INSIDE: THREE MODEL BUILDING PROJECTS

MODEL BUILDER

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ORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

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TOTAL ECLIPSE.

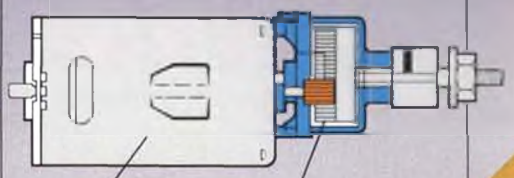
Airtronics' Eclipse, our first electric powered sailplane kit, gives you the best of both worlds. Ideally suited for beginning sailplane enthusiasts and advanced sport flyers, the Eclipse offers advanced aerodynamic design and engineering to ensure uncompromising soaring performance.

This new generation in sailplane technology continues Airtronics' quality kit tradition by combining the advantages of electric power and soaring flight. It's quieter and easier to use than gas engines, it's suitable for smaller fields for greater flying site flexibility, and it eliminates cumbersome hi-starts and winches.

The Eclipse features a sophisticated gear reduction system superior to direct drive units. This gearing provides for a higher rate of climb, additional performance and more altitude per charge.

The Eclipse utilizes a folding prop that produces longer flights by eliminating prop drag. The easily transportable three-piece wing incorporates built-in wash-out that provides excellent turning characteristics and prevents tip stalls. A high performance semi-symmetrical airfoil offers docile handling characteristics for beginners and first time electric flyers.

Available in two kit configurations, the Eclipse is simple and easy to build with detailed full size plans and fully illustrated instruction manual. The Standard Kit comes complete with all necessary hardware, hand selected wood and machine cut precision parts. The Deluxe Kit includes a high performance Mabuchi 550-S electric motor for power and endurance, Al-Tec 3:1 gearbox, Master Airscrew folding propeller, and Goldberg spinner. Both kits will accept optional high performance motors and battery combinations.



Powerful Mabuchi 550-S electric Motor

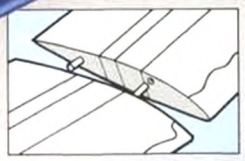
High performance Al-Tec 3:1 gear reduction system

Lightweight built-up tail surfaces

Rugged breakage-resistant plywood fuselage

Semi-symmetrical airfoil for improved L/D and soaring performance

Folding propeller for improved flight performance



Removable plug-in wing tips for easy transport

ECLIPSE SPECIFICATIONS:

Airplane Type:	Electric Sailplane
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Airfoil:	Semi-Symmetrical
Fuselage Length:	39"
Flying Weight:	45-48 oz.
Wing Loading:	10 oz./sq. ft.
Motor Size:	.05 Mabuchi 550-S Electric
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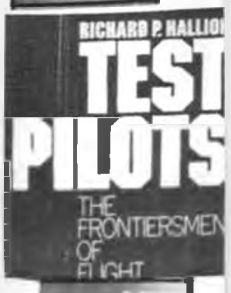

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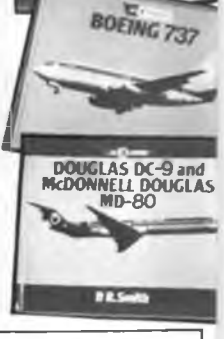

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MODEL BUILDER

AUGUST 1988

volume 18, number 199

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FEATURES

CONSTRUCTION

COVER: To lead off a most interesting series on a pioneer R/C aircraft and its creators, Bud Gordinier made this painting in commemoration.

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DRAGONLADY

When you first take your Modeltech kit out of the box, you will be very surprised. The fuselages are balsa sheet with plywood reinforcements inside. The wings are pre-cut foam cores sheeted with balsa (the dihedral is preset also).

Every piece is hand sanded. Much of the hardware comes with the kit. Some of the bigger kits have cowls and wheel pants as well as clear canopies and landing gear (some even have fiberglass landing gear that are very strong, light-weight and flexible like shock absorbers). All you have to do is glue on the vertical fin, the stab, join the wing halves, cover the model and install your radio.

