 31" span, for .29 to .40 engines. **$5.95**

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Safti-Flite ½A Handle including lines .....**69¢**
½A Flying Line .....**25¢**
Nylon Tape ¾" x 5 ft. .....**25¢**
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=4-40 Blind Nuts .....**20¢ for 4**
Snap'R Keeper .....**50¢ for 4**
=2 x 5/16 Sheet Metal Screws with Washers .....**20¢ for 10**
=4 x ⅜ Sheet Metal Screws with Washers .....**20¢ for 8**
Long Control Horn.....**50¢ for 2**

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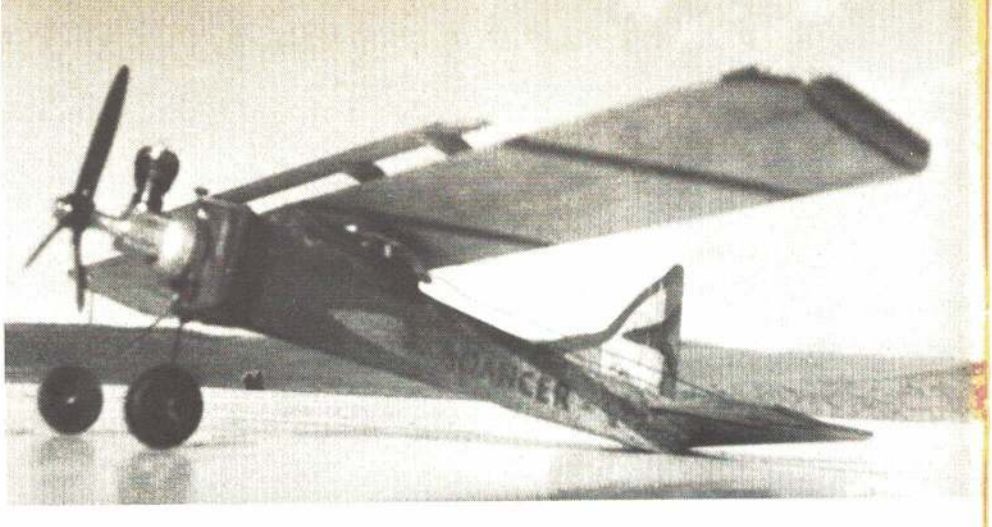
Photos by the Author



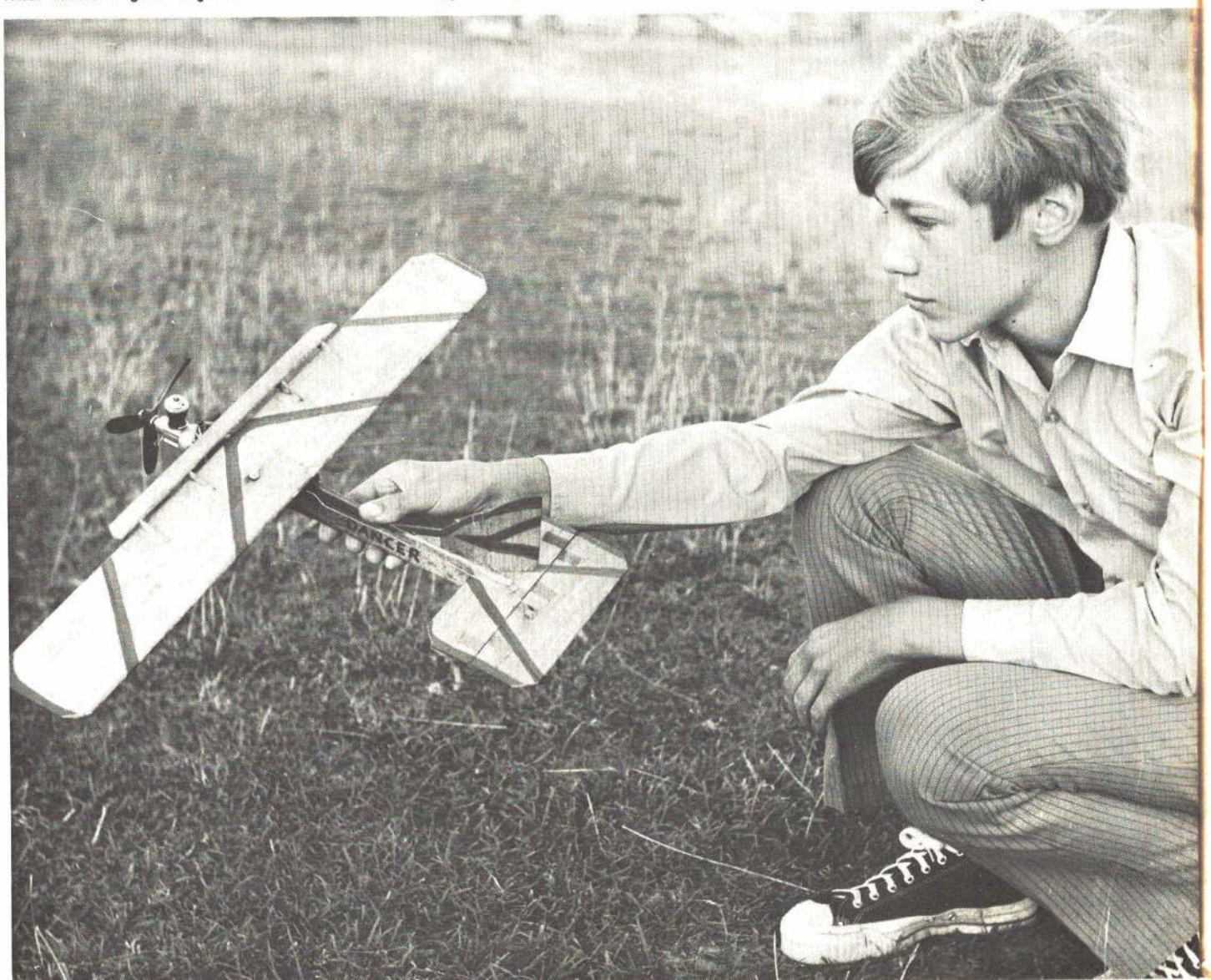
dancer

Dennis Haimerl is a Tenderfoot modeler, but he has designed his own control line trainer. Full-size and ready-to-use plans are on pages 45 and 48.

DANCER IS A SIMPLE model to construct because of its straight design. It does require elevator hinges, but they are not difficult to install. Hinging methods other than cloth (or other fibered materials) are up to the builder. However, cloth is best.

Ready-to-use plans are on the back of the magazine's centerspread. For the wing use a ⅛ x 3 x 24" piece of balsa. Mark its center and align with the cen-

What makes a good beginner's model? It must be rugged, easy to make, interesting, fairly slow, and easy to fly. Dancer is.



ter of the plans. Wing tops are placed at the end of the balsa. Cut out the pieces.

After the wing has been assembled, pin it down on a flat board. Apply cement liberally to the center of the wing and set the fuselage piece in place. Add the ¼ x ¼ x 3" fillets to each side and hold in place with pins. Using a small square, make sure the fuselage is exactly vertical to the wing. Apply cement to the center of the stabilizer and slide it into position in the fuselage slot. Again use the square to be sure the trailing edge of the stabilizer is at a right angle to the fuselage. Measure the distance from each stabilizer tip to the building board and make sure they are the same.

Be sure the rudder is parallel to the fuselage. Set the trailing edge of the rear piece offset ¾ in. to the right of the fuselage.

Apply cement to the back of the plywood firewall and to the two ½" gussets, then set into place. The firewall must be tight against the front of the fuselage. Cement two of the 1/16" plywood pieces to the wing at the bellcrank location. Allow the whole assembly to dry overnight.

Since the Dancer was built for flying, paint should be kept to a minimum. First smooth all edges with fine sandpaper, then apply only a few coats of clear dope.

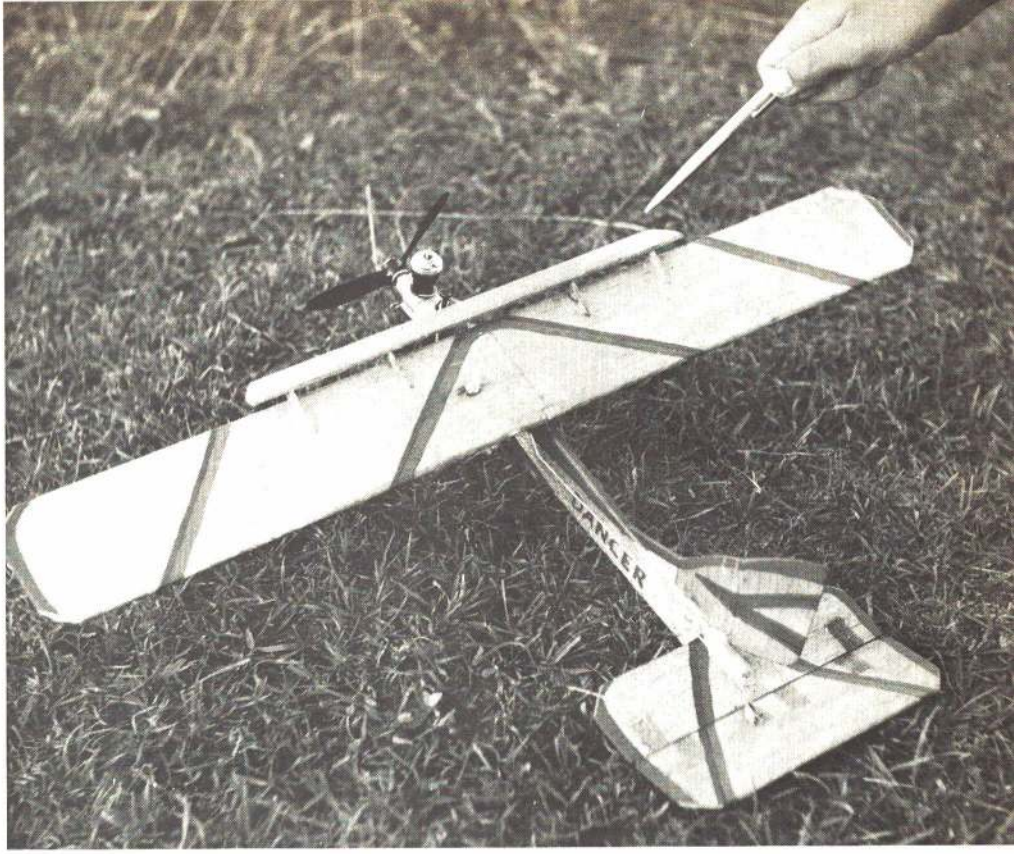
When the dope has dried, assemble the slot. It should be sanded as shown on the plans for best performance. Cement the triangular slot supports to the wing and, when they have dried, glue the slot in place. Cover these parts with clear dope. The entire model may then be covered with one or two coats of color dope, if desired.

After the final coat has dried, the controls and engine are installed. Mount the horn on the elevator and bend the pushrod to fit. Put the pushrod into the outer hole of the bellcrank, which is then set on the 1/16" plywood pieces attached to the wing. Drill a 3/32" hole through the bellcrank mount and attach the bellcrank with screws. If desired, make a landing gear of 1/16" music wire and mount it between the engine and the firewall.

Flying is easy. Use a 6-3 propeller and 20- to 30-ft. flying lines. Launch downwind to keep the lines tight. Have your helper toss the model level so that the controls are not jerked.

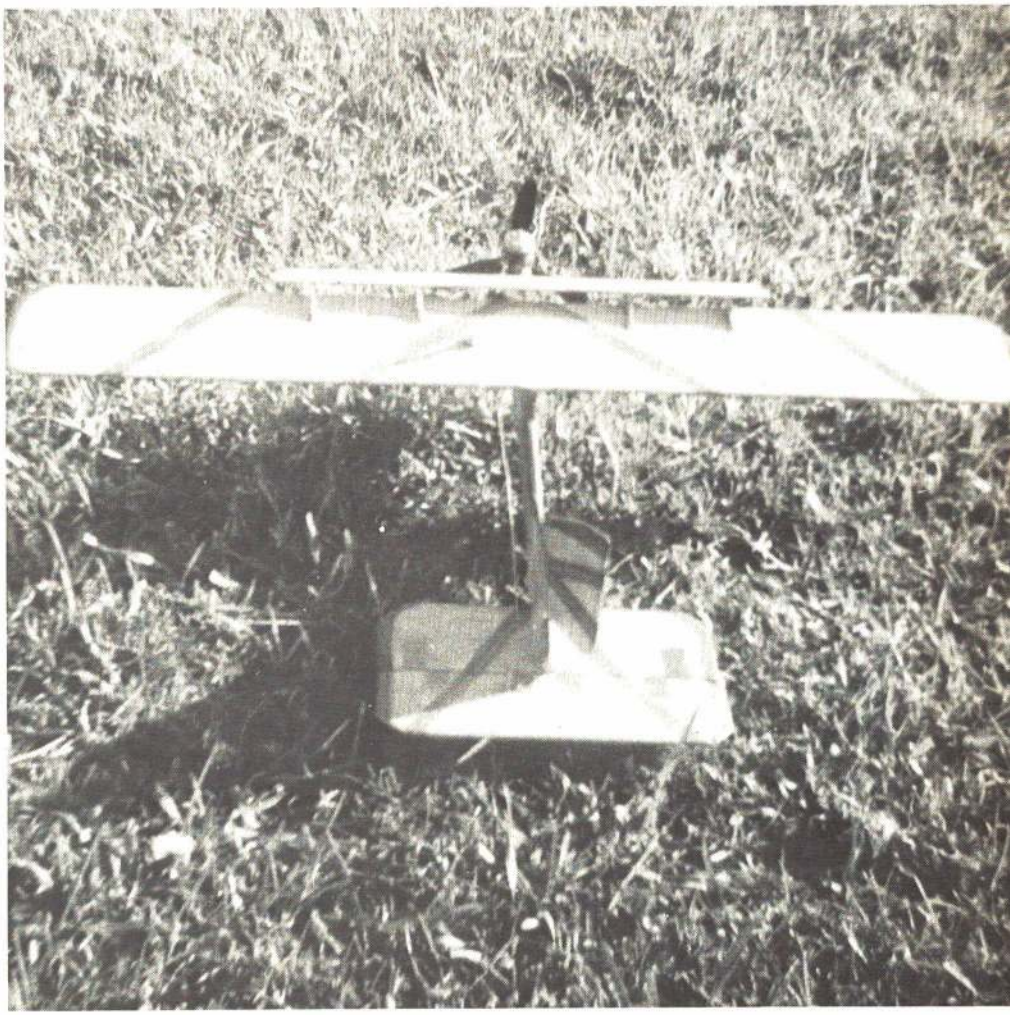
MATERIAL LIST

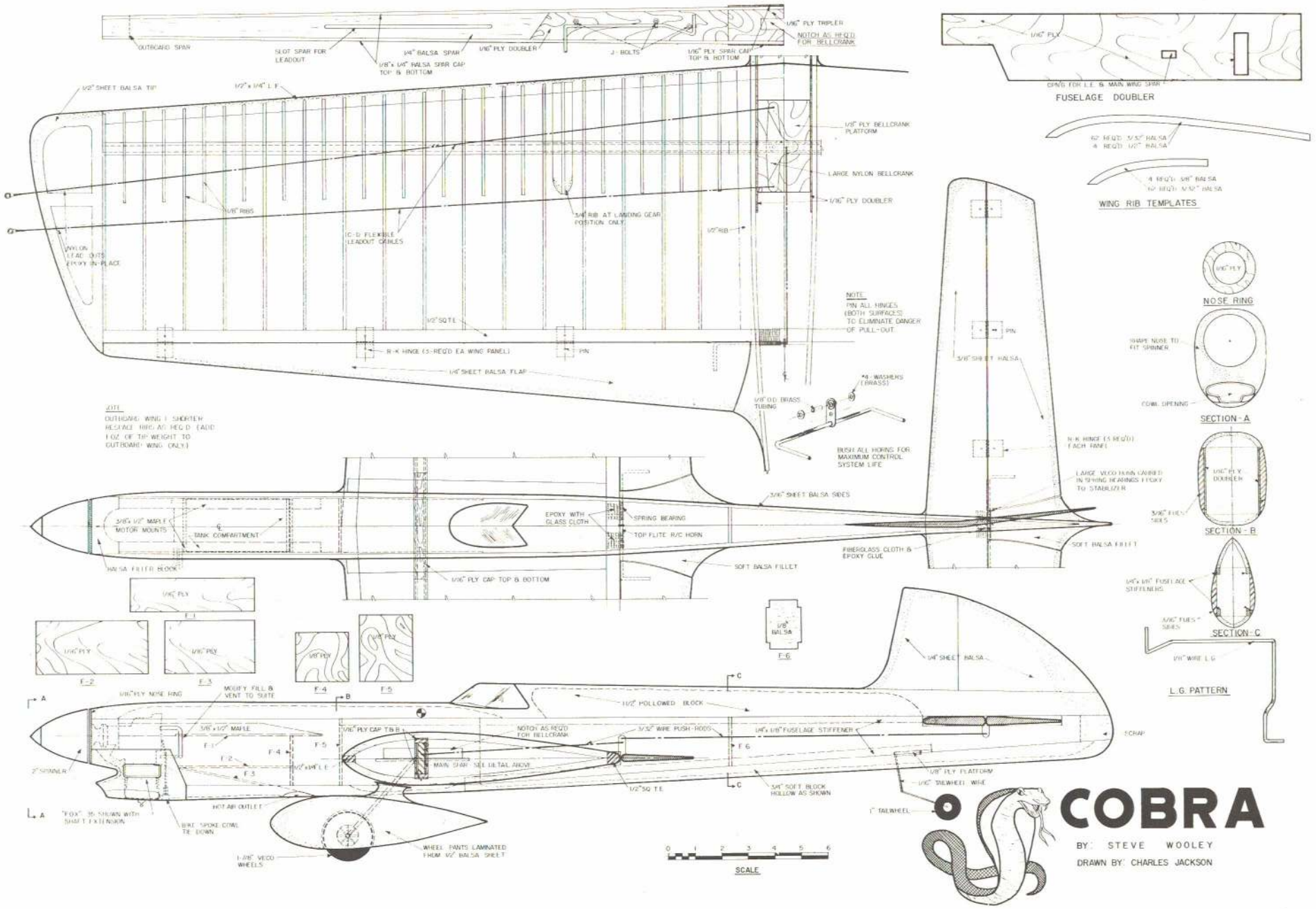
1 Baby Bee 049
1 pc. ⅛ x 3 x 24" balsa wing
1 pc. ¼ x 3 x 12" balsa fuselage
1 pc. 3/32 x 3 x 15" balsa tail
2 pcs. ¼ x ¼ x 3" balsa wing fillet
2 pcs. ½ x ½ x 1¾" balsa firewall gusset
2 pcs. 1/16 x ¾ x 1" plywood
1 pc. ⅛ x 1¼ x 1¾" balsa firewall
1 pc. ⅛ x ½ x 12" balsa slot
1 ½-A-size bellcrank and horn package
1 pc. .055 x 12" music wire pushrod
1/16 x 9" music wire landing gear
1 pc. 2 x 3½" silk cloth hinges
1 pc. 1/16 x ½ x 2" plywood
2 light 1-in. dia. wheels
4 #3 x ⅜ wood screws
small jar clear dope



The slot makes the flat wing act like a proper airfoil. Simple.

Large rudder and offset keep lines tight. Note slot gap above wing.





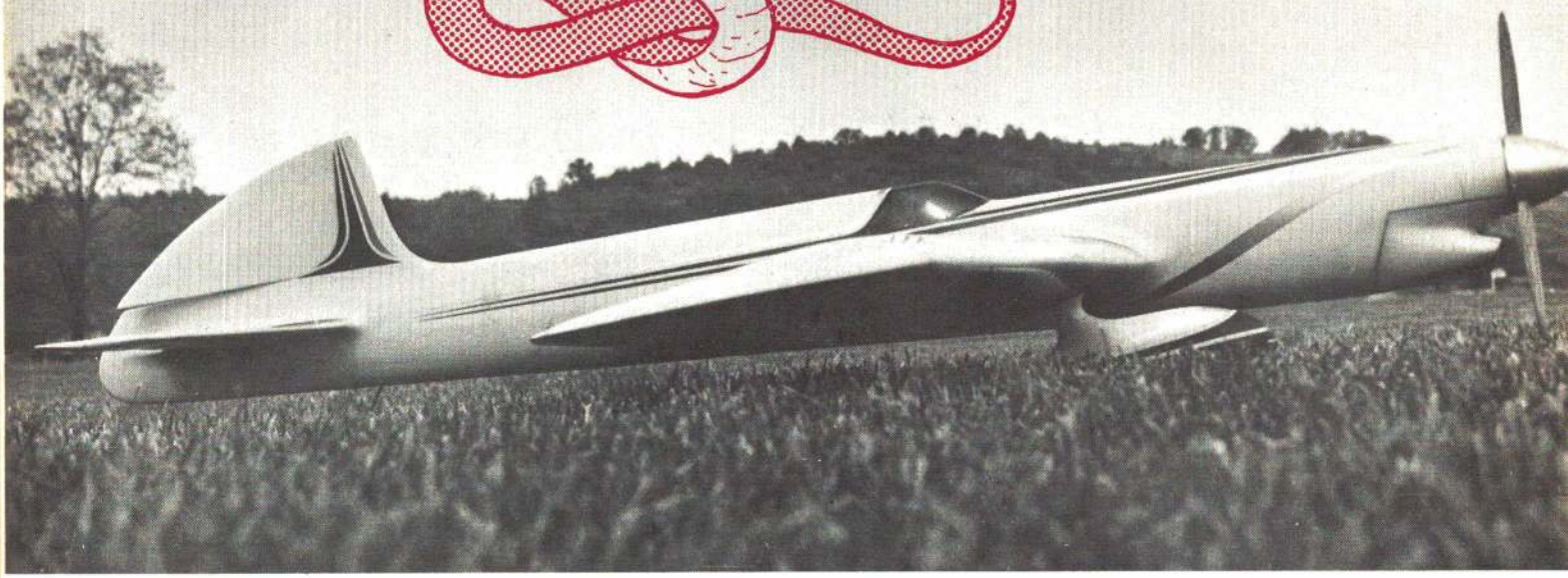
COBRA

BY: STEVE WOOLEY

DRAWN BY: CHARLES JACKSON

FULL SIZE PLANS AVAILABLE — SEE PAGE 70

COBRA



STEVE WOOLEY

This old classic precision aerobatic control liner is still winning. It is based on National and International successes by the author.

Fortunately for the Stunt event, there are several successful philosophies of design. Some argue for realism, scale, and large size. Others go for low front area, big elevators, 35 engines, and classical lines. One flier may feel only flying counts, while another thinks the event is a display from entry circle to finish of flight. Steve's Cobra is uncomplicated 35-powered model and a very smooth flier.

COBRA IS my approach to precision aerobatics with a control line model. It is not a stunter—the twin-boom, trimotored, jet-styled models of the past several years are. It is significant that, while the 1968 FAI Control Line Team selection events were crowded with jet-styled models, it was the conventional aircraft that finally placed one, two, three, four. Cobra was in this group and carried the U.S. colors to Helsinki, Finland, where it finished fourth in the 1968 World Control Line Championships.

Not without a pedigree, Cobra is derived from the successful Argus, which I flew to berths on U.S. Control Line Teams twice and which helped bring the title of World Precision Aerobatic Champions to the U.S. teams both times. Built in 1959 and first flown in 1960, Argus is still capable of performing contest caliber maneuvers and has never been altered in any way since its construction. But it is a small aircraft and has shortcomings. Large flaps that provide a slow, smooth turn for the original FAI pattern (no squares) require much effort in AMA contests.

Therefore, Cobra is larger by 80 square inches, has smaller flaps, and a very large horizontal stab and elevator. This ship will turn with anything flying but, since I feel a rather harsh overall pattern appearance is produced by the T-Bird or Shark type of turn, noseweight was increased until the desired kind of turn was achieved. Weight was added by machining a brass crankcase cover for the engine and trimming it until the proper ballast was reached.

I am not a scientific builder. My models could be compared with a bumble bee; perhaps they shouldn't fly, but they certainly do. I use no dihedral or anhedral in the wing or stab, no differential flap control, no three-bladed props, tricycle gear, or twin engines. I prefer the classic approach to precision aerobatics. Gimmick models may enjoy some limited success, but in the long run the classic ship will far outdistance them.

Cobra is a second generation Detroiter-type design of the Argus, Ares, Atom class and, along with Billy Werwages' Ares, seems to be the only model of this lineage enjoying success in recent seasons. However, the present larger Ares of 700 square inches was originally flown with a K&B 45, so Cobra is somewhat unique. It is interesting to note that Werwage has never enjoyed the success with his Super Ares that he had with the normal-size airplane.

Construction

Construction is quite simple. It is assumed that those interested in building the Cobra are competent modelers, so detailed instructions are not needed. Begin by constructing the main spar or I beam. Install the control system and slip on the assembled fuselage sides. Glue the front formers in place and then glue the spar-fuselage assembly together.

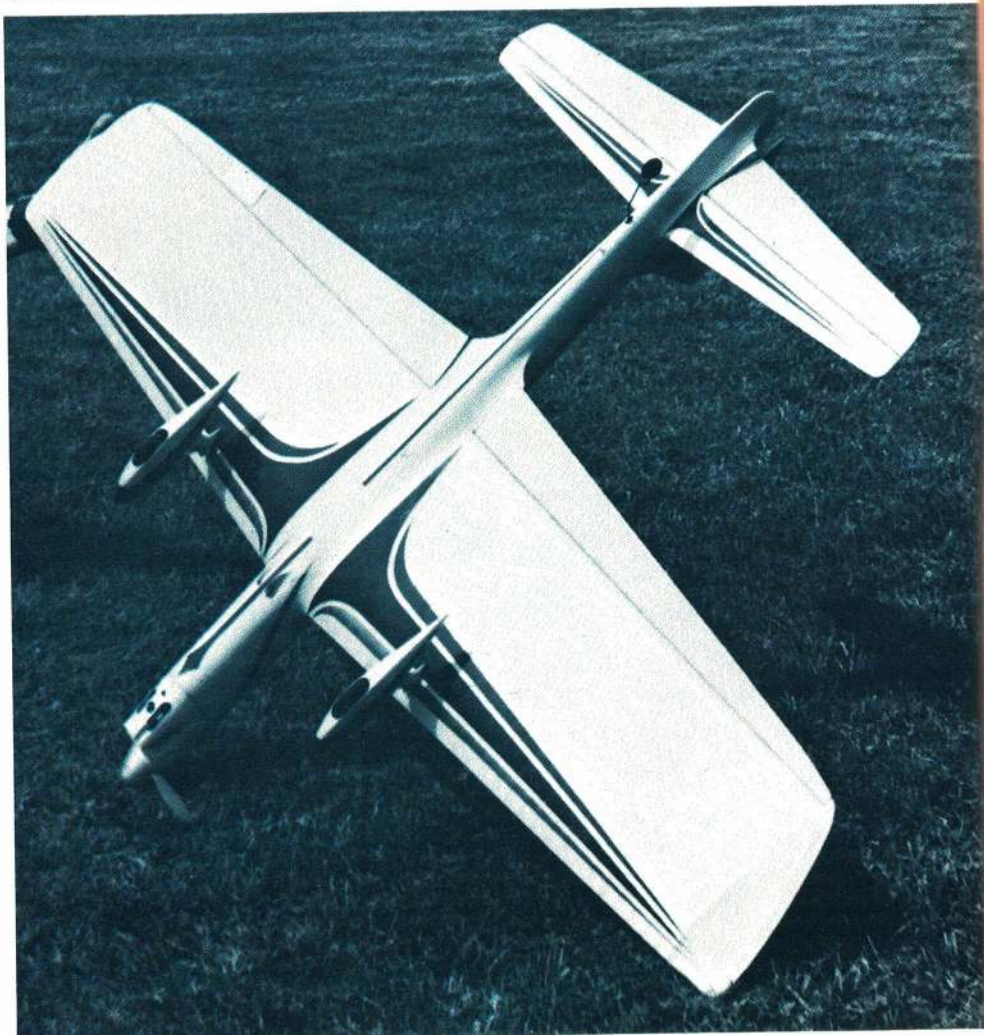
Invert on a flat surface and slip the leading and trailing edges into position. Jig up to the proper height and secure. Now begin gluing the ribs in place, always trimming from the trailing edge of the rib, never the leading edge. When dry, remove from the jigging and glue the top ribs in place.

Install the flaps and tips. Cement the rear fuselage former in place and tack glue on the fuselage blocks. Carve to shape; then remove and hollow to a 1/8-in. wall thickness, taking care to keep the rear fuselage sections as light as possible.

The stab-elevator assembly is installed

A first-flick start helps the score too, so model is always inverted to start. This allows an unhurried flight. Model is not placed on ground until pilot signals for launch.

Attractive undersides are of value in aerobatics because the bottom is in view almost as often as top side. The aircraft and its flight must impress the judge every moment.



next. Solder in the pushrods. The tailwheel fixture is added, and the shaped fuselage blocks permanently glued in place. Use epoxy to attach the plywood nose ring. The engine is installed next. Assemble the cowling and carve to shape. Bolt the landing gear, with wheel pants already attached, to the main spar as shown. Add cockpit detail as desired. Glue the canopy in place and begin to build up the wing and stab fillets of plastic balsa (or leather, if preferred).

The aircraft is now complete except for finish. Cover the fuselage and sheet balsa areas with lightweight silkspan. Then lightly sand with 320 wet-or-dry (it cuts the rough edges right now—courtesy of Art Adamisin). Two coats of clear dope should seal nicely. G. M. silkspan is used wet to cover the wing, followed by four or five coats of clear dope.

Apply base color as desired, two coats will be satisfactory if sprayed. Trim lines should be masked when the base is thoroughly dry and can be brushed on. Two coats are enough. Use a spray outfit to give the model two to three coats of clear, and then put the ship away for two or three weeks. By then, all the trapped thinner should have evaporated, leaving a nice hard finish for wet sanding and rubbing out.

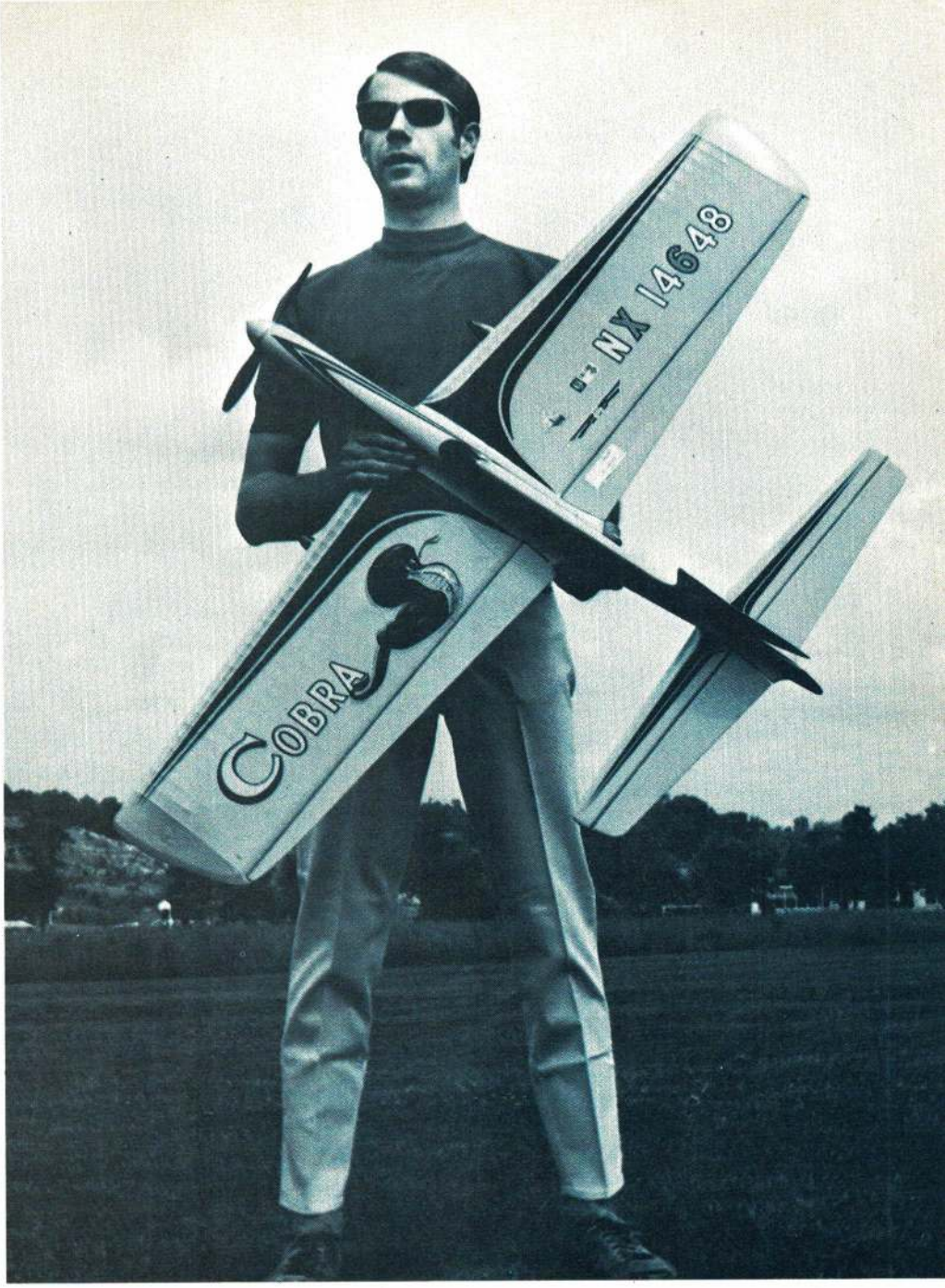
Flying

The Cobra is an extremely capable model. Treated with care, it will provide many years of competitive performance, barring pilot error. The following observations, made during several years of intensive contest flying, should be of value in making you and your Cobra a successful combination.

Leading competitors have been discussing something called impression points. Let's face it, they are real and, more accurately, should be called pilot appearance points. A competitor's manner, dress, and conversation all make an impression on the judges, which is frequently reflected in the scoring. Therefore, be as neat as possible, and dress to be noticed favorably. Above all, be professional. By handling yourself and your model with confidence and competence, the battle is half won. Avoid dramatics during maneuvers. Body english won't help and it tends to distract judges' attention from the aircraft.

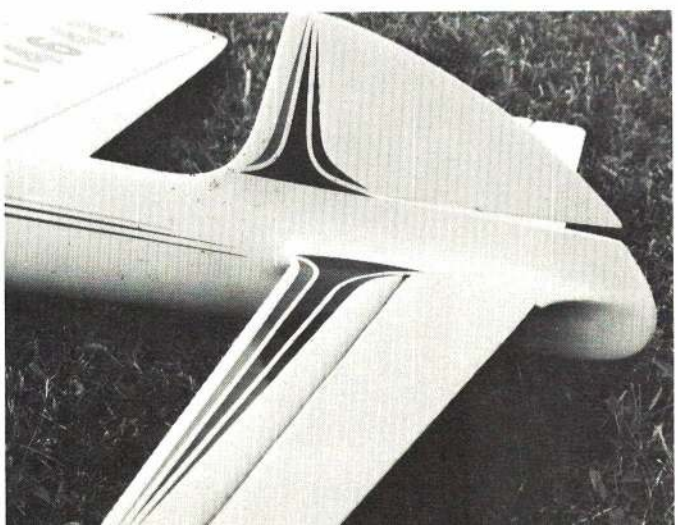
Cobra is always inverted for starting, to insure first flippers and gain those valuable points. The wheels never touch the ground until the instant of launch, eliminating the possibility of a chipped prop. Educate your helper on this point.

(Continued on page 64)



Steve Wooley with his Cobra. The article goes into more of what it takes to win than just the airplane. Steve believes in "impression" points—says "Be professional about it."

The plane's graceful curves are enhanced by the generous fillets, which also increase strength. Use soft balsa or leather.



Tank filler and vent are faced forward with long brass tubes. Both engine and tank are removable. Nicely carved cowl.

Where the action is...
FREE FLIGHT

Albuquerque Affair

FAI Team flyoffs were plagued by rough windy weather, but after three days an outstanding group emerged victorious.

BOB MEUSER, CHUCK BROADHURST, AND KERMIT WALKER

All Photos by Bob Meuser

TIME FLIES WHEN you're having fun, and it really zipped by at Albuquerque over the Labor Day Weekend. Free-flighters from all corners of the country came to compete for nine coveted positions on the 1971 FF Team which will represent the U.S. at the World Championships, to be held next summer in Goteborg, Sweden. At stake were three team spots each in FAI Power, Nordic towline glider, and Wakefield rubber powered models. The entries—about 100 of them—were to fly five rounds a day for three days. This grueling test was designed to prove consistency of man and model in good air and bad. And it did!

Barring a little rain, Albuquerque's pre-contest weather was typical. Average winds were less than 10 mph, except for the day Paul Crowley's No. 1 Wakefield was sucked up into a wayward thunderhead—the first seen in those parts for months!

Weeks before, the comforting word from the weatherman was that, statistically, only one or two windy days during September were likely. Hah! He also predicted, "The odds are three to one for clear skies and temperature maximums should be 80-90 degrees with abundant thermals." Hah, again!

Just hours before the big three-day flyoff was to begin, the Weather Bureau warned of hurricane winds in the Gulf of Mexico and of another massive storm system working its way across the Pacific Southwest out of Baja, Calif. Albuquerque never felt the full brunt of these storms, but their side effects on the contestants and models were something fierce.

Warren Gillespie broke a 50-lb. towline. Gene Jensen, picked up by a passing motorcyclist, followed his model nine miles through town. Kermit Walker and Phil Klintworth snapped 30-lb. lines on tow. Rattlesnakes appeared, too. Hank Spence almost stepped on one, and was he scared! One guy reached into a hole and pulled out a four-ft. bull snake. After that, we wondered how many decent, law-abiding snakes were dubbed "rattlers."

Saturday, opening day, skies were overcast, with slight drizzle. The wet stuff soon stopped, only to replaced by winds, ranging from 35 mph at ground level to 60 mph aloft, and scattered cloudiness. Who could pick a thermal under such conditions? In the first round, 1966 Wakefield team member John Lenderman posted 69 sec., 1968 Nordic team man Phil Klintworth got 146, and in Power, Buzz Averill (who was figured to be a strong contender)

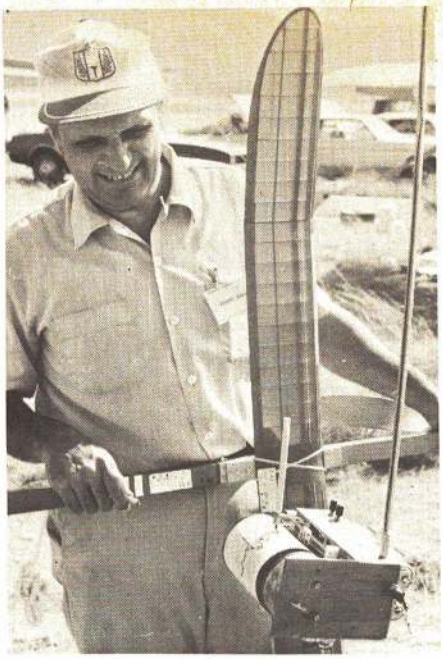
Buzz Averill placed second. He used thermal detector, electric starter, and tachometer.

Most unique plane is Doug Joyce's pusher. Great glide and climb, but poor transition.

Third in power went to Tom Kerr. Note the distinctive tip shapes and structure.

John Allen won Wake with MonoKoted job, timer-equipped. Aluminum front fuselage.

Fudo Takagi holds while Bob White winds. He always uses twin rudders, no auto-stab.



George Xenakis watches his original recording thermal detector. Others used similar ones.

could only muster 152. Disastrous! Out of 35 power entries, 23 failed to max. "I have a hunch that the Finals won't be settled by large strings of maxes, but rather by the best downdraft times," commented Denver's Bill Gieskieng.

At day's end, Dub McCormick was the only Power flier with a perfect score—900 sec. Others in the top five were Jim Taylor and Tom Kerr, with 887 each; Wallace Johnson, 874; and Buzz Averill, 872. Lee Polansky was all alone at the top in Nordic with five maxes, and Bob White paced the Wake fliers with 817. Obviously, most fliers were not prepared for the strong winds.

But conditions had to get worse before they got better. Sunday dawned not only cloudy, with high winds from the north, but cold too.

Round 1 was cancelled. So was Round 2. Anxious eyes peered skyward. Some fliers sought refuge in their cars. Others stood around in small groups chatting, shivering, and consuming gallons of coffee. A test flight was put up. In a minute and a half it was almost OOS. "When I saw birds walking," commented one entrant, "I figured we'd had it!"

The sun did break through by mid-day and, although the weather was still breezy, flying resumed. Time permitted only three rounds. McCormick powered to three maxes. So did Averill, Kerr, Rol Anderson, Dick Colonna, Annie Gieskieng and Bud Romak. Jim Taylor missed one max, but still was in fifth place after eight rounds.

Leaders in Wakefield and their eight-round scores were: John Allen, 1379; George Xenakis, 1344; Bob White, 1329; Gene Jensen, 1269; and Fred Pierce and Walt Ghio were tied at 1254. Topping the Nordicmen were Lee Polansky, 1436; Dennis Bronco, 1320; Hugh Langevin, 1301; Willard Smitz, 1280; and Phil Klintworth, 1250.

Labor Day came and so did strong winds, up to 30 mph. Drift was again north to south, putting numerous flights out over the city. Not until afternoon did Old Sol come through to warm things up. Six rounds were flown in each event.

After posting perfect scores for two days, the "great sump hole" and wing warps got Dub McCormick. The hole, acres in size, was situated just downwind of the Power launch area and models had to be either high or in good lift to get over it. Warps messed up Dub's power pattern and he missed three maxes. Rol Anderson got a 94 in the 12th Round and that was to beat him. Bud Romak dropped from contention after losing his No. 1 ship in the Tenth Round. Dick Colonna maxed out on the final day, but several low scores on the first day ruined him. Lady Luck had her arms around Jim Taylor. In the 13th Round his model looped under power and, with only one-third of normal altitude, he maxed. Luck? My eye! He knew when to fly and that saved him. The name of the game is thermal picking

Scores in the final round (the 14th) showed that Rol Anderson's 2370 and Dick Colonna's 2352 were the scores to beat. Tom Kerr flew early, hit lift, and the roar that went up from his Skyscraper teammates heralded his max for 2424 and a sure spot on the team. His model, powered by a Torp Special 15, was one of the most consistent on the field.

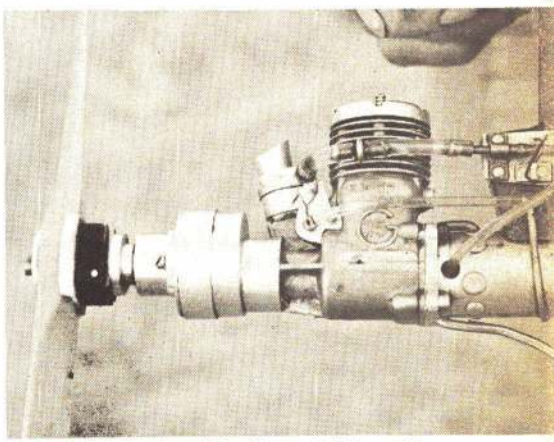
Buzz Averill needed over two minutes to best Anderson; Jim Taylor needed 90 sec. Averill took extreme care picking air, launching only after conditions looked just right. He maxed, too, for a 2427 total score. Taylor waited until late in the round and flew his No. 2 ship. It looked better than No. 1, got very high and into good air. He made his max, which meant he garnered high time —2460 sec. for first place in Power! Rol Anderson became fourth-place alternate.

Monday morning's wind and cool air proved costly to the Wakefield fliers. All of the top contenders except Bob White and John Gard dropped time in the opening round. White was down to his last

Up and away goes Jim Taylor's power job. Used thermal detector. Won Power, 13 maxes!

model, having previously lost two, but led the pack at the end of Round 13. A max in the 14th Round would have given him top time. He didn't get it, but his

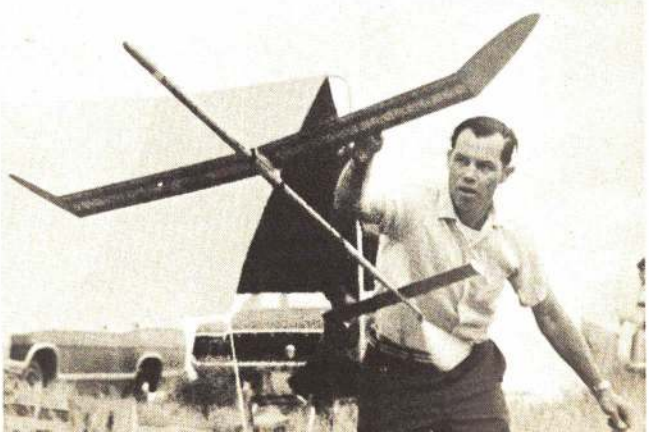
(Continued on page 78)



Tom McLaughlin's S.T. drives folding 9-in. geared prop. Fast climb, sounds strange.

In Nordic, Hugh Langevin won second with latest in his Osprey series. Features aluminum nose, high pylon, cambered stab.

Hank Cole launches pusher Wake. No rudder needed, prop does double duty. It is a long-cruising model for calmer conditions.



Radio Control COMBAT

Ed Niles shows proper launching technique. Straight underhanded, upward toss.

AAM proposes an easy-to-manage RC event for inexpensive sport-type models. It offers man-to-man competition and plenty of excitement. Try some streamer cutting at your next meet.

Riley Wooten designed the Voodoo for CL more than ten years ago; it still wins matches! Shown is one of the two models flown at last year's Toledo Show.

AN RC COMBAT CONTEST will take place at the 1971 Toledo RC Show (Feb. 27-28) and is open to any model meeting the rules stated below. If the contest is well-received and proves practical, this new modeling event will be proposed to AMA.