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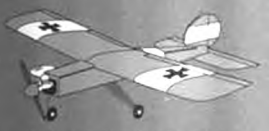

LUCKY STIK

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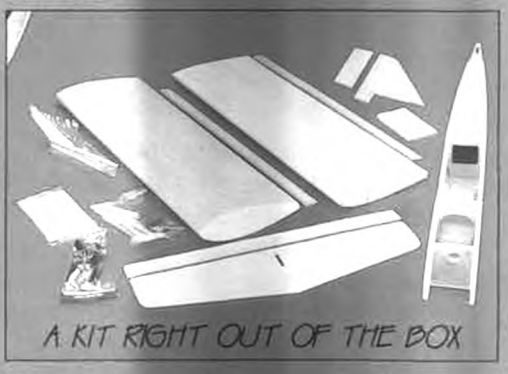

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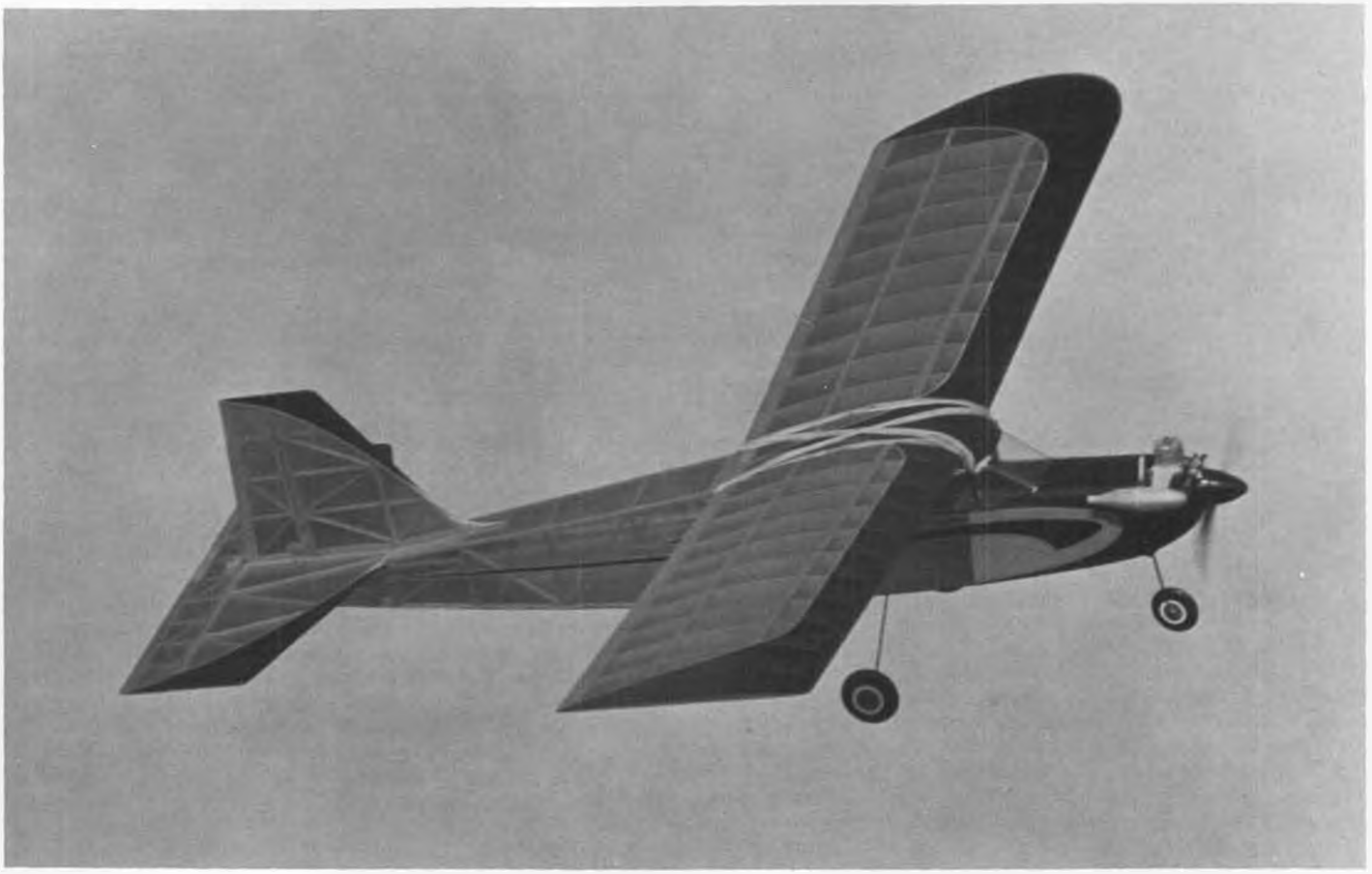

Our Kadet Senior set new standards in trainer performance and was hailed as a classic design. The Seniorita is a reduced size version produced for those builders who find the Senior too large for their building space and/or car. It will cruise around effortlessly in low throttle, giving a novice RC pilot time to think and develop flying skills. Should the situation get ahead of the flier, or the model into a bad attitude, allow the stick to snap to the neutral position. The built-in, inherent "hands off" performance of the model will return it to safe level flight. Though some expert assistance for first attempts is recommended, the learning and practice process requires a minimum of supervision. If necessary, the Seniorita can be flown without an instructor with more chance of success than with faster trainers.

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from Bill Northrop's workbench

• Didja ever play "catch" with a model airplane? It's the same idea as going out in the back yard with a friend and tossing a baseball back and forth . . . or maybe a football. Today you might compare it with a favorite beach-time activity. . . throwing a Frisbie. After you get pretty good at it, you learn to take advantage of its aerodynamic capabilities; putting it in banked turns so it curves right into the hands of your throwing partner, making it climb and then hover and settle gently so it can land on a finger and continue spinning, shooting a touch-and-go on a smooth hard surface, or slice across the space between you with the speed of a rocket!

Well . . . way back (Oh boy was it way back!) in the late 30's I had built a Thermic 50 glider. For those of you with the puzzled expression, this was a 50-inch span free flight glider featuring a pod-and-boom fuselage, a polyhedral wing with a classic bird-like or Minimoa (Huh? A famous pre-World War II German sailplane) style wing planform, and a V-tail. Simple handlaunch glides from shoulder height would produce beautiful, smooth landings about 30 to 50 feet away, where the glider would come to a stop, sit perfectly level for a moment, and then settle on one wing tip or the other. For a loner modeler in a small eastern college town, this was dream stuff, and I could do this for hours without getting bored.

Eventually, I found a fellow loner in the same town, and we enjoyed building, flying, and sharing new discoveries in this very special hobby that we both loved. At some point in time, the Thermic came out, and we took turns developing the technique of making smooth launches and getting the glider to land at a predetermined spot. But why walk back and forth between each glide? We spread out about 30 to 50 feet and started gliding the model back and forth (If there was a slight wind movement, we would work crosswind), allowing it to land, picking it up, and gliding it back to the other partner. Sooner or later, a longer-than-normal glide resulted in a midair catch, and then we were into another phase. Now we were, like I said at the beginning, playing "catch" with the glider, learning to move our hands with the model as it approached so the stop was gentle, like "rolling with the punch." Next came the banked turns, launching the Thermic about 20 to 30 degrees off course, but banked so it would turn toward the person at the other end. Then came the touch-and-goes, and then the climbing flight that would gently stall out over the head of the receiving partner. We used to do some of this on the college campus in the evenings, and very often would draw an audience that would cheer and clap, or groan, depending on the success of each toss.

The final touch was called the "never ending glide." One of us would make the first toss, and as the glider approached the other partner, he would gently clamp thumb and fingers on one wingtip and guide the model around 180 degrees and then release the glider back toward the one who made the first toss! It took a lot of practice to develop the release, and also to pick up the glide speed so the model could make it back to the other launcher. You increased the speed as you turned, holding onto the wingtip, twisting it slightly so as to raise the nose to gain altitude, and then, just as you released, you lifted the tip to get the model levelled out for the return flight. Our best attempt resulted in about three passes in each direction. It wasn't easy, and took lots of practice . . . but what the heck, life simply went at a slower pace in those days . . . or so it seems now.

That Thermic 50 . . . I still have it . . . very much in need of recovering for the umpteenth time. It was from a JASCO kit (Junior Aeronautical Supply Co.), and the designer and kit manufacturer was none other than the very famous Frank Zaic!

Another mystery model from the past. Photo taken in Minneapolis in 1940-41. Details are in the text this month.

What put all the above in mind was a letter from our good friend on the island of Maui, James Martin. One photo with this column shows the individuals involved in setting some records (Yet to be acknowledged by AMA Headquarters at the time of this writing) for Class A (Handlaunch) R/C Gliders. James was CD for the record trials in which Dale Collier and his son, Matthew, flew 1.5 meter versions of Joe Bridi's two-meter "Wind Surfer," which they named "Wind Surfer Baby." This model is only about nine inches larger in span than the old Thermic, though there is considerably more wing area.