The Toledo Show management has endorsed this meet. Contest Director is Ed Niles. The rules were developed by RC fliers and CL Combat competitors: Ed Niles, Al Signorino, Bob Baldus, Kent Truber, John Carr and Ed Sweeney.

Rules are short and to the point. No restrictions are placed on the type of model, but it must be a safe ship. The very nature of a Combat event requires that the models be safe, simple, inexpensive and repairable—but expendable. By power limitations, weight requirements and control limitations, the rules achieve these objectives.

A controversial point is the engine size limitation. A 15 may seem to be the desirable engine for weight and power requirements, but many inexpensive and suitable 19's are available. The power difference is small but mufflers are desirable too. The rules will allow 19's equipped with commercial mufflers, whose exhaust outlet is no larger than ¼ in. diameter.

It is hoped that the engine, fuel tank and system, weight, and time-of-flight points will combine to produce safe flying machines, without the necessity for specifying the aircraft type or wing areas or thicknesses. RC Combat ships must be designed to meet four specific requirements: maneuverability, speed, endurance and weight restrictions. However, the typical control line combat ship may be the best type of plane to be adapted for this event.

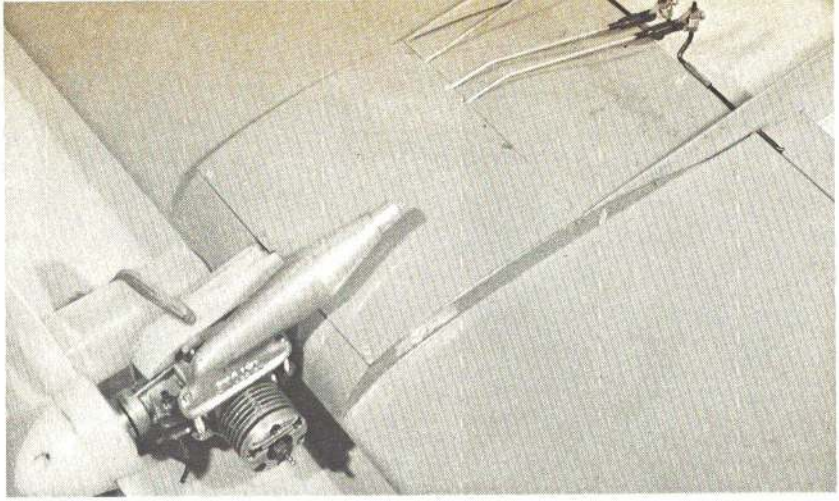
Control systems are restricted to two servos to keep weight down and to allow the control system to be well-protected by structure. Several inexpensive two-channel radios are available and

modelers would not want to risk expensive four-channel sets in this event. The rudder function would be useless and throttle unnecessary. However, the elevator servo could be used at full down plus down trim to trip the required fuel cutoff device.

Those who wish to try this event will find two excellent RC Combat models presented in this issue: the Voodoo and the Guillotine. A fine CL Combat model, the Toothpick, was shown in last month's AAM. Many suitable CL Combat kits, such as the Winder, Spectre and Kitten could also be modified for RC.

We hope to see you and your model at Toledo. Before competing, take time to know your model by flying it at least several times before the show.

For further information and answers to your questions, contact Ed Niles, 4229 65th St.. Des Moines, Iowa 50322.



Most combat models will use simple strip ailerons and all-moving, boom-mounted stabilator. Voodoo's thick center section houses radio. Muffler serves as landing skid too.

RULES FOR RC COMBAT

(1) *Engines:* One propeller driven by engine of up to .15 cu. in. piston displacement, or one engine between .16 cu. in. piston displacement and .2140 cu. in. piston displacement equipped with a commercially-produced noise muffling device whose tail pipe is circular and no larger than ¼" in diameter. A two-in. diameter rounded-nose spinner must be mounted on the engine for safety.

(2) *Number and Type of Models:* Models may not be equipped with intentional sharp protruberances or devices for the purpose of cutting an opponent's streamer. The propeller is the only intentional cutting device. It may not be sharpened for this purpose. A contestant is allowed to enter two models but only one may be used in any one match. A model must weigh exactly two lb. ready-to-fly except less fuel and less streamer. There are no restrictions on wing size or shape.

(3) *Fuel System:* Tank must be one rigid-type tank of no greater than two-oz. capacity. Pressure systems of any kind are not allowed. A fuel cutoff device which can be operated in flight is mandatory. It is suggested that an elevator servo over-travel at extreme down-elevator be used but not a separate servo.

(4) *Radios:* Only two servos are allowed in each model.

(5) *Streamers:* Contest management will provide crepe paper streamers in two colors. They shall be ten ft. long by 1½ in. wide and attached to a 1½ in. sq. card. A 10½ ft. string with pull test of six to eight lb. strength shall be attached to the card and a small piece of crepe paper shall be knotted to the string five ft. behind the model; this is called the "Flag." It indicates the safety zone. The first six in. of the string must be attached by the modeler to his plane within six in. of either side of the model's centerline.

(6) *Number of Flights:* Each contestant is allowed one attempt per match. No engine re-starting after the model is launched.

(7) *Flight Period:* Five minutes per match and five min. between matches. However, if the entry list is too long, the Contest Director may, at his discretion, set the maximum flight time at three min. for the first several rounds. He may also lengthen the maximum time per match if too few contestants appear.

It is up to each contestant to be ready for the start of each match. Engines are to be started when the five-min. period starts. Models must be landed within one min. after match period is over, or be subject to disqualification for that match. The match is concluded when a "Kill" is scored and both models must land as soon as possible. Stop watches will be stopped when the "Kill" is made. If the "Kill" was inside the "Safety Zone," the recorded time will help determine the winner.

(8) *Matching:* No effort is made to pair every pilot against every other pilot. Winning a match only advances that pilot to the next round of matches. Half of the entry list will be random-selected as Lead group, using the radio frequencies as evenly as possible. The remainder of the pilots will be matched with the Lead group by random selection, only passing up pilots when frequency clashes appear.

If pilots cannot be matched they will fly in the next round as the Lead group. This process will continue until a final winner is selected in the last round. Some pilots may have to fly more often than others; this is unavoidable. However, by permitting two planes per contestant, it is hoped that enough modelers will have different frequencies in the planes or be able to change frequencies at the field to give everyone an equal chance at combat.

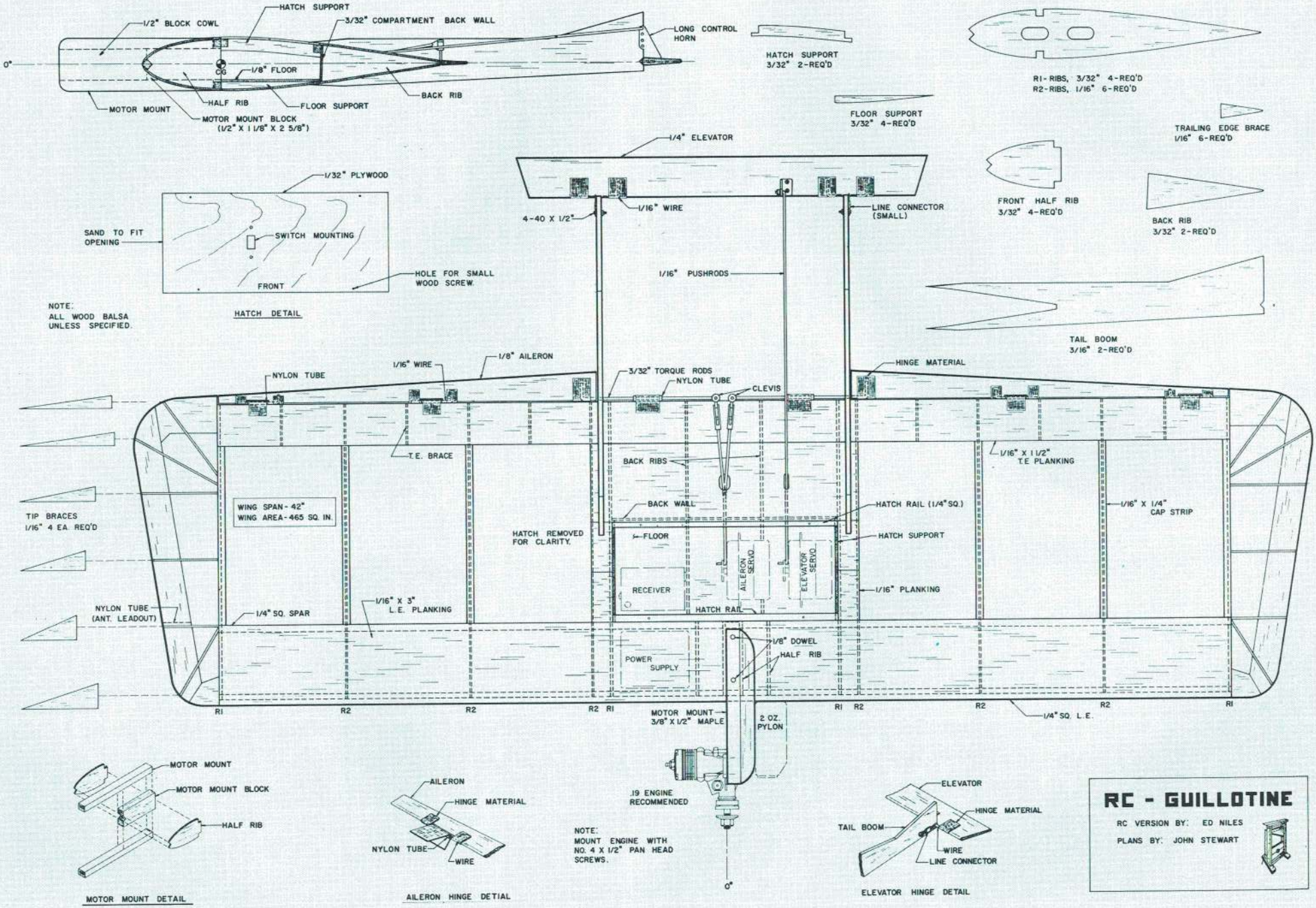
(9) *Scoring:* One point is scored for each second of flight. Sixty points are scored for each "Cut." A "Kill" scores as an outright victory. It occurs by cutting the opponent's string behind the "flag." If either model lands having its string cut ahead of the "Flag" a "Kill" is not scored but the match is over and "Cuts" and time-in-flight points will determine the winner. If a mid-air collision occurs, time and cut points will determine the winner.

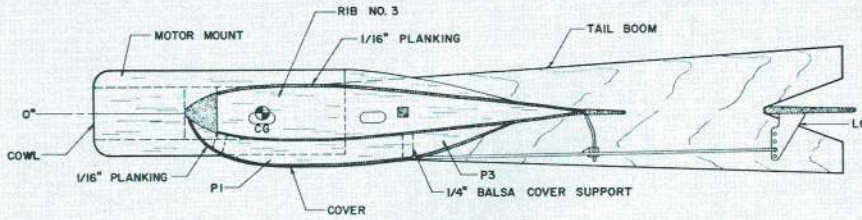
(10) *Tie Breaking:* Ties near the end of the round of matches will be broken by awarding victory to the pilot with the most "kills" in previous matches. If a tie still exists, then the pilot with the most "Cuts" in previous matches will be declared the winner. This tie situation can develop if pilots cannot fly off in a final set of matches because all may have the same radio frequency.

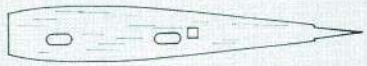
(11) *Disqualification:* A model that takes off at the start of a match, without a complete string or streamer is disqualified. Flying shall take place in only one 180-degree segment of the flying area. A model which crosses behind the pilots into the other half of the flying segment is disqualified the second time this infraction occurs. Disqualification of one pilot makes the other pilot the winner. If both are disqualified, both lose the match.

(12) *Judges:* There shall be three judges. One judge is the starter and five-minute time keeper. Other judges are assigned one to each pilot to time his flight and count his pilot's cuts. Each judge shall have a start and stop watch. The only communication between judges or pilots shall be to warn of "behind flying" infractions or other hazards. Judges shall not assist the pilots in any way.

(13) *Mechanics:* Each pilot may have one mechanic whose duty is to assist with starting, attaching streamer, string, etc., and launching. Once the flight starts, he must remove starting equipment from the area and not remain with the pilot. He may not assist his pilot during the match.


HATCH SUPPORT
1/2" BLOCK COWL
3/32" COMPARTMENT BACK WALL
LONG CONTROL HORN
CG
1/8" FLOOR
HALF RIB
FLOOR SUPPORT
BACK RIB
MOTOR MOUNT
MOTOR MOUNT BLOCK (1/2" X 1 1/8" X 2 5/8")
HATCH SUPPORT 3/32" 2-REQ'D
R1-RIBS, 3/32" 4-REQ'D
R2-RIBS, 1/16" 6-REQ'D
FLOOR SUPPORT 3/32" 4-REQ'D
TRAILING EDGE BRACE 1/16" 6-REQ'D
1/4" ELEVATOR
1/32" PLYWOOD
SAND TO FIT OPENING
SWITCH MOUNTING
FRONT
HOLE FOR SMALL WOOD SCREW
HATCH DETAIL
4-40 X 1/2"
1/16" WIRE
LINE CONNECTOR (SMALL)
FRONT HALF RIB 3/32" 4-REQ'D
BACK RIB 3/32" 2-REQ'D
1/16" PUSHRODS
NOTE: ALL WOOD BALSA UNLESS SPECIFIED.
TAIL BOOM 3/16" 2-REQ'D
1/16" WIRE
1/8" AILERON
NYLON TUBE
3/32" TORQUE RODS
NYLON TUBE
CLEVIS
HINGE MATERIAL
T.E. BRACE
BACK RIBS
1/16" X 1 1/2" T.E PLANKING
TIP BRACES 1/16" 4 EA. REQ'D
WING SPAN - 42"
WING AREA - 465 SQ. IN.
HATCH REMOVED FOR CLARITY.
BACK WALL
HATCH RAIL (1/4" SQ.)
1/16" X 1/4" CAP STRIP
FLOOR
HATCH SUPPORT
AILERON SERVO
ELEVATOR SERVO
RECEIVER
1/16" PLANKING
NYLON TUBE (ANT. LEADOUT)
1/4" SQ. SPAR
1/16" X 3" L.E. PLANKING
HATCH RAIL
1/8" DOWEL
HALF RIB
POWER SUPPLY
R1
R2
R2
R2 R1
MOTOR MOUNT 3/8" X 1/2" MAPLE
2 OZ. PYLON
R1 R2
R2
R2
R1
1/4" SQ. L.E.
MOTOR MOUNT
MOTOR MOUNT BLOCK
HALF RIB
MOTOR MOUNT DETAIL
AILERON
HINGE MATERIAL
NYLON TUBE
WIRE
AILERON HINGE DETIAL
.19 ENGINE RECOMMENDED
NOTE: MOUNT ENGINE WITH NO. 4 X 1/2" PAN HEAD SCREWS.
0°
ELEVATOR
HINGE MATERIAL
TAIL BOOM
WIRE
LINE CONNECTOR
ELEVATOR HINGE DETAIL
RC - GUILLOTINE
RC VERSION BY: ED NILES
PLANS BY: JOHN STEWART



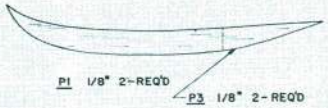


RIBS NO. 1 & 2 3/32"
13-REQ'D

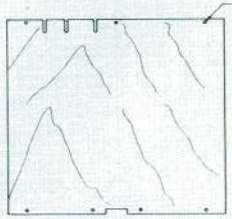
RIBS NO. 3 & 4 1/8"
4-REQ'D

NOTE:
PLANS SHOW CONTROL LINE
KIT MODIFIED FOR R/C USE.

TAIL BOOM
1/16" PLYWOOD
2-REQ'D



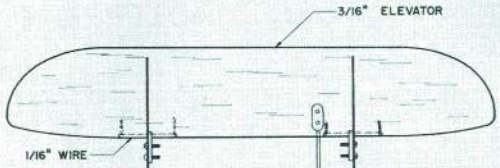
P1 1/8" 2-REQ'D
P3 1/8" 2-REQ'D

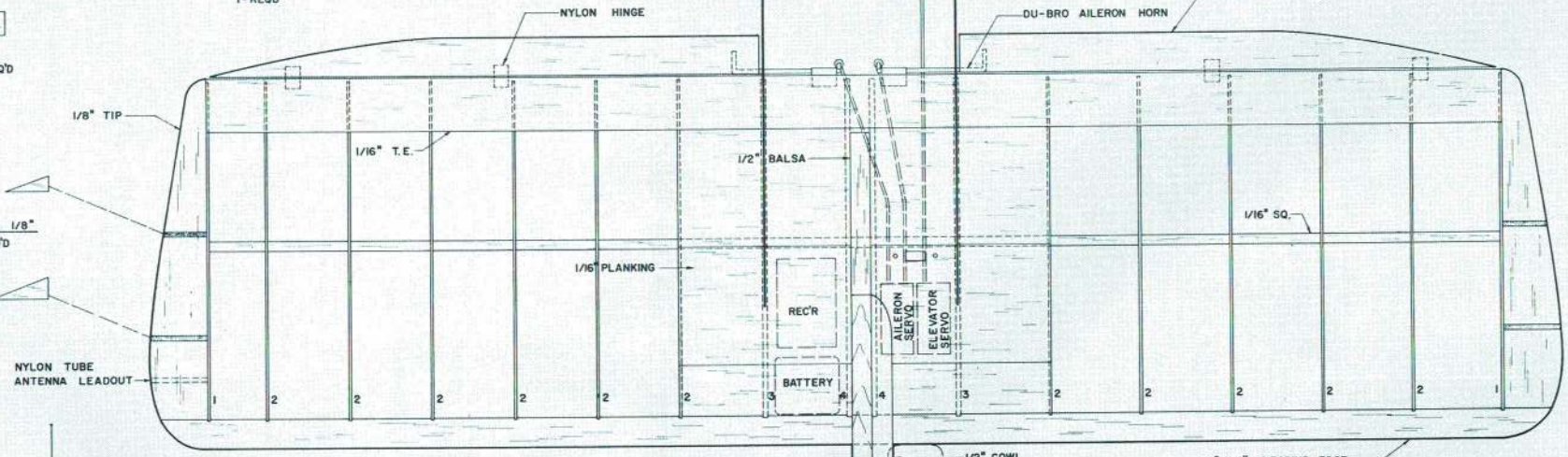


HOLES FOR SMALL WOOD SCREWS.

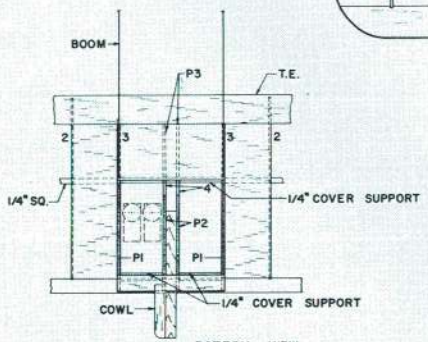
COVER DETAIL
1/32" PLYWOOD
1-REQ'D

P2 1/8" 2-REQ'D

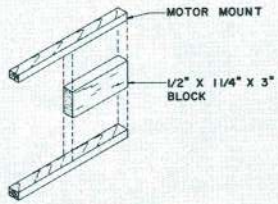




MOUNT ENGINE WITH NO. 4 X 1/2" PAN HEAD SCREWS.



BOTTOM VIEW



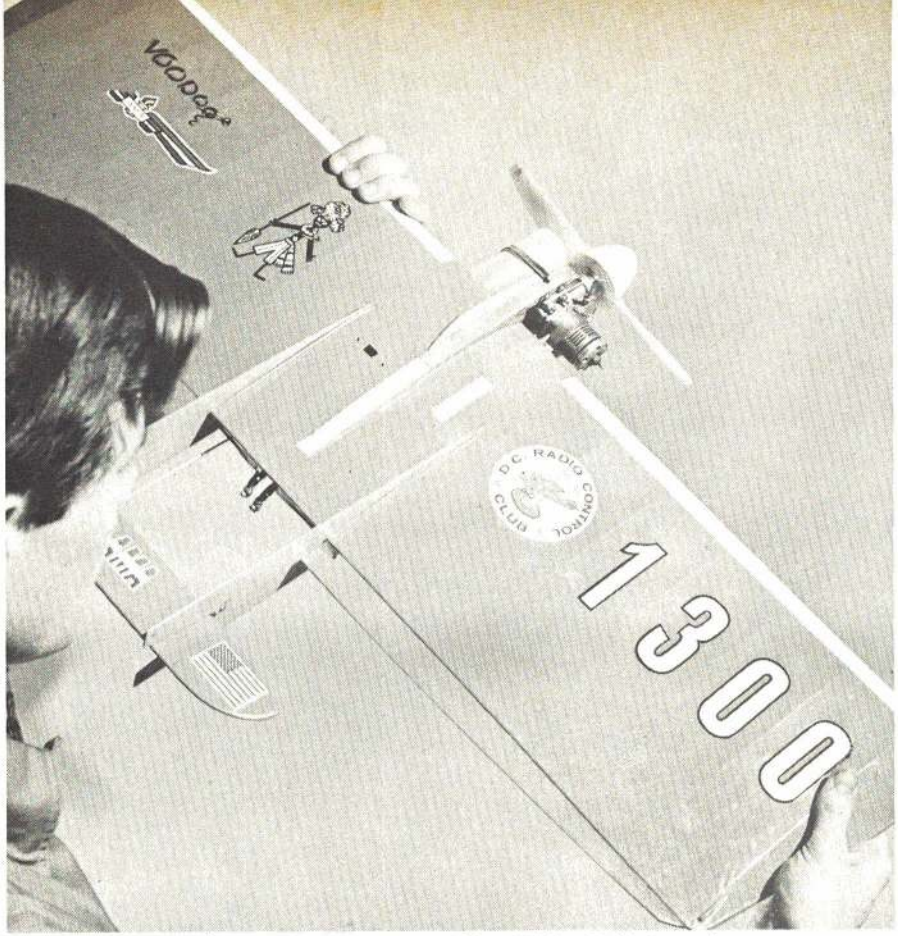
MOTOR MOUNT DETAIL

NOTE:
ALL WOOD BALSA
UNLESS SPECIFIED.

RC - VOODOO

R/C VERSION BY: ED SWEENEY
PLANS BY: JOHN STEWART

WING SPAN: 36"
WING AREA: 320 SQ. IN.



Bright colors and top/bottom contrast are essential for visibility. Builds in two hours.

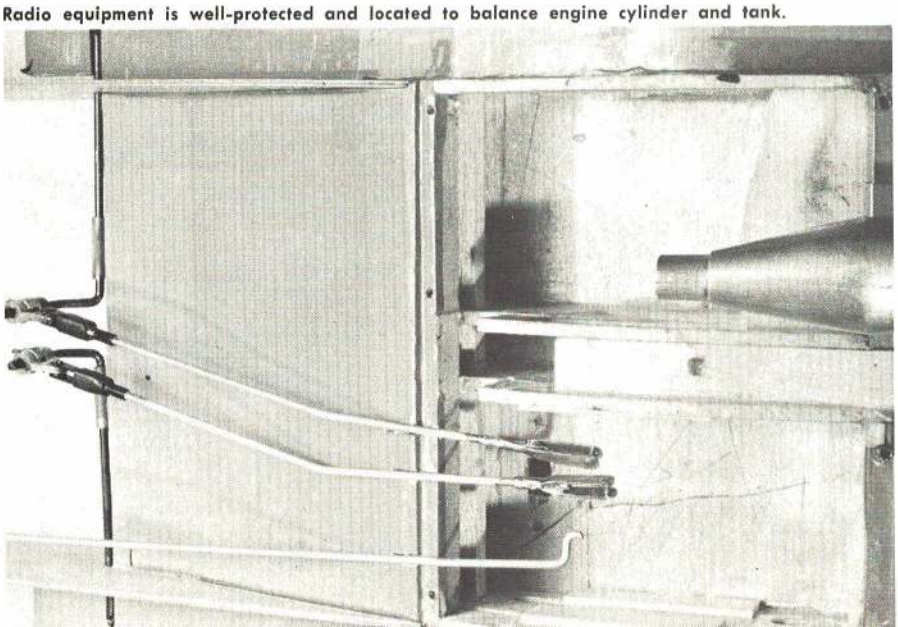
RC Combat

VooDoo for radio Too

Whether for combat or sport, converting the Goldberg kit is quick and easy. Same alterations for any CL wing.

ED SWEENEY

Radio equipment is well-protected and located to balance engine cylinder and tank.



I REALLY THOUGHT Terry Prather had flipped his lid when he walked into the MATS Trade Show in January, 1970, carrying a radio-controlled Combat Winder. He had designed the control line plane for the Sterling kit and he had a small radio, so the parts got together with a rear rotor K&B 40 up front. Terry wanted a hot Open Pylon racer and he had created just that.

It occurred to me that RC Combat with this type of plane might be interesting, so I purchased a Goldberg Double Voodoo kit and an Enya 35. The Double Voodoo kit provides two complete models in one box for $9.95. Originally designed by Riley Wooten many years ago, it is an old kit but still a winner in control line circles. Being a simple and small model, the ship went together easily, including modifications for RC as shown on the plans. The RC version could be built in two evenings with fast glue and a kind wife.

One Saturday, three hairy flights using the 35 engine were made—enough to prove that this Voodoo was overpowered and potentially dangerous. However, the ship was stable and predictable, although hard to see. That evening the nose was modified to take a S. T. 19. Sunday's flying with the smaller engine proved that this was a fine, safe flier. Before the second Voodoo was built, several other modelers flew the original and everyone liked its performance. We felt that RC Combat was just about to begin, but no one would make a model to fly against the Voodoo. So, the second Voodoo was made and tested; then came Toledo.

The rest is history. Don Lowe, John Elliott and I flew these two Voodoos in RC combat for the first time at the show. We used short leaders and streamers. No cuts were made, but the fun had begun. An event was born.

Construction of the Voodoo begins with obtaining the kit, which is old but still available at most hobby shops. The plans presented here show the necessary modification for converting the ship from control line to RC. The Voodoo could be scratch-built, but it is easier and cheaper to buy the kit.

Other items required are a 19 engine with muffler or a 15, a two-oz. fuel tank, two-in. spinner, RC-type hinges, aileron material, a 6 x 12 x 1/16" ply sheet, and control parts.

Step by step construction instructions are provided in the kit, as are most of the parts.

Assemble the plane, keeping in mind that ready-to-fly it must weigh (less fuel) two lb.—no more and no less. With this weight restriction, the radio compartment can be beefed up to protect the vital parts from crash damage. An aluminum equipment hatch is a good idea. Our models weighed well under two lb., so build and protect accordingly.

Flying is easy, but seeing the Voodoo in flight is hard. It appears as a thin line, and overhead it is symmetrical. New reflexes must be developed, based on discovering which way the ship goes with each control movement. The aileron and elevator controls quickly must become second nature, without regard to up or down or left and right. The model is not particularly sensitive.

By all means use the ten-ft. leader and ten-ft. streamer on all flights. Without the streamer, the Voodoo flies faster, but that's all. Launch the model by releasing underhand with a slight upward toss. It will climb out almost vertically VTO style.

Photos by Frank Pierce

Little rudder area needed, yet Guillotine tracks well, won't spin, and is quite stable.

RC Combat

Guillotine Streamer Cleaner

This bird's larger, thicker wing houses radio within airfoil profile. Maneuverability and glide are fantastic.

ED NILES

THE COMBAT MATCH flown by two RC Voodoos at last year's Toledo Show impressed me more than anything else.

Armed with the enthusiasm that this show generates and the idea of RC Combat, I made a trip to the local hobby shop in search of a kit which could accommodate almost any RC system. The CL Guillotine looked like the right plane because of its large wing area and thick airfoil. The Guillotine was originally designed by John Carr for quick turning and minimal stalling on flight maneuvers. A success in Combat at local contests, it was the winner of four places in the 1970 Nationals.

Working out the RC modifications and building the prototype took only two weeks. The first flight showed that the RC Guillotine was extremely stable and most responsive. Landing this plane was a pleasure since the glide was excellent and positive control could be maintained right up to the stall point (about 9-10 mph). We expected to run into a few problems with the little Enya 19 for power and a reduced stab area; but, to our relief, no difficulties materialized.

In fly-for-fun meets and demonstrations at contests throughout the Midwest, the RC Guillotine has had very good acceptance as an ideal sport plane. It has almost everything a Sunday flier wants: small size, quick and easy construction, excellent stability, maneuverability and low cost. However, it is not a beginner's plane.

The balsa selection is not critical for this plane, so use whatever is left in the shop. Begin construction by cutting out 1/16" and 3/32" ribs and gluing them to the bottom spar. While these are drying, glue the wing tips together. Next, glue the half ribs to the motor mount block, which is a ½ x 1⅛ x 2⅝" notched block. Then glue on the motor mounts, which for safety should be doweled in.

Glue the ribs to the trailing edge, making certain that the trailing edge is parallel to the bottom spar. When this part is set, glue the top trailing edge and the trailing edge braces between each rib. While this assembly is drying, sand and shape a minimal airfoil into the elevator.

Glue the motor mount assembly with zero degree incidence to the wing. No offset is needed. When this is dry, glue the leading edge and top spar into place.

Drill 1/16" holes in the elevator and insert the 1/16" wire, which is then covered with gauze or hinge material and glue well.

Place the ailerons on the plans; mark and notch where the wire is to be inserted. Drill 1/16" holes where the hinge wire is to be located. Place nylon tubing over the 1/16" wire and glue onto the ailerons. Notch the ailerons for 3/32" torque rods, which are expoxied in place. Reinforce the hinges and torque rods with gauze or hinge material.

Moisten the bottom leading edge planking and glue it to all the ribs and spars. When the assembly has dried, repeat this process on the top. Glue both the cap strips and the assembled wing tips in place.

Glue all four radio compartment floor braces in place and then plank the bottom center section of the wing. Next, glue the radio compartment floor and back wall in place.

The side hatch supports are glued flush with the ribs and both hatch cover supports installed. Now plank the top center section from the trailing edge to the radio compartment and along its sides.

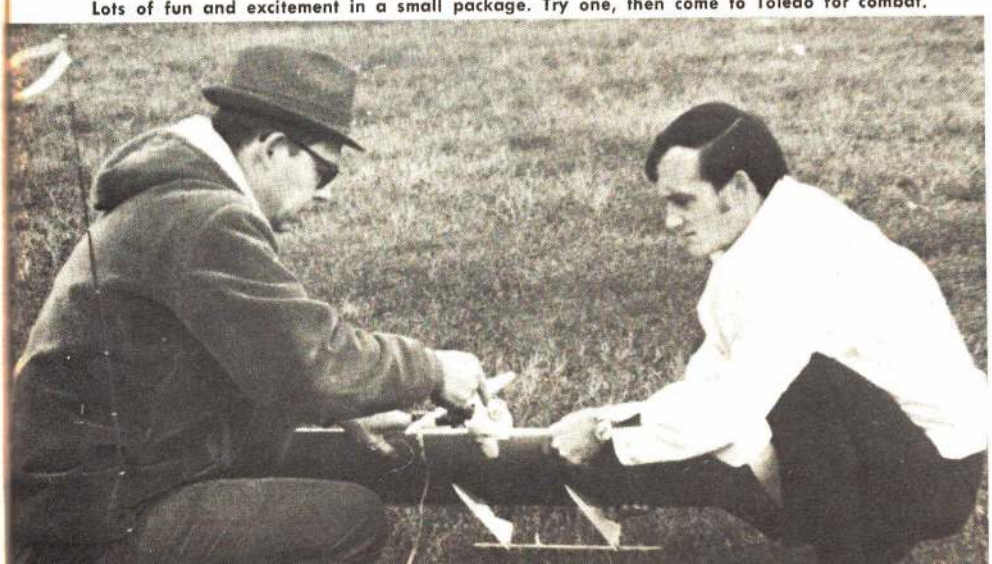
Shape, sand and glue on the cowling. If more strength is desired, fiberglass the nose section. Glue on the nylon tube for antenna leadout. Hinge the ailerons to the trailing edge and then glue on the tail booms, using the elevator for alignment. Sand and fit the plywood hatch with small wood screws.

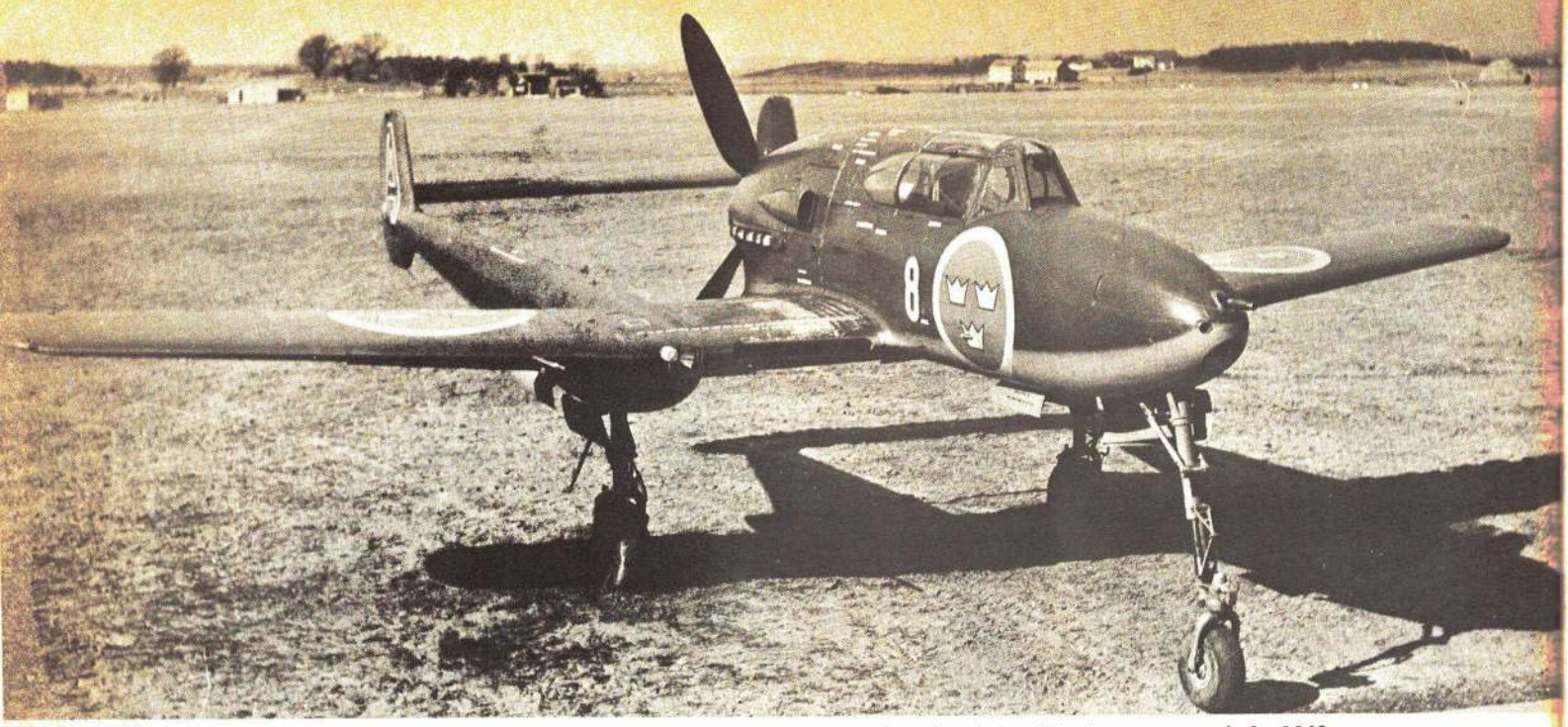
Mount the servos using Kraft side-mount servo trays or servo mounting tape. The servos should be mounted as far forward as possible. The receiver and batteries should be wrapped with ¼" sponge rubber. Mount the fuel tank, using rubber bands to hold it in place.

The aileron response is not critical, but keep the elevator throw to an absolute minimum. No more than ⅜" total throw is recommended. Launch the plane with a slight upward toss. It will maintain any attitude it is put in.

The Guillotine is being kitted by C.M.I. Quality Airplane Kits, 945 65th St., Des Moines, Iowa 50312.

Lots of fun and excitement in a small package. Try one, then come to Toledo for combat.





Increased visibility, streamlining, and concentrated firepower were offered in this pusher design. Tricycle gear was early for 1943.

DON BERLINER

JUST AS SOME of the earliest control line models were actually converted free flights, so some of the very early jets were little more than converted prop-driven aircraft. And while they flew and provided considerable knowledge quickly and, no doubt, inexpensively, they were hardly what anyone would call successful.

The best example of this kind of quickie conversion, and the only one both produced in quantity and used by operational squadrons, was the product of a firm now known better for cars than airplanes: SAAB, of Linkoping, Sweden. The airplane which made a bit of history was the SAAB J 21, not merely the first fighter to be produced by this now famous company, but also the only combat aircraft having a pusher propeller which was of any consequence and was built during World War II.

While the SAAB J 21 is hardly one of the important warplanes of the 1940's, having been built in relatively small quantity and never having seen action, it marked the beginning of a long line of highly impressive fighterplanes which SAAB developed and which have enabled a country as small as Sweden to achieve a major reputation for aviation technology.

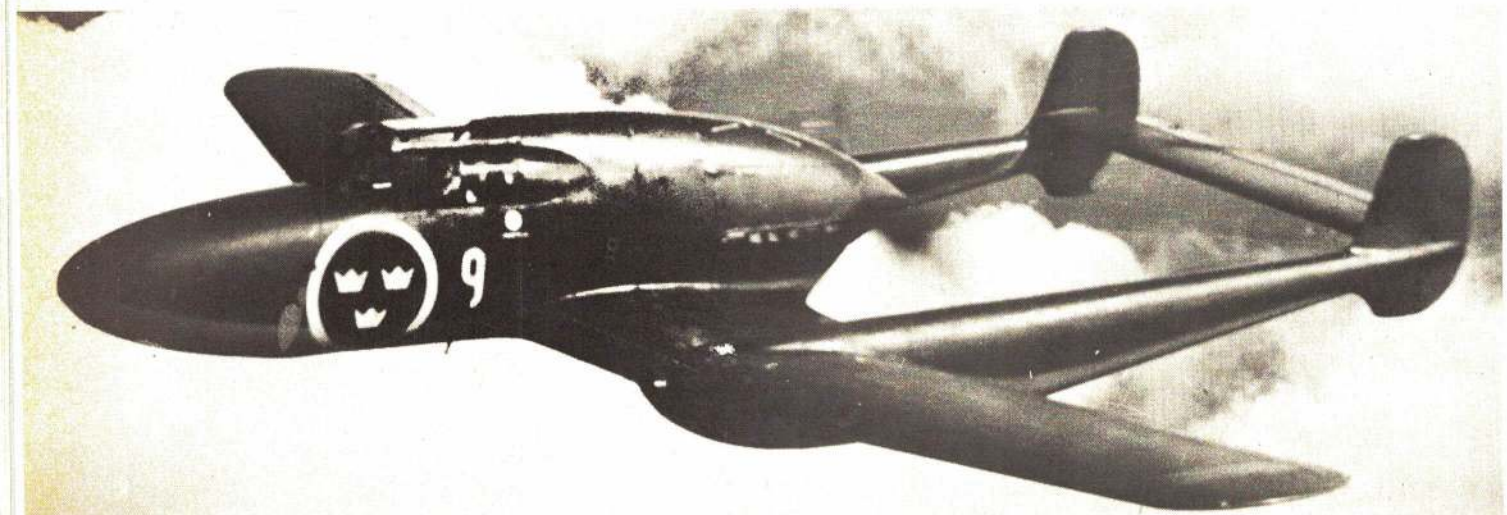
SAAB began operations in April, 1937, by building foreign airplanes under license: the Junkers Ju. 86K bomber from Germany, and the Douglas (Northrop) 8A attack bomber and North American NA-16 (AT-6 prototype) trainer from the U.S. By 1938, the first original design SAAB machine was being developed, and the first flight of the prototype SAAB 17 single-engine dive bomber was made early in 1940. Several hundred of them were produced, and the Swedish Air Force used them until 1947. The next in line was the SAAB 18, an all-metal twin-engine bomber which bowed in 1944 as one of the fastest aircraft of its type in the world.

Though it had a higher number, the interesting little J 21 fighter made its first flight almost a year before the SAAB 18, in the summer of 1943. It went into production late in 1945 and the first one was delivered to an operational unit in the beginning of December of that year.

Because no native Swedish aircraft engine was in existence at that time, the J 21 had to be powered by a license-built foreign engine. It was first planned to use the Pratt & Whitney R-1830 Twin Wasp, an 800 hp radial which was being built by Svenska Flygmotor as the STW C-3, but a need for considerably greater power forced a switch to the German Daimler Benz DB 605B an air-cooled V-12 rated at 1475 hp for take-off, and similar to that used in the Messerschmitt Bf-109G. The Swedes did considerable modification work on the engine, eventually developing it into a type suitable for use in later models of the SAAB 18B as well as the J 21.

The basic twin-boom pusher layout was selected because of its advantages in increased visibility, streamlining, and concentrated firepower. One of the most

Because of pusher prop, pilot escape was a problem. The J 21 was fitted with one of the first production ejection seats. Top speed 400 mph.



Swedish SAAB

This unique fighter of the World War II period was manufactured in quantity and operational in both piston- and jet-engined versions. Saw service over eight years.

obvious disadvantages was the risk to the pilot in the event he was forced to bail out, for he would go directly into the path of the propeller. After considering such techniques as jettisoning the propeller or even the entire engine, SAAB fitted the J 21 with one of the earliest production ejection seats, development of which had begun back in 1939. Another example of SAAB's farsightedness was its use of tricycle landing gear, still relatively rare when development work was begun on the J 21 in 1941. Preliminary tests on the gear were made using a modified NA-16, with the same plane then being used for pilot familiarization.

Armament on the J 21A was a standard grouping of a single 20 mm cannon and two 13.2 mm (.52 cal.) machine guns in the nose, and a single 13.2 mm machine gun in the leading edge of either wing, just outboard of the tail boom. The attack and bombing versions of the later J 21A's could carry a single 550 lb., 1100 lb. or 1300 lb. bomb slung

(Continued on page 72)

SPECIFICATIONS

Dimensions	J 21A-1, -2	J 21A-3	J 21RB
Length	34′ 3″	34′ 3″	34′ 3″
Wingspan	38′ ¾″	38′ ¾″	37′ 4″
Height	13′ 1½″	13′ 1½″	13′ 1½″
Wing Area	238 sq. ft.	238 sq. ft.	238 sq. ft.
Empty Weight	7,150 lbs.	7,150 lbs.	6,850 lbs.
Normal Weight	9,100 lbs.	9,600 lbs.	11,000 lbs.
Performance			
Top Speed	400 mph	400 mph	500 mph
Cruising Speed	300 mph	300 mph	435 mph
Landing Speed	90 mph	90 mph	95 mph
Rate of Climb	3,000 fpm	3,000 fpm	3,360 fpm
Ceiling	36,000 ft.	36,000 ft.	40,000 ft.

The J 21R jet version first flew March, 1947—64 were ordered.

VERSIONS AND VARIANTS

J 21A-1—54 built between December 1945 and December 1946.

J 21A-2—similar to J 21A-1, with additional instruments and Bofors instead of Hispano guns. 124 built between July 1946 and November 1947.

A 21A-3—attack version with larger droppable fuel tanks and provisions for bombs and rockets. 120 built of all "A-3" versions between May 1947 and January 1949.

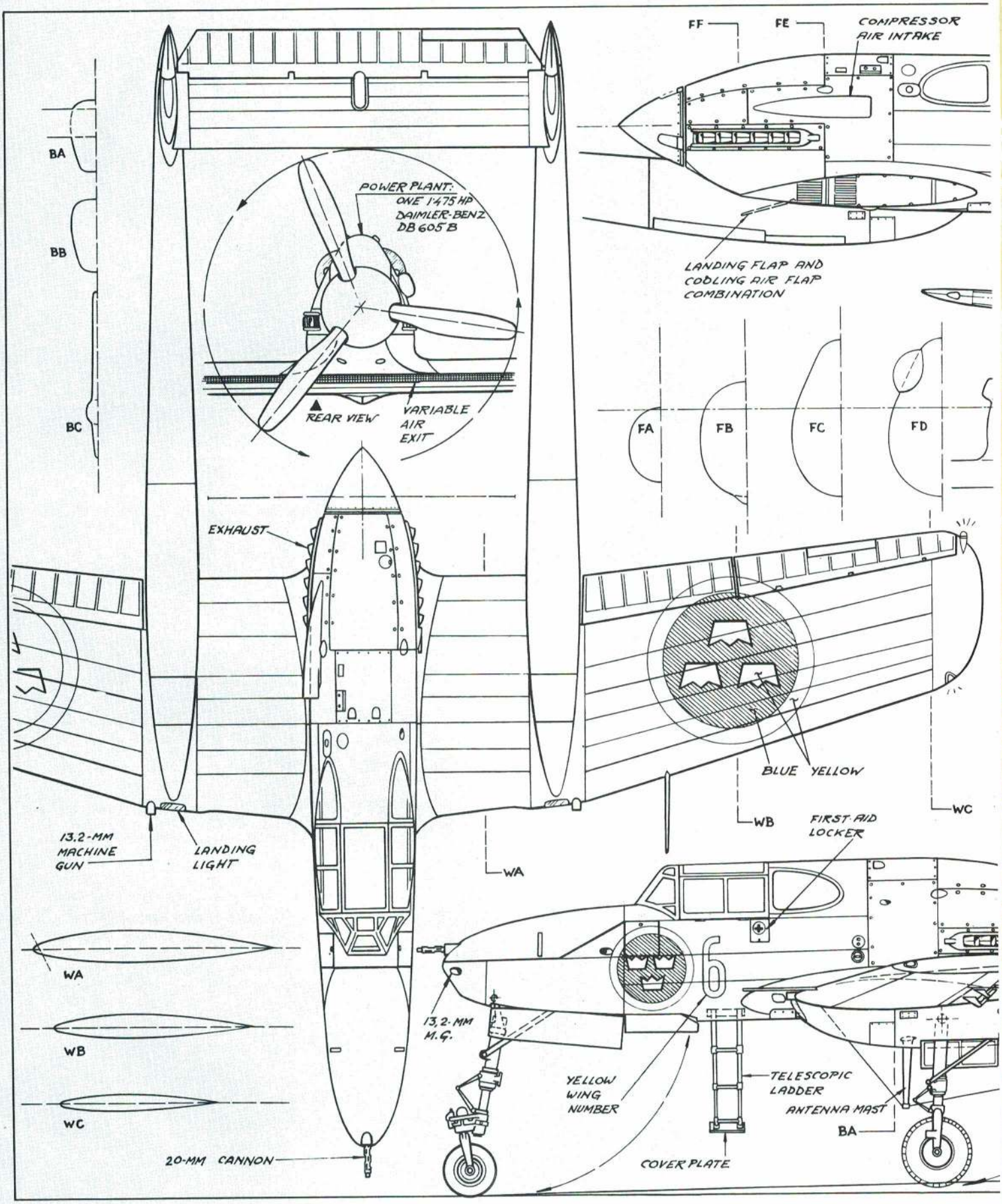
B 21A-3—bomber version of A 21A-3.