Dale flew his glider for an Open duration record (not thermal, but slope) of five hours, five minutes, and 40 seconds, while covering a closed course record distance of 120.4 kilometers, or 74.6 miles (602 laps). Matthew flew his Wind Surfer Baby for four hours, two minutes, and 49 seconds for a Junior endurance record. That should also be a record in attention span for a junior!

Dale used an Ace radio with an 800 MA

Gathered around CD James Martin(5th from left), are Matthew Collier(kneeling), Dale Collier and his wife(3rd and 4th from left), during AMA record-setting session on Maui(see text). Sad to say, we misplaced James' letter and cannot I.D. others in group.

airborne battery, and carried an external pack on the transmitter in addition to the internal pack, with a selector switch for the required transition. Matthew used a Futaba radio with Ace servos and AA dry cells! Following his own idea, Matthew flew his glider to a higher altitude when his transmitter pack was getting low, then shifted the module into a second transmitter to finish the flight. How about *them* apples!? Incidentally, the flying site is the same location where we made an unsuccessful attempt on the world R/C glider altitude record about six or seven years ago. We're convinced that with the right aircraft, one which was more streamlined and had a faster glide rate, and could therefore do a better job of penetrating the winds and stay out over the slope, it could have been accomplished.

ABOUT THAT FLYING WING . . .

We've only received two letters with possible identification of the mystery flying wing model shown in our June '88 column, plus one interesting letter about the flying site itself. Tanner Stover, of Cherry Valley, California, thinks it's the "Rickard Flying Wing," as published in Frank Zaic's 1938 Yearbook. We're inclined to disagree on that. Arthur Pasa, of Auburn, Washington, says it's the XP99, designed by Ben Shereshaw. I don't recall that design by Ben, but I'm checking with him to find out. Aviation historian N.H. Hauprich, Greensburg, Ohio, couldn't name the plane, but had some interesting sidelights on the flying field in the photo, as follows:

"I was most interested in the photo and caption on page 7. I was at that meet and remember some of the early gas-powered jobs which were a source of amazement in those days.

"I cannot recollect the field ever being called Lindbergh Field, though, we called it Checkerboard Field. During the early airmail days, it was a regular stop and was known then as 'Checkerboard Field.' At the time of the meet, there was one asphalt runway running north and south. To the west of the runway was Edward Hines Veteran's Hospital. They brought out all the ambulatory patients to watch the models.

"In 1937, my J-3 Cub (NC15972) was based there, and I have photos of same showing the old airmail hangars in the background. At that time, Roscoe Turner had his Lockheed Air Express (Gilmore) NC3057 stored in one of the hangars. Wonder what ever happened to it?

"We also had model meets at an area called 'Clearing,' which was a large open space with *one tree* at the east end. Guess what? (*If it was like any other flying field, every model landed in it sooner or later! wcn*) This was directly south of Chicago Municipal Airport and near both the Laird and Howard factories. I grew up in Oak Park, Illinois, which is very near Maywood."

Just to keep you guessing (and earn another free one-year subscription to *MB*), we're publishing another mystery model photo. This one was in some old correspondence I cam across from the late Harold Osborne. The only information available is that the photo was taken about 1940 or 41, in Minneapolis. Could it be canard free-flighter Doug Joyce?

THINGS TO DO

The National Association of Rocketry will be hosting its 30th National Contest and Convention at the Alabama Space & Rocket Center, Huntsville, Alabama, the week of August 7 to 13. For more information on the Contest and Convention, respectively, contact Contest Director Matt Steele, 13011 Branscomb Rd., Huntsville, AL 35803, phone (205) 883-6020, or Convention Director Connie Pursley, 1482 Hunters Park, Missouri City, TX 77489, phone (713) 499-5925.

* * *

The 19th Annual R/C Scale Rally, put on by the K-W Flying Dutchmen, takes place September 10 and 11, 1988, at Kiwanis Centennial Park, Kitchener, Ontario, Canada. For further information, contact John Towell, 40 Fran Ellen Crescent, Kitchener, Ontario, Canada N2N 2N5, phone (519) 742-5070.