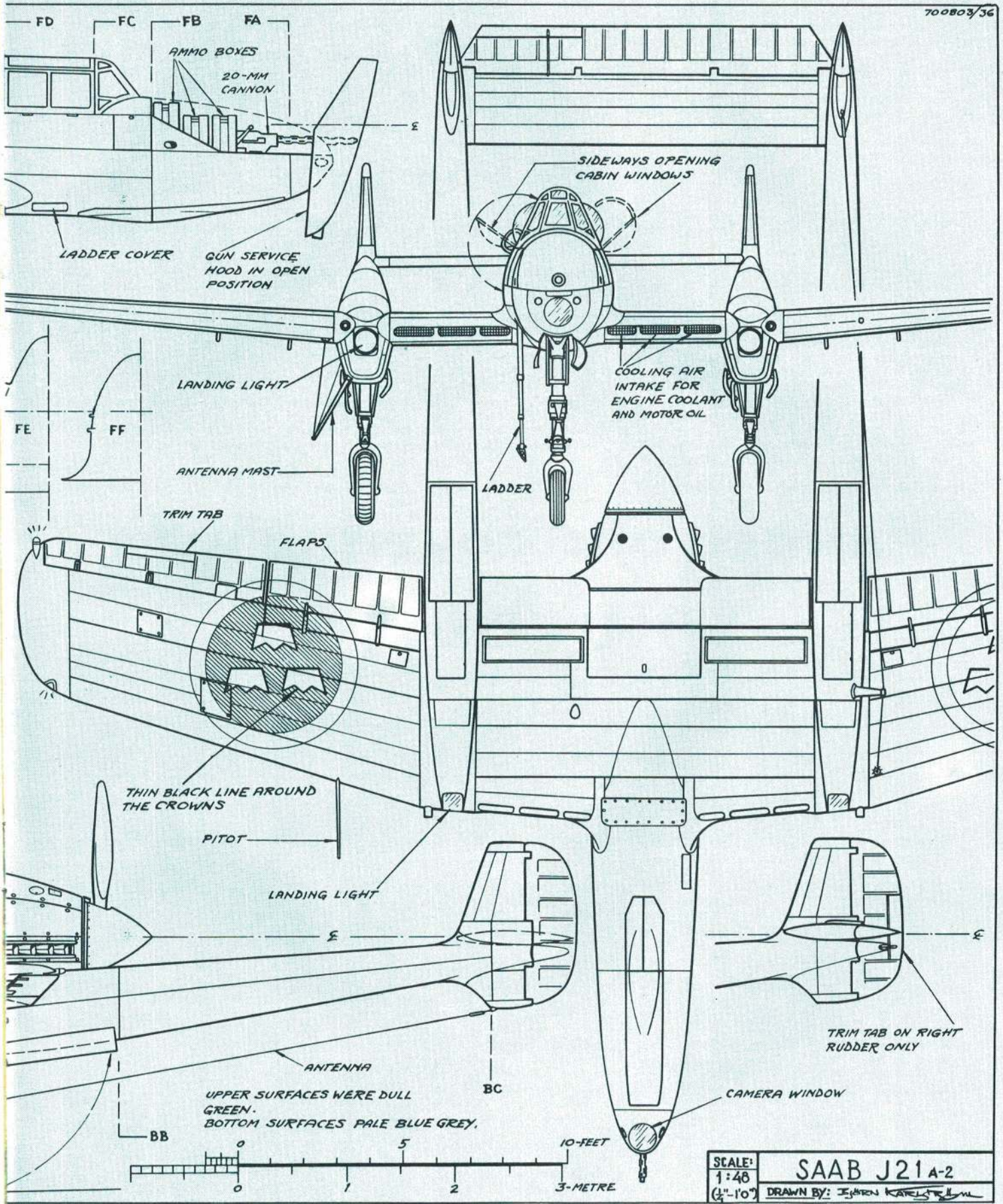
J 21A-3—fighter version of A 21A-3.

J 21B—planned with Rolls Royce Griffon engine, but never built.

J 21RA—34 built with DH Goblin 2 turbojet between August 1949 and August 1950.

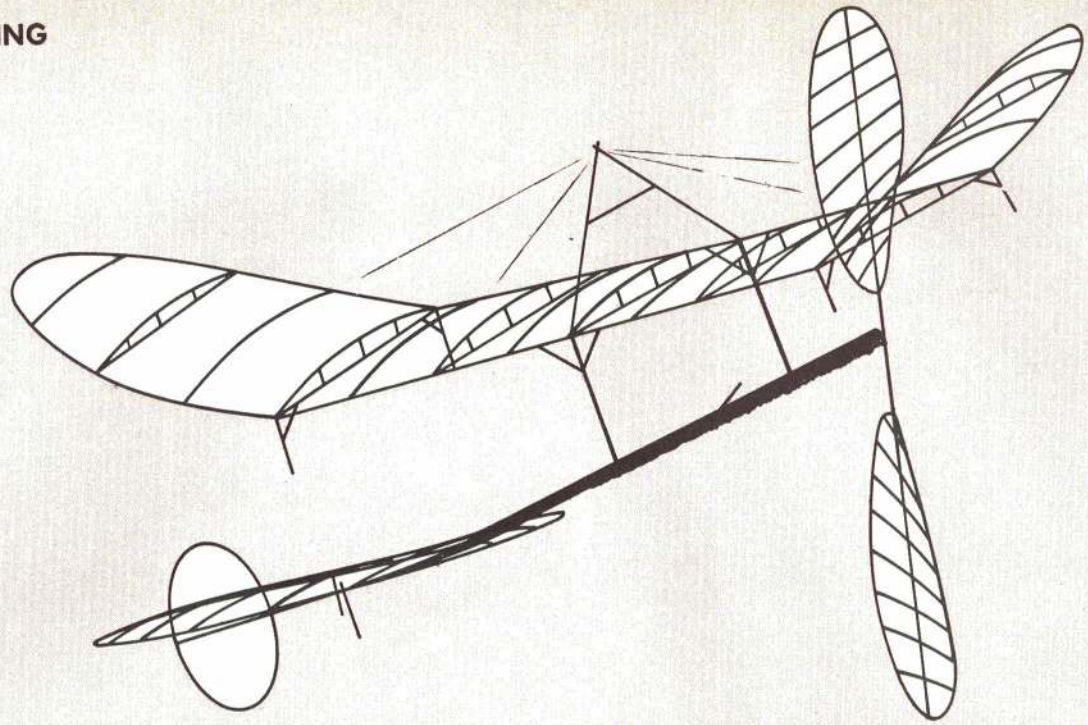
J 21RB—J 21RA with Goblin 3. 30 built between July 1950 and January 1951.


BA
BB
BC
POWER PLANT:
ONE 1,475 HP
DAIMLER-BENZ
DB 605 B
REAR VIEW
VARIABLE
AIR
EXIT
FF
FE
COMPRESSOR
AIR INTAKE
LANDING FLAP AND
COOLING AIR FLAP
COMBINATION
FA
FB
FC
FD
EXHAUST
BLUE
YELLOW
WB
WC
WA
13.2-MM
MACHINE
GUN
LANDING
LIGHT
FIRST AID
LOCKER
WA
WB
WC
13.2-MM
M.G.
YELLOW
WING
NUMBER
TELESCOPIC
LADDER
ANTENNA MAST
BA
20-MM CANNON
COVER PLATE


700803/36
FD
FC
FB
FA
AMMO BOXES
20-MM CANNON
LADDER COVER
GUN SERVICE HOOD IN OPEN POSITION
SIDEWAYS OPENING CABIN WINDOWS
LANDING LIGHT
COOLING AIR INTAKE FOR ENGINE COOLANT AND MOTOR OIL
FE
FF
ANTENNA MAST
LADDER
TRIM TAB
FLAPS
THIN BLACK LINE AROUND THE CROWNS
PITOT
LANDING LIGHT
TRIM TAB ON RIGHT RUDDER ONLY
ANTENNA
BC
UPPER SURFACES WERE DULL GREEN.
BOTTOM SURFACES PALE BLUE GREY.
CAMERA WINDOW
BB
0
5
10-FEET
0
1
2
3-METRE
SCALE: 1:48 (¼"-1'0")
SAAB J21 A-2
DRAWN BY: IVARSSON KARLSTRÖM

INDOOR MODELING

Part 2



Pouring and covering with microfilm

Last month, the Bandersnap, a low-ceiling contest-type model was presented by the author. Here he shows the art of covering it.

TOM VALLEE

A NUMBER OF EXCELLENT indoor model designs have been published in the last ten years. Unfortunately, many modelers who thought it would be fun to try building such a model have come to grief when attempting to make microfilm, or they have given up in despair when, after finally managing to pour some microfilm, covering the model resulted in disaster.

Such discouragements are a real shame because building an indoor model is not the difficult thing many people imagine it to be. It's merely a matter of mastering a few simple techniques! The problem is that, while many excellent designs are available, no major magazine recently has run comprehensive articles on the techniques of building and covering indoor models. An excellent series by Joe Bilgri appeared back in 1960, but ten years is a long time and this information bears repeating.

Microfilm is a thin lightweight plastic film used to cover indoor models. Unlike the Japanese tissue, silkspan, etc., used for outdoor models, it is not available in the local hobby shop. The builder has to make it himself and this is where the fun begins!

Microfilm solution is made from a nitrocellulose base (guncotton) dissolved in a mixture of various solvents, with plasticizers added to give the desired qualities. The solution has the consistency, appearance and smell of clear nitrate dope.

Although some experienced builders make excellent microfilm by starting with a mixture of clear nitrate dope or guncotton and complex mixtures of solvents and plasticizers, the indoor beginner should avoid home-brew microfilm. Having learned the hard way, I recommend strongly that for his first attempts the indoor beginner should use a standard commercial film solution from one of the following sources: (1) Micro-Dyne Type B microfilm—Micro-Dyne Precision Products, Box 2338, Leucadia, Calif. 92024; (2) Dead Slack American-type microfilm—Micro-X Indoor Model Supplies, 5200 Seven Pines Dr., Lorain, Ohio 44053; and (3) Sig Microfilm Solution—Sig Manufacturing Co., Inc., 401 (A) South Front St., Montezuma, Iowa 50171.

Briefly, microfilm is made by pouring a small amount of microfilm solution onto the surface of the tank of water from just above that surface. The solution spreads like an oil slick and then dries, leaving a thin film of plastic, known as microfilm, floating on the water.

After several minutes, a wet balsa frame is laid on the floating microfilm and the excess film is folded over the edges of the frame. The frame of film is now ready to be lifted by gliding it across the water toward one side of the tank. The leading edge of the frame is lifted slightly and air breaks the suction between the film and the water at this edge. As the frame moves forward and its leading edge is lifted higher, the finished frame of microfilm literally glides free of the water. Drain off excess water and set the frame aside to dry. The photos and diagrams should

make the whole process clear. Microfilm tank construction is easy. A simple rectangular frame is made from four 1 x 2" boards (approximately ¾ x 1½" in cross section) two each cut to the desired width and length of the tank. Set this frame on top of a table or workbench and lay over it a sheet of vinyl or polyethylene plastic (available at any dime store) several inches larger than the frame in all directions. This makes a complete microfilm tank with the plastic as a waterproof liner. Pour water in the tank to a depth of one half inch and allow at least a half hour for the water temperature to stabilize before pouring film.

Tank size is determined by the size of the frames of film needed. In general, the tank should be 18 in. to two ft. longer and wider than the largest frame. Thus, to pour 20-in. frames of film (such as are needed to cover last month's Bandersnap), build a tank about 38x30". When determining tank size, remember that better film is made in a large tank than in one that is a little too small.

My microfilm tank is a 3 x 4' sheet of ½" plywood, with 1 x 2" boards nailed to its edges. While this tank is more elaborate than necessary, it is convenient because I can set it up on a table with dimensions slightly smaller than those of the tank. This tank is used to pour frames up to 30 in. long. A 3½ x 5' tank will take frames large enough to cover even the largest indoor models.

Microfilm frames are made from ¼ x ½" balsa strips, with the corners reinforced as shown. My standard microfilm frames are 12 in. wide by at least two in. longer than the span of the longest wing I plan to cover.

For pouring microfilm, an ordinary spoon is an excellent device. The thickness of the film is governed mainly by the amount of microfilm solution used. The more solution used, the thicker the film. Using less solution makes thinner film.

After successfully pouring the first frames, notice that the microfilm, when held in front of a light at the right angle, shows colors because it is thin like a soap bubble! This important characteristic permits the modeler to judge the microfilm's relative thickness and strength by its color. Silver and gold are the thinnest film, while blue, red and green film are progressively thicker (and stronger). The beginner should use relatively thick microfilm (blue to green) which is easier to handle.

If it is difficult to lift those first frames of microfilm from the tank, it may be that not enough microfilm solution was used and the film is too thin and weak. Use more solution on the next pour and the thicker film should lift easily. Sometimes dry (nonsticky) film will slip off the frames. In this case, coating the frames with rubber cement should solve the problem.

It's good practice to make enough microfilm to cover several models before starting to build. It can be stored in a spare model box or cabinet until needed. After several weeks the film should go slack (loose) on the frames and be ready for covering a model by the techniques outlined below and illustrated in the photographs.

If, when needed for covering, the microfilm is still tight on the frame, it can be made to go slack by stretching the film. Light the gas on the front burner of the kitchen stove and hold the frame (moving it back and forth) in the rising column of warm air, about 18 to 24 in. above the heat source. The film will stretch and billow up, so remove the frame from the heat quickly and it will be ready to use. This is a variation of a technique outlined in Joe Bilgri's indoor articles.

Caution: If the film is held too close to the burner it goes poof and nothing is left but an empty frame!

The simple covering process takes three steps. (1) The wing (or stab, etc.) is laid upside down on a frame of slick microfilm.

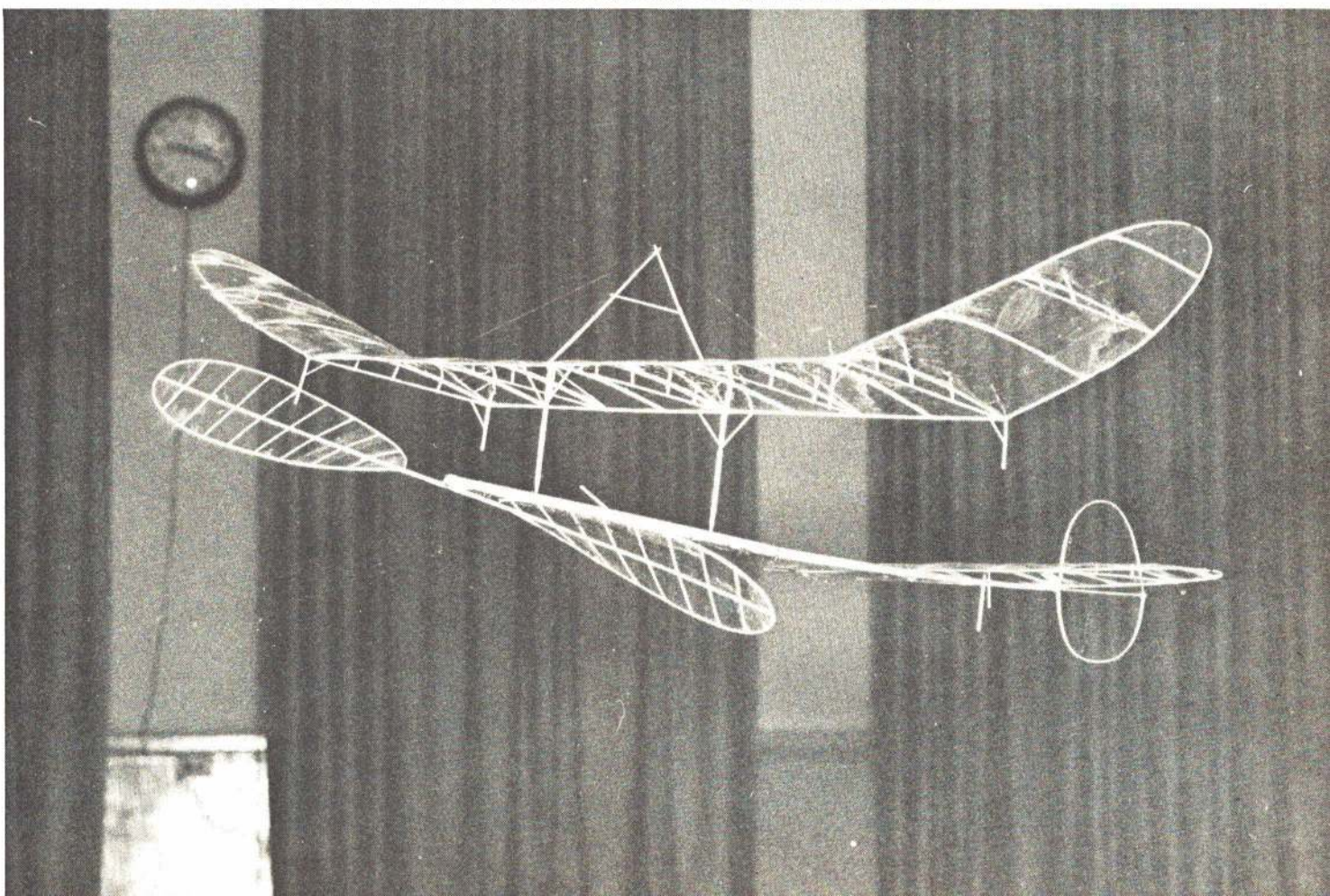
(2) The wing (or other part) outline is wet carefully, a few drops at a time, with a brush dipped in tap water. Moisture causes the film to stick to the wood.

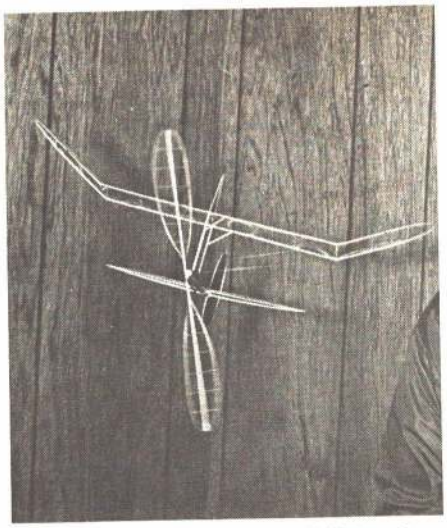
(3) After the wing (etc.) is partly dried, a hot wire or a soft, pointed brush dipped in acetone is used to cut the wing free of the frame. When using the brush, take care to use just enough acetone to cut the film. Too wet an acetone brush may make holes in the covering.

One important technique is patching holes. Despite several years of building experience, I seldom complete a model without punching at least one or two holes in the film. If Bill Bigge hadn't shown me how to make patching material, my first indoor model might never have been airborne.

Microfilm patching material is made as follows. A sheet of Japanese tissue is laid on the building board. Over this is placed a frame of microfilm which is

Snark Mk II FAI model is off on a record flight. It has regularly exceeded 20 min. under less than 20-ft. ceilings and set five national records. Note its intricate wing ribs and bracing. These features permit construction with superlight and ultra-thin balsa.





The Bandersnap in flight. For full-size plans, see pages 36-37, January 1971 AAM.

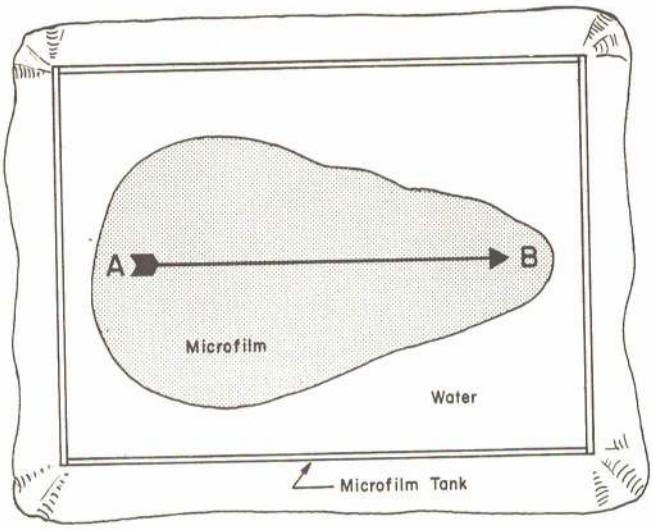


FIG. 1 Start pouring microfilm solution at A, moving hand across surface of tank at a uniform rate. Pouring is finished at B. Solution spreads across surface of water like an oil slick to form microfilm (shaded area) shown at moment pour is finished at B.

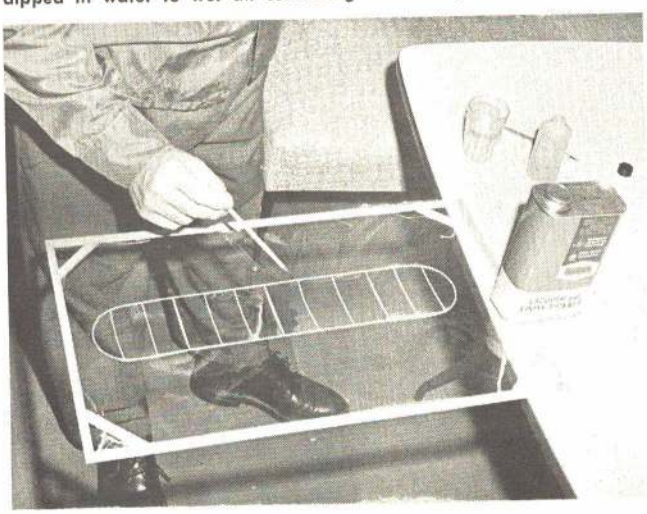
To hold film to the frame, carefully fold excess material over frame edges. Must be no breaks or open areas inside.

then covered with another sheet of tissue. Cut around the inside edge of the frame with a sharp blade and lift frame and excess paper clear. What is left is a large sheet of patching material, a sandwich of microfilm between two sheets of paper. It is easy to cut with a pair of scissors to any size or shape needed.

Cut a patch and separate the two sheets of paper. The film will stick to

Lifting is ticklish, to say the least. Actually, the frame is glided off. Slide it to one edge of pond and lift free edge slowly.

Covering process begins with wing on the film. Use a soft brush dipped in water to wet all contacting woodwork, ribs too.



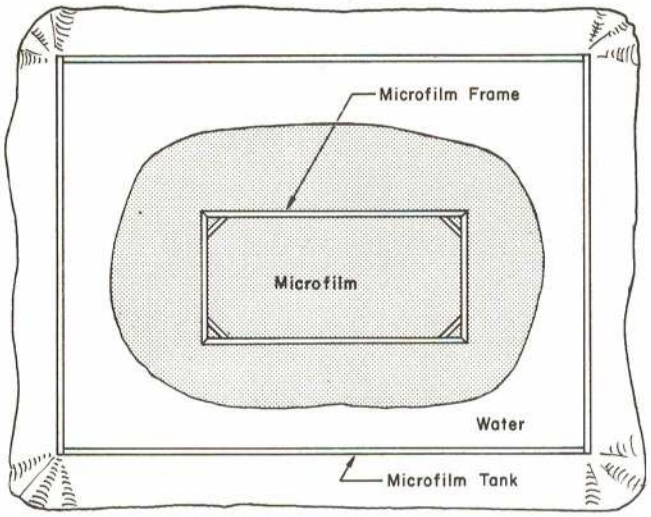


FIG. 2 Solution finishes spreading to form an oval of microfilm on the surface of the tank. After the microfilm has dried for several minutes, a wet microfilm frame is placed on the film.

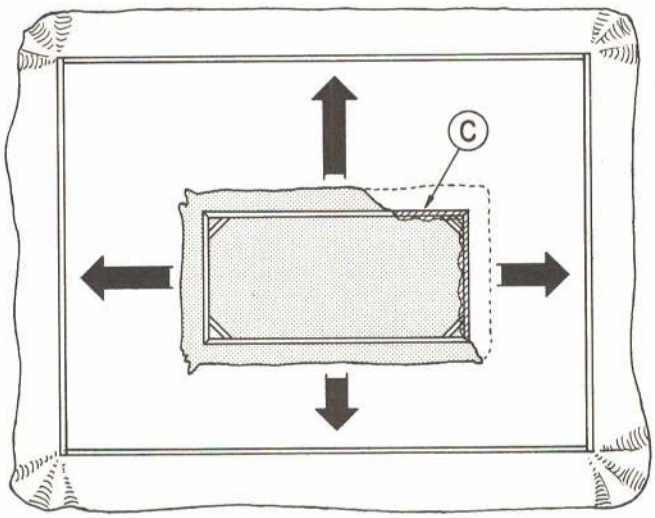


FIG. 3 The microfilm frame is now floated to within two inches of each side of the tank. This gathers film outside the frame close to edges of the frame. This excess film can easily be folded over the edges of the frame as indicated by C. When this process is completed, the film is ready to be lifted from the tank.

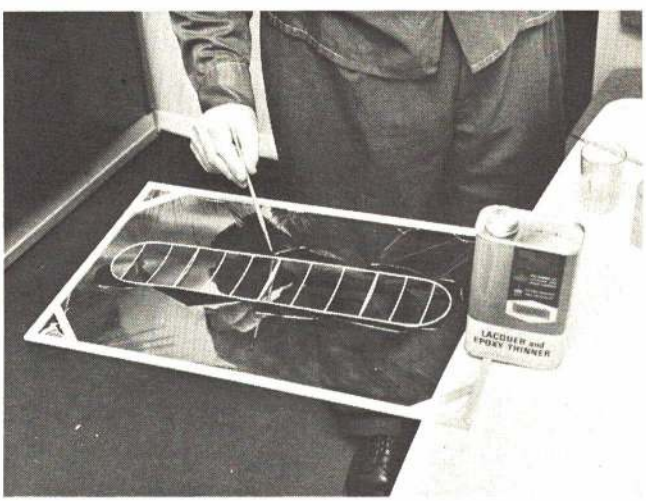
one piece of paper. Before mending, apply just a few droplets of water with a soft, pointed brush around the edge of the hole or the patch. This will help the film to stick. Lay the patch, microfilm to film, over the hole and pat the mend between two fingers until film adheres to film. Carefully peel the tissue free and the model is ready to fly.

Hopefully this article will help the beginner avoid common pitfalls. Other information and assistance is available from a number of sources. The Joe Bilgri articles are an invaluable investment for indoor model builders. Reprints are available from Bud Tenny, Box 545 Richardson, Texas 75080.

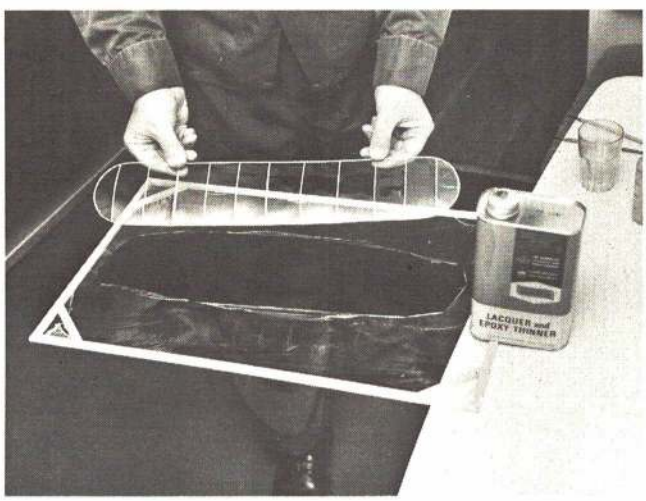
At the same time, join NIMAS (National Indoor Model Airplane Society). Its monthly bulletin, "Indoor News and Views," is chock-full of data on indoor modeling—the latest designs, building techniques, and where indoor models are being flown. Membership is three dollars. Again, contact Bud Tenny.

NIMAS is also ogranizing a group of indoor instructors across the country. For their addresses, send a letter and a stamped, self-addressed envelope to Roger Schroeder, 4111 W. 98 St., Overland Park, Kansas. If you have any other questions, please write me in care of **AAM.**

To remove wing from film, use either brush dipped in acetone or a hot wire to cut material. Whole wing is done at one time.

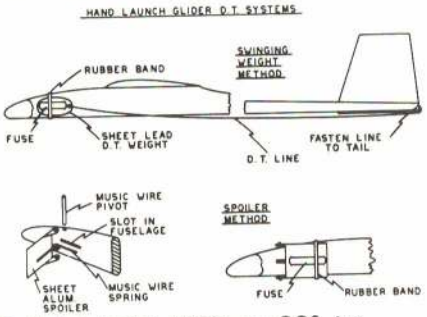


Finished job is beautiful, but fragile. Refer to last month's article on the Bandersnap to complete the model.



Where the action is...FREE FLIGHT

F/F BOB STALICK
Specialist Correspondent
GLIDER and RUBBER



Don't be fooled, HLG's go OOS too.

Keep It Light!: How many times have you heard that admonition from free flight friends, or read it in an construction article? Of course, keeping the model light should allow it to glide better, but there's a catch. Not only must it be light, but light in the right places—such as the wings, especially the tips; and the tail feathers, especially the stab. The reason is something called moment of inertia.

Simply stated, this means that the weight of the extremities of the model and its stability have a high correlation. The heavier the model, the more stable it is; that is it will be upset from its flight path less easily but, once upset, it will recover more slowly. Light extremities do help the model in maintaining its proper flight path, just as it was trimmed to fly. An example of a typical light extremity is an A-2 Nordic which, when shot off the top of the towline, recovers into a normal flight pattern, usually after only one stalling turn. Whereas, an A-2 with heavy extremities would stall several times before recovery, losing altitude with each successive stall, possibly stalling all the way to the ground.

The secret with any weight-rules model (such as A-1 and A-2, Wakefield and FAI

(Continued on page 77)

F/F BUD TENNY
Specialist Correspondent
INDOOR

Warped Models?: The contest season is in full swing, and you're raring to go—only to find that your prize-winning Easy B or paper stick model has warped badly during its summer sojourn in the attic. Sooner or later, this discouraging problem affects beginner and expert alike.

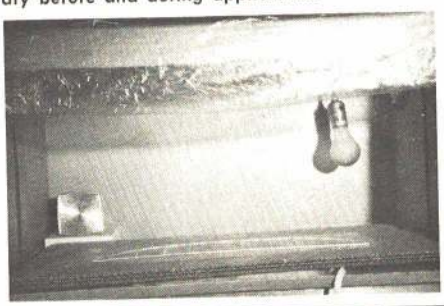
The Problem and a Solution: The basic problem is that condenser paper, which is used to cover indoor models, is extremely sensitive to moisture. When moist, it expands greatly. As a result, a model covered with moist paper warps as the paper dries out and shrinks. The solution is to use completely dry paper for covering. Sometimes, paper can be heated in the kitchen oven (preheat the over on low heat, turn off the heat and insert the paper) but, if the workshop's humidity is over 30%, this method won't work.

Build A Hot Box: A special covering "oven" (see photo) to eliminate humidity problems with condenser paper can be used. Set up the box, turn on the heat, insert the paper and the wing, and close the plastic curtain. Let the temperature rise to over 100 degrees and the humidity drop to less than 20% before trying to cover the wing. If no hygrometer is available, wait at least 45 min. Loosen the plastic along the bottom to gain access to the box and cover the wing completely inside the box. By following this practice, the paper never gets damp, regardless of the relative humidity outside the box, and it should never warp the model unless water is spilled on it. . . .

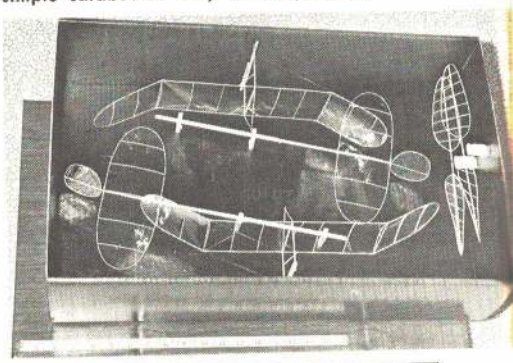
Model Storage and Transportation: Fragile indoor models need an airtight, waterproof box for storage. Such a box also must be arranged for easy accessibility to the models. Tom Vallee's solution is a basic cardboard storage box available from many department stores. It must be waterproofed inside and out, using care in the selection of the waterproofing material. Aircraft clear dope or other similar material is best, since some acrylics and spray paints often have residue solvents that last for weeks after the paint feels dry. Minute amounts of solvent in the closed box may cause droopy microfilm, which is a terrible shock the first time you see it!

After the box is waterproofed, make fixtures to hold the various model parts in place. Tom's model arrangement is a good one, with wings mounted on slides which fit into clips on the side of the box. The props are held by clamps which grip the prop shaft, and the fuselages slip into friction-fit clips on the bottom of the box. Note that the fuselage and wings are arranged so that one complete model can be removed without disturbing the other, and that there is clearance between the parts.

Cardboard box has lamp inside and heating pad beneath working surface to keep tissue dry before and during application.



Tom Vallee's microfilm model carrying box is simple cardboard. Why be complicated?



F/F WALT MOONEY
Specialist Correspondent
SCALE

McCracken's gas-powered bipe was meet's most realistic model. Did ROW when pushed.

Too big for its engine, this Vought 02U could not take off unassisted but flies well.

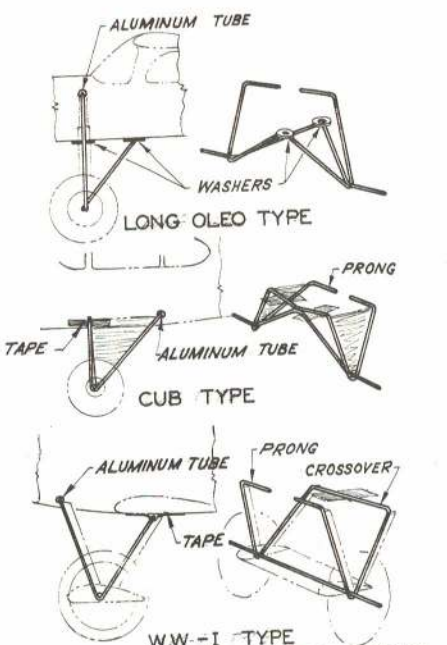
Seaplanes Soar Again: North American Rockwell Flightmasters held a second Free Flight Scale Seaplane contest, and it was as much fun as the first. Performances of models and contestants were vastly improved—partly the result of a little practice. Several entrants had test flown their models the previous weekend, which certainly helps.

Bill Brown's little CO2 engine showed itself to be a natural for ROW flying. First and second in Open Gas and first in Junior Gas were won by CO2-powered models. Among the engine's advantages are: it always starts at first flip; it's easy to adjust the power setting; and, if the model dunks itself, the CO2 gas under pressure keeps water from getting into the engine so restarts are easy.

Biggest problem for all contestants was insufficient power to take off. It's really amaz-

(Continued on page 76)

Water Bomber's rubbers angle to fin. Does ROW, flights short but smooth, by Mooney.



R/C DON LOWE
General Correspondent
SPORT and PATTERN

Retracts—Panic or Panacea?: This contest season witnessed a rush to retractable landing gears by top competition fliers (even I tried—again!). Success by the International champ was the obvious stimulus. Retracts, which have been around a long time in various forms, never have been adopted by a significant number of fliers. It reminds me of the introduction of proportional control systems. Analog propo (remember Space Control and TTPW?) and pulse systems were around quite awhile without making much impact until name fliers really took an interest and Kirkland won the NATS with propo (1963).

Retracts won at the NATS this year, also at the Internats team selection finals in Memphis. They were on winning ships at a significant number of other contests—primarily because the better fliers were using them. Those with retract experience usually respond positively as to their performance value. The same guys will cuss the things for being so blasted unreliable and causing so many maintenance headaches. However, retracts are used by the top-notch fliers simply because they feel these gears provide a performance edge necessary in top-notch competition.

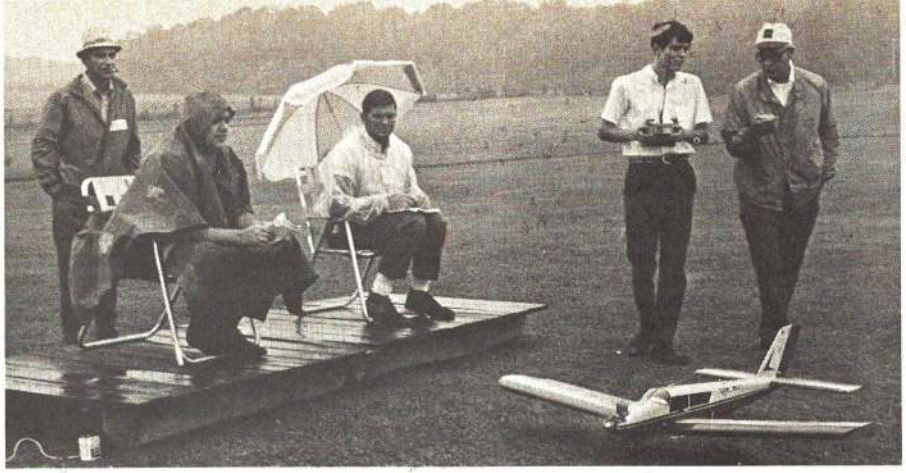
Observation of fliers in classes A, B and CN this year showed no significant use of retracts. A few could be found in CE and Class D, and an occasional one in A, B and CN.

Consensus is that retracts do help model performance in the air, presuming their weight is not a handicap. The overwhelming preponderance of evidence indicates, however, that present gear ruggedness and reliability leaves much to be desired. The nose gear which is exposed to exhaust and to vibration of very high intensity is particularly weak. Experience shows vibration and the resultant wearing-out of mechanisms to be the dominant problem. This vibration failure may occur after a few flights, depending on make of gear, balance of props, mounting of engine, location of gear, etc. Much improvement in all makes of retractable nose gear is needed. The main landing gear seems to be much less affected since vibration levels in this location are lower.

A second major weakness in retracts which employ remote servo actuators is the servo itself. A number of makes use conventional 180 degree propo servos for operation. If the gear is spring-loaded or balanced, little servo force is required for actuation. Problems do arise when binding occurs, due to strut bending or linkage placement, and excessive servo loads result. Also, gears, because of linkage adjustment, may not completely lock up or down and very high loads are imposed on the servo, particularly on landing. Special servos, capable of taking these loads without stripping gears or wrecking mounting and mechanisms are needed. How about metal gearing and rugged cases and output mechanisms? The servo doesn't really need to be proportional, so how about simple sequential operation and a lower price?

Until the state-of-the-art yields rugged and reliable retractable gears at a reasonable cost and with simplicity of installation and opera-

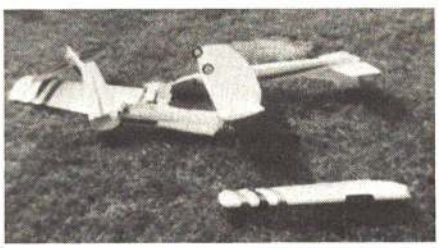
(Continued on page 75)



Greater love has no man than to fly a contest in steady rain. Scene at FORKS annual in Ohio. Something of a tribute to the radio equipment—none failed, despite the weather.

Lou Penrod, son Tommy, and Don Coleman at Memphis Labor Day meet. Don won meet.

Sequel to mid-air crash at Orlando—small scatter of debris was Lowe's airplane.



Ens. Gibson's two-stage, ducted-fan-powered RC B-70 uses a 19; has spoilers, rudder, elevator. He viewed real XB-70 test flight.

Official U.S. Navy photo

R/C BOB MORSE
Specialist Correspondent
PYLON RACING

Western States Pylon Championships: The Pioneer R/C Club really threw a wingdinger this year at the club's field at Sunnyvale, Calif. It had been prepared for racing with grading and blacktop, so that the club need no longer travel to a racing site at Turlock, 120 miles away.

Sixty-six entries were on hand and flew a total of 127 racing heats and three flyoff heats. Having an adequate staff of workers in addition to CD Bob Francis and Manager Jack Ullstad permitted an average time at five minutes per heat.

The best heat time was 1:37, posted by Bob Smith of the B & S racing team. Best time for the weekend was 1:35, by newcomer Ken Van Tyle of the Pioneers, in a flyoff for the K&B perpetual trophy. Final finish in Formula I had the B & S team in first place, followed by Ken Van Tyle in second, and Roger Owens in third. F.A.I. was won by Garry Korpi of the Pioneers. . . .

Scatter Pylon Flagmen: For those who invariably wind up working the flags at the scatter pylon—build a set of signal lights to replace those arm-wearying flags. Instead of baking in the noonday sun, the flagman is able to relax and enjoy the races.

We recently completed two weekends of racing with a relatively inexpensive, fully portable set of lights, and our flagmen had nothing but praise for them. It was quite a sight to see the flagmen out there with their beach umbrella, lounge chairs and refreshment coolers. More surprising, though, was the fact the fliers and their callers had no problems calling their turns with the lights!

Now's the time to build a set of lights for the 1971 racing season. Our set consists of four 12V auto headlights in two ¼ ply boxes cut from one 4 x 8′ sheet. The sheet is ripped into 9″-wide strips and these are cut in half to 48″ lengths. They are then assembled into two 9 x 9 x 48″ boxes with one side hinged to form a cover. Two lights are mounted at each end of each box and connected to four remote switches and a single 12V auto battery that should, if fully charged, provide a complete weekend of racing. Sunshades for the lights were made by rolling posterboard into a cone shape and gluing ply mounting rings to the small diameter end of the cone. The shade assembly was then screwed to ply boxes whenever the lights were set up.

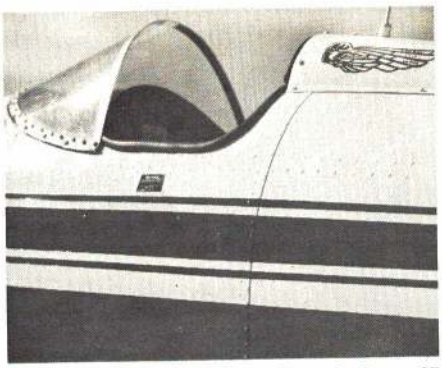
Our set incorporates ¾ dia. x 48″ dowels as support legs which slip into pipe clamps attached at each end of each box. All of this packs up into the two boxes for portability and storage between races. . . .

New Products: Several issues back we reported on a new "in-flight" adjustable carburetor developed by C & B Enterprises. A new item has been added to their expanding line of products, a true running spinner. Machined from T-6 aluminum bar stock, the spinner presents a satin finish and employs a tongue and groove to position the spinner into the backplate. This is a quality product and we do not hestitate to recommend it. C & B Enerprises, 15713 Via Repressa, San Lorenzo, Calif. 95480.

R/C CLAUDE McCULLOUGH
Specialist Correspondent
SCALE

Painless Panels: Maxey Hester's simulation of overlapped metal sheets on his Ryan ST Special received a lot of attention from modelers at the Scale World Championships, since an easy way of duplicating this difficult area has long been needed. The model is of conventional construction with balsa-planked fuselage and silk covering. After filler-coating, double layers of masking tape were laid down to outline the panel edges—doubled because a single layer did not produce a thick enough edge. Using a short, straight edge (an X-acto whittling knife blade is handy) a strip of Sig Epoxolite putty was squeegeed onto the fuselage against the masking tape and feathered into the fuselage contour an inch or so ahead. Sanding will eliminate this forward blending point and the area can be filler-coated to match the rest of the fuselage before removing the tape.

Maxey points out that particular care must be taken during color doping to avoid building up a layer of dope over the seam, since it will bridge across and spoil the sharp edge effect. A good, smooth, well-filled filler-coated surface that does not require much final finishing after being paneled is essential for success. . . .



Metal panels simulated on Hester's Ryan ST using Sig epoxolite. Balsa/silk fuselage.

Rivets From Resin: Hale Wallace's World Champs fourth-placing Chipmunk features a realistic job of riveting. His method calls for completing the color scheme first. Fiberglass resin is then dyed to match the model by use of the special concentrated pigments sold by boat supply houses. Droplets of the resin are transferred to the surface with a pointed 1/16" wire. Since the resin does not shrink when it sets up, Hale's rivets are smoother and rounder than most glue versions. Needing no painting, they adhere satisfactorily to any type of finish, yet can be picked off when necessary for a repair job. . . .

Long Drive to Meetings: Even if you don't live in the Los Angeles area, send three dollars to Fernando Ramos (one of the hard-working Chicago Nats scale judges) at 19361 S. Mesa Dr., Villa Park, Calif. 92667, and join the Flightmasters. They are an enthusiastic, exclusively-scale group, and their monthly newsletter is a classic, featuring regular reprints of rare three-views, plus plenty of building hints and news. . . .

Breaks Or Brakes?: Many RC scale events are lost on the ground, not from low static scores but from failure to come to a complete stop during taxiing. Since this must be accomplished twice, an appreciable percentage of the possible flight points is involved. Usually brakes are stuck on as an afterthought on half of the elevator movement and are seldom adjusted or used except at a contest. This is really shortsighted, because all the other gimmicks, such as bombs and flaps on which so much care and extra channels are lavished, earn Scale Operations points which are worth only one-eighth of brake (flight) points. It would be much more productive to devote full travel of an auxiliary servo to ensure sufficient mechanical action to really yank on that string, or to increase the voltage carried for electric types, to make certain the brakes will grab for stopping. A heavy scale model rolling downwind on asphalt takes a lot of drag. . . .

Scale Data Sources: Musee de L'Air, 91 Boulevard Periere, Paris (XVIIe), France, will supply information from its large collection of photos and drawings. State type of material desired and prices and descriptions of available items will be listed. For a sampling of some of the aircraft on display in the Museum, see **Air Progress**, Dec. 64/Jan. 65, April 65, and May/June 65. Coverage on these types should be particularly good.

R/C GEORGE SIPOSS
Specialist Correspondent
R/C CAR RACING

Lightweight Chassis: With the advent of superlight chassis and ultra-wide tires, car speeds are going up. Only time will tell whether a light and fragile chassis is more reliable (and thus be able to finish a race) than a heavier but sturdier car. At the Nationals, the heavy cars certainly outshone the new lightweight jobs. . . .

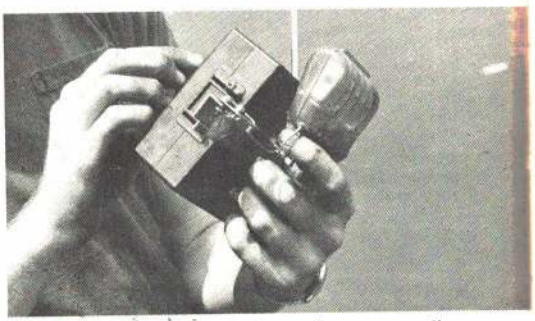
New Equipment: Dynamic has a straightforward sidewinder chassis which promises to be the standard of the industry. R/C Components Mfg., a new company, has two new items available, an antenna and an air filter. The antenna has a bayonet base and a 12-in. chrome-plated whip, while the air filter is of the tube type with wire screen integrally mounted. Write P.O. Box 161, La Mirada, Calif. 90638.

TOMCO (P.O. Box 4403, Little Rock, Ark.) recently released a starting battery eliminator. This consists of a small electronic black box with four wires coming from its sides. Two of the wires are connected to a plug which goes into an automobile cigarette lighter while the other two are connected to the glow plug. This eliminates the need for a 1½V starting battery, and the car's 12V are reduced to a safe level.

World Engines recently introduced a new radio system for $109 (with one servo) which is the lowest cost way to get started in RC cars. Add a second servo ($19, in kit form) for a full digital proportional radio set. They also have an accessory to permit a soft (slow) center action in the steering assembly and a fast one on approaching the two sides. Can be mounted on any S-4 servo, costs $1.98. . . .

New Club in Japan: Tomoako Yakobori, 25-2 Motomachi Senju, Adachiku, Tokyo, Japan, is forming a club affiliated with ROAR. Other groups are being organized in this country and in Europe as well. . . .

Vertical projecting antenna eliminates breakage and adjacent driver confusion.



Slot-car controller throttle action so well learned here, it had to be retained!

Engine Modifications. The latest rage in engine mods is mounting a 29 or 40 carburetor on a 19 K&B or VECO engine. A bit of fairly easy lathe work is required. The result is more top speed, although at the cost of increased fuel consumption—somehing to think about in this age of Enduros where many cars have lost a race during the last lap because of an extra pit stop for fuel. Remember, ROAR rules specify a maximum fuel tank capacity of 4 oz. Most race directors organize Grand Prix races so that the fuel limit is reached at around the last lap, which forces the driver to go easy on the throttle or else risk an additional pit stop. . . .

Nutsy-Boltsy News: Two transmitter modifications have been seen lately. One is by former slot racers who have gotten used to the Russkit hand controller. They simply mount a pistol grip type of controller on the back of the transmitter and connect the trigger to the throttle lever. This may be located on the side (such as Orbit's Cobra) or one of the sticks on a two-stick system. An extremely agile left index finger is needed to use pistol grip.

The other modification is simple, yet offers so many advantages that it's surprising nobody thought of it sooner. Most antennas stick out from the top edge and are horizontal when the transmitter is held in the hand. Thus, the antenna is prone to jab someone in the eye and the transmitter tips over easily when it stands on the ground. To remedy, simply relocate the antenna base socket on the transmitter's front face. Now the antenna is almost vertical and will not spear anyone. The unit is stable on the ground when not in use. Two of my radios were knocked over and damaged in impound, so I have converted to the above system.

Make sure that, when work is done inside the transmitter case, no delicate components are damaged and that no chips from drilling the new hole remain inside the case. Insulating washers must be properly remounted to prevent antenna-to-case grounding. The newly drilled hole edges may have to be filed smooth to prevent sharp edges from cutting into the insulating washers. When drilling into the case, have someone hold it to prevent vibrations from upsetting the delicate adjustments.

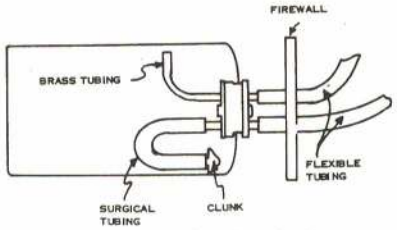
Keep those reports, hints, ideas and shortcuts coming in. Be sure to include a simple but clear sketch if needed.

R/C FRED MARKS
Specialist Correspondent
TECHNICAL ITEMS AERODYNAMICS

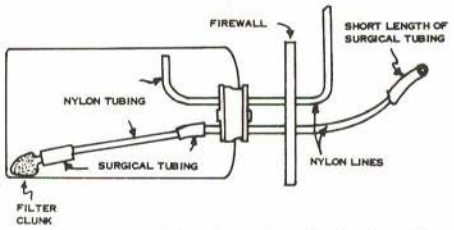
Some Suggestions for Fuel Systems: Problems with fuel tanks, lines and fittings are common: leaky lines, the clunk flips forward, lines become hard (if plastic lines) or gummy (if surgical tubing), lines are not easy to replace in the field and refueling is difficult. Presented here are a number of separate suggestions which should alleviate most, if not all, of these problems.

One solution is the filter/clunk presented in Aug. 70 issue of AAM. A commercial filter/clunk is an alternative. The second solution comes from the Tom-Tom, (Indian City RC Club newsletter, Bob Mayhew, editor). Instead of using a single piece of flexible tubing to extend from the fuel pickup (clunk) to the outlet, insert a short piece of nylon tubing, such as 1/8 Nyrod, in the pickup line. Now the clunk can't fly forward (Fig. 1).

Another idea, from John Spaulding, appeared in the DCRC Newsletter. Instead of using brass for the fuel outlet lines, use 1/8-in. nylon tubing. By holding it over a soldering iron or near an open flame, the tubing can be bent to any reasonable shape without collapsing. This makes it easy to fit a tank into those difficult areas. By expanding on this idea, I have eliminated pesky flexible tubing lashups and now make all my lines nylon tubing up to within an inch of the carburetor. I use about one in. of surgical tubing for that connection, plus the two short pieces in the pickup line.



Had this problem: fuel pickup kinks up front and won't drop back? What maneuver did it?

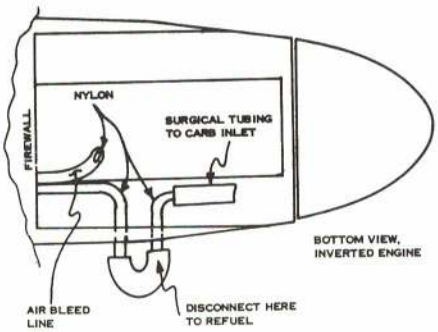


Solution is to add a short length of stiff tube. Nylon can be used extensively at tank.

Models such as the RC Shark 45 and the RC Nobler have inverted engines, which makes it difficult to get the inlet line for refueling. The arrangement I have adopted (Fig. 2) permits an external connection and has proved essentially trouble-free over the past three years.

Babcock Puzzler: Franklin Svobda writes, "Recently I purchased some used Babcock RC equipment and, being somewhat of a novice in RC, I am puzzled by its functioning. The system I acquired was the BCT-18 transmitter, and I am unable to increase the system range over 100 ft. Since I have no directions for the system's operation, I wonder if you might know where I can obtain the schematics and operating instructions."

Frank, it took a bit of digging to find anything on the system, much less schematics and operating instructions. The system described was produced by Babcock in 1964, and was a single channel tone system designed as a complete package. The transmitter had an electronic keyer built in to key a compound escapement for left rudder or right rudder or up elevator or down elevator, nonsimultaneously. Throttle was obtained via a "quick blip" and a secondary escapement. The airborne set was designed to operate from a single 9V battery and it was superheterodyne.



Bottom view of inverted engine installation shows two-tube tank system. Refueling easy.

On Frank's behalf, may I request anyone having the instructions and/or schematics to reproduce and send them COD to Franklin Svoboda, 2256 Magney Dr., Cloquet, Minn. 55720.

Since a number of requests similar to Frank's have been received, let me suggest the following general checks. First be sure that battery voltages are correct, both in the trans-

(Continued on page 76)

R/C HOWARD McENTEE
Specialist Correspondent
GLIDERS and FAI

Congratulations, FAI Scale Teams!: For the few who haven't heard by now, the U.S. RC scale team placed second in the FAI World Championships. Maxey Hester flew his Ryan ST Special to second; Hale Wallace brought his DH Chipmunk Special in fourth, Walt Moucha flew his just-finished Bowers Fly Baby (original had been wrecked earlier in summer; plane he flew had first test flight in England the evening before actual competition started!) to fifth.

Team Winners: (1) England; (2) U.S.; (3) Sweden; (4) Germany; (5) Ireland; (6) France; (7) Switzerland. Sixteen planes were entered. Let's also give a real salute to our CL scale team which placed first at the same meet! . . .

Largest U.S. Glider Meet: Eighty-five contestants brought some 125 to 150 gliders to the League of Silent Flight 1970 RC Soaring Tournament. Held at Livermore, Calif., it certainly was the largest such meet to take place in the U.S. and rivaled the huge affairs sponsored by the Graupner concern at Kirchheim/Teck, Germany. Gliders had to conform to FAI rules. Scoring was handled by a computer (see this column, Nov. 1970 AAM).

Five tow winches were employed (four electric, one gas, with several spares if needed). All launches were ROG—glider is held on ground, released by pilot or helper. LSF feels this is much safer than hand launch. Only two launch crashes occurred. Despite a huge number of flights (over 500 in the two days), there was little other glider damage. Many gliders had spoilers, flaps, ailerons, or combinations.

Top winners include: Precision (exactly one- or five-minute flight, spot landing)—Sportsman Class, Max Carnohan; Open, Les Anderson; Distance (maximum closed course laps in ten minutes one day; fastest clocked time over five laps the other) Sportsman, Bruce Estes; Open, Paul Forrette. Duration (ten-minute max plus landing one day, 15 minute max plus landing the other); Sportsman Jeff Walters; Open, Roger Hebner. Les Anderson flew his Graupner Cirrus to top place for all events; Ken Willard (8' span MaxiSailer orig.) tied for second with Roger Hebner, also flying a Cirrus. Thirty-five pilots entered the Open category (those who had flown in more than three prior RC glider meets during 1970); 50, in Sportsman class. Top winners were awarded fine trophies, but every entrant received a commemorative plaque. North Bay Soaring Society and South Bay Soaring Society were co-hosts for the meet, which received strong support from Kraft Systems, Inc.; Du-Bro Products, Inc.; Top Flite Models, Inc.; Midwest Products Co.; and Orbit Electronics, Inc. . . .

Madison Avenue Discovers Sailplanes: RC planes have been seen in ads for entirely different fields before, but in recent national magazines one of the "big three" auto makers showed a fellow carrying a Cirrus glider

(Continued on page 76)

Early morning arrivals. Over 100 models were in the pits before the first launch. Over 500 flights made. Photo by Cal Street.

Just off ROG pad, Rick Walter's original 12-ft. design claws for sky. He pulses the electric winch to "kite" the model higher.

C/L BILL BOSS
General Correspondent
SPORT and SCALE

Indoor CL Flying: In many parts of the country winter means minimal control line flying, done only by those hardy fliers who have braved the cold. The rest of us stay in our warm basements and build for next summer. But does winter really mean we must stop flying? The following suggestion tends to refute that idea.

Joshua Schwartz, member of the Tech Model Aircrafteers at MIT, suggests that the old slot-car motors and speed controls can be put to good use for some winter indoor control line flying. He feels a real gap exists between indoor and outdoor multi-engined model aircraft. Twin-engine aircraft, which occasionally are built for indoor rubber flying, are tricky to construct and rarely give as good a performance as the single-engine type. The average multi-engine control line scale model is a labor of love and often requires more effort, skill and dedication than most modelers are willing to put forth. What is needed is a small, easily-built scale model that need not be flawlessly finished or intricately detailed. He believes that those criteria can be met by electric-motor-powered control line planes.

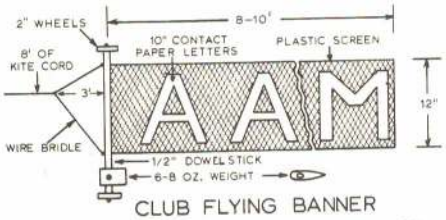
For his initial project, Joshua scaled up a DH88 Comet (from an AAM centerfold) to 30 in. span. The ship was powered with two small slot-car motors turning 4½ x 2½ Cox gray nylon propellers. A Cox slot-car handle was used to permit throttle control.

The DH88 was flown on 15-ft. lines which were attached to a center pylon equipped with slip-rings, so that the plane could be flown from the outside of the circle. The power supply was made adjustable from 12-28V DC to power the Comet's two motors, which were wired in series. Performance of the plane is limited by the length and size of the flying wires. Experimentation is required to find the right combination.

Instead of supplying power via this pylon slip-ring method, why not supply the power from overhead so that the pilot can fly the plane as he does other control line planes. I'm sure this idea could be developed into some good indoor CL flying. How about indoor Scale, Navy Carrier, Speed and so on? Local school gyms would be ideal for this kind of activity, perhaps even larger basements or living rooms.

Joshua's final comment was, "Even the electric plane has that distinctive twin sound and this one won't bring the neighbors out yelling.". . .

Fly A Banner: Warren Truppher proposes a club flying banner as a novel and effective way of telling the crowd at the local flying field or contest who is doing the flying. All it takes is a few items from the scrap box, plastic screening and contact shelving paper from the hardware store, and time at a club meeting for construction. Sounds like a good way to pep up one of those dull winter meetings.



CLUB FLYING BANNER

Advertise your club with this eye-catching banner. Note wheels location for takeoff.

The banner size shown is best towed by a plane with a good 35 engine. Banner end flutter and whipping will then be at a minimum. Even better is a plane equipped with speed control for the towing. The eight-ft. kite cord used as a towline also acts as a safety line. Should the banner snag on takeoff or landing the cord will break, thereby protecting the plane from damage. To lessen the possibility of snagging, wheels were added to this banner, but they can be eliminated, if desired.

Scaled from AAM centerspread, Comet is an indoor electric-powered twin. During winter some clubs turn to slot-car-motored models and compete in scale and speed events.

Construction is rather simple. Since plastic screening is 24 in. wide, a five-ft. piece can be cut down the middle and stitched end to end. To attach screening, double up approximately three in. on one end, wrap it around the 20 in. dowel so that two in. of the stick is above top of banner, and sew or staple it in place. Locate the counterweight about five in. below banner.

Lay out and cut letters from contact paper. Peel off the backing and press in place on the screen. When all letters are attached, turn the banner over and paint their backs (through the screening) with ordinary rubber cement. This assures adhesion of the letters to the screen.

(Continued on page 74)

C/L JOHN BLUM
Specialist Correspondent
CARRIER and STUNT

This beautifully painted All-American Boy is a modified Nobler by Ken Moore. Big flaps.

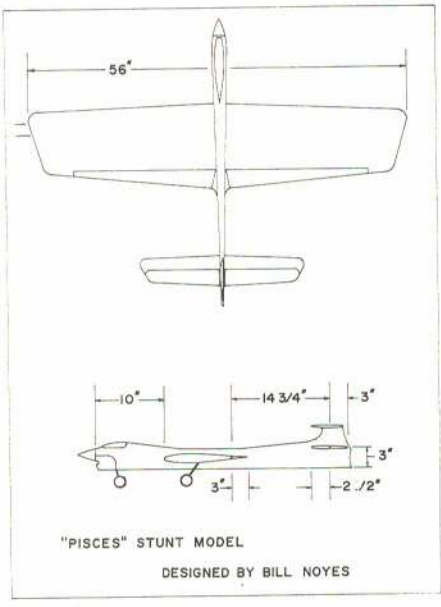
Lone Star Contest: Kingsville, Texas, was the site of the First Annual South Texas Regional Model Contest. The AAA meet, held at the Naval Air Station's south field, was sponsored by the Navy Jet Training Squadron and offered more than $2,000 in prizes, with contest proceeds going to the 1970 Navy Relief Society.

The two-day affair, as the Navy publicity release puts it, gave South Texas modelers a chance to do their thing. Using the proudly displayed miniature deck, the USS Kingsville. John Daubenspeck won first in Carrier; Tom Mason first in Profile. Another fine example of Navy support. . . .

Profile Fuel Tanks: George Foster shares his ideas on tanks for profile fuselages. He feels that the far-outboard location of the fuel supply tube in conventional tank installation causes a lean run at the end of the flight. His proposed method aligns the fuel supply tube with the engine spray bar, thus

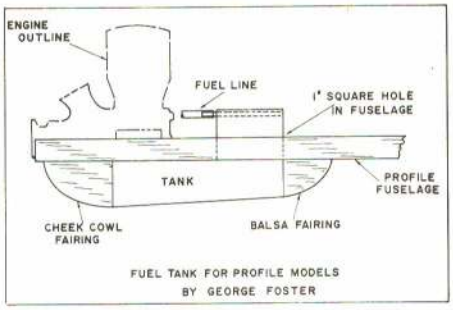
Tom Mason's Profile P-51 about to land on carrier deck at Navy-sponsored South Texas Regional AMA meet. Official U.S. Navy photo.

Have a new design? Send pix and views.



"PISCES" STUNT MODEL
DESIGNED BY BILL NOYES

This slow Combat bipe was scaled up from an Aurora plastic model by Gary Hetric. It uses a Fox 29X and is reasonably fast. Paint scheme same as used on U.S.S. Ranger. Colorful planes make event worthwhile.



FUEL TANK FOR PROFILE MODELS
BY GEORGE FOSTER

creating an in-line arrangement during the entire flight. The design maintains the conventional wedge at the pick-up tube and the standard fill-overflow for sport and stunt. For use with pressure, the quick-fill tube can be easily installed. Adds looks to the model with balsa fairings. George suggests the novice disassemble an old tank for knowledge of construction. . . .

West Coast Stunt: From the Valinda and Whittier Narrows (Calif.) area, Bill Noyes reports on stunt activity and shows parallels in model size and detail to Midwest and Eastern stunters (see drawing). Perhaps it is not unusual that similar philosophies about rules change proposals and appearance points are held.

Several 1970 contests eliminated appearance points to encourage participation. Others, which preferred fine finish and detail, maintained those standards. . . .

Foam In The Fuselage: Control line modelers have a common problem with construction joint fatigue at the wing leading edge-fuselage juncture. Many methods of reinforce-

(Continued on page 74)

C/L JOHN SMITH
Specialist Correspondent
SPEED and RACING

A Full Mailbox: Last month the mailbox overflowed! Thanks to all of you for the many photographs, letters, and ideas. I'll try to use as many as possible. Some beautiful color slides came in; however, black and white photos are best—the bigger the better (8 x 10", if possible). Only a few can be used each month so don't despair if your picture is not used right away. . . .

New Open A Record: Charlie Vassallo set the record at 170.87 mph, backup was 168+. His ship was an original design, with a TWA-type engine by Vassallo. It was proxy-flown by Bob Hemingway, and the record set at the Association of Model Airplane Clubs of Greater New York Tenth Annual Meet. Pan-Am Social Athletic Club was the sponsor. The engraving on the trophies cost more than the trophy itself! Note says Bob flew all of Charlie's ships in the meet and sacrificed much of his own flying time. Bob did place second to Charlie in A speed. How's that for sportsmanship?. . . .

And a Record Lost: At the recent Cold Cash Speed Bash (Dayton), Fred Randall was over the record with a 174+ flight in Open A Speed using a TWA 15, but Freddie couldn't quite get around the pole fast enough. This model was turning a lap every 1.3 sec. which is a long way to run. Anybody have an answer? . . . .

Delta Dyna-Jet: Jerry Farr built an unusual 60-sq. in. delta-winged honker. Several launches by skidding it off found him almost eaten alive, but using a dolly he turned a near record speed. . . .

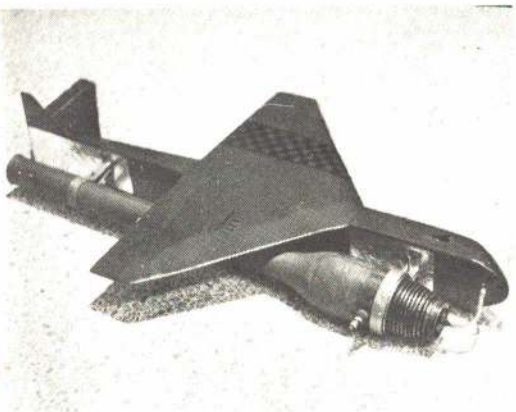
FAI Team Selection: Once again our FAI Speed team took all the marbles in Belgium. Those who didn't read Doc Jackson's report in **Competition Newsletter**, Sept. 1970, should beg, borrow, or swipe a copy. The work the team members put into this competition is fantastic. They represent our country the same as do our Olympic teams. Two new members, Arnie Nelson and Jim Nightengale, placed first and second respectively.

There's still time to try out for the 1972 team, so if you have an airplane you think is fast enough, why not give it a try? Check the AMA contest calendar for the nearest elimination. Even if you don't try, support the FAI team.

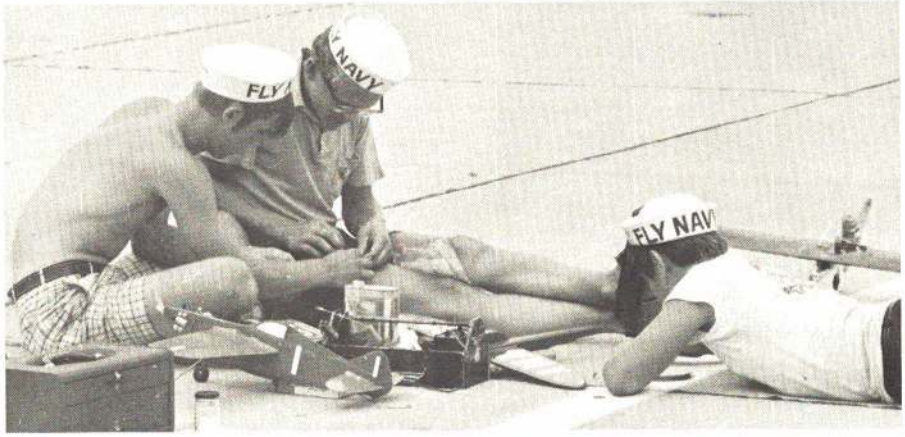
Equipment Suppliers: For fuel switches, aluminum wings, spars, and all components for Speed, Rat, Goodyear, and Proto, contact Technamics Corp., P.O. Box 1665, Scottsdale, Ariz. 85252, for free information and price lists. . . .

Check The Rules Book: When building equipment for the coming contest season check the rules book for your particular event. At the 1970 Nats the biggest problem at processing was rules infractions. AMA numbers must be at least one inch high, and the line wrapped in the specified manner or its equivalent. Check all new flying wire with a micrometer before making it up—better a thousandth over than half a thousandth under. If using acid core solder to make up lines, be sure to wash all joints with with a baking

(Continued on page 74)

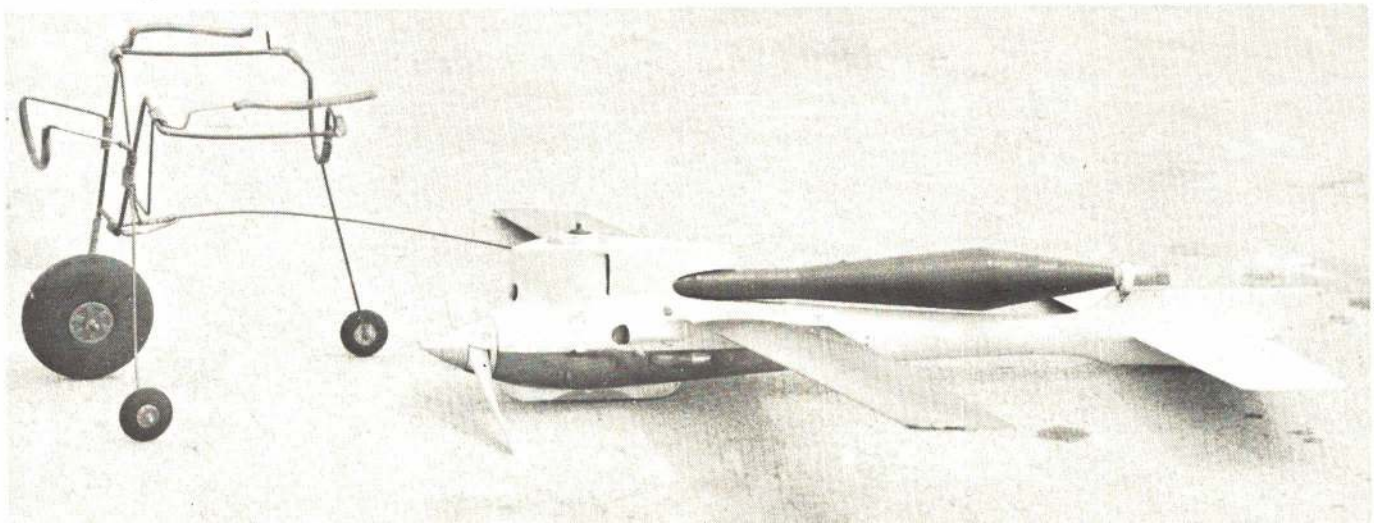


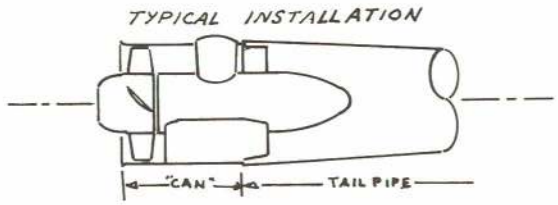
Jet outside tank (centrifugally) minimizes fuel-feed problems and ups speed. This design needs refinement and streamlining.

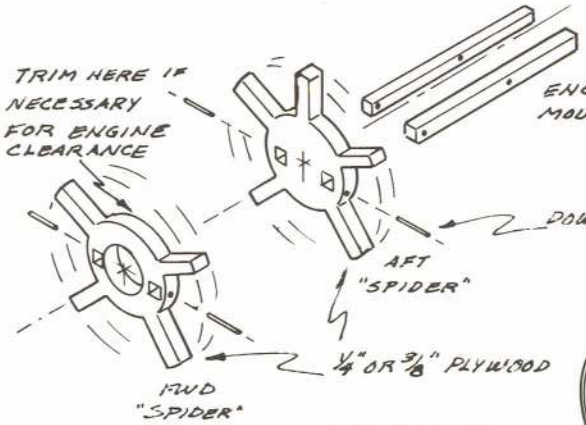


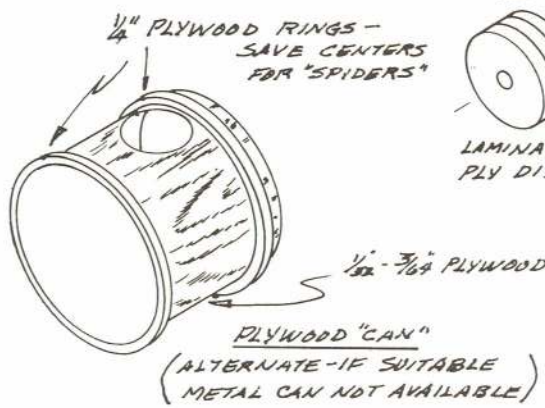
A variety of models was flown in speed events by these Juniors from Rockford, Ill. Dave Berquist, Jim Tibbett, and M. Pofelski. Rat racer, Goodyear, Speed and Proto at the Nats.

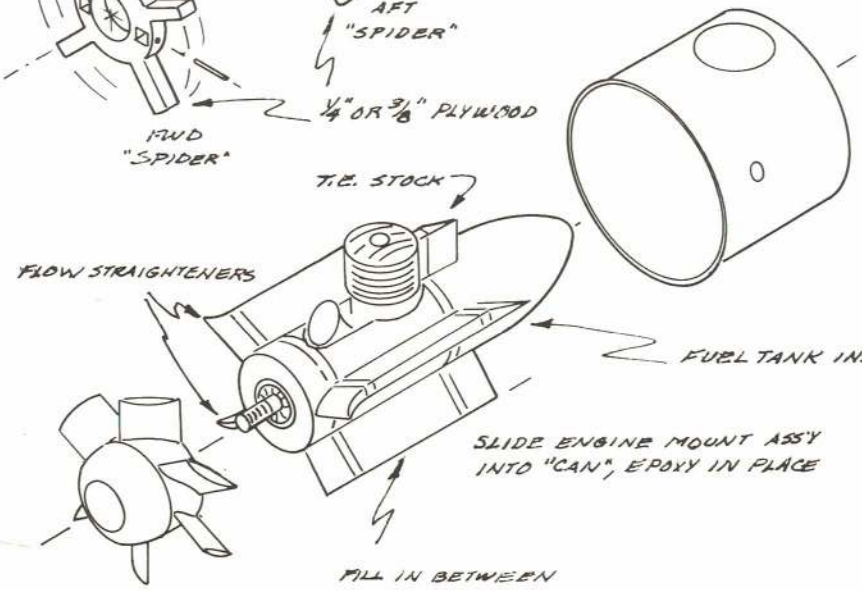
Glen Lee's original TWA-powered, with tuned pipes, arrow-like fuselage. How about that weird, wheeled, lightweight dolly?

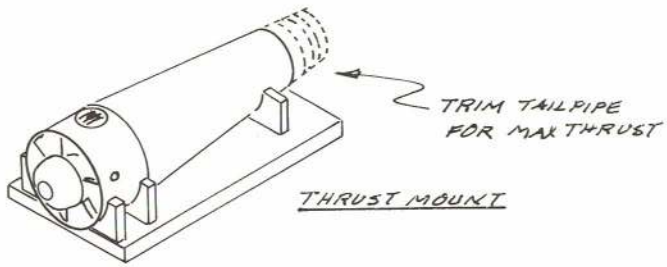




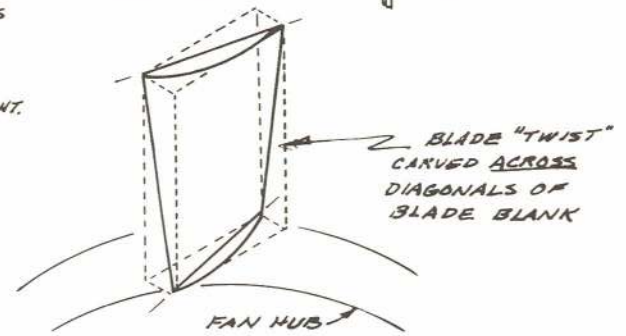




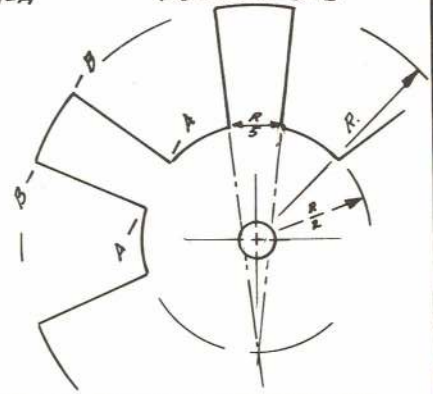




FAN CONSTRUCTION



METHOD #2



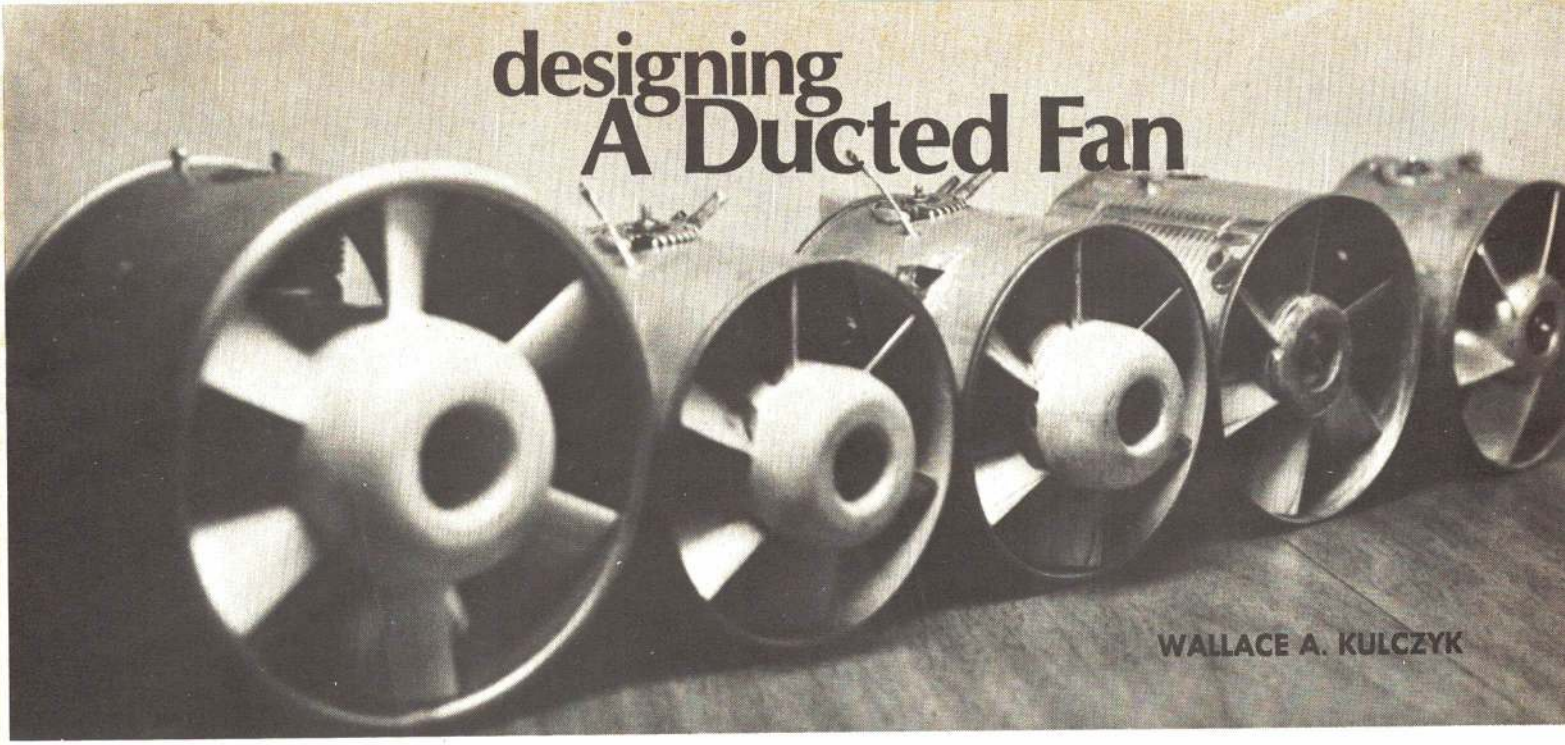
DUCTED FAN "POWER-PAK"

GENERAL ARRANGEMENT AND CONSTRUCTION

DESIGNED, DRAWN AND FLOWN BY: W.A. Kuhlyghe Jr.

JANUARY 1970

designing A Ducted Fan



WALLACE A. KULCZYK

To be useful, these piston-driven air pumps require careful design, testing, and adjusting.

THE ADVENT OF THE JET airplane presented a serious challenge to the scale modeler. How could it be duplicated in model form? Obviously, hanging a model engine/propeller combination on the nose of a scale model jet airplane will make it fly, but it certainly detracts from the appearance and defeats the intent of scale modeling, i.e. to duplicate, to the maximum extent possible, the features of the full-size airplane. Model jet engines, at least those that are presently available to the average builder, are terribly noisy, generate fantastic amounts of heat and, in general, are hard to handle. The ducted fan propulsion system has evolved as a result of the requirement to simulate jet propulsion in a model aircraft.

Simply stated, the ducted fan system generates thrust by accelerating an air mass and ejecting it through a simple nozzle. Power is applied to the air mass by means of a multi-bladed fan rotating in a duct or shroud which fits closely around the fan. Fan efficiency is improved by the close shrouding of the fan which reduces airflow losses around the tips of the fan blades. The ducted fan is in essence an "air pump."

Studying available data on existing ducted fan designs has led to several conclusions: (1) Poor Maintainability: In almost every case, the engine and fan combination is built into the airplane during the early stages of construction and, thus, is essentially inaccessible for normal maintenance, cleaning, or servicing thereafter.

(2) No Performance Guarantee: The builder has no way of knowing, until after the model is built, that the proposed engine/fan combination will provide the required thrust.

(3) Non-Interchangeability of Parts: If more thrust/power is required (see item 2), the builder is forced to disassemble the model, to some extent, in order to replace the engine (see item 1). In addition, the power unit is not easily interchangeable between models.

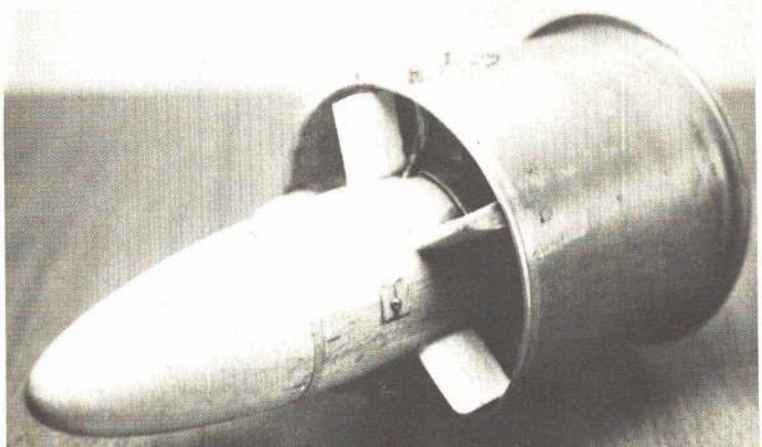
(4) Improvement Required in Fan Design and Construction: Sheet metal fans are frightening! A blade failure at 15,000 rpm plus, can be disastrous to the operator, the model or a spectator. Proper shrouding helps but sheet metal exposed to vibration is notorious for developing fatigue cracks.

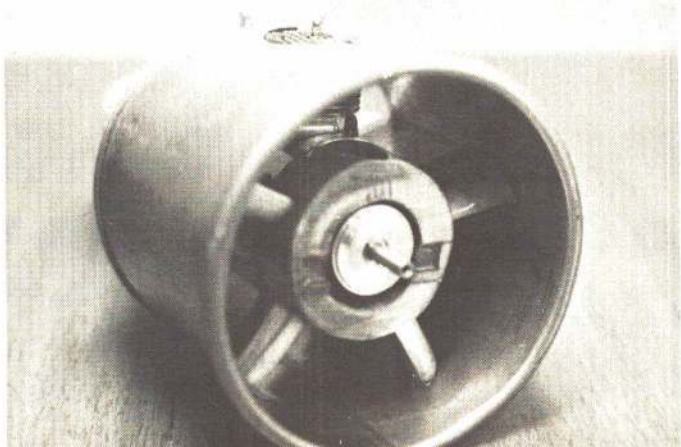
Evaluation of the above deficiencies resulted in the development of the ducted fan power package presented here. We have attempted to eliminate the disadvantages and difficulties encountered in ducted fan construction. The power package is constructed using a metal can or appropriate tube as the basic unit. Plywood "spiders" support the engine in the center of the can. These supports also form the basic frame for the airflow straighteners which are essential for good performance. The fuel tank is mounted behind the engine and is faired in by using balsa blocks.

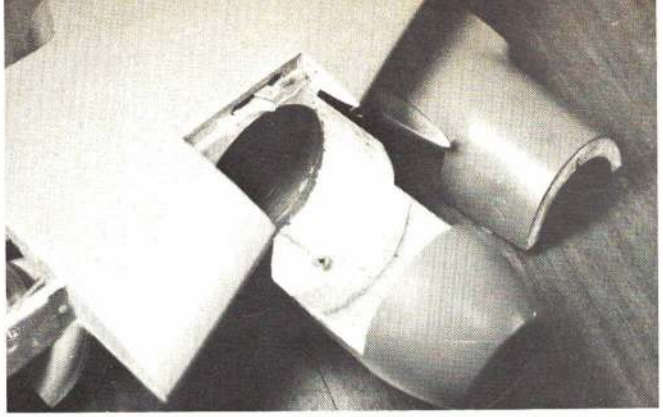
The entire engine/fuel tank/flow straightener assembly is assembled as a complete unit prior to installation in the can (see sketches). The power package can be mounted on a test block and thrust-checked by using a cardboard tailpipe of the same dimensions as those to be used in the model. When the thrust output has been verified, the model can be designed around the dimensions of the power unit, with reasonable assurance of good performance.

The first step is to determine the fan diameter. Regardless of the size desired, the same basic design procedure will apply. Experience has shown that

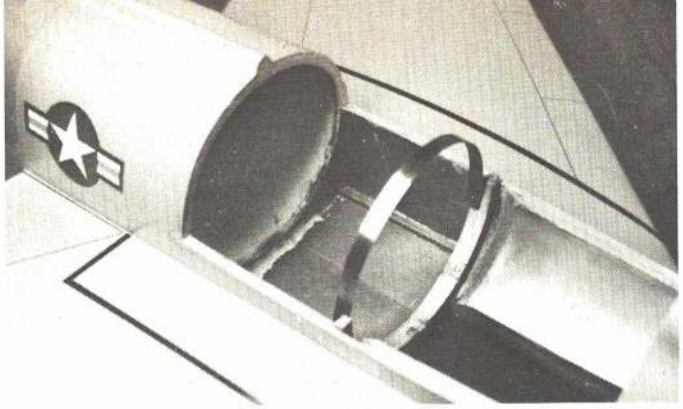
Rear of five-in. unit shows streamlined, fuel-proofed tank fairing. Leading edge of flow straighteners is opposite fan blade angle.



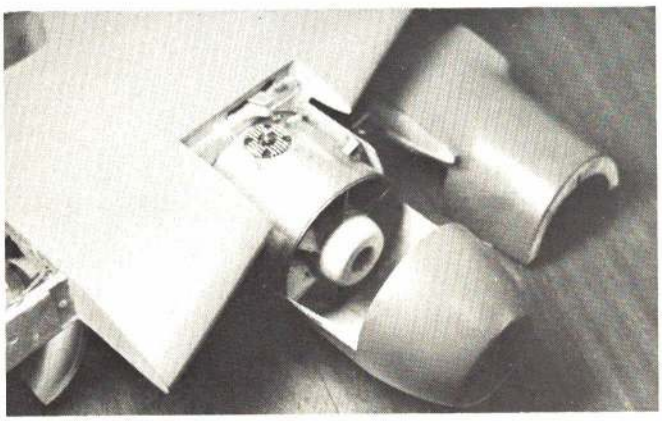


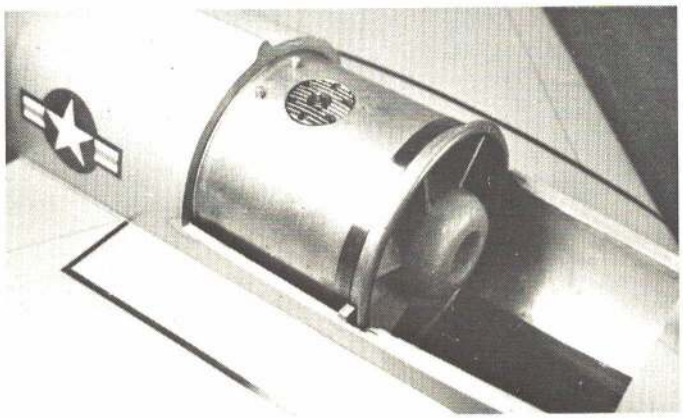


ME-262 model uses two four-in. fan units, powered by S.T. 23 with throttle. Fine-flying model also sports complete retractable landing gear. Three bolts mount the air pump.



F-100 model ready for power-pack installation. A strap mounts the five-in. fan. Note screened auxiliary air intake forward and below fan unit. Plenty of access for hand-starting.





fans of less than four-in. diameter do not produce sufficient thrust for anything except a lightweight free flight model.

Extensive testing indicates that a six-bladed fan with a hub diameter 50% of the fan diameter performs exceptionally well. The blades are mounted on the hub at a 45-degree angle to the plane of rotation. The blade chord should be such that the sum of the chords of the six blades at the hub does not exceed the circumference of the hub. However, this generally provides a blade with a chord wider than necessary for the rpm's at which models will be operating. The fan would be excessively loaded, therefore, 75% of the figure obtained above works well for blade chord.

Two methods of fan construction are shown. The first method, which uses plywood blades pinned into slots in a laminated plywood hub, requires the builder to carefully carve the twist into the blades. Twelve to fifteen degrees twist, resulting in a blade tip angle of 30 to 33 degrees, is desired. The amount of twist available will depend on the thickness of the blade material.

The second method, stacking the fan profiles, permits the builder to easily obtain the desired twist angle. Either method requires careful but not difficult work. "Resorcinal" glue is used to fabricate the fans regardless of which method is used.