* * *

Another one in Canada, this is for the 50th Anniversary Contest for Replicas of Roy Nelder's 1938 winner of the Moffet International Trophy. It's to take place on September 17, 1988, at the 33rd Annual Eastern Canada Open, Gananoque, Ontario, Canada. The event will be flown in accordance with the 1938 Moffett Rules. There will also be a couple of events for classic Wakefields. For more information, contact Peter Mann, 36 Sydenham St., Guelph, Ontario, Canada N1H 2W4.

* * *

If you're not flying Moffett or Wakefield in Canada on September 17, you might want to head for Reno, Nevada for the Silver Anniversary of the National Championship Air Races, September 15 to 18, 1988. AT-6, WWII stock trainers: Formula One, homebuilts; Biplanes; and Unlimited aircraft will bring more than 100 pilot entries looking at a record total purse of $450,000. The Unlimiteds prizes will total $287,500, the At-6's and Formula Ones will each get $65,000, and the Biplanes pick up $32,500. Winner of Sunday's Unlimited Championship Race will receive the event's largest amount, $32,862.

September 12, 13, and 14 will be for qualifying trials, which are free to the public. Heat races are Thursday and Friday, and the Finals are on Saturday and Sunday. Also to

Continued on page 107

ADVICE FOR THE PROPWORN
—By Jake

Dear Jake:

My youngest son is into finding out how things work. So he takes things apart and puts them back together again. For the most part his little experiments have been harmless and rather amusing. We thought it was cute when he dismantled an old windup alarm clock, and there really was no harm done when he dissected a Go-Bot. But last week I pushed the button on my garage door opener and all the parts fell in my lap. I had to get out of the car in a pouring rain and open the door by hand. Turns out junior had tried to find out what kind of magic made the garage door go up and down. He just hadn't put the sending unit back together exactly right.

Now I have an even bigger problem. Seems the lad's curiosity about radio-controlled things extended to my JR Century Series. When I went to fly this weekend, nothing worked. I shook the transmitter and it sounded like a bag of Scrabble tiles. I'm afraid to look inside. Junior won't confess, but I'm pretty sure my transmitter was the victim of one of his experiments. Any ideas on how I can straighten out this mess?

Frazzled Dad in Racine, Wisconsin

Dear Frazzled:

Your problem seems to have two distinct parts. I'm not sure what you can do about your disemboweled transmitter, but wailing on junior with a cricket bat might go a long way toward solving the other half of your problem.

Jake

* * *

Dear Jake:

I keep reading about P-forces and how

Continued on page 107

OVER THE COUNTER

All material published in "Over the Counter" is quoted or paraphrased from press releases, furnished by the manufacturers and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by MB does not constitute an endorsement of that product, nor any assurance as to its safety or performance by MB.

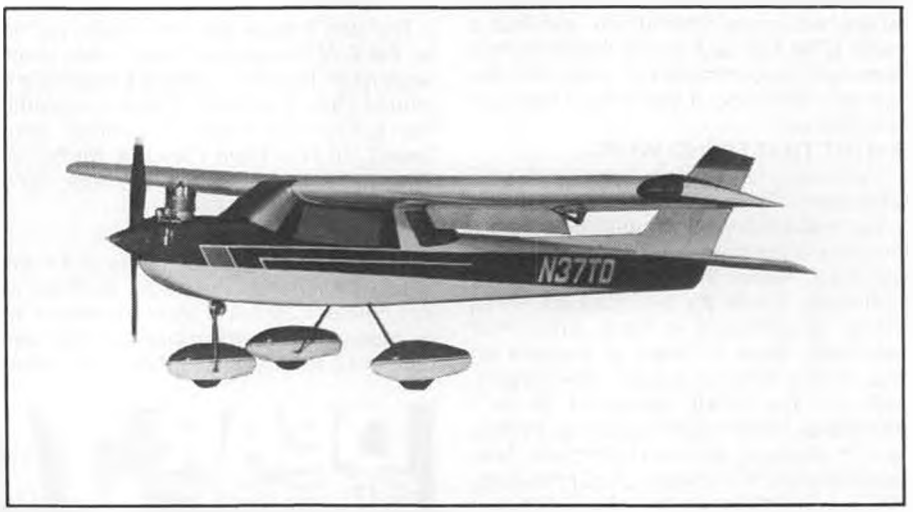
• Davey Systems Corporation has announced the release of a new R/C Cessna 150 in sport scale. The kit features die- and machine-cut balsa, maple, and hardwood, precut sheet sides and tail, vacuum-formed wheel pants, and a unique simplicity of design to make construction easier. The wingspan of the Cessna is 50 inches, with a wing area of 410 sq. in. The semi-symmetrical airfoil offers smooth flying and easy handling, and the Cessna can also be built with flaps if you desire. The recommended engines for this model are a .20 to .30 two-stroke, or a .40 four-stroke. For more information on this good looker, contact Davey Systems, 675 Tower Lane, West Chester, Pennsylvania 19380.