Aluminum fans have been constructed using a turned-aluminum, slotted hub with pinned sheet aluminum blades, but their weight far exceeded any expected thrust increases. The extended fan hub is simply a turned balsa block affixed to the basic fan assembly. Do not delete the hub since it helps to establish airflow into the fan blades—especially at the root of the blade.

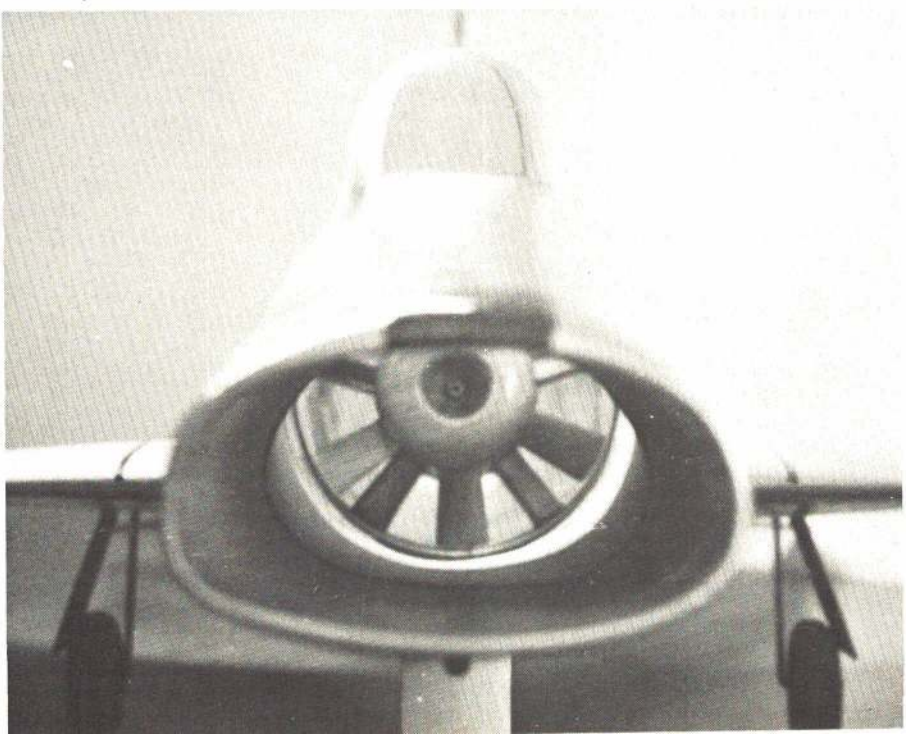
The engine mount is designed around the dimensions of the engine. Having determined the distance from the front face of the thrustwasher to the rear of the crankcase (assuming a front rotary valve engine), and the width between the engine bearers, some basic design considerations can be made. The dimension from the face of the thrustwasher to the cylinder centerline also must be determined.

Plot these measurements into a full-scale profile and front view of the can to be used. Superimpose the diameter of the hub on the front view and locate the engine bearer cutouts. Plot the "spider" legs (five for a six-bladed fan) at least ¼" wide, ⅜" for a five-in. or larger unit. The legs are spaced 72 degrees apart, the top center leg of the rear spider being located behind the engine cylinder. The location of the forward spider should allow for a curved leading edge to be installed as a lead in to the flow straighteners.

Fore and aft location of the engine mount in the can will be determined by

(Continued on page 86)

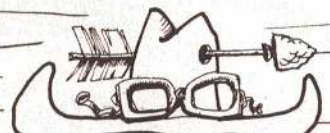
Most important detail in ducted fan installation is smooth, well-finished intake and outlet.



1/8 X 5/8 X 12 BALSA SLOT

1/16 PLYWOOD SLOT SUPPORT - SEE FUSELAGE SIDE VIEW FOR SHAPE. MAKE 5

LOCATION OF 1/4 X 1/4 FILLETS



FOR THE TENDERFOOT

WING-TOP VIEW

1/8 X 3 X 24 BALSA

FUSELAGE CENTERLINE

3/32 BALSA STABILIZER

3/32 BALSA ELEVATOR

RUDDER DETAIL TOP VIEW

3/4

3/32 BALSA RUDDER

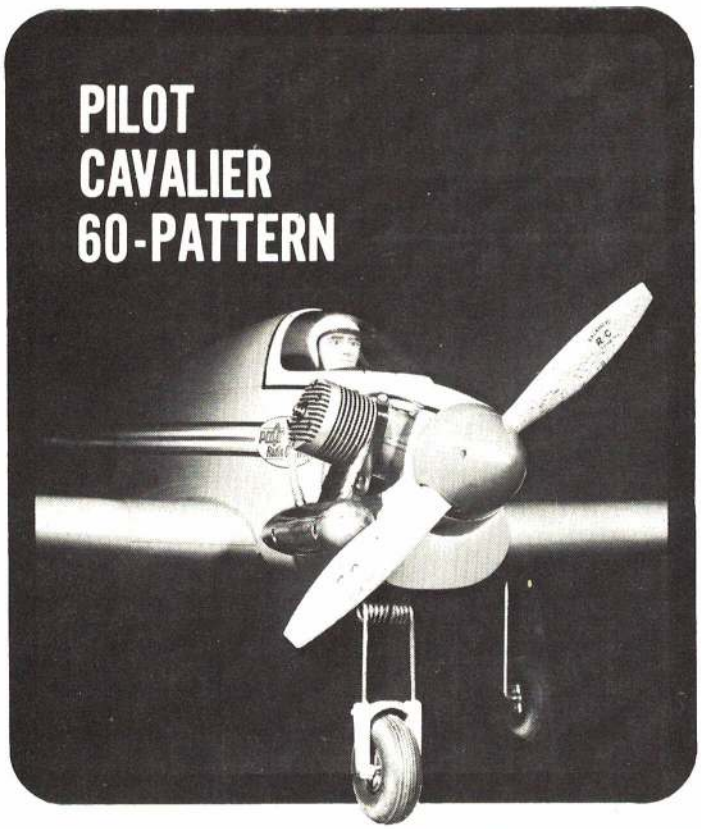
3/32 FIN BALSA

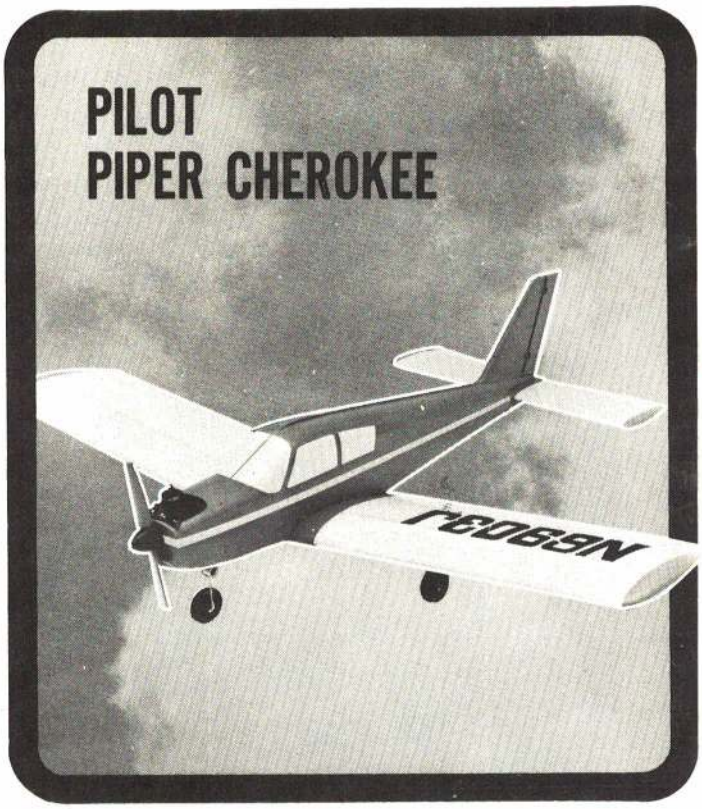
055 DIA. PUSHROD

ELAGE-SIDE VIEW

1/4 BALSA

CUT SLOT FOR STABILIZER





PILOT—HIGHER STANDARDS OF QUALITY IN ARTF'S*

World Engines recently signed an exclusive contract with the OK Model Company of Osaka, Japan (who made the Pilot line) for distribution of their model airplanes in the United States. Since these models are Japanese, it might quickly come to mind that here we have an inexpensive rotten copy of the models made by the almost-ready-to-fly industry in the United States and Europe. We are delighted to draw your attention to some of the construction details of these airplanes so as to illustrate to you that nothing could be farther from the truth. Mr. Takamatsu (Four Bow) has on his staff one of Japans finest flyers and dedicated designers. The Pilot designs are sharp and professional looking. Let's look at some of the construction features—on their 60 powered pattern Cavalier the vacuum formed fuselage is reinforced by a fiberglass inner fuselage that contains the inner wood frame. This extends from the nose back to the rear of the wing. Pilot has a unique way of making a vacuum form fuselage. Instead of splitting the fuselage horizontally and joining a top and bottom, they split the fuselage at the vertical plane center line producing a right and left half. They trim these in the die which leaves a little radius edge. This makes a nice place to bond. Then they hide this little ridge with a top and bottom cap plate which is also joined to the top and bottom of the fuselage (very strong). It is possible to draw the edges on these top and bottom places down where they form openings for the motor in the cowling so you do not get that sharp edge of plastic that you see on many almost-ready-to-flys. The Cavalier comes with a dual strut nosewheel with rudder horn. The fuselage is cast with pushrod exit guides in place. Pilot uses a vacuum form leading edge on their lighter than average foam wing. The trimmed canopy that is supplied fits in a recess on the fuselage. Kits are complete with all "control horn" hardware. Last but not least, the fin is formed in place with the rudder hinged. Shown above is the new small 3 channel Piper Cherokee. When this ad breaks we should be getting delivery on three new Pilot kits, the Piper Cherokee, the Cessna Cardinal, and the Sky Wagon. Do not be frightened by the fact that the Piper Cherokee is a low winger without ailerons. This is one of the most stable flying little planes—rudder-elevator—that you will ever get your hands on.

PILOT

OLYMPIA—15/19 R/C rudder, elevator, engine.....$28.98

★CESSNA CARDINAL—15/19 R/C rudder, elevator, engine.....$28.98

★CHEROKEE—14/19 R/C rudder, elevator, engine.....$28.98

★SKYWAGON—35/40 R/C aileron, elevator, rudder, engine.....$42.98

SHELL FLY "B"—35/40 R/C full house with steerable nose wheel.....$42.98

CAVALIER—60 R/C full house with steerable nose gear, Pilot's finest.....$59.95

★NEW KITS

*Almost-ready-to-fly

BLUE MAX SYSTEMS

Manufactured by World Engines in Plant—Cincinnati, Ohio

Blue Max 6 Channel with 4 servos.....$330.00

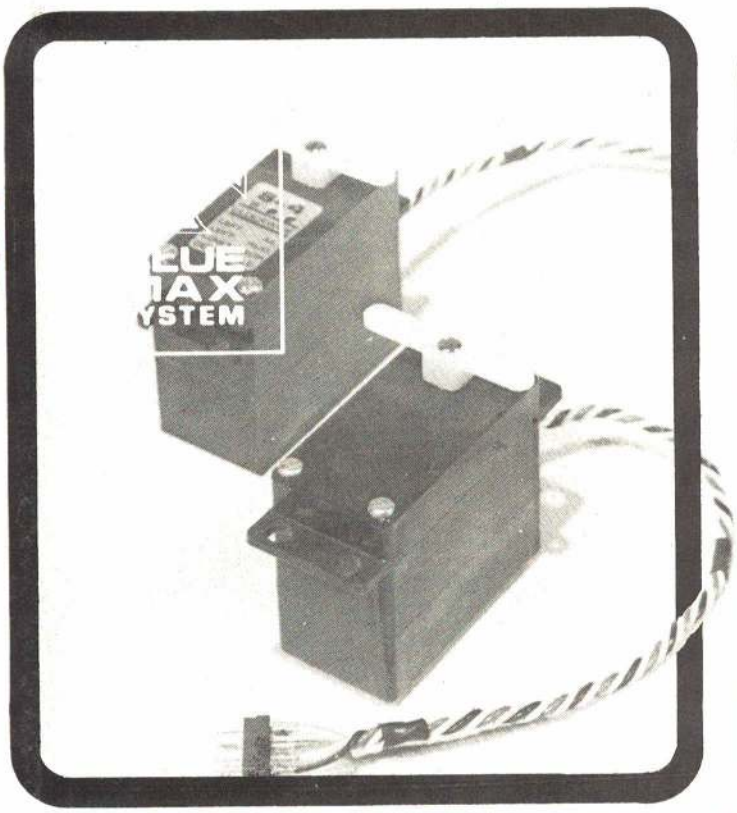
Blue Max 5 Channel with 4 servos.....$315.00

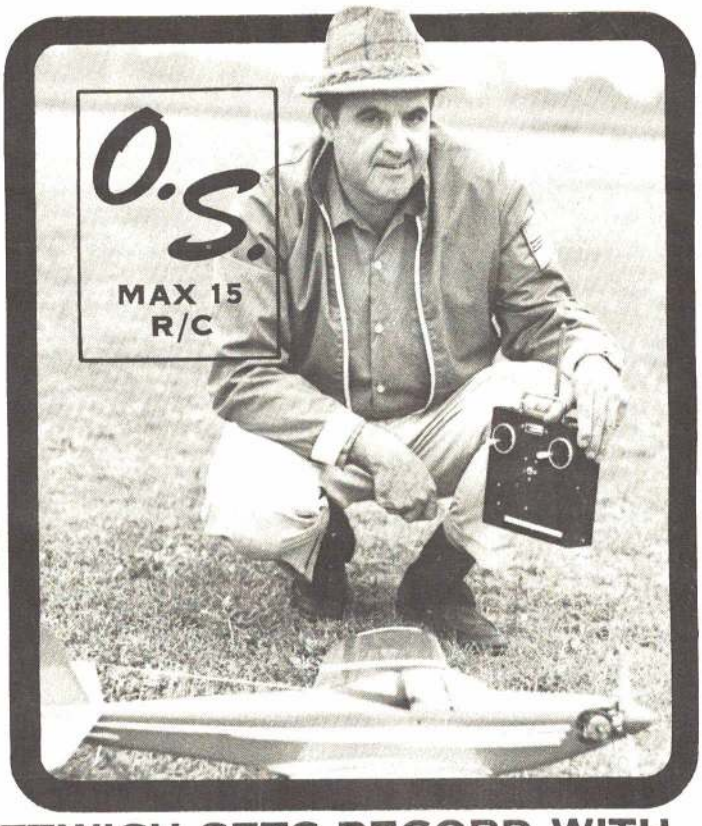
Blue Max 4 Channel with 4 servos.....$300.00

Blue Max 4 Channel Semi-Kit.....$249.98

Blue Max 4 Channel Full Kit.....$224.98

Add $25.00 for Single Stick (Assembled kits only)





SPEED MERCHANT AUSTIN LEFTWICH SETS RECORD WITH

BLUE MAX SYSTEM

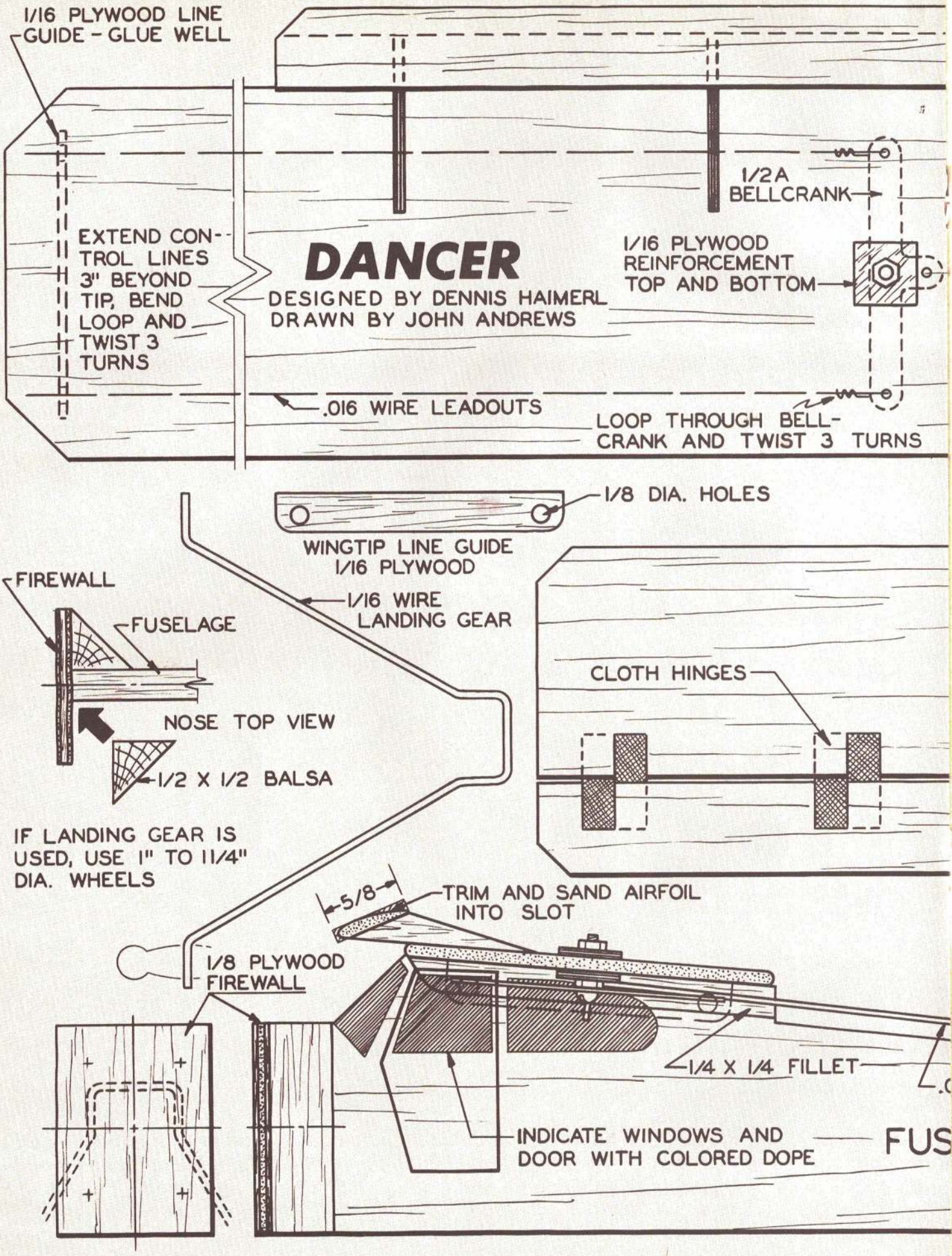
MAX 15 R/C

We are very pleased to see our friend, Austin Leftwich, and several other serious contest contenders, using our Blue Max System. Next year we hope to see two of our staff members, Bill Welker and Dave Brown, beating the contest trail and carrying the company flag. Actually, the World Engines radio control enterprise stems from Jack Port's win at the '53 Nationals. Our R/C history dates back to that point in time. Today there is a certain amount of professionalism in model aviation contest activity and many times it is the principles of the companies involved that are making reputations for their equipment in the contest arena. There is certainly nothing wrong with this but, on the other hand, if the same amount of time were dedicated to making a better radio control set, there could be something said for that, too. Here at World Engines with our Controlaire reed equipment, our Controlaire and M.A.N. digital systems, with the original digital kit—Digitrio—and now with our new system, the Blue Max System, we have consistently brought the purchaser a radio equipment, a quality set, generally priced lower than the competition. R/C equipment popularity is regional by nature. In some areas you will find a lot of our sets and in other areas none. Each area has its own local champion and authority on what is good and what is bad. We have a lot of Blue Max Systems out in the field at this point in time—actually thousands of them. More than ever before, we can say these sets are really working well. If you happen to be the proud owner of one of our sets and, if you picked it up for two-thirds of the price of Brand X, we certainly must feel that you have a smile on your face when you are flying your set around knowing that some of your buddies paid a lot more and possibly got even less. We would just like to go over some of the things we have in our equipment which reflect our general approach to manufacturing this equipment to point out some of the things you might find in World Engines Digital equipment that you do not find all of the time in all other systems.

The Blue Max System employs a 12 volt nickel cadmium power supply in the transmitter. To our knowledge this transmitter is the most powerful available. The higher voltage gives us an opportunity to keep the current down in the transmitter thereby not only giving you high power but longer battery endurance. We employ a transformer in our charger for our transmitter and receiver pack. Few others do this. Our transformer reduces the amount of heat. The transformer is a safety device which helps prevent your being shocked with 110 volts. Some sets do not permit independent charging of flight pack or transmitter indiscriminately whereas our charging circuit does permit this.

We believe our S-4 Servo is still the fastest servo available. Also, we have had tremendous success with our Furuichi carbon brush motors. We have had hardly any servos come back because of motor failure. Another small but helpful item is the handle that we put in our transmitter. Many other sets omit this. Also, we have an antenna that will collapse almost down flush with the case top. Many other sets require that you unscrew the antenna. We use a quality meter in our set, not an iron vane meter like some other people use. We take the trouble to recess the metal art on our transmitter case so you will not tear your mittens on it out at the field. One thing we really have going for our equipment is the new OS floating pin connectors to which we still solder the wires and stiffen the joint up with heat shrink tubing. We have a good simple Buddy Box arrangement on our transmitter and also, if you accidently knock the Buddy Box switch arm when you are flying solo with the transmitter, it will not shoot you out of the sky. In the receiver we still use germanium transistors for good low voltage sensitivity and low temperature operation.

Austin Leftwich advises that he successfully defended his 1/4 Midget Pylon record at the World Championship using a Blue Max 4 Channel and an OS Max 15 R/C—best time 2 min. 8 sec. or 9.5 sec. faster than last years record. Max 15, 50-60% nitro, thin blade 7" diameter X 7½" pitch prop. 16,000 RPM on ground with idle reliable for landing. Congratulations, Austin Leftwich.


1/16 PLYWOOD LINE GUIDE - GLUE WELL
1/2A BELLCRANK
EXTEND CONTROL LINES 3" BEYOND TIP, BEND LOOP AND TWIST 3 TURNS
DANCER
DESIGNED BY DENNIS HAIMERL
DRAWN BY JOHN ANDREWS
1/16 PLYWOOD REINFORCEMENT TOP AND BOTTOM
.016 WIRE LEADOUTS
LOOP THROUGH BELLCRANK AND TWIST 3 TURNS
1/8 DIA. HOLES
WINGTIP LINE GUIDE 1/16 PLYWOOD
FIREWALL
1/16 WIRE LANDING GEAR
FUSELAGE
CLOTH HINGES
NOSE TOP VIEW
1/2 X 1/2 BALSA
IF LANDING GEAR IS USED, USE 1" TO 11/4" DIA. WHEELS
5/8
TRIM AND SAND AIRFOIL INTO SLOT
1/8 PLYWOOD FIREWALL
1/4 X 1/4 FILLET
INDICATE WINDOWS AND DOOR WITH COLORED DOPE
FUS

THIRTY-SEVENTH
IN A SERIES

HOWARD McENTEE

Getting Started in RC

More on Control Linkages

CONTINUING THE DISCUSSION begun in Part 36, it again must be emphasized that no metal-to-metal joints should be used in linkages. This is especially important with digital apparatus (regardless of the number of controls). In pulse propo systems, as well as those utilizing escapements or motor-driven servos which operate like escapements, superhet receivers will be found much more susceptible to linkage noise (metal joints rubbing together) than will superregen receivers. The latter generally are immune to such problems, as are multicontrol reed outfits.

The illustration shows a typical pushrod of either wood or fiberglass tubing. A length of 1/16" dia. music wire is bound at the forward end, which goes to the servo. At the rear end, the clevis rod itself is bound to the rod. Model cement applied liberally over the binding will keep everything snug. To assure a better grip on fiberglass tubing, roughen the surface where the binding goes. Better yet—use epoxy on such tubing.

The servo end has just a single bend in the wire, often termed an L-type linkage end. This slips through a hole in the servo output disk, arm, or lug and is retained by a keeper (see detail C). Several styles of nylon keepers are marketed, metal ones are available too. All hold reliably if applied correctly.

Part 36 covered the use of flexible nylon tubing pushrods. One detail shows a typical ending for such a pushrod. A locknut is sometimes used to prevent the pushrod from turning, and a clevis keeper (a plastic or rubber ring small enough to put some tension on the two sides of the clevis) assures that vibration will not jar the clevis out of the horn. The rod extension is needed inside the smaller tubing only if this tubing extends more than two inches beyond the end of the larger casing—or if the casing itself is not clamped or cemented to the fuselage or other structure right at its end.

No matter what type of pushrod, rigid or flexible, never put a threaded clevis at both ends. Vibration could cause the rod to rotate sufficiently so that the threaded rod at one end would drop free of its clevis. The locknut tends to prevent such action. However, a clevis at one end, and an L or Z end at the other is much safer. The adjustable end (the clevis) usually is placed outside the fuselage, so the modeler can make control adjustments without removing the wing.

The Z-type rod ending mentioned above is seen in detail D. This needs no keeper; however, it is rather difficult to bend in music wire. If the wire end is heated red hot, then cooled slowly, the wire will lose some of its temper and will be much easier to bend. Strength will not be reduced significantly for this use. As a rule, some component, such as a servo, must be moved to install or remove a Z-link.

Some servos today have push-pull (also called linear) output, others have a rotary arm or disk, and some have both. In the push-pull style (on left of the servo sketched at E) one output lug always moves opposite in direction to the other and to the same extent. Both are driven together by an internal gear. This sort of servo output gives the same amount of pushrod movement near its center position as it does at movement extremes, with the same control stick displacement.

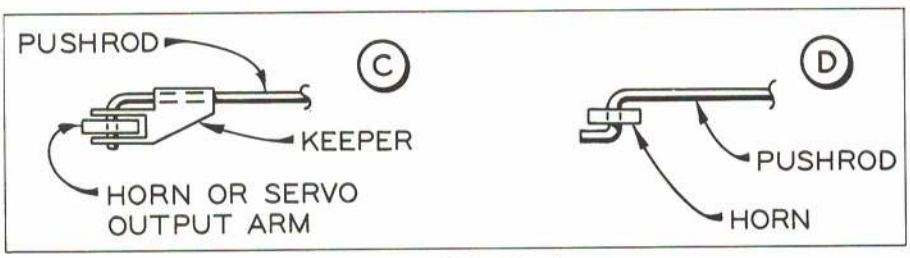
Rotary output (right side of E) does not. Although the control stick is moved the same amount at center and at either extreme, the pushrod will move somewhat more near the center. This makes the controls more sensitive near neutral, which is the opposite of what is desired.

Why does rotary output give this result? If a pushrod were linked to the arm shown in E, when the servo was operated to move the arm end ⅛" each side of the center position shown, the pushrod would move a total of about ¼" (⅛" each side of center). But if the arm were rotated 90 degrees, so that it pointed fore and aft along the servo axis (assuming the servo itself was always mounted fore and aft in the fuselage), the same ⅛" arm rotation each side of this new neutral position would give practically no fore and aft movement of the pushrod, although the servo end would shift up and down.

Most servos do not produce 90 degrees rotation each side of neutral, the limits are about 30-45 degrees. One exception is servos intended for actuation of retractable landing gears, which often do allow 180 degrees total output rotation.

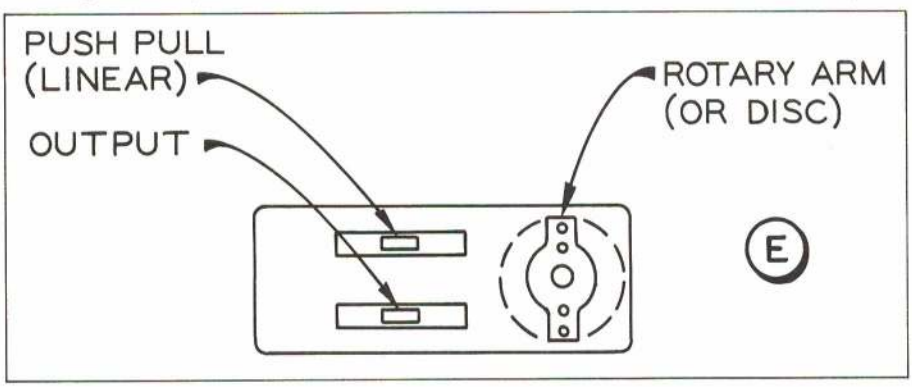
Thus the gear may be locked either up or down, and any shocks, such as

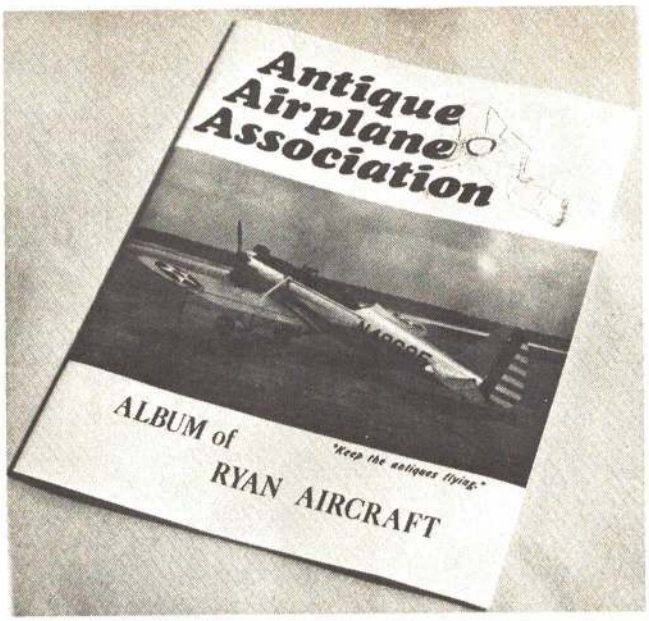
(Continued on page 67)

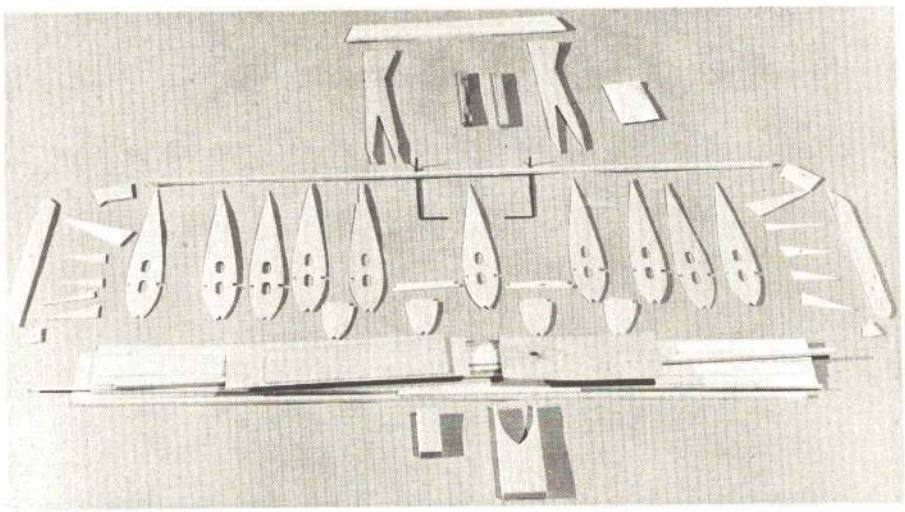


For pushrod attachment without a clevis, use Z bend or keeper.

Advantage of rotary output is adjustable throw for given rotation.







NEW PRODUCTS CHECK LIST

FRANK PIERCE

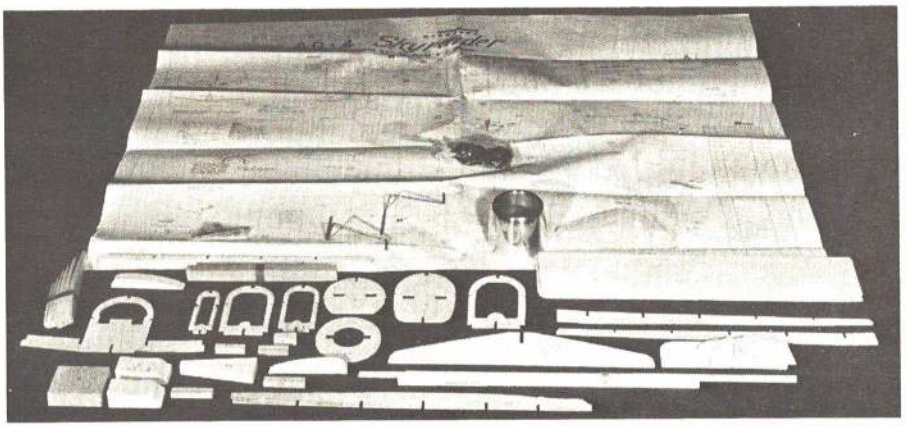
Antique Airplane Association/Album of Ryan Aircraft. 35 pages of data on Ryan Aircraft and its products. From 1925 to 1945, book details trainers, commercial aircraft, etc. Lots of photos, three-views, specs. $2.50. **AAA Aviation Specialty Publication,** Route 5, Industrial Airport, Ottumwa, Iowa 52501

W. C. Hannan/Peanut scale wheels. Ultra-lightweight, ultra-realistic, wheels come in clear or neutral-colored finish. Clear wheel may be scribed to simulate spokes. ¾" shown; larger sizes also. Neutral, 55¢, clear 60¢. **Plans and Things,** Box A, Escondido, Calif. 92025

Seaside Products/Canned Helium. Quick, easy way to blow up balloons for nudging hung microfilms from rafters or for combat attack by RC aircraft. Safe, non-toxic. 7-oz can. 3 for $5. **Seaside Products,** Box 8026, Jacksonville, Fla. 32211

C.M.I./RC Combat Guillotine. Twin-boom combat-type model redesigned for RC. Highest quality hand-selected balsa, all major parts die-cut. $9.95. **C.M.I. Quality Airplane Kits,** 945 65th St., Des Moines, Iowa, 50312

Orbit Electronics/Three-channel RC system. Economical use of only three servos to control gliders, ships, cars. Interchangable crystals gimbal-action control stick, NiCad-powered. Can be used with either PS-3, -4, or -5 servo. **Hawk** price, $219. **Orbit Electronics,** 11601 Anabel Ave., Garden Grove, Calif. 92640



Kayeff, Inc./Two new CL models. From Kyo, Japanese manufacturer, comes **F8F Bearcat** and **Douglas A-1.** CL kits are designed for 29 to 35 engines. Beautiful pre-cut and sanded parts speed up construction time. Semi-pneumatic tires, canopy, metal cowling, quality throughout. $18. **Kayeff, Inc.** 511 Campesina Rd., Arcadia, Calif. 91006

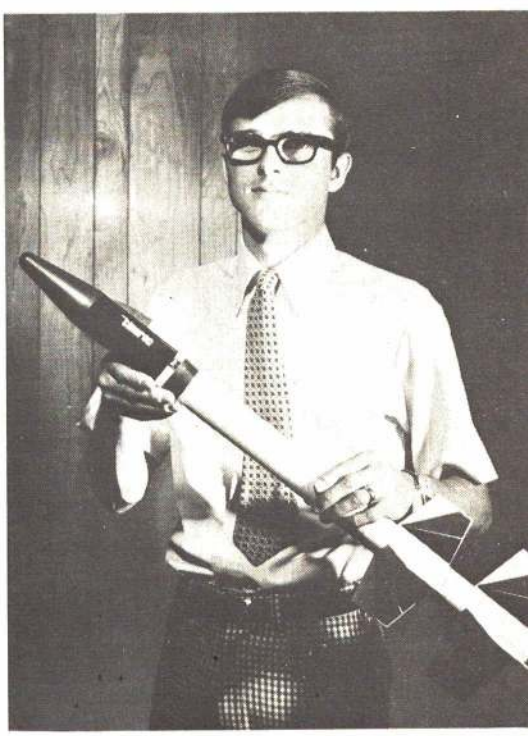
Southern R/C Products/"Sorghum." Bonds balsa sheeting to foam-core wings. Brush on with 2" brush, allow to dry, and press sheet firmly into place. 6-oz. jar covers one wing and stab. **Southern R/C Products,** 527 Pecan St., Citronelle, Ala. 36522

Vortex Model Engineering/RC competition yacht. With 1100 sq. in. of sail and length of 70 in., **Santa Barbara** provides impressive sailing on two-function proportional or reed control, with optional third servo for jib control. With finished suit of dacron sails, $142.50. Further info, write **Vortex Model Engineering,** 210 E. Ortega St., Santa Barbara, Calif. 93101

Weller/Hot knife and soldering iron. With dual capability, tool has interchangeable knife blade which can be heated to make smooth cuts in light plastic, etc. Also standard soldering iron tip. 25 watts. $4.98. **Weller,** 100 Wellco Rd., Easton, Pa. 18042

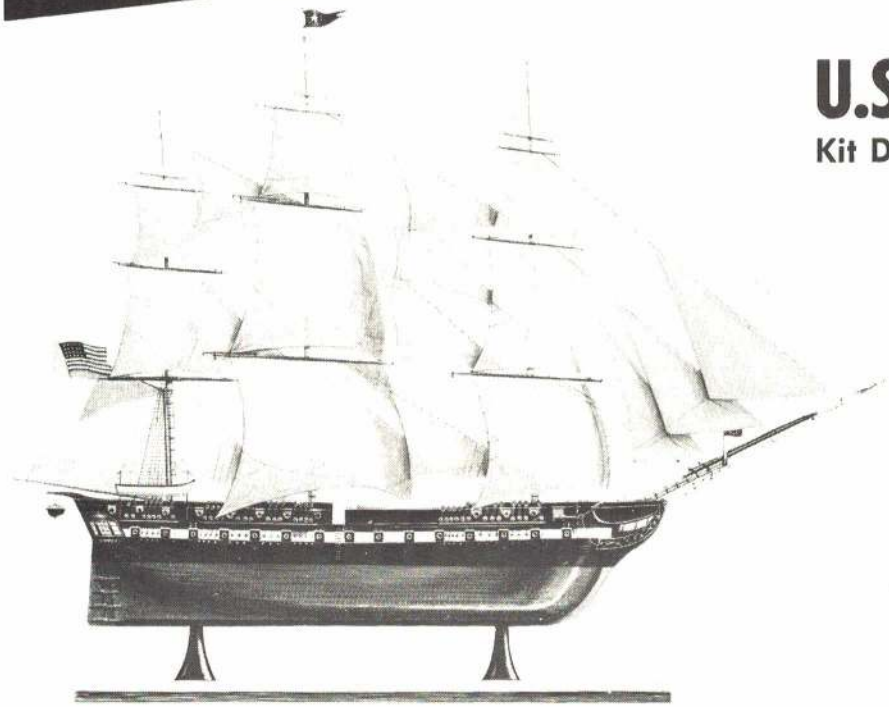
Sherlock Aircraft Models/Boeing 727. Big, spectacular 20:1 scale model uses 60 power with recommended four-channel RC. Precision molded, prefinished fuselage requires only addition of RC gear and decals. Can also be flown CL. 70" span. $89.50. **Sherlock Aircraft Models,** 1275 Dana Ave., Palo Alto, Calif. 94301

Estes Industries/CineRoc. Two-stage rocket with Super-8 camera in nose. 10' film reel provides 40-sec. projection time. Wide-angle 10-mm lens gives view of rocket plus spectacular view of earth below. With **Astron Omega** launch vehicle, $22.95 Color **Flight-Pak** cartridges, $4 ea. **Estes Industries,** Box 227, Penrose, Colo. 81240



BETTER DETAIL!

NE



U.S.S. CONSTITUTION

Kit D9 — Length 14½" **12.95**

Sterling MODELS
BELFIELD AVE & WISTER ST
PHILADELPHIA, PA 19144

Superbly Crafted For Easy Assembly

WOOD SHIP MODEL KITS

With Fine Quality Cloth Sails

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

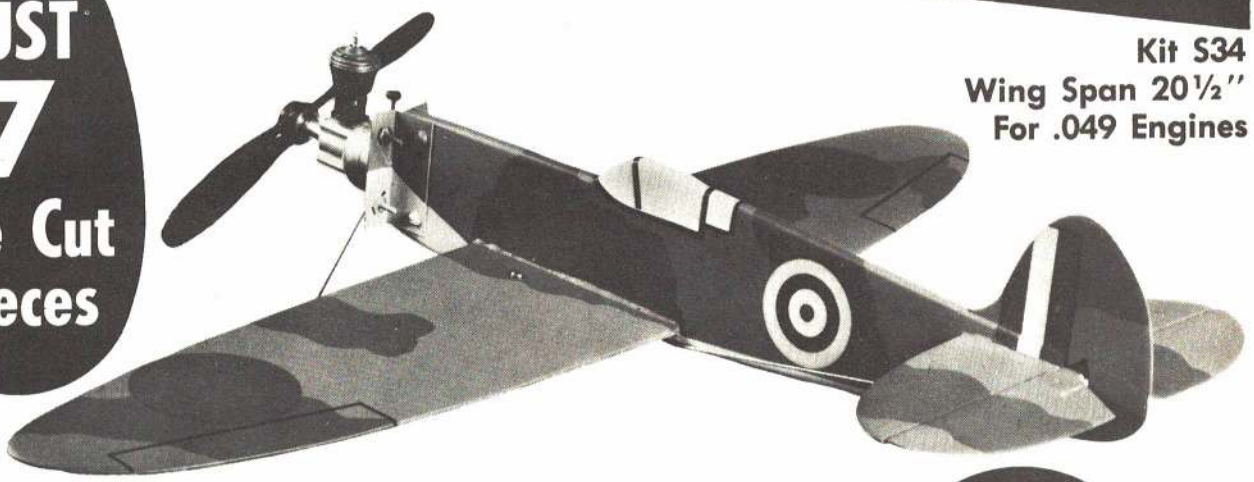
The use of hardwood throughout, insures an heirloom permanency that will last for generations — Carved hardwood hulls — Planking grooves printed into decks — Tapered birch masts and yards — Miniature rope for rigging in different sizes and colors — Complete hardware pack contains dozens of cast metal fittings — Many finished hardwood parts (as req.) Brass Chain (as req.) Authentic decals — Fine mahogany display base with mounting pedestals and hardware — Plans completely illustrated and detailed in step-by-step fashion, showing every "secret" method of easy mast construction and rigging — etc., etc.

SLOOP FERRET

Kit D8 — Length 15½" **9.95**

EW! BETTER FLYING!

JUST 7 Die Cut Pieces



Kit S34
Wing Span 20½"
For .049 Engines

The world-famous World War II Fighter — now amazingly simplified for beginners! Die-cut balsa wing and tail makes assembly just a matter of minutes! NO TISSUE COVERING! Engine and control system installation now *a snap for anyone* because this kit includes Aluminum motor mounts, Bell crank and Elevator horn — as well as finished Landing gear, Wheels, British Royal Air Force insignia and assorted Hardware. Plans and instruction are simple and complete.

2.95

and it does EVERY STUNT in the book

BEGINNERS SPITFIRE CONTROL LINE KIT

SCHWEIZER SGS 1-34 SAILPLANE

Kit FS-26 Span 8 ft. 2½ in. Area 615 Sq. in. Wgt. 2¼ lbs. (less R/C) Scale 2 in. = 1 ft.

CAN BE FLOWN WITH SINGLE CHANNEL THRU FULL HOUSE R/C

$23.95

LANCER Advanced R/C Stunt Trainer

Kit FS-25 — Span 53½". Area 525 sq. in. Wgt. 3¾ lbs. (less R/C). Engine .35 to .51

ASSEMBLES QUICKLY AND EASILY. SUPERBLY RESPONSIVE IN FLIGHT

$24.95

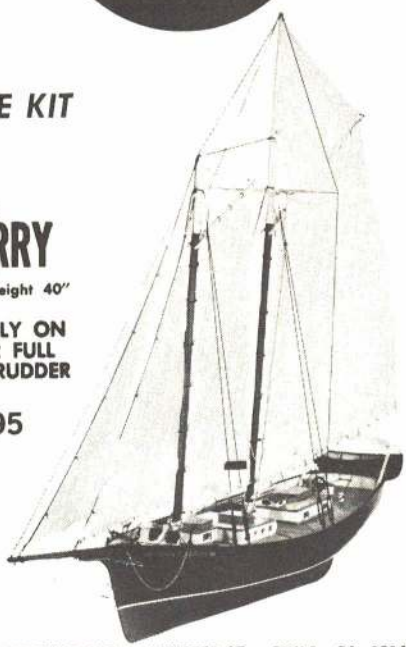
SAILING SCHOONER

EMMA C. BERRY

Length 49½" Beam 10¾" Height 40"

OPERATES RUDDER-ONLY ON SINGLE CHANNEL OR FULL HOUSE WITH SAILS & RUDDER

KIT B-21 **$34.95**



STERLING MODELS • BELFIELD AVE. and WISTER ST. • PHILA., PA. 19144

If no dealer available, direct orders accepted—with 10% additional charge for handling and shipping. (60c minimum in U.S., $1.25 minimum outside U.S.)

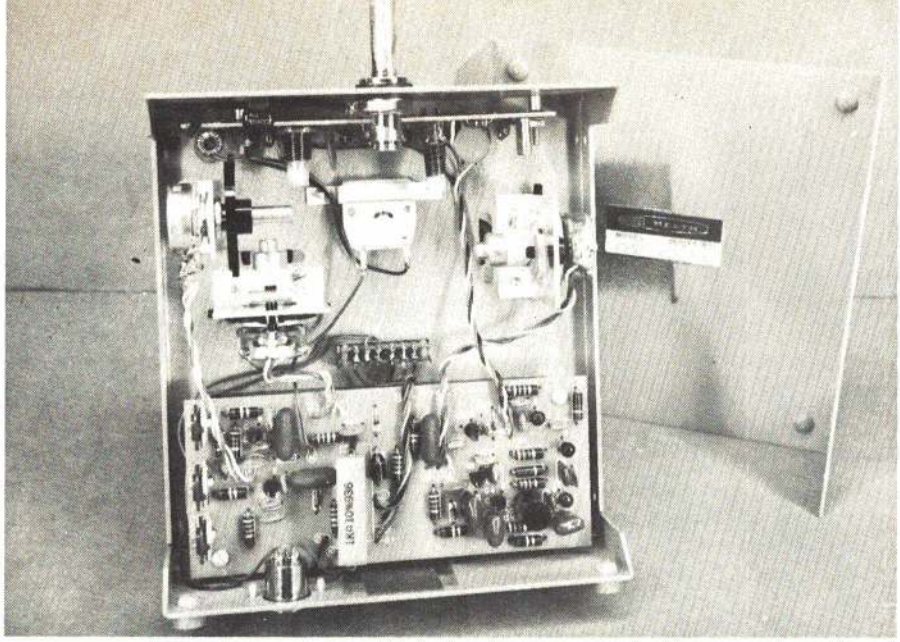
- ☐ Catalog of entire line of airplane control line model kits, R/C scale and Trainer kits, boat model kits, accessories; etc. 10c enclosed.
- ☐ "Secrets of Model Airplane Building," including design, construction, covering, finishing, flying, adjusting, control systems, etc. 25c enclosed.
- ☐ "Secrets of Control Line and Carrier Flying," including preflight, soloing, stunting, Carrier rules and regulations, Carrier flying hints and control line installation instructions. 25c enclosed.

Name_____

Address_____ City_____ State_____ Zip_____

Blue Ribbon Review

A Technical Review



Transmitter is much easier to assemble and RF section comes ready to use and tuned. Charging is indicated through meter.

HEATHKIT 3-CHANNEL for cars, boats, or Lanier's Hawk glider

Author with complete project. Lanier Hawk is best suited for slope soaring or areas of strong thermal lift.

HOWARD McENTEE

THE HEATHKIT MODEL GD-57 control system and this maker's new Spectre car were announced at the same time and obviously are designed to work together. However, the new three-control digital system is every bit as applicable to planes and boats, so the Lanier Hawk, an ARF glider, was chosen as the test aircraft.

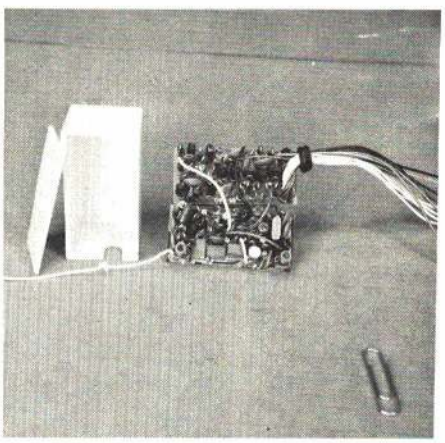
Heath has designed a simpler and much lower cost control system, intended more for the sport modeler rather than for competition fliers. While many parts of the GD-57 system are similar or identical to those in the much more expensive GD-19 five-control system, costs have been reduced in ways that do not cheapen the GD-57 system.

Most of the mechanical differences are in the transmitter, which is in the smaller conventional two-piece case. All small electronic parts except the RF components but including the charger are on one p.c. board. Paper phenolic is used for this board rather than the more expensive linen epoxy material.

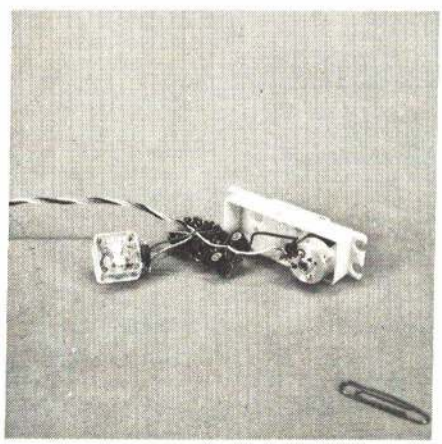
Control stick assemblies are simple since each stick operates only one potentiometer. The third control is a small lever projecting from the back of the case (when set near neutral, this lever sticks out farther than the rubber bumpers on the case back and can scratch polished surfaces). The RF strip seems quite similar to that in the GD-19 transmitter but has a different part number.

The GD-57 system also includes a high-grade pencil-tip iron (which han-

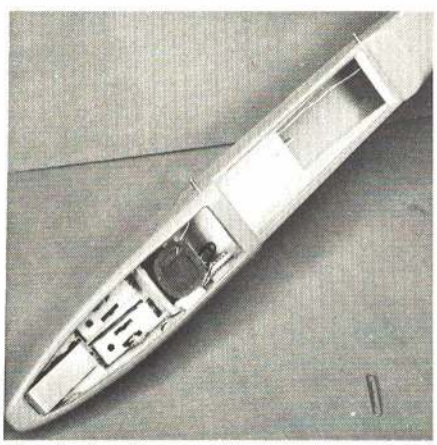
(Continued on page 80)



Unique Heath feature is use of ceramic filters instead of IF cans. This affords sharp alignment without any IF tuning.



Difficult part of system is servos. Parts must fit close together. Another feature is capacitive feedback, no wiping contacts.



Two-servo installation in Lanier's glider puts all parts as far forward as possible, but some lead is still needed for balance.

FEBRUARY 1971
MODEL AVIATION
Official magazine
A.M.A. NEWS
Academy of Model Aeronautics • 806 Fifteenth Street N.W., Washington, DC 20005

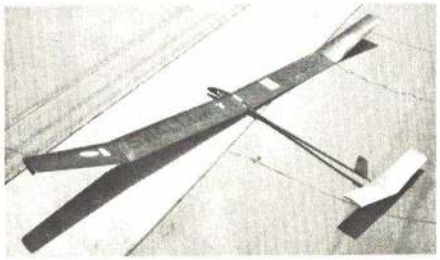
Reviews of National AMA Record Holders

A report of selected recent record holders highlighting the designs and equipment used.

FF A-2 Nordic Towline Glider national AMA record, Open age class: 48 minutes, 20 seconds, established by Kermit Walker, Acampo, Calif., on April 12, 1970.

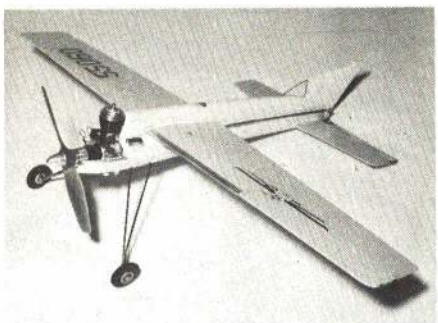
Two models of different design were flown in establishing this record: flights 1 through 9 were with a modified kit design, "Stratos Too," which became lost; flights 10 through 12, when the 8-minute max was missed primarily due to a short dethermalizer, were with Walker's pictured original design named "Swallow".

The "Stratos Too" has a projected wingspan of 76.5", 6.2" major chord, polyhedral, elliptical tips. The stabilizer is of 20" span, 3.75" major chord, while the over-all fuselage length is 43.45", of which 5.5" extends in front of the wing. Construction of the wing and stab are basically conventional except for the wing spars being set 3/32" beneath the top rib surface, and for the main stabilizer spar being an ⅛" sq. H-beam from the model railroad department. Covering was red silk finished with 5 coats of a mixture containing 50% clear, 30% thinner and 20% Fokker red Aerogloss.



Walker indicates that the design of the "Swallow" was influenced somewhat by the ideas and models of the late Mike DesJardins. The wing (84.4" projected by 5.75" center chord) has its top surface covered with sheet balsa, 1/16" center panels, 1/32" tip panels, both taper-sanded. The anti-vortex wing tips are carved from soft balsa. The wing was covered with red tissue (double on bottom surface) finished the same as "Stratos Too". The V-dihedral stabilizer (20" span by 3¾" center chord) also has the top surface covered with 1/32" taper-sanded sheet balsa. This design required a fold-up fin (or sail) (ala Conover's "Lucky Lindy") under the stab to prevent the model from spinning when dethermalizing (by means of a pop-up stab actuated by a Seelig DT timer). Wing-stab angular difference is in the area of 4-5 degrees which Walker says allows very good turbulent air stability without seeming to hurt calm air Glide.

CL ½A Profile Proto Speed national AMA record, Junior age class: 82.54 mph, established by James Wade, Anaheim, Calif., on August 16, 1970.



Wade's 7-oz. model was the "Santana," a design by Dale Kirn published in the September 1968 **American Aircraft Modeler**, powered by a Cox TD .049 with high-compression head, left-hand crankshaft and crankcase pressure fitting for Wade's own pressure tank. Prop used was of 4¾" diameter by 5" pitch, left-handed, and made of fiberglass by Dale Kirn. The fuel was a home mix of 62% nitromethane.

The model's 18" wing has an airfoil which varies from a lifting type at its center to a symmetrical section at the tips. The model was built primarily from Sig balsa, and both the wing and tail were covered with MonoKote. Otherwise, the model had a Poly-Aqua expoxy marine finish. Control was accomplished with a modified Perfect bellcrank, enclosed in the wing, and a modified Cox plastic handle. K & B streamline wheels completed the landing gear.

Wade increased this record to 86.12 mph on October 18.

FF HL Glider national AMA record, Open age class: 11 minutes, 17 seconds, established by Bill Blanchard, Sunland, Calif., on September 13, 1970.

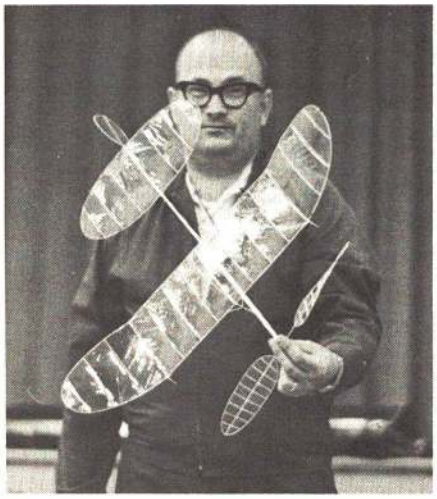
Blanchard's original "Polly" design used in establishing this record was a modification, placing the vertical fin aft of the stabilizer, in order to allow for a fuse operated, spring loaded, pop-up stab dethermalizer. The wing is 18" by 4" while the stab is 6" by 3". The flat bottom wing airfoil has its ¼" maximum thickness at 25% from the leading edge. The model weighs 1.2 ounces.

The record setting model was built from Sig balsa and finished with 1 coat thinned Sealette, then 3 coats of nitrate dope. The wing bottom was covered with black tissue to improve the model's sky visibility, while the upper wing tips were colored bright red to help locate the model on the ground.

The dethermalizer fuse was not lit for Blanchard's fourth flight owing to the rules which allow the full flight time to count. The model was lost out-of-sight at 5 minutes, 17 seconds, but it was found by another modeler and returned later in the day. Blanchard remarks that this was the first time he has ever had a HL Glider found and returned to the field.

Blanchard increased this record to 22 minutes on October 25.

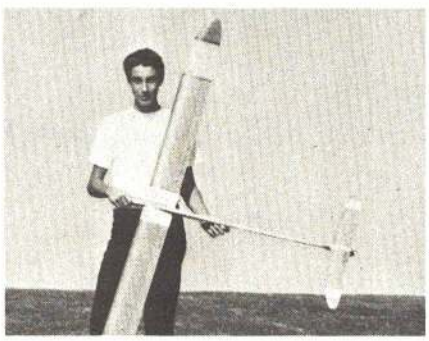
Indoor FAI Stick national AMA record, AMA ceiling category I, Open age class: 20 minutes, 35.8 seconds, established by Thomas Vallee, Laurel, Md., on May 31, 1970.



Vallee's original design, named "Snark Mk III" has a wingspan of 25.25" and major chord of 5.5". The stabilizer is 12" by 5". Airfoils of both are a smooth curve with high point at 40% of chord. The motor stick is only 10" long, and the wing is offset only ½"; thus, the model bears more resemblance to older traditional designs than to those of the current trend. The propeller is 16"D x 32"P powered by a 14" loop of .060" Pirelli lubed with a glycerine and green soap mixture.

Another flight with this model on the same date established a new FAI Stick national AMA record for FAI ceiling category I: 20 minutes, 49.5 seconds.

FF A-2 Nordic Towline Glider national AMA record, Junior age class: 35 minutes, 22 seconds, established by Mike Taibi, Lakewood, Calif., on September 13, 1970.



Mike's model was a design by Dennis Bronco called "Vega". Its wing has a 77½" span, 5⅞" chord, B-7457d-2 airfoil. Both the wing tips and stabilizer planform are similar to a reverse double ellipse. The overall fuselage length is 45¾", with 5" in front of the wing. Covering was Jap tissue finished with nitrate dope. For dethermalizing, Mike used a Tatone DT and also a back-up fuse.

For this category of model, times recorded consist of up to 3 minutes for each of the first 7 flights; then (if the first 7 total 21 minutes) additional flights are scored with the max progressing 1 minute until one is missed. Mike was on his 10th flight (6-min. max) when, unfortunately, his dethermalizer actuated early and the model landed at 5:22.

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Similarly, for subsequent issues, it's necessary to get membership processing initiated as soon as possible—it's too costly and complicated to do anything else. If you haven't signed up for the 1971 AMA membership yet, do it now in order to avoid losing any more service—if your dues payment is received by January 15th, you will receive the April issue which is mailed in February.

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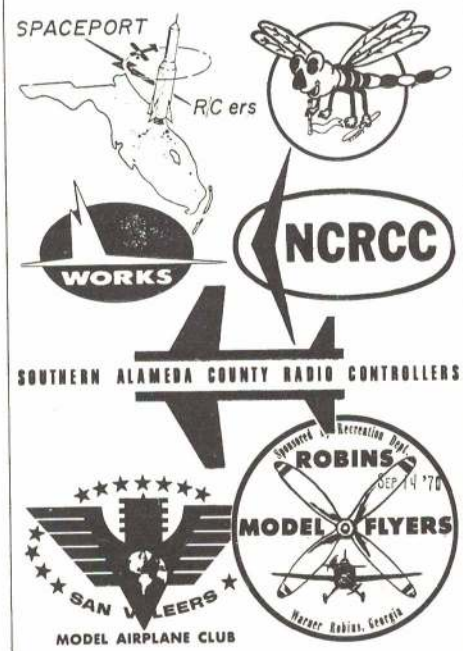

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S.M. Cloud Busters, Ken Wilson
10915 W. 59th Terr., Shawnee Mission
Shawnee Mission RC Club, W. Stuckwisch
6107 Melrose Lane, Shawnee Mission
Wichihawks, Michael Tallman
3014 Exchange, Wichita 67217
Wichita RC Club, Melvin Gassert
1421 Prairie Lane, Derby 67037

KENTUCKY

Central Kentucky RC Club, H. Lemay
221 North Limstone, Lexington 40502
Lexington MAC, William Barr
2000 Larkspur, Lexington 31415
Syntonic Aero Club, Don Witt
141 Ohio Avenue, Fort Thomas 41075

LOUISIANA

Acadian RC Club, J. H. Munnerlyn
409 Marrell Drive, Lafayette 70501
Dyna Soarers MAC, Albon Seither Jr.
7520 Weaver St., New Orleans 70127
Shreveport Area RK, James Monk
574 Janet Lane, Shreveport 71106

MARYLAND

Aero Masters MAC, Frank Foight
Box 800, Severna Park 21146
Baltimore Aero Craftsmen, Howard Weil
3606 Monterey Rd., Baltimore 21218
Chesapeake Bay RC Club, Q. Weaver
8466 Greenway Rd., Pasadena 21122
Cumberland Aircraft MS, Charles Jones
Bowling Ave., B. Green, Cumberland
D.C. Maxecuters, Patty Thornhill
Route #1, Mt. Airy 21771
DC/RC Club, Inc., Richard Johnson
3717 Leverton St., Silver Spring
Flite Streaks Model Club, A. Horner
1931 East Field Rd., Baltimore 21222
Flyaway RC Club, Paris White
RRT 2, Box 247, Waldorf 20601
Frederick MAC, John E. Patton
Route #5, Frederick 21701
Meade Modelers, William Laslo
Attn. M22, National Security Agency,
George Meade 20755
Mid Atlantic RC Society, Paul Ennis
R. #6, Parker Rd., Box 88, Salisbury
National Capitol MAC, Howard Bizzell
1500 Kanawha St., Apt. 103, Adelphia
Pegasus RC MAC, Giles Shillingberg
26 Scott Hill Dr. Hagerstown 21740
Prince Georges RC Club, J. Lawrence, Jr.
8451 Glendale Rd., #T1, Greenbelt
RC Modelers of Baltimore, James Green
Route #2, Box 116, Phoenix 21131
Rhody Aero Guidance Soc.
109 Strathcon Way, Luthnersville
Suburban Maryland MAC, Ray Vojtko
17124 Downing St., #302, Gaithersburg
Westminster Aero Modelers, C. Rudisill
69 Sycamore, Westminster 21157

MASSACHUSETTS

Berkshire RC Flying Club, Dave Pryde II
127 Maplegrove Ave., Pittsfield 01201
Cape Ann RC Model Club, Robert Smith
239 Central St., Rowley 01969
Charles River RC, Alan Spievack, M.D.
6 Old Dee Road, Cambridge 02138
Chelmsford RC Modelers, Tom Shipko
113 Graniteville Rd., Chelmford 01824
Franks MAC, Frank Baptista
172 Coffin Ave., New Bedford 02740
Hampshire Co. Radio Con., R. Yarrows
5 Moody Bridge Rd., Hadley 01035
Lawrence Air-Istocrats, Joe Lambert
80 Manchester St., Lawrence 01841
New England RC Modelers, R. Meisner
63 Jerome Ave., Auburn 01501
No. Attleboro Prop Twisters, Lee Jenkins
56 Sims Ave., Seekonk 02771
N. Plymouth Balsa Bugs, Leo Wirzburger
92 Nicks Rock Rd., Plymouth 02360
Northshore MAA, Robert Colozzo
28 Corinthian Rd., Somerville 02144
Pioneer Valley RC Club, Tony Borgatti
206 Mountainview, E. Longmeadow
Precision Modelers Assn., Phil Hinson
26 Bates Ave., So. Weymouth 02190
South Shore RC Club, Ronald Giacobbe
16 Broad St. Randolph 02368
Springfield RC'ers, William Sargent
288 Circle Dr., W. Springfield 01089
Valley Thunderbirds, Roland Houle
70 Knox St., Springfield 01105

MICHIGAN

Aero Radio Club, Alvin Heitchler
6050 Lancaster Dr., Flint 48504
Ann Arbor Airfoilers, Richard Bremer
3249 Lockridge Dr., Ann Arbor 48104
Ann Arbor RC Falcons, J. Marshall
1425 Saunders Crescent, Ann Arbor
Detroit Balsa Bugs, Walter Hartung
14759 Kilbourne Ave., Detroit
Flying Robots RC Club, Joe West
36219 Dover, Livonia 48159
Indian City RC Club, Darrell Daly
9684 Elm St., Taylor 48180
Jackson RC Club, Mike Muelikin
℅ Hobby Hub, 222 Frances, Jackson
Lansing Flying Aces Inc., Milton Stevens
1610 Gordon Ave., Lansing 48910
Lapeer RC Assn., Charles Lamar
425 East St. Clair St., Almont 48003
Livonia Ribcrackers, John Rogers
838 Flowerdale, Ferndale 48220
Michigan RC Society, Bryant Wilson
30359 W. 11 Mile Road, Farmington
Midwest RC Soc., Robert Williams
1359 Hollywood, Grosse Pointe Woods
Pontiac MAC, Gary Putman
468 Algene Dr., Lake Orion 48035
RC Club of Detroit, Helen Brett
18864 Millar Rd., Mt. Clemens 48043
Saginaw Sodbusters Model Club, Don Tait
118 S. Michigan, Saginaw 48602
Saginaw Valley RC Club, Gerald Gill
2020 Lone Rd., Freeland 48623
Seaway RC Club, Don Wilson
1775 Manz, Muskegon 49442
Signal Seekers RC Club, Francis Hubel
31505 Alvin, Garden City 48135
St. Clair Shores Modelers, Sam Giacchina
30737 Primrose Dr., Warren 48093
St. Paul MRC Club, Paul Costello
2539 15th Ave., No. St. Paul 55109
Strathmoor Model Club, Dennis Adamisin
224 Fairfax, Taylor 48180
The Basketcases, Kenneth Hauser
7345 Hawthorn, Westland 48185
Whirlwinds of S/M, Charles Ellis
3383 Valleyview, St. Joseph 49085
West Godwin Hobbies RC Flyers, F. Pulte
1545 Iowa St., SW, Wyoming 49509

MINNESOTA

Central Minn. RC'ers, Donald Schibel
708 No. 27th Ave., St. Cloud 56301
Elk River RC Club, Craig Lamatson
R.R. #2, Elk River 55330
F.M. Skylarks, Maurice Floden
#7 Dilworth Ct., Dilworth 56529
Minnesota MAC, Willard Anderson
302 Park Ave. #30, Elk River
Minn. Piston Poppers, Inc., J. Welliver
7525 59th Pl., No., Minneapolis 55428
Rochester AMC, Dick Dorman Jr.
915 7th Ave., N.W., Rochester 55901
St. Paul Model RC'ers, P. Stapleton
5548 27th Ave. S., Minneapolis 55417
Twin City RC Inc., Wayne Jaax
2328 N. Brookview Dr., Minneapolis
Twin Ports MAC, David Payson
820 E 9th St., Duluth 55805

MISSISSIPPI

Capital City RC Club, Frank Ruscio
814 Brandon Ave., Jackson 39209
Meridian RC Club, William Dodge
5102 Mosby Rd., Meridian 39301

MISSOURI

Central City RC MAP, Willie Kizine
3543 Bales, Kansas City 64128
Hot Heads MAC, John Moll
4501 St. Leo, St. Ann 63074
Indian City RC Club, Earl Hickman
16037 McCann, Southgate 48192
Kansas City RC Assn., Bob Rodkey
4411 Gillham Rd., Kansas City 64110
Kansas City No. Knights, G. Thompson
1114 E. 44th St., No., Kansas City
Kirkwood Thermaleers, Robert Hotze
673 Craigswoods Dr., Kirkwood 63122
Lafayette Esquadrille, August Vogee, Jr.
703 Connie Lane, Manchester 63011
McDonnell Free Flight Club, Bill Moody
7770 Wooddale Lane, Normandy 63121
McDonnell RC Club, Richard Palmer
9111 Meadowbrook, Overland 63114

Last Chance for '71 Scholarship

The deadline has been extended until February 28 for submitting applications for AMA's '71 Scholarship Program, applicable to 1971 fall enrollment in a college or university. Any current AMA member is eligible who (1) has flown a model in AMA sanctioned competition during 1970, (2) has participated through his school in the National Merit Scholarship Qualifying Test, and (3) graduates from high school in 1970 or 1971. See the September 1970 **American Aircraft Modeler** for more details.

A Scholarship Application Form is available by sending a request with a self-addressed, stamped envelope to AMA HQ, 806 Fifteenth St., N.W., Washington, D.C. 20005.

Signal Chasers RC Club, W. M. Norris
144 So. Elm Ave., Webster Groves
Sky Devils of Kansas City, James Dunkin
10411 E. 39th Terr., Kansas City
Spirits of St. Louis, Carl Raab
17 Rolling Hills, Florissant 63033
St. Charles Phantom Flyers, Edwin Gross
431 Vine, O'Fallon 63366
St. Louis Yellow Jackets, Art Schaefer
4206 Virginia, St. Louis 63111

MONTANA

Big Sky RC Modelers, Steve Crandall
4166 5th Ave. So., Great Falls 59401
Billings Flying Mustangs, William Poehls
2511 Howard Ave., Billings 59102
Cut Bank Skyhawks, Dean Hoefner
Box 1254, Cut Bank 59427
Helena Flying Tigers, Ernest Pearce
Box 151, East Helena 59635

NEBRASKA

Aero Design Flying Club, Randall Moore
1120 N. 41st Street, Lincoln 68507
Hastings Skylarks, L. J. Schmidt
P.O. Glenvil 68941
Mid Nebraska MC, James Banks
1605 7th Ave., Kearney 68847
Orbiting Eagles of Greater Omaha,
F. Griffith, 8834 Lake, Omaha

NEVADA

Reno RC Club, William Taylor
4600 Azalea Dr., Reno 89502

NEW HAMPSHIRE

Concord Aeroguidance Soc., Garner Prest
24 Rumford St., Concord 03301
Southern N. H. RC Club, Bill Fitzgerald
205 Wilkins St., Manchester

NEW JERSEY

Berkeley Blade Busters, Greg Jones
211 Lorraine Dr., Berkeley Hts. 07922
Bergen County RC Club, Roy Luyster
617 Briarcliff Ave., Maywood 07607
Burlington County RC Club, J.R. Imhoff
PO Box 121, Rancocas 08073
Central Jersey RC Club, Dick Plavincky
1746 Holly Rd., North Brunswick 08902
East Coast Indoor Modelers, E. Radoff
61 Spirngbrook Rd., Livingston 07039
Edison Recreation MAC, Robin Crawford
98 Idlewild Rd., Edison 08817
Esso Engineering Club, J. S. Clarke
419 Manor Ave., Cranford 07016
Garden State Circle Burners, Mike Turo
43 Old Orchard Ct., Cedar Grove 07009
Jersey Aircraft Modeler, G. Snyder III
283 S. Fellowship Rd., Maple Shade
Jersey Coast RC Club, Henry Ruddy
176 Halgren Crescent, Haverstraw
Jersey Tailwinds, Fred Smalfue
246 Mercer Ave., Bellmawr 08030
Kearfott RC Modelers, Paul Sauvin
500 McBride Ave., West Paterson 07424
Lakeland RC Club, E. Norman Ellison
855 Devon St., Kearney 07032
Mercer County RC Society, Gary Katona
1049 Hughes Dr., Trenton 08690
Middlesex Modelers Inc., Herbert Kurz
234 Oneida Place, N. Plainfield 07060
Mis-Guided Missiles, Roger Johnson
15 Acorn Dr., Bridgeton 08302
Monmouth MAC, Inc., James Crouch
60 McCambell Rd., Holmdel 07733
N. Jersey RC Club, Dave Jaggie
La Salle Ave., Hasbrouck Hts. 07604
Oakland RC Club, Walter T. Young
594 Franklin Ave., Franklin Lakes
Rockaway Valley RC Club, E. Hoffman
158 Carpenter St., Belleville 07109
Rockland County RC Club, Leon Audino
254 Glen Rd., Woodcliff Lake 07675
Sky Furys M.A.C., L. Peters
248 E. Howard St., Clayton 08312
South Jersey Aeromodelers, Paul Haley
Braddock Ave. Rd. 5, Hammonton 08037
S. Jersey Flyaways Inc., John J. Gamble
603 State Rd., Mantua 08051
Thunderbirds, J. Florenzie
34 Buttonwood Dr., Parlin 08859
Top O'New Jersey RC Club, H. Hatton
Box 568, Hopatcong 07843
Tri County RC Club, Mike Sansone
1375 Sioux Rd., North Brunswick 08902
West Jersey Radio Flyers, Hansel Hall
921 Newmans Lane, Somerville 08876
West Jersey RC Club, Tom Dyl
Apt. M-3, Jamestown Apt:, Blackwood

NEW MEXICO

Albuquerque RC Club, J.D. Wright
13315 Chico NW, Albuquerque 87123
Albuquerque Thunderbirds, Dick Shead
500 A Kentucky SE, Albuquerque
Clovis Mads, Charlie Meyer
P.O. Box 1592, Clovis 88101
Hobbs Aero Radio Kontrol, Jim Crosby
2022 Acoma Dr., Hobbs 88240
South West Aero Team, Ed Piggott
8711 Las Camas NE, Albuquerque

NEW YORK

Aeroguidance Society, Ralph Jackson
21 Holiday Hill, Endicott 13760
Aero RC of Syracuse Inc., C. H. Killam
8838 W. Shellmans Dr., Rd #1, Clay

Balsa Busters, Robert Andrews
55 Ellsworth St., Hornell 14843
Blue Angels RC Club, Martin Meyer
79 Charles St., New Rochelle 10801
Flying Knights of Hamburg, H. Doland
7144 Combs Dr., Hamburg 14075
Flying Knights MAC, Inc., Jean Hultberg
Route 1, Box 140, East Nassau 12062
Flying Rebels, Evert Ecklund
75 Benson St., Jamestown 14701
Flying Sparks, Inc., Donald Jurusik
446 Wells St., Elmira 14901
Green Bush Pilots, Jean Hultberg
RFD #1—Box 140, East Nassau 12062
Golden Knights, Art Denard
19 Clinton St., Geneva 14456
Hudson Valley RC, Inc., Fred Bange
64 Farm Rd., Briarcliff Manor, N.Y.
IBM RC & Model Club, Joe Luzzi
Apt. 4D, Dutchess Apts., Van Wagner
Rd., Poughkeepsie 12603
Island Model Plane Soc., Dick DeFrancis
134 Northfield Rd., Hauppauge 11787
Kingston Aeromodelers, Bob Thomson
RT #1, Box 35 H, Rhinebeck 12572
Long Island Aero RS, George McCarthy
24 Birchwood Dr., Great River 11739
Long Island Drone Soc., Joe Holmes Jr.
216 Sherman St., Westbury 11590
Long Island RC Club, Bob Luhrmand
6 Oatley Pl., Commack 11725
Meroke RC Club, Inc., Morton Ross
216 Broadway, Massapequa Pk. 11762
Midstate Modelers, Dennis Mead
Box #35, Cazenovio 13035
Modelers of Binghamton, Bill Johnson
833 W. Circle Dr., Vestal 13850
Mohawk Valley RC Modelers, Bill Smith
5536 Sunrise Terrace, Marcy 13304
N.Y. Sky Blasters MAC, Nestor Cortijo
182 South St., New York 10038
Niagara County RC MAC, Saul Green
3113 Lewistown Rd., Niagara Falls
Oswego Valley Model Airs, Phil Smith
4460 Verplank Rd., Clay 13041
Penn. Ave. RC Soc., Bernard Sanders
410 Broch 48th St., Far Rockaway
Queens County RC, Edmund Bernum
119 Herman Ave., Bethpage 11714
RC Club of Rochester, Inc., Dick Smith
300 Steko Ave., Rochester 14615
RC Soc. of Marine Park, Martin Berman
2249 E. 28th St., Brooklyn 11229
Saratoga Co. Aeromodelers, Guy Cannon
322 A RD #2 Traver Rd., Gansevoort
Sky Rovers RC, Dave Bowerman
72 Buffalo St., Canandaigua 14424
Sky Scrapers, Roger Long
3421 80th Street, Jackson Hts. 11372
STARS, Lon Sauter
103 Brookfield Rd., Mattydak 13211
Squadrone Escarole, Inc., John Sbare
3240 Baker Ave., Bronx 10467
Suffolk Falcons, Wallace Zober
1 East End Rd., Rocky Point 11778
Suffolk Wings MAC, Bob Smith
33 Pleasant Ave., Centereach 11720
Sullivan County RC, Sy Appel
59 York Ave., Monticello 12701
The Sky RC Pulsers of W. N.Y., D. Gordon
236 St. Lawrence Ave., Buffalo 14216
Thundervolts RC Club, Daryl Hull
15 Service Rd., Schenectady 12303
Westchester RAMS, Don Kilgus
8 Pondfield Dr., Chappaqua 10514

NORTH CAROLINA

Cherry Point MA Wing, Joe Muelane, Jr.
28 E. Moret Ave., Havelock 28532
East Carolina RC'ers, Cpt. Myron Rich
302 Beck St., Goldsboro 27530
Ft. Bragg MAC, Mike Disser
314 Cartwright Dr., Fayetteville
Gastonia RC Club, Reid Sipe
1710 Wildwood Rd., Gastonia 38052
Greensboro RC Modelers, Dave Pearce
805 W. Bessemer, Greensboro 27406
Hickory RC Club Prop Twisters, S. Teague
625 5th Ave., S.W., Hickory 28601
Kingston Aeromodelers Club, J. Cantu
705 Dixton St., Kingston 28501
Monroe RC Club, Dale Gaffney
1247 Marlwood Terr., Charlotte
Montgomery Randolph RC Club, C. Pugh
Box 455, R.F.D. #1, Franklinville 27248
Morganton RC Club, Winfred Shytle
Rt. #2, Box 4, Connelly Springs 28612
Prop-Twisters Model Club, G.F. Brumback
1201 Forest Hill Dr., Greensboro

NORTH DAKOTA

Red River Radio Control Club, D. Casey
335-A Teak Ave., Grand Forks AFB

OHIO

Canton Model Society, William Hulbert
174 Castle Blvd., Akron 44313
Capital City Controlliners, C. Hemmerly
5607 Sandalwood Blvd., Columbus
Central Ohio FF Club, Floyd Miller
1313 Brookridge Dr., Columbus 43221
Cincinnati Aeromodelers, G. Vogeler
2873 Carroll Ave., Cincinnati 45211
C O R K S, Robert Dye
6118 Sedgwick, Worthington 43085
Darke County Aero. Assn., Dan Weaver
222 Markwith Ave., Greenville 11726
Dayton Buzzin Buzzards, Bill Keller
201 Ashwood Ave., Dayton 45400
Dayton Wingmasters, Val Dahlem

AMA News Extra .....

NEW AMA RULES FOR 1971

The Radio Control, Free Flight and Combined Contest Boards have completed their Final Votes on proposals to revise the AMA competition rules, allowing announcement of the following revisions to the rule book effective January 1, 1971.

RADIO CONTROL

Pattern. The "grab bag" schedule for Class C Pattern maneuvers has been replaced by a fixed maneuver schedule as follows: (1) Takeoff, (2) Touch & Go, (3) Three Rolls, (4) Three Inside Loops, (5) Four-Point Roll, (6) Figure M, (7) Horizontal Eight, (8) Double Immelman, (9) Three Outside Loops, (10) Reverse Cuban Eight, (11) Slow Roll, (12) 180-Degree Turn, (13) Top Hat, (14) Three Spins, (15) Landing, (16) Spot. Class C Flight Time. The entire pattern, including engine starting within the first two minutes, must be completed in 10 minutes. Contestant Advancement. Henceforth, advancement from Class A to B, Class C or D Novice to Class C or D Expert, etc., will be by placing first, second or third in three sanctioned contests in the flyer's chosen class, except in the case where the flyer's skill class is not being flown.

Pylon. The requirement for a single barrel throttle to reduce engine speed has been modified to permit the use of any means by the pilot to be able to shut off his engine within five seconds, with the aircraft in an upright position, upon official command, plane on ground or in the air. Starting Time. The new rule is that a maximum time of 1 1/2 minutes will be allowed for starting and adjusting the engine; any contestant not ready to have his plane released at the end of the 1 1/2 minutes will be eliminated from that heat. Formula I Chord Thickness. The point of measurement has been changed from the centerline to the "root" as defined for Form. II, and the CB has interpreted this to mean that a "no-go" gauge set at 7/8" should not slide closer than three inches to the aircraft's centerline. Also, the chord thickness of the exposed portion of the wing, from fillet to tip, must have a straight-line taper on both top and bottom surfaces. Also for both Form. I and Form. II, the race starter will be allowed to Black-Flag any entrant for unsafe flying (requiring pilot to pull off race course and land); models will be weighed "wet" for weight rule compliance after being flown; and the race course minimum safety dimensions have been revised by adding an additional 100 feet to previous dimensions.

Soaring. The RC Contest Board has voted to establish RC Gliding as a Provisional AMA category in 1971, the rules for which will be recommended by the League of Silent Flight, subject to approval and/or modification by the RC Contest Board.

FREE FLIGHT

General. Two categories of national AMA records have been established for classes which previously had only five-minute max rules. Category I continues the five-minute rules as previous, while in Category II the max flight limit is reduced to three minutes (and for engine-powered models, runs are reduced to nine seconds HL, 11 seconds ROG). Flight records may be obtained only in the category stated in advance on the meet sanction application. Also applicable to all FF classes is a new Contest Board interpretation that an official flight can be recorded in only one event, the event to be declared when the contestant requests an official flight.

HL Glider. The system for flyoffs is changed from an unlimited fourth flight to repetitive two-minute maxes until one is missed. Payload and Cargo replace the titles, Payload Gas and Payload Cargo, used previously.

COMBINED CONTEST BOARDS

The Contest Boards have voted to revise their Guidelines for Contest Coordinators, a chief feature of which is the "protected drawing area" of an AMA sanctioned meet. In general it is recommended that the following distances separate same day meets having the same category of events: 100 miles for Class A meets, 400 miles for Class AA, 600 miles for Class AAA; no Class AAA meet anywhere on the same date as the Class AAAA National Contest. Traditional Class AA and AAA meet dates are given preference over others wishing the same dates, and the new guidelines stress the necessity of communication between Contest Coordinators in adjacent districts. A revised system of Classification of Sanctioned Meets was also adopted.

CONTROL LINE AND SCALE

Final Voting was in progress by the CL and Scale Contest Boards when this was written, but response by board members was not sufficient for definitive conclusions. Hopefully, the outcome can be presented next month.

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

6022 Hemingway Rd., Dayton 45424
Electronic Flyers, John Converse
1822 Jamestown Dr., Mansfield 44906
Flying Aero Sport Team, Dick Rhoads
48 Brookside Dr., Brookville 45309
Flying Circuits, T. Thompson
RD #1, Clover Ct., Grenville 43023
F O R K S, Charles Clark
332 Reese Ave., Lancaster 43130
Goodyear MAC, Peggy Boleratz
1192 W. Comet Rd., Clinton 44216
Jackson RC Club, H. C. Hertz
4760 Village Lane, Toledo 43614
Lake Erie Gas Model Club, Dick Woodward
4818 Maplecrest Ave., Parma 44134
Lakewood Flite Masters, Robert Ivey
5010 Longwood Ave., Parma 44134
Licking County RC Club, R. A. Hole
202 Rose Ave., Mount Vernon 43050
Lorain County RC Club, George Larkin
168 Alexander Dr., Elyria 44035
Maple Hts. Skyliners, Craig Testuth
5263 Homewood, Maple Hts. 44137
Northern Ohio FF Assn., Rudy Kluiber
2021 Lakeland, Lakewood 44107
Ohio Flying Aces, J. B. Peters, Jr.
315 Bradford Dr., Canfield 44406
Portage Aero Modelers, Francis Zuppan
222 Lowell Dr., Kent 44240
Prop Busters of Lake City, A. Matuszewski
1448 Sulzer Ave., Cleveland 44103
RC Short Circuits, H. Hanser
4283 Maureen Dr., Youngstown 44511
RC Thermaliers, J. B. Merrill
Rt. #2, Box 58, Wheelersburg 45694
Shoo Flyers MAC, Steve Stanford
P.O. Box 89, Ohio City 45874
Skyhawks RC Club, Marvin Waggoner
5618 Norquest Blvd., Youngstown
Southern Ohio Aero Models, B. Salisbury
Box 278A, Blanchester 45107
Southwest Ohio Free Flighters, C. Harper
207 Riverside, Loveland 45140
The Weak Signals RC Club, Don Belote
P.O. Box 5772 Wernert Station, Toledo
Tri State RC Club, Stan Edwards
610 Washington St., Coal Grove 45638
Trumble County RC Modelers, N. Flavell
4404 Victoria Terr., Warren 44484
Western Ohio RK Society, W. Lehn
450 Deauville Dr., Dayton 45429

OKLAHOMA

Okla. City Controliners, Dick Cloud
4716 Judy Dr., Del City 73115
Ponca City RC Modelers, Norman Barnes
1712 Potomac Dr., Ponca City 74601
Ponca Pivot Pilots, Dale Courtney
1918 North 5th, Ponca City 74601
The Oklahoma RK Society, S. Coffman
2516 N.W., 116th, Okla. City 73120
Tulsa Glue Dobbers Inc., John English
4233 E. 52nd Place, Tulsa 74135

OREGON

Eugene Prop Spinners, Gordon Rea
5025 Saratoga St., Eugene 97405
Flightmasters, Dick Wickline
P.O. Box 623, Klamath Falls 97223
Fly-A-Ways RC Modelers, Walt Brooks
15570 S.W. 79th, Tigard 97223
Portland RC Pilot Assn., F. Blacksmith
2254 S.E. Secaruthers, Portland 97214
Portland Stardusters RCMC, D. Weigandi
4710 N.E. Simpson St., 97218
Rogue Eagle RC Club, Robert Hawkins
4790 Fern Valley Rd., Medford 97501
Salem RC Pilots Assn., Bob Ellison
1595 19th St. N.E., Salem 97303
The Falcons, Dennis Whitney
19774 S. Midhill Dr., West Lynn 97068
Willamette Modelers Club, R. Stalick
2807 South Oak, Albany 97321

PENNSYLVANIA

Aircraft Modeler Assn., Jack Healey
2302 Solly Ave., Philadelphia 19152
Beaver County MAC, Larry Depaolis
1225 Harvey Run Rd., Freedom 15042
Brentwood Flying Aces, Robert Volk
138 East Francis Ave., Pittsburgh
Bucks County RC Club, Joe Fox
25 Lark Dr., Holland 18966
Carlisle RC Club, Dr. Richard Lave
438 W. Penn St., Carlisle 17013
Delaware Valley RC Club, W. Cummings
24 Edgemont Ave., Clifton Hts. 19018
Ephrata RC Club, Dick Yeagley
541 East Orange St., Lancaster 17602
Erie Model Aircraft Assn., Linley Reichel
3301 Cindy Lane, Erie 16509
Erie Model Controliners, T. Muye
954 W. 21, Erie 16503
Fallen Angels, Doug Sorber
209 Centennial St., Rahns 19426
Flying Dutchman MAC, Donald Scott
2001 Stone Mill Rd., Lancaster 17603
Glenside Air Scouts RC Club, J. Salisbury
2909 Joyce Rd., Roslyn 19001
Greater Erie Modeling Soc., V. Rapp
3057 W. 24th St., Erie 16506
Greater Pgh. A.R.C.S., Ralph Manroe
1490 Henderson Ave., Washington
Golden Eagles, Donald Reed
371 Southcroft Rd., Springfield 19064
Hedgehoppers MAC, Richard Mindler
121 S. Tenth St., Quakertown 18951

Keystone Clippers RC Club, N. Bartko
2306 James Street, McKeesport 15132
Keystone RC Club, James Bachelor
732 Longshore Ave., Philadelphia
Keystone RC Society, John Landis Jr.
704 Haldeman Ave., New Cumberland
Lancaster Co. RC Club, Dr. D. Weinberg
455 Sixth St., Columbia 17612
Laurel Highlands MAC, John Hathaway
Woodmere Dr., New Stanton 15672
Lebanon Valley RC Club, Howard Rittle
207 N. R.R. Street, Meyerstown 17067
Lehigh Valley RC Club, J. Lamar Delp
P.O. Box 2203, Allentown 18002
Levittown Flying Bucks, Bob Leishman
167 Goldenridge Dr., Levittown 19057
Mercer County MAC, Charles Tuck
Route #3, Greenville 16125
Merco Macs, Wes Mitchell
185 S. Mercer St., Greenville 16125
N. Hills Cloud Duster RC, E. Evermann
783 Thompson Run Road, Pittsburgh
Olean MAC, George Ward Jr.
155 Harrisburg Run, Bradford 16701
Penn-Ohio RC Society, Tom Allison
322 Norwood Ave., New Castle 16105
Philadelphia Sky Pirates, Arnold Waldner
337 W. Durham St., Philadelphia 19119
Quaker City RC Club, Herbert Zemble
7716 Summerdale Ave., Philadelphia
RC Club of Erie, Richard Thaler
PO Box 8132, Erie 16505
Science Park Aero RC Club, Al Neissner
RD #1, Box 398, Boalsburg 16827
Skylarks of Sharon Pa., Charles Quinby
254 Prospect St., Sharon 16146
S P A R C S, Jay Gerber
1142 Longshore Ave., Philadelphia
St. Mary Area RC Society, John Florio
123 Fourth St., St. Marys 15857
Susquehanna Valley RC, James Rechel Jr.
967 High Street, Williamsport 17701
The York Area RC Club, Jacques Buck
RD #1, Green Briar Rd., York 17404
Tri County Wing Snappers, Inc., D. Klein
765 Lobelia Ave., Reading 19605
Tuscarora RC Club, John Klavinsky
169 Penn St., Tamaqua 18252
Valley Forge Signal Seekers, L. R. Laux
734 Hickory Lane, Berwyn 19312
Valley RC Model Club, Martin Kandelin
504 Second St., Athens 18810
York Line Tamers, Richard Denves
2560 Sunset Lane, York 17404

RHODE ISLAND

Aquidneck RC Fliers, John Kroenert
349 New Meadow Rd., Barrington
Rhode Island Aeromodelers, B. Collins
11 Taft St., Cranston 02905
Rhody Aero Guidance Soc., Louis Peters
125 Summit St., Central Falls 02863

SOUTH CAROLINA

Catawba RC Modelers, W. McFadden
1154 Hermitage Rd., Rock Hill 29730
Charleston RC Society, Dennis Martin
1059 Harbor View Rd., Charleston
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Montgomery Randolph RC Club, D. York
Box 524, Pauleys Island 29585
Sumter M.A.C., Charles R. Johnson
PO Box 621, Sumter 29150
Western Carolina RC Club, Frank Queen
104 Clearview Ave., Greenville

SOUTH DAKOTA

Flying Eagles Model Club, Glenn Schmig
318 N. Highland, Sioux Falls 57104
Rapid City Propbusters RC, C. Besancon
4926 Pierre St., Rapid City 57701

(Continued on page 84)

CONTEST CALENDAR

Official Sanctioned Contest of the Academy of Model Aeronautics

Jan. 1-2-3—Jacksonville, Fla. (AAA) King Orange FF & CL Meet. Site: Imeson Airport. J. Wagner CD, 283 E. 8th St., Hialeah, Fla. 33010.

Jan. 23-24—Buckeye, Ariz. (AAA) 21st Annual Southwestern Regional FF, CL & RC Model Airplane Championships. Site: Municipal Airport. N. Lemak CD, 3810 Golden Ln., Phoenix, Ariz. 85021.

Jan. 24—Aurora, Colo. (A) MMM Indoor Meet. Site: Hinkley High School. G. Batiuk, Sr., CD, 2945 So. Teller St., Aurora, Colo. 80227. Sponsor: **Magnificent Mountain Men.**

Feb. 7—Green Bay, Wisc. Winter Polar Bear FF Meet. Site: Frozen Green Bay. R. Cowles CD, 2424 Ducharme Ln., Green Bay, Wisc. 54301. Sponsor: **Green Bay R.U.F. Club.**

Feb. 21—Aurora, Colo. (A) MMM Monthly Indoor Meet. Site: Hinkley High School. D. McGhee CD, 1260 Elm, Denver, Colo. 80220. Sponsor: **Magnificent Mountain Men.**

March 21—Aurora, Colo. (A) MMM Monthly Indoor Meet. Site: Hinkley High School. G. Batiuk, Jr. CD, 3066 So. Upham St., Denver, Colo. 80227.

April 18—Phoenix, Ariz. (A) Spring FF Contest. Site: Pinnacle Peak. W. Morris CD, 7422 E. McKinley St., Scottsdale, Ariz. 85257.

May 29—Union, N.J. (AA) 17th Union CL Model Airplane Invitational Meet. Site: Morrison Field, F. DeCicco CD, 53 Broadview Ave., Maplewood, N.J. 07040.

June 5-6—Nashville, Tenn. (AAA) Mid-South 8th Annual RC Championships. Site: Percy Warner Park. B. Reuther CD, 216 Vaughns Gap Rd., Nashville, Tenn. 37205.

June 5-6—Dahlgren, Va. (AA) National Capitol RC Tournament. Site: Naval Weapons Lab. B. Violett CD, 64 B, Rt. 1, Clarksburg, Md. 20754. Sponsor: **DC/RC Club.**

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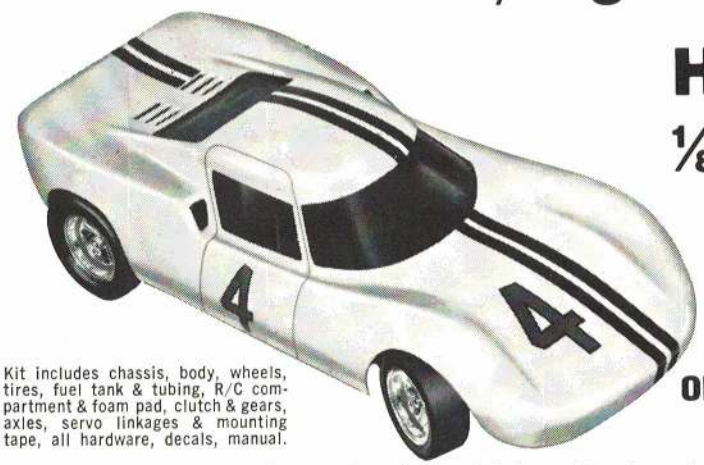

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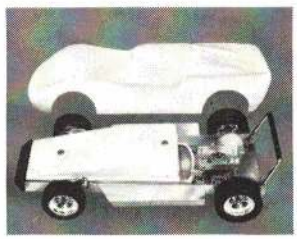

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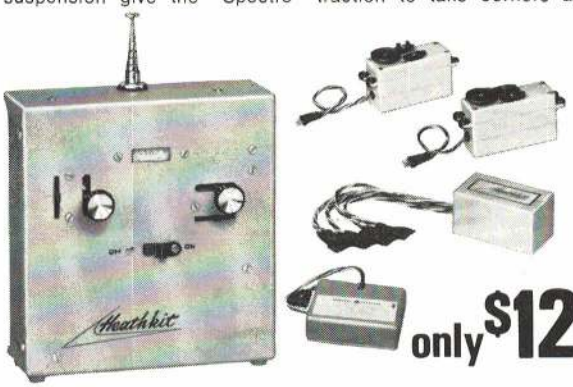

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Cobra

(continued from page 19)

Know your engine and treat it with respect. I have used a Fox 35 with one additional head gasket and an O&S needle valve assembly for several years. I also use a 25% nitro fuel (after many years of un-nitrated fuel) and a 10-5 prop. This combination produces an rpm range in which the engine can develop its maximum power. Use light machine oil in the motor between contests.

A Fireball long-reach, cold heat range plug lights the fire and keeps it lit. If using the O&S spray bar, don't reduce its diameter. It does restrict the venturi more than the standard Fox bar, but it also increases fuel draw. The extra power available in the nitrated fuel more than offsets the potential power loss.

A small filter between the tank and engine is a must for most fliers, but I prefer to filter the fuel when purchased and again when filling the tank. By using this procedure, I've never had problems.

Practice with the Cobra until a satisfactory pattern is achieved, then hang it up. I'm firmly convinced that most of today's fliers are overpracticed. Instead, make two or three flights the evening before the contest to insure that all systems are go. Then, one additional flight the morning of the contest, preferably at the contest site, should be sufficient. Clean and wax the model so it is in top shape for appearance judging. From then on, it's all up to you and Cobra.

RC Glider Nats

(Continued from page 12)

Trophies, merchandise prizes, meet personnel and incidental expenses were furnished by the sponsors. Judging from the enthusiastic turnout—and the continuous stream of AMA officials, model and RC manufacturers and Nats official contestants who visited the glider meet—we'd say the point was well-proved!

Such a meet poses a problem of space, since it is necessary to find a field much larger than 1000 ft. (the approximate length of tow lines) in every direction so that any wind direction can be accommodated. Many good flying spots are closer to Glenview N.A.S., but none were all-direction fields—a vital necessity for RC glider operation. The St. Charles field is used by the local Flying Fools model plane club, with over 100 members who are active in all phases of model aviation and who have a strong RC interest. Although bounded on two sides by busy roads, and with quite a few industrial buildings nearby (one glider landed unharmed atop an adjacent hamburger emporium, several tangled with other structures), the field worked out quite well.

Fortunately, the wind direction held steady from the southwest for the two days. There were thermals about, but they had to be searched for. A reasonable number of maxes were scored in both classes. A thunderstorm halted activities an hour early on Monday, and another came along Tuesday afternoon but held off until the meet was completed. Three rounds were flown Monday, four on Tuesday. Several fliers who were in both classes admitted they'd had their fill of flying by late on the second day! Thirty fliers entered the meet, with 11 planes in class A, 27 in Class B.

The two glider classes were A—under 750 sq. in. total area (wing area plus area of horizontal tail surfaces) and B—those over. Specifications were set for maximum weight and area, for maximum and minimum wing loading. Launch was by either winch or high start with a maximum line length of 300 meters (984.3 ft.). No hand tows or powered gliders were allowed (some gliders carried engines, but the props were removed). Maximum flight length

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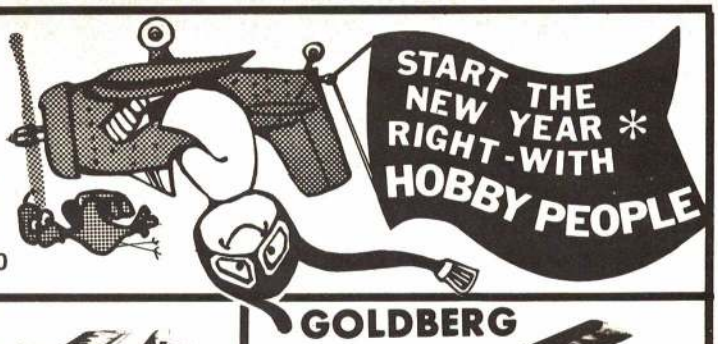

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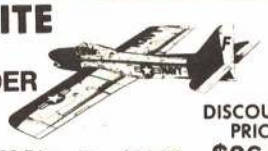

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was 15 min., with one point given for each second in the air, and one point subtracted for each second after 15 min. had elapsed. The later provision caused spectacular dives at the end of a number of max. flights! An additional 100 points were given if the glider landed inside a 15-ft. circle, 50 points if inside a 30-ft. circle. Final scores were a total of the best flight scores.

No high starts were used. Five winches were available Monday, with three electric jobs seeing the most service. The one gas winch was used only a few times and was not even set up Tuesday.

Quite a few kit planes were in use, with Cirruses (Graupner version) most numerous. Some interesting originals were seen too. Carl Lorber received a special trophy as designer of the Best Original Design and Most Consistent Performer. The ship, a copy of his Gaggler pod and boom soarer, was flown to second place in Class B by Jack Hiner.

Bob Andris flew a true scale glider in Class B. An exact copy of the English two-place Slingsby Cadet training glider, it has swept-forward wings and is a great performer. Sam Crawford entered a kit Cirrus in each class, placing fourth in both! His Class B entry was strictly stock, but for the smaller class, Sam cut 12 in. out of each wing half (just inboard of the point where tip taper starts) and removed 2½ in. from each stab tip. As far as could be determined, only two thermal sniffers were in use —by Walt Good and Bob Andris.

As with most meets, a few problems arose. Wind directions forced the fliers to operate near the junction of two roads, with the results noted above. Some entrants felt the flight line was not pushed enough, especially on Tuesday when only two winches were in use most of the time. On the other hand, glider meets are traditionally supposed to be a relaxing form of RC competition! The large score board brought to the field was not utilized to keep a running tabulation of scores—always of prime interest to contestants and spectators alike.

No official frequency monitors were

in use, although few complaints of interference were heard. The few crashes were caused mostly by abrupt contact with nearby structures. There was only one flyaway (later recovered). All in all, the entrants enjoyed the meet immensely. It's always most interesting to see what fliers in other areas of the country are using. Surprisingly, only three entrants came from the East Coast, but a contingent of six or more represented California. The rest were mostly from Illinois and Michigan. (Detroit is getting to be a glider hotbed, and fliers from this area furnished several of the electric winches which were in constant use.) The meet could even be labeled international thanks to a lone entrant from Canada!

We truly hope that the success of their brainchild compensated to some extent for the vast amount of work put into planning by Dave and Dan. We also hope that AMA officials who observed the action were impressed enough to consider adding RC gliding as a provisional event at the 1971 Nats (which probably will be held at Glenview N.A.S. again).

Top Winners: Class A—(1) Mark Smith, 2739 pts; (2) Bob Andris 2215; (3) Rick Walters, 2148; (4) Sam Crawford, 2136; (5) Bud Pell, 1742; (6) J. Nielsen, 1282; (7) Earl Pell, 1237; (8) Dale Willoughby, 1234; (9) Sigi Telzer, 1161; (10) Max Geier, 794.

Class B—(1) Walt Good, 3480; (2) Jack Hiner, 2445; (3) Dan Pruss, 2282; (4) Sam Crawford, 2259; (5) Mark Smith, 2229; (6) Ed Smith, 2193; (7) Rich Bremer, 2134; (8) Ray Vanderdonk, 2124; (9) Earl Pell, 2048; (10) Rick Walters, 2040.

Special design award went to Carl Lorber, as noted above. Best Sportsmanship Award went to Ed Smith.

Getting Started in RC

(continued from page 49)

from a rough landing, are not transmitted to the servo gear teeth. Rotary output is useful in that the amount of pushrod movement can be changed by attaching the rod at varying distances from the pivot point. Most servos have a series of holes in the rod or disk for this purpose. The push-pull output cannot be changed readily, although simple accessories are available to allow more or less rod movement with such servos.

Control surfaces almost never move against stops at the ends of their travel. The linkage is set so that the angular movement gives the amount of control action required in flight. Engine throttle arms do have solid stops at the high and low speed ends of movement. The low end is especially critical, as most throttles are not linear and produce relatively much more rpm change near the low end than near the high. It is extremely undesirable to allow any linkage to come up against a solid stop, because this puts a solid load on the servo, which just keeps trying to move the linkage. Servo current rises to a very high value, which may lead to motor or output transistor damage. Furthermore, the abnormally high battery drain can discharge the power supply rapidly.

Fortunately, current digital servos have sufficiently good "resetability" so that the servo itself can be used as the stops. The idle stopscrew on the throttle is backed out until the throttle arm goes

(Continued on page 72)

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ACE R/C INC.

HIGGINSVILLE, MO. 64037

Dear Friend:

Above is the Ace exhibit at the Oklahoma Hobby Fair held last fall. It previewed many of our new Pulse products, and was an advance look at what promises to be a whole new and exciting extension of R/C.

Brad and George, two of our staff at the show, were kept busy answering questions about Pulse- how it works and so on; and why it fits certain applications BETTER than any digital system on the market.

Demonstrations on Sunday gave ample proof that the small Owen Kampen designed planes, equipped with Pulse Rudder, not only fly--but perform incredibly well!

The Dick's Dream (now a kit) is proving itself in the hands of beginners and old timers. With a Pee Wee it's tame; with a Tee Dee it's hot! It is designed for R/C gear of THREE OUNCES or less--and that's where our Pulse Commanders come in. The Skampy is a design recommended for the experienced builder and flyer. Plans and wings are available.

And that glider--that's something else! It uses both of our constant and taper chord section mini foam wings. With a Babe Bee on the pod it hauls it up like a homesick angel and then--floats and floats and floats! This is another design by Owen Kampen with flight tests by Paul Yee and our staff. When thoroughly proven, plans will be offered.

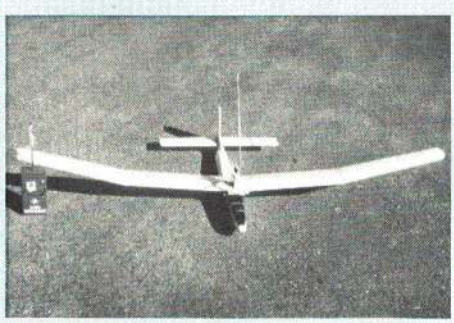
So at the Oklahoma Trade Show we introduced a total concept--plane and radio gear DESIGNED FOR EACH OTHER.

Our hat is off to the Oklahoma City Arts and Science Foundation and the TORKS for a very successful Model Hobby Fair. Next year it should be even bigger.

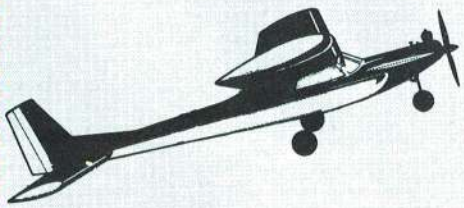
Look for the display pictured above at Toledo Weak Signals Conference the last weekend in February--it will look about the same, but the big difference will be that we'll be able to give you firm shipping dates. We'll be glad to see you and show you the NEW 1971 line of Pulse systems, our TOTAL CONCEPT OF PLANES AND SYSTEMS.

Keep 'em pulsing,

Paul F. Runge



DICK'S DREAM PLANE KIT
For the Beginner or Expert!



NOW! A Mini Foam Wing Airplane Kit. This is a first! DESIGNED FOR PULSE!

There are foam wing kits on the market but with the Ace Mini Foam Wings, small planes in the 30-35" range fill a gap for something that did not exist in the kit field.

This kit is of the Dick's Dream, designed by Owen Kampen. Has been extensively test flown over a period of years by a number of modellers in various parts of the country. The Dick's Dream is partially a scaled down Whiz Kid--a proven performer. It has several innovations which are for the small breed of airplane specifically, and with the foam wing the beginner is assured of overcoming a big drawback to success. Features crutch type fuselage construction to assure line-up and accuracy.

Balsa and hardwood parts specially selected and clean precision cut by Lou Andrews of Aamco especially for this kit. This assures you of quality and integrity. Wire parts for landing gear and torque rod, hinge material, and other extras are supplied. Wheels and engine mounting hardware are not.

Full step by step instructions to assist in building this gem of a kit. AND ultra simple installation shown for the Commander R/O Baby or Baby Twin!

Span is 32" (cut from the Ace constant chord foam section), 5½" chord, length is 25 inches. Weight with R/C gear is 12 to 14 ounces.

With a Pee Wee .020 and a Commander R/O Baby you have a docile performer and excellent trainer. If you want something hot, TeeDee .020 with the Commander R/O Baby Twin will do the job--it'll do everything in the Rudder Only book!

Excellent for the beginner--fun for the experienced flyer. Join in with assurance of satisfaction with the new Ace Foam Wing Dick's Dream.

No. 13L100—Dick's Dream Foam Wing Airplane Kit $5.95

ACE MINI FOAM WINGS

Special 17% semi-symmetrical airfoil expanded foam developed by Owen Kampen for the small planes.

The constant chord measures 35" span, width is 5½". Area is 192.5. Weight about 3 oz.

The taper section is 35" span, center is 5½" which tapers to 4". Area is 166.24. Weight is just over 2 oz.

Come in two 17½" pieces which may be easily epoxied for desired dihedral. May be used unfinished. Or may be finished with polyurethan varnish. Stripe with Monokote for trim.

Build small with foam. Makes planes which are ideal for the Cox Pee Wee or TD .020 engines, and the Commander R/O Baby or Baby Twin units.

No. 13L166—Ace Foam TAPER Wing $2.95
No. 13L192—Ace Foam CONSTANT Wing 2.95

PULSE .. Best Choice for You!

FULLY PROPORTIONAL--BUILT-IN RAND STICK WITH TRIM; ALL BATTERIES SUPPLIED, NICKEL CAD PAK FOR AIRBORNE UNIT; THOUSANDS IN USE

PULSE COMMANDER FOR 1971—

** New, smaller Transmitter case

** 50% more powerful actuator

** COMBOS with all batteries AND charger!

** BASIC Paks less batteries - charger

RUDDER ONLY PULSE IS:

* FULLY PROPORTIONAL!
* LIGHTEST--2.5 oz. for Baby
* SIMPLEST--only one moving part, noise free
* VERSATILE--arrange to suit your particular installation. You can go up in size or down in size. You can even go micro and mini, and not obsolete your transmitter or basic receiver. Simple changes of battery and actuator allow a variety of installations. Motor control can be easily added to larger units.
* EASY to install
* GREAT for Beginners--CHALLENGING to the pros.

COMMANDER BASIC R/O PULSE PACKS

Available in Four Sizes

We are offering our Commander Rudder Only series in both "Choose-Yourself" style, and in the same combos as last year. This offers you greater choice and therefore more versatility.

The Basic Packs contain the new improved Dickerson Designed Rudder Only Pulse Transmitter, the Commander DE 2.4 v superhet receiver, and four choices of size on the more powerful Adams actuator.

Our Basic Pack (A) comes less batteries and charger. You select the size of the battery pack and charger kit (BC) you want, and this ABC makes it YOUR combo. (If for instance, you have a glider in which you want to use just the Baby or Baby Twin Pack, BUT need 500 ma nicads instead of the usual 225 ma, you can get this combo by just ordering the right choice of A and BC units.)

The Baby and Baby Twin are ideally suited for the new Ace Mini Foam Wings, and the Mini Foam Wing plane kits, while the Standard and Stomper will handle larger jobs--even up to .19-23 size and Motor Control may be added.

The Baby is for .010 to .020 jobs. Airborne weight 2.5 oz. (If you use 225 ma nicads).

The Baby Twin is for hot. 020 to .049 ships. Airborne weight 2.9 oz. (If you use 225 ma nicads).

Use the Standard for more power for hot .049 to .09 power. Airborne weight 4.5 oz. (If you use 500 ma nicads).

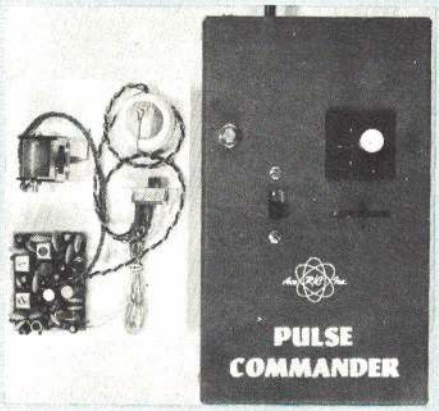
The Stomper is the workhorse and will be useable in ships from .049 to .19-23. Weight 4.9 oz. (If you use 500 ma nicads).

ALL UNITS ARE COMPLETELY WIRED, TESTED, GUARANTEED

To help the beginners, we also offer the usual combos which contain the Basic Pack (A) plus the Battery & Charger Kit (B-C) which have proven to be the best all-around combinations.

10G25—BASIC R/O Baby Pk (A)	$59.95
10G25T—BASIC R/O Baby Twin Pk (A)	62.95
10G26—BASIC R/O Standard Pk (A)	59.95
10G27—BASIC R/O Stomper Pk (A)	62.95

26.995, 27.045, 27.095, 27.145, 27.195 mHz
Please Specify



COMMANDER R/O PULSE COMBOS with ALL batteries and charger!

If you are going the routine way, and want to get started with what we recommend for all ordinary applications, this is the way for you. Here you have the Basic R/O Pack (A) and the suggested B-C matched.

10G15—COMPLETE R/O Baby Combo	$69.95
10G15T—COMPLETE R/O Baby Twin Combo	72.95
10G16—COMPLETE R/O Standard Combo	71.95
10G17—COMPLETE R/O Stomper Combo	74.95

26.995, 27.045, 27.095, 27.145, 27.195 mHz
Please Specify

COMMANDER BTRY. & CHGR. KITS

The two kits you need to make up any of the four R/O Packs to come up with the Combo of your choice. Consist of 2.4 Nicad Battery Pack in either of two sizes (you CAN use pen cells, but we don't recommend it). Mallory M1603 Transmitter Battery, and Deluxe Charger complete with submini jack and plug. Charger is transformer isolated for your protection.

No. 10K35—B-C 225 Kit for Baby or Baby Twin	$10.75
No. 10K36—B-C 500 Kit for Standard or Stomper	12.75

MICRO GEM RECEIVER AVAILABLE

The new Micro Gem Receiver is available for the foregoing units. Just specify "WITH GEM" when ordering and add $5.00 to the Basic or Combo cost.

The Gem measures 1 1/16 x 1 1/2 x 1/2" and weighs under 1 oz.

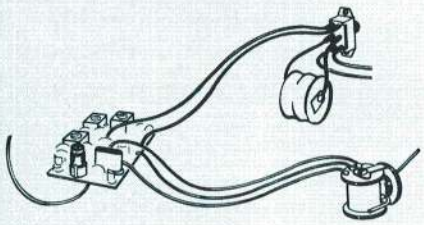
Also available separately. The DE model is used with Adams actuators.

No. 12K2—Commander DE Gem Rx $31.50
26.995, 27.045, 27.095, 27.145, 27.195 mHz
Please Specify

COMMANDER FLITE PAKS

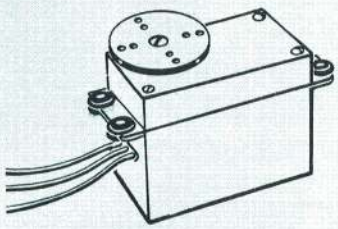
We have the Combo Flite Paks available separately for installation in that extra plane or boat. Get frequency to match your transmitter, and expand economically.

Complete details in our catalog.



ADAMS ACTUATORS

The new and improved models of the Adams Actuators available separately. Has 50% more power! Four sizes. See catalog.



KEN'S PULSE THROTTLE CONTROL

Recommended for use with the Standard or Stomper Commanders

Manufactured by Ken's R/C this new unit uses a motor driven servo. Designed for high, medium and low throttle on Rudder Only Pulse systems, the control requires only slight modification to the Transmitter. Easy to hook up to airborne R/O Packs--just three wires. Uses same battery supply. Designed specifically for the Commander R/O series of Standard or Stomper size.

Housed in a WE S4 case. Completely wired and tested. Weight only 1¾ oz.

Transmitter modification is simple, since Throttle Control requires a fast pulse momentarily. Kit is available or complete custom factory conversion of your transmitter.

No. 14K69—Ken's R/O Throttle Control $24.95

TRANSMITTER CONVERSION

Kit to allow you to convert your Commander R/O Transmitter for above motor control. Easy to follow instructions.

No. 14K70—Tx FP Throttle Control Kit	$3.00
No. 14E71—Factory Custom Installation of above unit in your Tx (Includes above kit) (Postage return paid)	$6.00

NEW HANDBOOK-CATALOG
For the Fun Flyer and Tinkerer

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

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

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SUDDEN SERVICE PLANS

Full-Size Plans — Shipped First Class Mail Within 48 Hours — No Extra Charge

No. 0101, Undone I — R/C Pattern plane for 60 engine for new maneuvers and lightweight equipment. Wing span 59". $3.50

No. 0102, Skyvan — Semi-scale twin 049-powered STOL transport. Simple construction, all-balsa. For C/L. $1.50

No. 1191, Scimitar — Unusual-looking R/C stunter. High-speed maneuvers, clean tracking. 60 engines. Low-tail Rivets look. By Joe Foster. $3

No. 1192, Ryan Mailplane — Light, F/F, with plenty of details. For rubber indoor or outdoor. Plan has scale views. $1.50

No. 1193, Mig 21d — 40-powered C/L version of Russian fighter is fast, stable flyer. By Roland Baltes. $2.50

No. 1194, 1937 Gas Model — Half-size 049 copy of great old-timer. Has durability and easy-to-fly characteristics. Frank Ehling. $2

No. 1091, Halberstadt — Nearly scale R/C WW I fighter with semi-symmetrical 6' wings. 60-powered. Two sheets. $4

No. 0791, Pusher Galore — Bill Hannan's all-sheet, rubber pusher for Tenderfoot. Looks like supersonic transport. $.75

No. 0894, Voltswagon — Trainer and stunter by Marsh for electric tether flying with slot-car motors. Plans for the pylon included. Great club activity. $1.50

No. 0794, Skimmer Airboat — Sled-type fun watercraft by Paul Hook. .09 engine, R/C rudder, throttle. $2

No. 0991, Flashby I — Rakish-looking all-balsa ROG by Wayne Brown. For the Tenderfoot. Tricycle gear. $1

No. 0992, Fouga Cyclone — Scale model of jet-assisted French sailplane, by Nick Ziroli. Gains altitude easily on 09 engine. A two-piece 7-ft. wing. For R/C. $3.50

No. 0993, La Jollita — Profile 15-powered Goodyear C/L racer by James Kloth, fast, groovy. On mild fuel and engine does 85 mph. $1.25

No. 0892, Taylor Cub F-2 — Sport, F/F, scale, .020. Stick-and-tissue. By Schreyer. $1.75

No. 0893, Martin MO-1 — Rare WW-1 era monoplane, carrier fighter ideal for Class 1 Carrier. Ailerons keep lines tight at low speed. By Reeves. $1.50

No. 1181, Junkers D-1 — Joe Tschirgi 1918 fighter, proportions for perfect R/C scale. .45 engine. Low-wing has 500 sq. in. $2.50

No. 1182, FAI Pussy Cat — On this FF, Earl Thompson used high thrustline, rear fin, clean lines to hurdle climb/transition gap. Hot .15. $3.50

No. 1281, Strato-Streak '68 — Frank Heeb's ½A F/F updated version of hottest gas model of 1941 era. Simple pylon, 275 sq. in. $1.50

No. 1282, Sky Mite — Small R/C multi by Hibbard has performance of larger craft. Foam and fiberglass. Span 52". Weight with 4-channel gear, 4 lb., .19 to .35 engines. $2.25

No. 0191, Curtiss-Wright Jr. — Robert Hawkins transformed open-cockpit pusher of thirties for single channel. First step into RC scale. Span 44". Use .049. $2.50

No. 0192, Skyraider — Mottin's Navy Carrier, fast, light, .40's or .60's. Easy construction. $2.50

No. 0193, Cutie Coupe — Coupe d' Hiver F/F by Dave Linstrum. Quick to build with all-sheet surfaces. Your first rubber contest model. $1.75

No. 0291, R/C Nobler — Ed Sweeney's conversion of famous C/L stunt ship. A highly maneuverable R/C. Only .40 for all AMA/FAI stunts. $2.50

No. 0491, Emeraude — Duke Crow reduced famous home-built to R/C size (65"). .40 to .60, does stunt pattern. Gentle. Two sheets. $3.75

No. 0492, Biceps — Don Yearout's show Control-Line bipe spectacular performer. .60-powered, flies slow, maneuverable. Two sheets. $4

No. 0591, Small Fry Special — Mottin's C/L trainer for Tenderfoot. Easy to build. An .049. $.75

No. 0592, Messerschmitt Bf. 109E — R/C, semi-scale by Munninghoff. Mean look of efficient fighter. Two sheets. $3.75

No. 0593, Manta — Howard Kuhn's Boost Glider for model rockets easy to build from sheet. A winner. $.75

No. 0691, Jr. Sky Squire — R/C sport-trainer by Jess Krieser, .09 to .19. From Galloping Ghost to multi-digital proportional. Span 48" (416 sq. in.), 3 lbs. $2.50

No. 0692, ½A Sky Squire — Small version famous Sky Squire. 1 ch. rudder-only, or rudder, elevator and motor on Galloping Ghost. Only 22-28 oz. $2

No. 0693, Mustang — Rabe's great near-scale C/L stunt. Flies pattern with ease. ST 40. Over 57". $2

No. 0792, Rivets — Speedy, responsive R/C. Owen Kampen design for .020. Adams Baby Actuator, rudder-only. $1.75

No. 1183, Corrigan — James Wilson's unique ½A C/L stunt model. Flies tail first! Stable like big stunt ships. Easy to build, 23". $1.75

No. A693, Sweeper — Windy Urtnowsky's giant, C/L stunter, 78" span. .60 up front. Many trim adjustment features. $2.75

No. A695, Lady Maxley — Brian Donn's A/2 Nordic towline. Davis 3 foil. Ritz construction. $1.50

No. A697, Dwarf Dip III — Easy to fly, rubber Coupe de Hiver by Charles Sotich, a winner! For small fields. Warp-resistant. $1.50

No. A691, E A A Biplane — Nick Ziroli's scale R/C uses .40 engine, full house gear. 38" wings, semi-symmetrical foil, box-and-stringer fuselage. Two sheets. $2.50

No. A692, Miracle Worker — John Blum's C/L trainer, Combat, carrier, stunt. Easy-to-build profile. .35 engine. $1.50

No. A694, Montana Duster — R/C Class-C stunter by Simon Dreese, semi-scale appearance. Foam wings, simplified assembly in 6 hrs. Two sheets. $3.50

No. 1291, Demon Delta — Fast, mild-stunting C/L for 35-45. Looks like modern fighter. Attract attention for demonstrations. By Jerry Farr. $2.50

No. 1292, Dolphin II — Czechoslovakian R/C for pusher, 09-15 mounted at rear under T-tail. Rudder/motor, good slope soarer. $1.75

No. 1293, A/Wonder — Simple all-balsa A-1 towliner by Bob Stalick. Ideal for beginners at towline events. $1.50

No. 0201, Cardboard Cutie — Inexpensive all cardboard C/L for Tenderfoot. 049. Two sheets. $1.25

No. 0202, Push-Air — For Brown's tiny CO2 engine. Simple F/F by Ehling, like Curtiss-Wright Jr. $.75

No. 0203, Ole Tiger — Bob Morse's swift Formula I R/C of Bob Downey's famous racer. K&B 40. $3.50

No. 0204, Classical Gas — Haught's C/L stunt for 35, for flyers graduating from profiles. $2

No. 0205, Kestrel — Dave Boddington's delightful R/C rudder-only soarer with 02. $1.50

No. 0302, Bearcat — Al Rabe's stunt C/L was talk of the 1966 Nats. Aldrich customized ST 46. $2.00

No. 0301, 1916 B&W — Biplane on floats was Boeing's first airplane. Beautiful R/C job by Francis Reynolds, uses a 60. Two sheets. $4.50

No. 0303, Mistral — R/C by J. Swift, is fully aerobatic 50" job with 40 engine. $3.00

No. 0304, M. K. Sportster — Ho Fang-Chiun's cute cabin free-flight takes 049 power. $1.25

No. 0401, D-H 88 Comet — Scale twin by Skip Williams from Jan. '69 centerspread for .20's. Fast, stable, can fly pylon rules. $3.75

No. 0402, Lively Lady — World Championships winning Nordic by Elton Drew. Well detailed plan. All weather flyer. $3.75

No. 0403, Bonster — C/L Goodyear for club project with 35 engines. All balsa and plan has balsa cutting guides. By Williamson. $2.50

No. 0404, Sweapea — C/L Goodyear by Williamson for club project also is tough trainer. For 35 engine. Balsa cutting guide incl. $2.50

No. 0501, Classic — Contest F/F for ¼A to C engines. Build any size, photo reduce plan to suit. As supplied, plan is for C class. Good detail. $4.50

No. 0502, Mod Pod — All-purpose model, F/F, R/C, or tether — glider or power. Fiberglass pod, arrow-shaft boom. $1.75

No. 0503, Royal Marine — By Yuji Oki of Japan, magnificent seaplane with 6' wing. Two 40's or one 60. Graceful lines, smooth flyer, handles easily on water. Two huge plan sheets, every part shown in detail. $8.00

No. 0504, Dragonfly — Advanced C/L trainer with interesting shape for a 19. Flat-bottom airfoil easy to build, flies slowly. $2.50

No. 0601, Flower Power — Sport/stunt full-house RC with a 40 engine. All-balsa, simplified structure. Plugs generation gap. $2.50

No. 0602, Skyraider — Profile or built-up fuselage shape Navy Carrier job for 35-60 engine. A winner or a trainer all-in-one. $2.00

No. 0603, Waco — Delightful bi-plane, stick and tissue, rudder-only RC on 09 to 020 for FF. Very well detailed plan. $2.50

No. 0701, Suds — Nimble RC for sport or competition. One-piece construction, 40 to 60 engines. Build fast from standard balsa sizes. By Joe Dolan. $4.25

No. 0702, Contender — Military-like RC, also Sport/Stunt type for 35-60. Tri-gear, removable no-dihedral wing. Fast building. By Dave Platt. $4.25
Special Offer: Get both Suds and Contender plans for only $7.00

No. 0703, Ironsides — Record-holding CL jet speed model. Metal or wood model shown. Uses Dyna-Jet. By Jerry Thomas. Two plan sheets. $1.25

No. 0704, Cessna AW — Delightful stick and tissue FF of great private plane of years ago. Indoor or outdoor version possible. Peanut Scale too. $1.50

No. 0801, Winnie Mae — Spectacular RC Vega for strong 60 engine in 2"-1' scale, foam and balsa, lots of details. By Monty Groves. Two big sheets. $4.50

Also, special 1½"-1' version for FAI scale, 40 thru 60's. Two sheets. Order as No. 0802. $4.25

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Please send the following plans by First Class mail, at no extra charge. I enclose $_____ for payment.

Name _____

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City _____ *State* _____ *Zip* _____

PLAN NO.	COST
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# _____	$ _____
# _____	$ _____
# _____	$ _____
# _____	$ _____
# _____	$ _____

Total: $

No. 0803, Thermal Dart — Enlarged and improved rubber-powered beginner's delight by Frank Ehling. **$1.00**

No. 0804, BV-141 B — Asymmetrical WW II fighter bomber in profile for 049 engine by Terry Aldrich. Easy to make, good flyer. **$2.00**

No. 0901, Sorcerer — Pee Wee 02-powered, free-flight flying saucer uses sheet wing, easy to make by Tenderfoot builder. **$1.00**

No. 0902, Cloud 9 — Intricate contest winning Wakefield by Roger Gregory. Plan shows streamlined prop/hub design. **$3.50**

No. 0903, Hawker Typhoon — Dennis Adamisin's scale-like CL stunter which won Junior Nats stunt event. Conventional type. **$4.00**

No. 0904, Antoinette — Signorino/Zundel RC. 98" wing, nearly scale, flies well on .36, like powered glider. Plans 3 huge detailed sheets. **$9.00**

No. 0905, Mini Cat — Bud Atkinson scaled down the Cat series, for pulse or light digital and up to 19 engines. Easy to make RC sport flyer. **$2.75**

No. 1001, Phantom — Well-engineered RC Dyna-Jet-powered scale fighter by Ralph Saldivar is practical but noisy model. Highly detailed plane. Jet installation shown. **$4.00**

No. 1002, Hobbit — Simplified Nordic Al by Bob Stalick is steady on tow, all-weather flyer. **$1.50**

No. 1003, Charger — ½A powered sweptwing stunter does full pattern on long lines safely. **$2.00**

No. 1101, Autogiro—Simple 049-powered model builds fast and gives unique performance. Pusher prop or motor. **$1.25**

No. 1102, Aerobile—Large scale CL or RC of a famous Waterman roadable plane. Uses 45-60 motor. Wing detachable, car drivable! Large single-sheet plane. **$4.00**

No. 1103, Akromaster—RC scale/stunt model or real aerobatic plane for 45-60 engine. Fast and responsive, easy to make, simple shapes. **$2.75**

No. 1104, Tardon—Formula II semi-scale pylon racer or stunt plane for 40 engines. Won event at 1969 NATS. Groovy flier. **$3.00**

No. 1201, Stiletto—Unique ½A proto model uses much-extended motor shaft for clean prop thrust and speed. **$1.00**

No. 1202, King Kong—Huge flat-land soarer for competition use has 12' wing of glass, foam, and balsa. By Sarpolus. **$3.25.**

No. 1203, 10-HI—Six-foot span, 049-powered flying wing is high-performance model with sporting flair. Huge plan. **$3.50.**

No. 0111, Dragonfli — Fast graceful competition stunter by Phil Kraft. Uses big 60's and retracts. **$4.00**

No. 0112, Toothpick — Long thin winged combat CL ship is both fast and quick turning. For hot 35's. **$2.25**

No. 0113, Luton Minor — Delightful 10-powered semi-scale RC for three light servos is high-winged parasol monoplane. **$2.25**

THIS MONTH'S PLANS

No. 0211, Cobra—Steve Wooley's great, smooth-flying CL stunt ship for 35's. Light model, ideal for both FAI and AMA patterns. **$3.50**

No. 0212, Voodoo—Converted Goldberg kit for streamer-towing RC combat, by Ed Sweeney. Two servos with 19 engine. For new event. **$2.75**

No. 0213, Guillotine—Modified from CL for RC combat. Maneuverable, fast, responsive, and fun. Glides well. For two servos and 19 engine. For new event. **$2.75.**

considerably beyond the spot where the motor quits at low speed. Then the linkage is adjusted so that the servo moves to the desired engine idle position.

The throttle trim lever can be used for fine variations in idle speed. Some fliers set the idle with the trim lever toward the high speed position. Then, for landing and taxiing to the pits, moving the trim to close the throttle further will stop the engine. Note that the servo must not move far enough in either direction (high speed or low) to bring the throttle against its stops, with both the throttle lever and its associated trim lever moved in the same direction. On most engines, the high position is not too critical. The throttle arm can be backed away from maximum high speed position a bit (so the servo cannot pull the arm to the high speed stop position) with little or no loss in top rpm. Throttle override attachments, available for some servos, make throttle setup easier, and avoid pulling the throttle servo up against solid stops at high and low.

As stated in Part 36, linkages are every bit as important as the servos themselves. A broken linkage can wreck a plane just as fast as a defective servo, receiver or battery—and a great many have done so! It pays to take real pains with linkages, following the general guidelines covered in these two Parts.

Swedish SAAB

(continued from page 29)

under the fuselage pod, plus four 110-lb. bombs under the wings. Either eight light rockets or two heavier ones could be mounted below the wings.

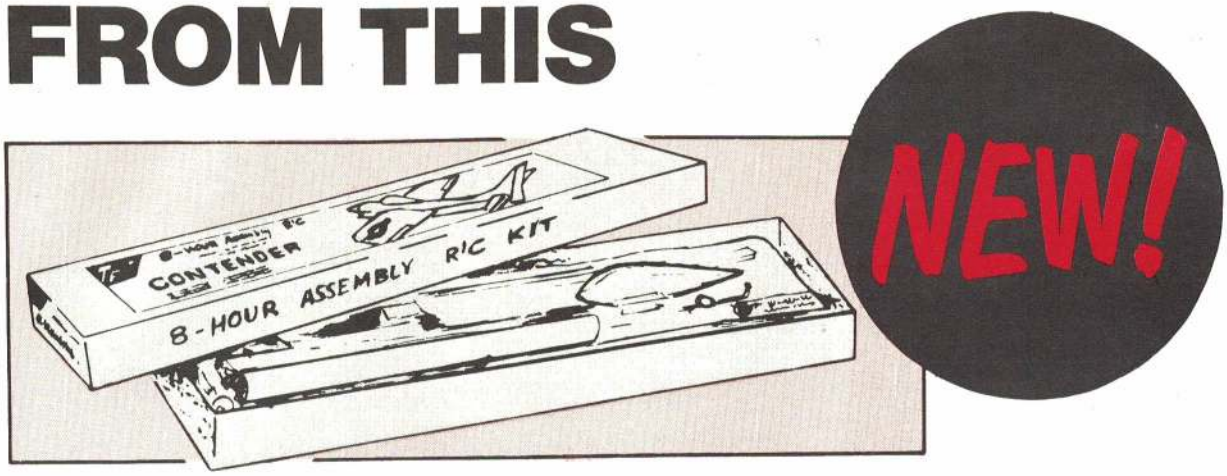
As the end of the Second World War approached, it became evident to the engineers at SAAB that the 400 mph top speed of their J 21 simply was not enough to challenge the first-line fighters of any of the major powers, although none had seen fit to attack her, and the Swedish Air Force must have been part of the reason. Looking for an improved fighter, they first considered installing a 2000 hp Rolls Royce Griffon engine like that in late-model Spitfires, and even a Griffon version with contrarotationg props, the combination uesd by the British in the experimental Seafang 32 which was capable of 475 mph at 21,000 feet. However, the estimated maximum speeds of these two planned versions were only 416 mph for the J 21B and 435 mph for the SAAB 27. But jets were coming.

The unusual design layout of the J 21 appeared to be easily adaptable to jet power, and so the piston engine was removed and a Swedish-built, British-designed deHavilland Goblin turbojet of some 3300 lbs. thrust was installed. The resulting J 21R series was actually more new than old, with major changes being necessary to the fuselage and tail, even though the overall dimensions were almost unchanged.

Initial design work began in 1946 and the first flight of the prototype J 21R was made on March 10, 1947. The airplane worked, but obviously not as well as had been hoped. The original production order for 120 was reduced to just 64, while the Swedish Air Force bought deHavilland Vampires, a British jet very similar in appearance and considerably superior in performance. The J 21R carried the same fixed guns as its prop-driven predecessor, along with eight more 13.2 mm machine guns in an odd-looking streamlined pod under the fuselage, and 10 rockets mounted under the wing center section.

The operational life of the J 21A was almost eight years, from the first delivery in December, 1945, until the last one was replaced by more modern aircraft in 1953. The J 21R was in service for almost as long, from August, 1949, until it, too, was superseded by better and faster jets in 1956. Not a single example of the turbojet twin-boom machine is known to exist, but three of the earlier prop-driven SAABs are still around. All are J 21A-3's, one of which is in the Stockholm Museum of Technology, another in the Swedish Air Force Museum at Malmslatt, and a third which was on display during the 1970 Scandinavian Aviation Exposition and European EAA Fly-In at Angelhom.

FROM THIS



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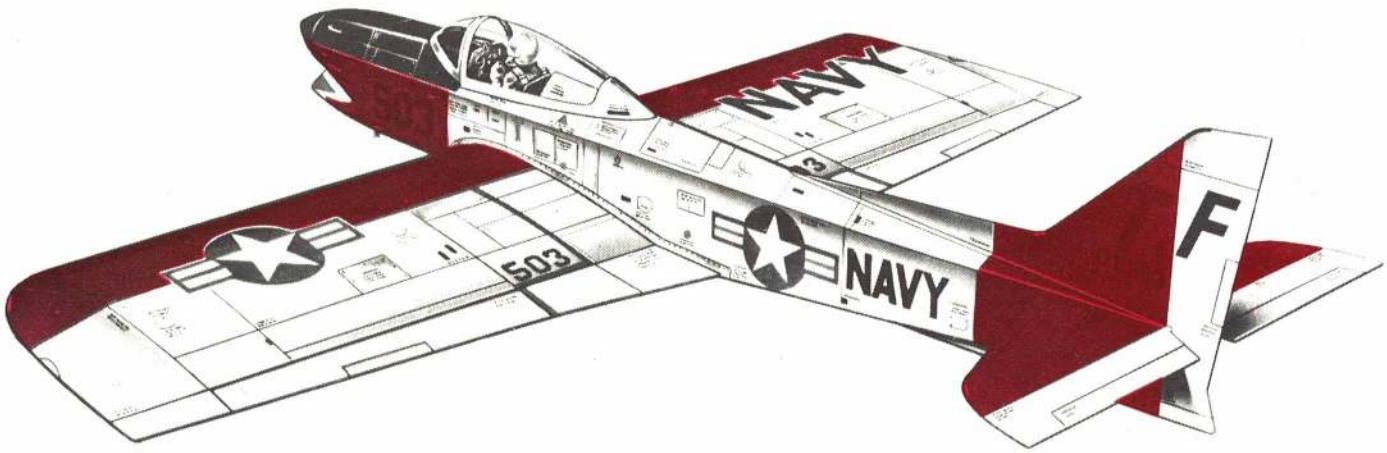

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Blum on CL

(continued from page 41)

ment from glue to fiberglass have been used to alleviate this problem, but with only minimal results.

Bob Gieseke, International Stunt Champion, handles this problem with a partial foam core. Examination of Bob's famous Nobler at the Nats revealed perfect fillets with no signs of joint failure or cracks. The foam fuselage core is installed during construction and is tapered from the nose firewall to the trailing edge of the wing. This presents a lighter model and is enhanced by the use of fiberglass over the fuselage to wing joint. Vibrations resulting from engine torque and flight stresses are then absorbed by a larger mass and distributed over a larger area. The result is less damage to a few critical glue joints. . . .

4-H Club Modelers: Duane Shryver reports on activities by the Niagara County 4-H Club. Forty-three members ages 9 to 19 entered the annual fair exhibit, with 20 competing in the flying contest.

Duane hopes to benefit from this success by encouraging father-son participation and by presenting new events. Workshop sessions and on-the-field training will introduce 4-H modelers to more advanced stunt and carrier deck flying patterned after AMA rules. Clubs and modelers in the area could support the club's interest and enthusiasm with assistance and demonstrations.

Boss on CL

(continued from page 40)

Attach the bridle wire with two small screw eyes. Put on wheels if desired, add towline, and the club banner is ready to fly. . . .

Scale Information Source: At a local New York contest this summer, I had the pleasure of meeting a most interesting gentleman. Fred Wolff is an illustrator and writer of books covering the aeronautical and space technology fields.

Our conversation dealt with many facets of modeling, but eventually got around to scale and the related problem of obtaining scale data. I found Fred has amassed a file of over 34,000 photographs of hundreds of planes, many of which cover production and modification detail. The obvious question was: would he be willing to supply scale modelers with photos and information?

He indicated that he would supply copies of photos and information on file at a nominal fee to cover the cost of reproduction and mailing. Those interested in obtaining photos of planes you have long searched for may write Fred Wolff, 68 Berkshire Dr., Berkely Heights, N.J. 07922. . . .

Scale Team Praise: Congratulations to our scale teams for their fine showing at the first Scale World Championships. They placed first in CL and second in RC. A great performance! It appears 1972 will be the year for the next championships and now is the time to support the still-to-be-selected teams. I'm referring to financial aid. The 1970 teams had very little help ($216!) from the Scale Team Fund. All of those who are interested in seeing our teams make it again—this time without financial concerns—may send contributions to the AMA-Scale Team Fund. Even the smallest amount will help our boys go a long way.

Smith on CL

(continued from page 41)

soda solution to rid the joints of acid. Then give them a light coating of 3 in 1 oil. Making sure of the requirements will take a great load off contest directors' shoulders. Many records have been lost because models did not meet the rules when they were checked for the record application. . . .

More Texas Ramblings: Jerry Farr also says the Abilene, Texas, crew is mighty hot in Goodyear, Rat and Proto racing. His color picture of his ½A Proto job was beautiful. It's an exact scale German WW II fighter. Looks like an Me 109. Even has cockpit detailing. He uses a TD 049 with a left-hand shaft. By using scale models in Proto one can leave the cylinder and head out in the breeze. This does cut down on frontal area. Has anyone ever checked these scale models against a true Proto speed model with the engine cowled? The cylinder drag is probably just as great as the larger fuselage. It does make a beautiful model—which was the original idea behind the Proto event in the first place.

Proto rules have been bent, stretched, and broken more than those for any other event in Speed. Way back in the 1957 Nats, a Proto ship was disqualified because it had swept-back wings and a tricycle gear. The event director said, "It doesn't look like a real airplane." Now look what we are flying! We even allow the engine to be off the centerline. What's next? Take a hint from Mr. Farr. Dig out some scale drawings and build a Texas-style Proto job. Put the Proto back in Proto speed.

Lowe on RC

(continued from page 37)

tion, the average flier isn't going to be (and perhaps shouldn't be) interested. An industry capable of producing the marvelous digital control systems available today should be able to solve the far less complex electro/mechanical landing gear problem—that's what business competition is all about. . . .

Masters Tournament, Memphis, Tennessee: The International Team selection finals at Memphis saw 27 fliers battle it out for the privilege of representing the U.S. at next year's International. After the smoke and rain had cleared, Jim Whitley, Phil Kraft, and Ron Chidgey emerged winners, with Jim Kirkland and Jim Edwards as first and second alternates. The winners flew retracts. In fact, only two or three fixed-gear ships were in the competition. Jim Whitley and Ron Chidgey installed retractable gear after the Nats and went from fourth and seventh positions at the Nats to first and third respectively, at the Masters. Does that prove that retracts help? A good question! I changed from fixed-gear which I flew at the Nats to a new airplane with retracts for the Masters competition and fared much worse. I feel the most important ingredient for winning is a competent, well-practiced flier who is intimately familiar with his ship. Beyond that, other improvements are a small bonus.

Incidentally, latest word has it that the 1971 Internats will be held in this country somewhere on the East Coast—hurray!

The Masters were flown under trying conditions. On Saturday, only one rain-soaked round was flown. Sunday was much better and three additional rounds were completed. Despite rain and tough competition, only one bash was recorded in over 100 flights—good fliers and good equipment! Highlighting the weekend were exhibition flights by Doc Brook and Ted White—fantastic low level work by Doc and a polished composite aerobatic pattern by Ted. Ted flew conventional retract gear and scored very high in takeoffs and landings. Conventional gear is great as long as it can be operated directly into the wind. Cross-wind on a hard-surface runway, however, makes it tough.

As an interesting sidelight, ships had to meet the FAI wing-loading requirement of 24.51 oz./sq. ft. The fliers really sweated out the tale of the scale and ruler! Some would not have made it if the tail area was not counted as lifting surface! Eight-lb. or more was average—a seven-lb. airplane with retracts is a rarity. . . .

Memphis RC Annual: This annual Labor Day contest served, for some time, as a warmup for the Masters. Forty-seven entries competed in six classes. The results (courtesy of K. K.

McClure) were as follows: Class A, Robilio; Class B, Gardner; Class D-N, Rivalto; Class D-E, (1) Coleman; (2) Whitley; (3) Chidgey; Scale, Vonseuter; Pylon I, K. K. McClure. Fastest time, by Lou Penrod, was 1:49.8. . . .

F.O.R.K.S. Annual Contest: The annual Fairfield County, Ohio, Radio Kontrol Society contest was held in a steady rain, ranging from drizzle to a downpour, with winds to match. The soggy but happy winners were well-rewarded, however, with television sets for those placing first! Winners were: Class A, J. Marshall; Class B, K. Fisher; Class D-N, G. Villard; Class D-E, Miles Reed. . . .

Workshop Tips: Mixing glues—a note in the Meroke (Bethpage, New York) Radio Control Club Newsletter, Smoke Signals, warns of the hazard in improper mixing of epoxy glues. Editor Ed Yulke experienced poor physical properties in the glue because of improper measuring of the half and half proportions. Quality ranged from a fairly firm jelly with too little hardener to a brittle mix if too much hardener is used. He rationalized that, in mixing small quantities such as are needed for fast-setting stuff, one is much more likely to use improper proportions than when mixing larger quantities. Also, due to haste, ingredients are not thoroughly mixed. Therefore, he advises care in preparation, particularly when gluing a vital member, such as a wing spar. Leave a little of the mixture to test after setting to make sure things will stay together!

Adjustable clamp—Frank Tomaschko presents a simple clamp to hold nylon tubing. The tubing is squezed gently into position by a clamp made of plywood and a woodscrew, with emery cloth between the plywood and tubing. The grit grabs the tubing and prevents slippage. It may be loosened for adjustment. Simple and effective!

Marks on RC

(continued from page 39)

mitter and receiver; then check to be sure that the supply voltage actually reaches the P.C. board, i.e., that the switch functions properly. Since Frank's system had a 100-ft. range, these items probably are correct.

The next stage requires at least a vacuum tube voltmeter (VTVM). Connnect the VTVM ground lead to negative supply voltage and check for the presence of at least an equal or increasing voltage from one IF stage to the next. Obviously, even with the schematics one must have the ability to trace the circuit through the equipment. Not many people do.

The crux of the matter is that, even at a seeming bargain price, outdated equipment, particularly that for which there is no repair service, really isn't a bargain. True, if given a set, don't look a gift horse in the mouth, since playing with the stuff can be fun. But don't invest much money unless you know how to repair: a much better bet is to invest in a late-model used digital set with one or more servos and for which repair service is available . . .

Remember When?: Until next month, how many can remember when Testors 39 meant 39 cents a pint for fuel?

McEntee on RC

(continued from page 39)

to his car, transmitter on the ground nearby. Looked like a beautiful flying spot in background, too! . . .

ECSS Closes Out Season; The East Coast Soaring Society, composed of RC clubs having a total membership well over 300, ended a highly successful season with a meet sponsored by the Dover (Del.) Mosquitoes. While all other ECSS meets have enjoyed good weather, heavy and gusty winds in the morning caused quite a few wrecked planes as well as many landings far downwind! Heavy rain at noon interrupted flying for over an hour, and intermittent showers all afternoon kept everybody on edge and miserable.

Most of the 27 entrants flew—or tried. The FAI event was concluded with three rounds, but only one could be run off in modified FAI. Top meet winners were: FAI, Lee Messick; Modified FAI, L. Carter.

Season results are now in for the four meets. Winners were: (1) W. Gottorf, (2) L. Messick, (3) H. McEntee; Mod. FAI—(1) W. Good, (2) G. Durney, (3) a six-way tie! Overall season winners for the two events were Walt Good, Lee Messick, and Joe Roslyn. ECSS awards will be made to the season winners at an end-of-season banquet.

The FAI event followed International RC glider rules exactly; the modified event differed mainly in allowing use of double the tow-line length, twice as long max flight time. No conclusions have been made yet on rules for 1971. However, FAI rules allow no second try for such mishaps as broken towline, defective winch or high-start, etc. Such matters are usually no fault of the flier involved, so changes should be considered here.

Mooney on FF

(continued from page 36)

ing how much additional power must be added when a landplane model is converted to a seaplane that will ROW. Most rubber jobs require at least double the normal motor, and the same increase is required for gas. Interestingly enough, this doesn't make for wildly overpowered models in flight because the weight and drag of the floats, as well as their shape, tame the model down. The increased power requirements resulted in relatively small models winning the events. Most of the larger models were just too low-powered to get off.

The winning gas entry, by Bill Hannan, is

an example. He entered a very small (it may be Peanut Scale) C02-powered Train Monoplane, which looked a little like a Demoiselle with a single wide sea-sled float. It flew really well. First in Junior was taken by Curtiss Mooney's Pilatus Porter floatplane, also powered by a CO2 engine. Takeoffs were beautiful to behold, as were landings.

The winning rubber model was a small Tiger Moth on floats, built by McCracken. He also entered a beautiful gas-powered Vought 02U which couldn't quite get off the water unassisted. It did fly once when it was pushed hard enough to be on the step at release. Without doubt, it was the most realistic model there.

An interesting rubber job, which made all of its ROW takeoffs successfully and flew and landed well, was my small scale twin-engined Canadair CL-215 Water Bomber Flying Boat. It is simple and exact scale except for dihedral. Scale points suffer a bit because of the construction and the rubber motors come out through the nacelles to hook onto the front of the vertical tail. Flights were short—15 to 20 sec.—but the ship does ROW beautifully. It placed fifth in rubber. . . . .

Save That Landing Gear: Who hasn't had a scale model collide with a rock or a curb? Usually, the only damage is to the rear strut of the landing gear or to the fairing behind the landing gear wire. This problem is almost unavoidable with normal Cub-type model landing gears, and with non-scale models is avoided only by having a single wire without fairings.

A solution to the problem has been sketched for three different types of scale models. On the long oleo type, the gear is held on by inserting the prongs into an aluminum tube built into the fuselage. The others require a small piece of tape to hold the crossover to the body. When the plane hits an obstruction, the gear will lift the tape and is then free to slide along the fuselage and to pivot about the tubing without damaging the model. This system may not be indestructable, but it is much better than other I've seen for small scale models.

Stalick on FF

(continued from page 36)

Power) is that the model should have the extremities built as lightly as possible, consistent with proper strength, and with as much weight added as ballast at the center of gravity as is necessary to bring the model up to required weight.

At this point, some thought should be given to wing and stab planforms. Whatever the aerodynamic arguments for or against elliptical and/or tapered planforms, one fact is indisputable—it is easier to build a low moment of inertia wing and stab if they are tapered or elliptical, rather than rectangular. So, it becomes readily apparent that certain parameters for model design are basic to good performance. They are tapered or elliptical wings and stabs; light extremities, and weight concentrated at the center of gravity.

Of course, many models that do not have these three features have been designed, built, and successfully flown, but it is worthwhile to think about what improvements in performance would result if the basic low moment of inertia ideas were incorporated . . .

Dethermalizers for Hand-Launch Gliders: Low moment of inertia is pertinent for hand-launch gliders as well as other models. After building that super-light extremity Sweepette, it would be a pity if it took off into the blue and was lost forever. To forestall such an occurrence, several ideas for dethermalizing that hand-launch glider are presented.

Although the principles behind each idea vary (one depending on an upset of balance for stalling out of the glide; the other by airflow blockage to spin out of the glide), both offer a sure way to bring that highly sophisticated model back for more flying. Both ideas should be considered as starting points for experimentation, for you may find that neither suits your fancy (or Sweepette, for that matter), but they should serve as inspiration to better things. If you come up with some good ideas, send them to me, care of AAM. . . .

One More Thing: To be legal in AMA contests, a snuffer tube must be added for any fuse-operated device. Next month, we'll take a peek at the non-smoker's answer to easy DT fuse lighting, via a simple, semi-automatic, make-it-yourself igniter. Tune us in.

Albuquerque Affair

(Continued from page 21)

105 assured him of 2265 and third place, just ahead of Gard. Earlier, White dropped 52 sec. when the timer, while switching to binoculars, lost sight of the model in a boomer. Frank Parmenter maxed to put him a scant 20 sec. ahead of White for second place. This really put the pressure on John Allen. He needed 151 sec. to beat White and 172 sec. to catch Parmenter. John wound his gummy bands and waited. And waited. And waited some more. We don't know how long he held, but it must have been over 15 min., all the time concentrating on his thermal detector. Finally, he launched. Up went his bird and away to the max that put him in top position on the team.

Had there been a sportsmanship award, Wake flier John Gard most certainly deserved it. On the final day. in the 13th Round, he missed a thermal and was down in a little over a minute. But the scoreboard showed him credited with a max. John knew better and promptly informed Bill Bogart, event director. Obviously, the timer had watched the wrong model. No one had the flight's official time and Bogart ruled it "no flight." Gard re-flew, and maxed. Some might say John was "out of his mind" to give up a max when no one had protested his score, especially when he was a top contender. But he did the only thing he could do—and still live with himself!

Monday was disastrous for Nordics too. Aside from snapped towlines and broken wings, models were drifting into residential areas and some were lost. Spare models were an absolute necessity. Tom Hutchinson had eight, but all had been tested in winds up to 25 mph and none was trimmed for gale winds. No one will ever understand how Denny Bronco was able to fly all 14 rounds with his No. 1 ship. Once, he strained it through power lines over Albuquerque, knocking off both wing tips. Another time, his Sharkie DT'd on a busy street. At least 20 cars veered around it before it was recovered intact.

Going into the final rounds, Lee Polansky led the Nordicmen, then Lee bombed into a big one for 54 seconds. But he still retained the lead at round's end by a scant nine sec. over Hugh Langevin and 67 sec. over Willard Smitz. Round 10 came and Lee bombed again—97 sec. But Langevin and Smitz failed to find good air too, and Denny Bronco, who maxed, moved from fourth to first place. Denny put up four more straight maxes for a total score of 2322. The remaining team slots were filled by Polansky with 2256 and Langevin with 2199. Smitz became first alternate with 2134.

The configurations of the winning Nordic designs were completely different. Bronco's Sharkie (by Lee Hines) featured a high aspect ratio, which is great for calm air but generally conceded unsuitable for strong winds. Polansky's modified Dragmaster was straightforward and conventional. And Langevin's Osprey, originally developed for the 1964-65 FAI program, was strictly unconventional with its long tapered-from-the-rear wingtips, high tip dihedral, tapered stab, built-up cambered rudder, and moderately short tail moment.

Other Random Observations: Doug Joyce's original Lightning pusher-canard went straight and fast and got very high, when it was in trim. While the glide was excellent, its transition from climb to glide often was poor. If he ever cures this (with an auto-rudder perhaps?) he'll be tough to beat. . . .

Rol Anderson's Atlas original power job features full engine cowling and twin metal pylons. . . .

Bob White flies high-pylon twin rudder models in all rubber-powered events, and no auto-stab. Bob preferred his minimum-area Wake for the wind, but lost it. . . .

Annie Gieskieng flew her Siren-Ara to sixth place in Power, beating out many former team members. Her model, the cleanest design on the field, features fully cowled engine with indoor plumbing, and timer-operated wing flaps, engine cutoff, auto-stab, auto-rudder, and DT. A large removable panel on the side of the fuselage exposes a maze of gadgets. . . .

Things happen when Bob Wilder launches his Wake. Prop pitch and wing

incidence vary with motor torque. . . .

The serenity of the Ray Krocker household was shattered when Ray's daughter announced, "An airplane just landed on the patio!" It turned out to be Bob Whites' Wakefield. Ray, an RC modeler, returned it to the field. Later Bob lost it again, and another, permanently. . . .

George Xenakis, member of the 1967 Wake and 1969 Nordic and Wake teams, got in one of the longest flights—18 min. —thanks to a fuse that was singed but not lit. Asked earlier why he didn't use mechanical timers, George had replied: "Because they're unreliable!" . . .

Youngest fliers in the Finals were Jim Stockton and Jon Davis, both 18, of Albuquerque. They finished 6th and 11th, respectively, in Wake, ahead of some of the old pros. . . .

As a postscript to three Albuquerque fliers—Allen, Averill and Taylor—making the team, Bob White could be counted as the fourth because he once lived and flew there. While in Albuquerque, he was a meteorologist! . . .

Highest climbs in the Power event were obtained by Taylor, Averill, Spence, Joyce and Doug Galbreath. All but Joyce, who used Supertigres, relied on Rossi engines most of the time. . . .

The inescapable conclusion is that the Central Flyoffs at Albuquerque produced tough competitors for the Internats next year—if experience, dedication and sheer ability as pilots, under pressure, mean anything at all.

Denny Bronco, a former Junior and Senior National Champion, is fresh out of the service. This year he finished second in line for Open and Grand National Champ. Polansky, A Gas record-holder (94 min.) and transplanted Texan, no doubt is second to no one when it comes to flying in poor weather. Langevin, winner of Nordic team slots in both 1965 and 1967, repeatedly has flown his Osprey in 40 mph-plus winds.

In Power, Tom Kerr, a relative newcomer, has a sixth sense when it comes to picking air. He had only one bad flight (111 sec.) in 14 rounds. Southwest Aero Team's (SWAT) Buzz Averill and Jim Taylor were terrific! They not only displayed discipline and cool as fliers, their models (modified Night Trains) were great. They really penetrated the wind, getting high and gliding well. Perhaps being hometowners might have been an advantage to Jim and Buzz, but we just can't believe they did their test-flying in 35-mph winds.

This holds true for John Allen in Wake. One common clue to the local fliers' success in their use of thermal pickers. They watched 'em like hawks. So did Wake winners White and Parmenter. White is a two-time holder of the Unlimited Rubber record and Parmenter is on his third Wakefield team. Some complained—loud and long—that Albuquerque's gales "didn't prove anything" as far as picking a strong team. What they forget is that the winds blew on everybody. If marginal fliers had won, we would have to agree that nothing was proved. But that plainly wasn't the case.

As bad as conditions were, Albuquerque demonstrated that the Central Flyoff is the fairest way to choose a team. Selection through three regional flyoffs, at best, saves travel time and expense. Ukie and RC fliers use the single, nationwide finals system. Even competitors for berths on the U.S.'s Olympic Team gather in one location for their finals. In

MALIBU WINS WORLD RECORD!

Aug. 30, Oahu, Hawaii. Bob Boucher piloted his two channel R/C glider "Malibu" to a new closed course distance record of 189 miles in 11 hours 9 minutes. More than 1½ times the previous world record.

the last analysis, it would seem fair that all finalists in the FAI Program be subjected to the same pressures of a big contest as well as the same weather. Anything less than such a standard is a poor compromise.

Finally, we applaud the entire SWAT club, our hosts. CD Bob Bicknell did a splendid job. So did his event directors—Pete Sotich in Power, Floyd Miller in Nordic, and Bill Bogart in Wake. Extreme care was exercized to avoid one event from flying directly upwind from another. Buzz Averill, in his real flying machine, spent a lot of time looking for lost models. John Allen was one of the most accommodating hosts on the field. He spent from morning until night answering questions and helping people feel at home. The scoreboard setup permitted contestants to see their standings at a glance. The Albuquerque affair was a wonderful, memorable time!

Heathkit 3-Channel

(continued from page 54)

dles all jobs in the system assembly), ample quantities of correct grade solder (small diameter solder for receiver and servos), a receiver tuning tool and a transmitter antenna wrench. Although it takes some time, checking over all the system's parts before assembly begins is wise. If any parts are missing, they can be sent for immediately, and other assembly jobs completed meantime.

The 130-page instruction manual is comprehensive and covers theory, assembly and tuneup, trouble-shooting and just about everything else needed. It covers systems on 27, 50 and 72 MHz spots.

When ordering a Heath set, specify the frequency and band desired. While it is fairly easy to change frequency within a band by using new crystals ($8) and retuning the receiver, conversion to another band is complicated and expensive, requiring new crystals and new RF sections, as well as a complete tuning. A change to 50 MHz also requires a new transmitter front case to allow for the keying button which is pressed to identify the signal at conclusion of transmissions. A person having a ham license will know what this is all about.

The charger for both transmitter and receiver nickel-cad packs is in the transmitter, and the same convenient single charging connector (on bottom of transmitter case) as in the GD-47 and 19 systems is used. There is no charger bulb. When the transmitter switch is off, the transmitter meter is put in the charger circuit as an indicator. With switch on, meter indicates RF output.

This transmitter has the handy fully-collapsible antenna Heath pioneered. Positive means now prevent the spring clip on the bottom of this antenna from coming off.

In the transmitter, assembly parts are larger and components well spaced-out, but in the receiver things are considerably tighter. Servos are trickiest to assemble and are done last. Having assembled the two earlier Heathkit systems, we had no problems whatever, either mechanical or electronic.

The receiver has two circuit boards, as in the GD-19 receiver, the boards for

the RF section being similar but apparently not identical. Off-register printing on our receiver made spotting parts locations difficult, but copious drawings and photos in the instruction book clarified the layout.

The decoder board is quite different from that in the GD-19 receiver. It has only three controls to handle and uses a pair of transistors for each, rather than the SCS's in the GD-19. The two boards are mounted one above the other, resulting in a receiver measuring 1 5/32 x 1 3/16 x 2 ¼" and weighing 2.15 oz., including the cables and connectors. When the receiver is completed, a resistor may be left over. It will be 2700 ohms if the outfit is on 27 MHz, 470 ohms if on 50 or 72 MHz. Apparently both resistors are packed with every receiver.

The two GD-57 servos are identical to late model GD-19 servos and are interchangeable (connector pin diameters did seem a bit different, but not enough to prevent easy interchange). Early GD-19 servos, by the addition of one resistor, can be made the same as later-model GD-19 and all GD-57 servos. (When the early servos are driven fully one way, they bounce a bit before stopping.)

The resistor can be fitted with little trouble and is included in all later Heathkit servos. There is no bounce when they are driven to the other extreme. This bounce is hardly noticeable if the servos are loaded with a linkage and control surface, but it is worth mentioning.

Current drain from the 500 maH, 9.6V transmitter pack is about 100 ma, while the receiver draws 6 ma from its center-tapped 4.8V, 500 maH pack. The latter weighed 4.2 oz. with connector. Servos idle at around 2 ma not moving; current can rise to as much as 350 ma if they are stalled. They weigh 2.52 oz. each with connector. Total transmitter weight is 2 lb.

Quick frequency change within the 27 MHz is convenient and often mandatory in some types of competition (pylon racing, RC car racing, etc.) For car work, Ed Sweeney and Fred Marks have described a simple method for quick frequency change. The required crystals for transmitter and receiver should be purchased from Heath in matched pairs (use parts numbers from the instruction manual). Also buy a Motorola integrated circuit socket of the long rectangular style.

Cut off a section across this socket and solder it to the transmitter p.c. board where the crystal has been removed. (A hole could be cut in the case top and the new crystal socket placed on the present underside of the p.c. board. Thus crystals could be changed without opening the transmitter case.) Cut off another section of the Motorola socket and solder it in the appropriate location on the underside of the receiving p.c. board. Then turn the board around in the case and cut a slot in it so the crystal may be inserted from the outside.

For RC car purposes (where ranges are rather short) no retuning of either transmitter or receiver is required to operate on any of the five available 27 MHz RC spots. Both crystals must be prevented from coming loose due to vibration, handling, etc. A simple strip of sticky tape should do the job. Code each crystal with colored dope to match the frequency, making sure the code clearly indicates which crystal is for

transmitter, which for receiver.

Our experience in building the GD-57 system has been excellent and its operation in a Heathkit Spectre and in the Lanier Hawk glider, reliable. This certainly seems a fine system for the sport plane flier or for competition RC uses which can be handled with a maximum of three controls. By following the book carefully, it really is hard to go wrong. Construction time was a bit over 18 hours for the transmitter, the receiver, battery and switch harness, and two servos. This includes tuneup and adjustments.

The Hawk Glider

Plastic planes are considered by some to be completely expendable, thus not worth anything but the most rapid and slipshod assembly job. We disagree. Even if the plane itself is expendable, the radio certainly is not. Therefore, it is as important to use as much care with these ARF jobs as with a prized original.

The Hawk is quite similar to Lanier's earlier Eagle glider. The main difference is the Hawk's nose, which is considerably longer by some four inches. This makes for better appearance and takes less lead to balance (but plenty is still needed). Scanty instructions might indicate that the Hawk was intended for the experienced builder, rather than the glider novice who wants to try this mode of RC with a minimum expenditure of time and money. However, the following discussion should clarify construction details.

An engine mount inside the nose compartment is shown, but it makes it difficult to fuel-proof the plywood frame which strengthens the inside of the fuselage. Keeping fuel away from the radio equipment would be difficult and fuel residue would quickly make a real mess of the uncovered foam wing and stab.

Lanier recommends using high start, which we strongly endorse. (Slope flying really would be the best for this heavy craft.) The wing seemed to take high-start launches fine. Full-length 3-ply spars in the wing panels are ⅞ x ⅛".

Wing surfaces were sanded with fine paper before assembly. Trial assembly with the dihedral braces showed a 3/16" mismatch between the three panels at each joint, so the edges were sanded to remedy this. Wing dihedral is not specified. We blocked up the tips 5½" at the tip undersurfaces and this seemed ideal.

Instructions suggest attaching the wing tips and the LE and TE center plastic doublers with narrow strips of Air-O-Sheet. This may be a quick method, but epoxy is much more reliable. Being dubious of the Air-O-Cement stab fuselage joint, we fitted four Air-O-Sheet angles under the stab instead of two.

The raised top over the stab must be cut out to insert the fin, necessitating a slot of about 4¼" long by ½" wide at its widest part. Trim the edges so the fin will fit flush against them. Then trim the fin bottom edges so they conform to the stab top and the fuselage top.

A small piece of ⅛" ply is furnished for a stub spar inside the fin. This piece was too narrow to spread the fin sides against the raised fuselage cutout edges (close contact is needed if the Air-O-Cement is to hold at all). A piece of firm ¼" thick balsa, cut to fit here, was also contoured on the underside for a reasonable fit on the stab top. This piece was epoxied into the

fin and against the stab top.

When dry, Air-O-Cement sealed the fuse-fin edges, and a fillet of Aero-Gloss model cement joined the LE of the fin to fuselage top. This may seem like a lot of fuss, but the joint has held firm through some horrendous cartwheel landings in gusty wind!

A standard rudder horn was used with a small block of balsa cemented inside the rudder to take the compression of fastening bolts.

The sheet plastic area under the wing was cut out to determine what kind of a compartment it would afford for the radio. The cutout sheet contributes considerable stiffness to the fuselage torsionwise and, after the pushrods were installed, it was replaced. Servos were located as far forward as possible for good balance.

For the Heathkit servos, slots 1 x 2¾" were cut in the ply nose platform. Four corner holes were drilled for each, then the ply was removed with a Moto-Tool and various cutters. Servos are held by #2 x ½" wood screws through the grommets.

The Sullivan GoldN-Rods pushrod casings are held in slots near the tail and to the plywood just above the rear rubber pegs with Goo. Casings should be roughened first. Their forward ends are held in the ply with aluminum nuts.

The linear output of the elevator servo is fine, since elevator movement need be only ⅜" up and down. Wide rudder movement is required for most gliders, and the Hawk is no exception. The original link from linear servo output lug to the innermost hole of a Midwest horn gave about 1¼" rudder movement to each side, which is not enough. Alternatives are to use a shorter horn or use the rotary bar servo output. Rudder movement should be at least 1½" each way.

A tow hook must be added to the Hawk skid, which has a cutout area at the right point. Ours was bent of soft .050" aluminum sheet. It is held to the skid by two #4 bolts.

To get the receiver as far forward as possible, ⅝" of the vertical ply just to the rear of the piece holding the pushrod ends was cut away. The receiver is wrapped in foam plastic and set vertically in the fuselage.

Battery pack placement was a problem. By removing the case from the Heath flatpack, rearranging the cells in a two-over-two shape, and repackaging with plastic electrical tape, the new square pack goes neatly in the Hawk nose, just ahead of the servos.

Hawk instructions casually mention needing about 8 oz. of lead for plane balance! However, with the radio as far forward as possible, about 6½ oz. was needed (with wing and fuselage top cover in place). Lead in the form of two horizontal U-shaped pieces was installed in the nose, using plenty of epoxy. The plane should balance at the wing spar, about 3" in back of wing LE.

Final job is fitting the fuselage cover over the nose compartment and wing and then adding the canopy to this piece. The cover needs to be trimmed drastically to fit over the wing. Apparently the cover is intended to be held by the wing rubbers, but it was best to put an extra band across the cover between the rear rubber pegs. Instructions specify small sheet-metal screws to attach the cover at fuselage nose. However, in any landing where the wing is

pulled loose, the screws can be torn out; sticky tape would be better.

Aside from many hand glides to get the feel, all serious flying was done on a high start (the Soarplane version mentioned in Hawk instructions). The glider towed aloft nicely but, because of its weight, some wind would have helped. Once off the towhook the Hawk has a reasonable glide angle, but it's no Cirrus! The wing loading explains why. Our Hawk weighed 68 oz. and useful wing area (excluding covered center area) is about 4.87 sq. ft.—a loading of about 14 oz./sq. ft. Many current high-performance gliders run 10 oz. per sq. ft. or under. We feel the Hawk would do best in slope soaring.

Other improvements might be suggested. Lightweight RC equipment is no advantage since weight is needed in the nose anyhow. Larger diameter wing rubber pegs are needed because in a ground loop the wing rubbers often did not pull off the pegs, but the wing rotated far enough to pull the rubber off the rear doubler and onto the foam, which tore. Rubber pegs should be at least as large in diameter as the heads of the holding screws.

The rear wing doubler should be twice as long to prevent foam damage by the rubbers in a ground loop or cartwheel. Again, when the wing is knocked askew, the fuselage area just behind and above it takes a real beating and should be strengthened.

Strips of Air-O-Skin on the wing TE would help prevent handling dents and digs. If the ply shelf in the nose area were extended ⅝" by moving the bulkhead back, it would allow more space for the larger servos; if the forward end of this shelf were dropped ¼" it would make battery installation much simpler.

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Ducted Fans

(continued from page 44)

the thickness of the fan hub, cylinder head location, etc. The engine mounts extend aft of the rear spider assembly, if required to support the fuel tank. A little ingenuity at this point will provide a fuel tank of maximum capacity in a minimum of space. Having determined all the basic dimensions of the engine mount, all that remains is to transfer them to the appropriate material and begin construction.

Construction

Having determined the fan size, next find a can of the appropriate dimensions. A trip to the local supermarket (with a ruler in hand) will soon reveal which product must be bought to satisfy these requirements. (In the case of the

four-in. fan—beef stew.) Examine the can carefully for dents or other defects. Buy the stew and heat and eat the contents or throw them away. Carefully remove the top and bottom of the can so that the stiffener rings (ends) are not deformed.

If a fan larger than four-in. is required and a suitable can is not available, several alternate solutions are possible. Rolled 1/16" sheet aluminum with the seam welded and then filed away or a plywood "can" as shown in the sketches will do the job nicely. The can is the heart of the unit and extra care in the fabrication of this item will pay dividends later on.

The first step in method number one is cutting several disks from plywood, then laminating them to provide a hub of the required thickness. After the glue has set, chuck the hub in a ¼" electric drill and with a wood rasp or sanding block true up the assembly. Next mark the hub for the blade slots. Make up a template to insure that all slots are exactly the same angle on the hub. Plan to make the slots deep enough so that after the blades have been inserted, the hub and blades can be drilled for ⅛" or larger dowel pins. These pins are insurance that the blades will not separate from the hub at high rpm's.

After the assembly has been glued up and is thoroughly set, file, carve and sand the airfoil into the blades as shown. Keep leading and trailing edges sharp and the back side of the blade flat. A simple convex shape to the front face of the blade will do nicely.

Method number two for fan construction involves stacking up a series of plywood profiles to the desired hub thickness. Stagger each successive profile until the required root and tip angles are obtained. The proportions shown in the sketches should establish the width of the blade elements adequately to insure that sufficient material is available to obtain the required air foil. Note that this method provides a blade which has a wider chord at the tip than at the root. However, with the more effective twist obtained, the blade tip angle is more favorable and the increased chord should be handled easily.

The fan must be carefully and critically balanced, and must run as true as possible. Balance may be achieved by drilling holes into the back of the hub, but don't get carried away. Do not establish the final fan diameter until ready to mount the engine assembly in the can. The closest possible running fit is most desirable. Properly constructed, the fan will be close to perfect balance to begin with. An extra coat of clear dope on one or two blades may do the trick.

Engine Mount

The engine mount consists of a forward and aft plywood spider (¼" or thicker) and a pair of hardwood engine bearers. Saw out the spiders, leaving their legs slightly longer than required. Slip them over the engine bearers with the engine on the rails so that any trimming requirement for engine clearance can be determined. Once the correct positions of the components have been established, mark, drill for dowel pins and engine mounting bolts and epoxy the whole assembly together, with the engine in place.

Fuel-proof all interior surfaces of the mount assembly and make certain the engine mount bolts will not loosen under vibration. Trim the ends of the spider

legs for a slip fit into the can. The engine crankshaft must be centered. It may be necessary to remove the cylinder head. Small balsa blocks or curved sheet balsa panels are used to fair the engine into the center body of the mount. Cut a hole under the engine to vent off crankcase heat and excess fuel or oil spillage. Don't forget fuel-line access holes.

Having faired the center body, next cut inserts from balsa of appropriate thickness to fit between the forward and aft spider legs and up against the center body. Build up a curved leading edge on the forward spiders to form an angle of approximately 20 degrees to the chord of the flow straightener and opposite the direction of fan rotation. These serve as lead-ins for the rotating airflow leaving the fan.

The desired 20-degree angle should be available at the outboard end of the straightener and may be reduced closer to the center body. If the size or construction of the unit cannot provide this curved leading edge, simply round off the leading edge of the spider leg, favoring the direction of the rotating airflow off the fan.

The aft spider legs are faired by using trailing edge stock of appropriate thickness—¼" or ⅜". Install, keeping the 90-degree edge on the side of the flow straightener which meets the rotating fan airflow. Observed in cross section, the flow straightener should look like a crude air foil.

Fairing the fuel tank is up to the individual. A little study will reveal the best method to adequately fair in the tank and provide a smooth transition for the fan airflow.

Fuel-proof the entire engine mount assembly and it is ready to be installed in the can.

ASSEMBLY

Cut holes in the can as required for the cylinder head and needle valve extension. Fuel-tank fill and vent lines should also pass through to the outside of the can. With the fan trimmed and mounted on the engine, slide the engine mount assembly into the can, lining up the hole for the cylinder head.

Make a shim of a strip of poster paper and encircle the ends of the fan blades, centering the fan in the can. Use as many thicknesses as required to insure that the fan will be centered. Now, working from the aft end of the can, check for any shims which may be required between the flow straighteners and the inside of the can.

Install the cylinder head on the engine. When satisfied with the location of all components, "paint" the assembly into the can with epoxy thinned with a few drops of dope thinner. Very smooth fillets should result and the thinned epoxy has excellent penetration. Let the unit set over night, pull out the fan shim, check free rotation.

When the power package is completed, verify its performance. From scrap shelf stock, available at most lumberyards, build a thrust mount as shown. The two forward mounts support the can assembly and the rear mount supports the tailpipe. Make a tailpipe of light poster paper which fits snugly over the aft end of the can, and which has an exhaust area of 75% of the effective fan area. Effective fan area is defined as the total area based on fan diameter minus hub frontal area.

The thrust mount may be mounted on wheels, rollers or in a swinging

parallelogram to provide as friction-free an assembly as possible. Run the unit, tying the thrust mount to a small spring scale to measure the thrust. Slice sections from the tailpipe, gradually opening up the exhaust area and thrust check the unit after each adjustment. Use the tailpipe area which generates maximum thrust for the particular fan/engine combination being used.

The ducted fan power package described here was conceived as being interchangeable between several models and suitable for free flight, control line and radio control use. The installation of the unit in the model requires only that the aft edge of the can be a snug slip fit into the forward end of the tailpipe, with the forward portion of the can resting in a suitable cradle, held down by a simple strap or lugs.

Selection or design of a model to use this type of propulsion should take the following features into consideration: (1) Reasonable wing area for the size of the aircraft (MIG-21 or F-104—maybe, U-2—no question). (2) Reasonably sized tailpipe exit. For scale designs, those aircraft with afterburning engines will provide adequate exhaust area in proportion to the size fan installed. Example: F-100—good; T-33—aft fuselage would need modification for tailpipe.

(3) Inlet areas should be at least equal to the effective fan area. Some minor considerations to scale are acceptable and, if necessary, auxiliary air inlets can be provided. Example: MIG-15—adequate as is; F-100—too small, requires auxiliary inlet.

(4) Thrust to weight ratio—1:2 or better is desirable. One of my models has a 1:3 ratio and flies well (6-lb. aircraft—2-lb. thrust). The ability to thrust-check unit provides weight target.

Recommended Engine/Fan Size

Fan Diameter	Engine Size
3″	049—099
3½″	074—15
4″	15—29
4½″	23—35
5″	29—45
5½″	40—60
6″	51—up

Pressure fuel systems work well and provide consistent operation, but are not necessary. Throttle systems also work well but either an exhaust baffle or intake throttle only is required since very low rpms are not necessary to effectively reduce thrust.

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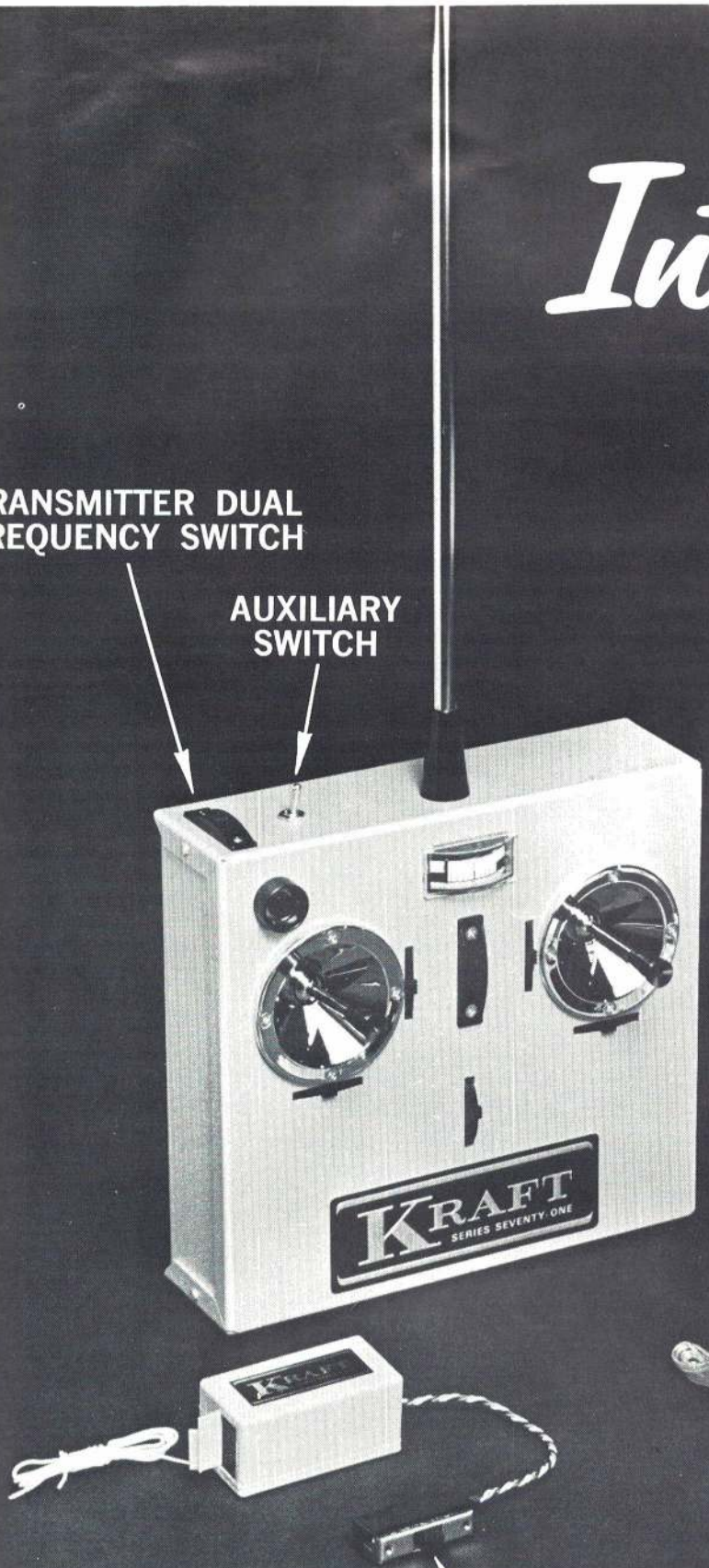

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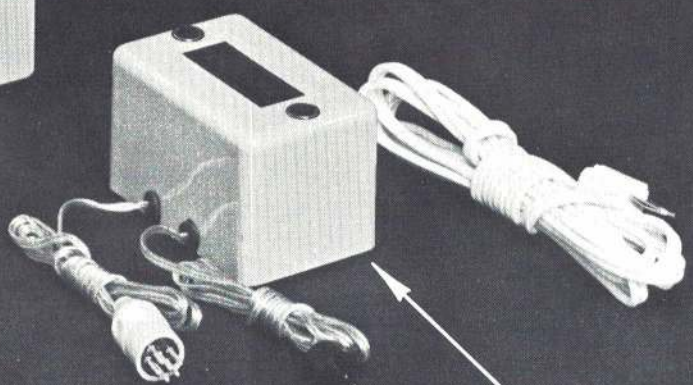

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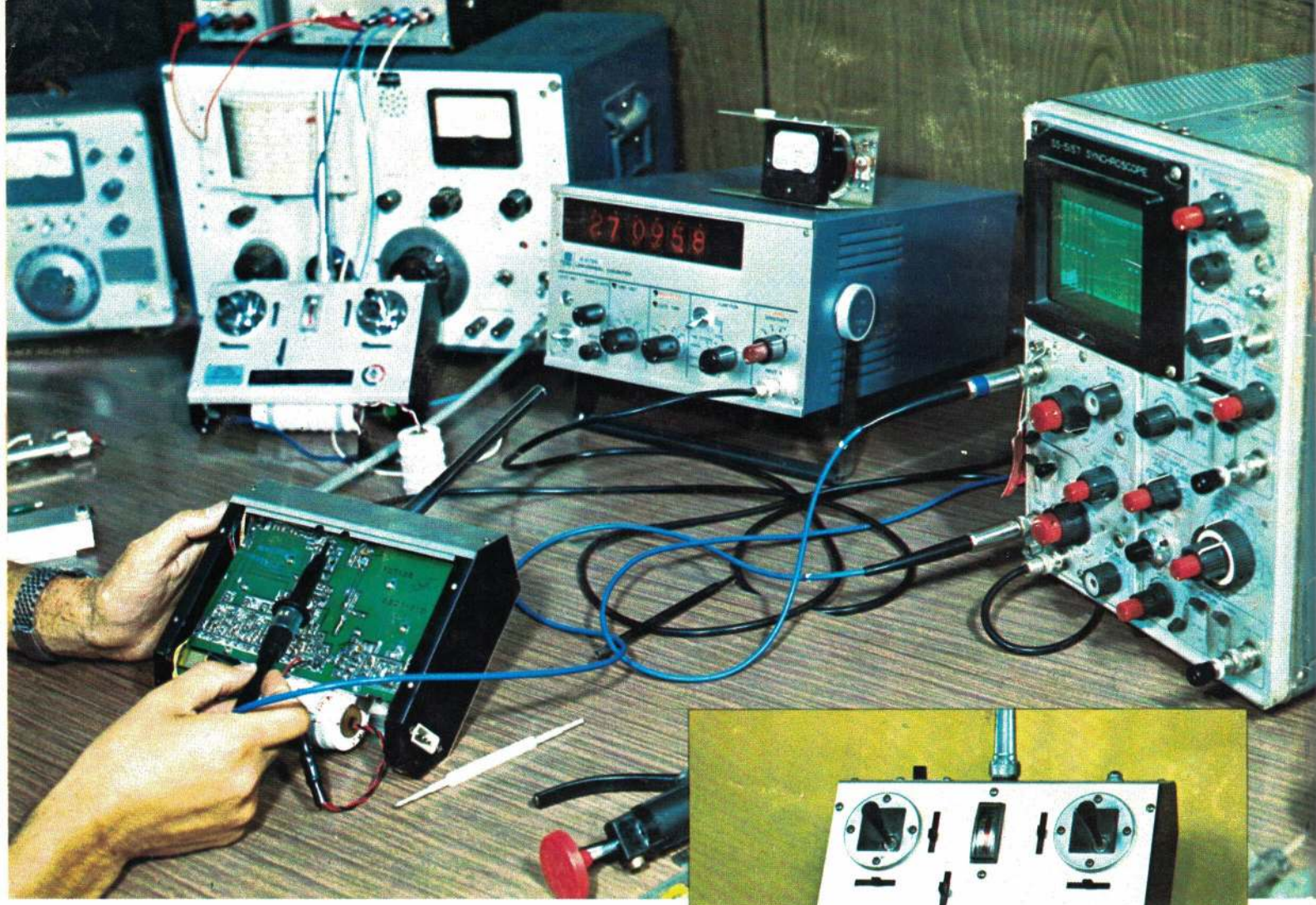

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