* * *

Peck-Polymers has come out with a new 035 electric motor that weighs only 2.6 ounces and draws only 6.5 amps with six cells. This means you can use a battery with half the capacity for the same running time of other motors. Using a smaller battery saves a major part of the total flight weight, making this the ideal motor for the person who wants to fly small models. The Silver-Streak motor is recommended for mini R/C or free flight models with a 30- to 48-inch wingspan. See your dealer or write: Peck-Polymers, Box 2498, La Mesa, California 92044.

* * *

How about a self-feathering, adjustable-pitch propeller from Master Airscrew for 05 electric motors. The patented feathering mechanism will greatly reduce drag in the glide mode and will change instantly to a preset pitch for powered flight. Pitch adjustment of 8 to 40 degrees is made with a 4-40 set screw accessible through the spinner cone. You can find the Master Airscrew Self-Feathering Prop at your hobby dealer, or write for more information: Master Airscrew, 384 Tesconi Ct., Santa Rosa, California 95401.



Davey Systems' Cessna 150 in sport scale R/C.

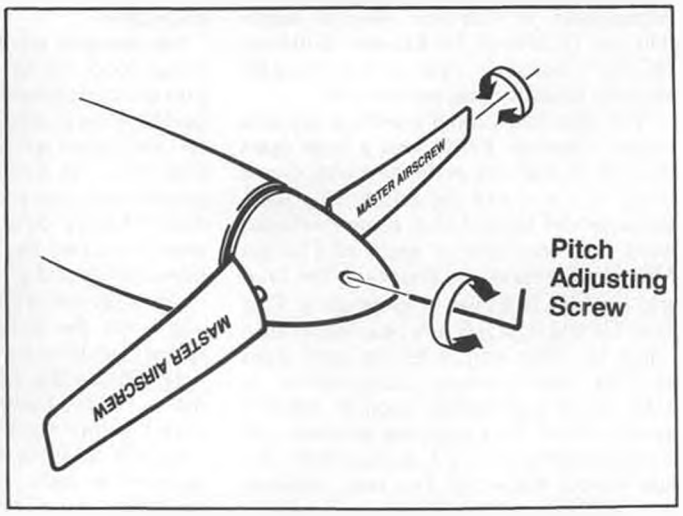
* * *

Distributed by Great Planes, the O.S. line of engines is continuing to expand. The latest in this fine group of engines from Japan is the O.S. .10 FP ABC. This is called the perfect sport engine for .10-size planes; it features Schneurle porting and an expansion muffler with an adjustable exhaust position. Like all the FP engines, the O.S. .10 is designed for easy starting and minimal break-in, making it ideal for beginners. In addition to the .10 FP, three other new .10 FP engines are available: the .10FP-S for control line; the .10 FP-M for marine use, with a watercooled head; and the .10 FP-B for cars, with a large heatsink head. Look for these fine engines at your nearest Great Planes dealer, or write: Great Planes Model Distributors, Box 4021, Champaign, Illinois 61820.

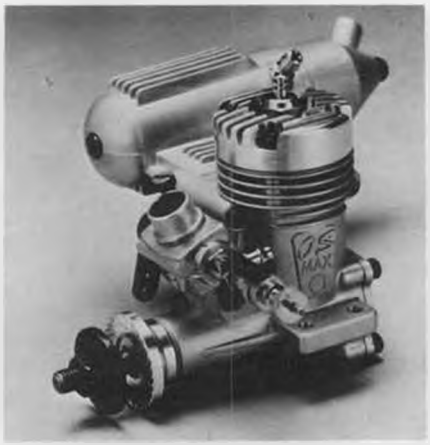
* * *

Assemble-Eze Wing Control Disconnects is a big name for a little gem from William Bros. that allows you to disconnect aileron-actuating controls when the model's wing panels are removed and reconnect them during reinstallation of the panels. The disconnects come in two sizes, for large or small models, and come packaged in pairs.

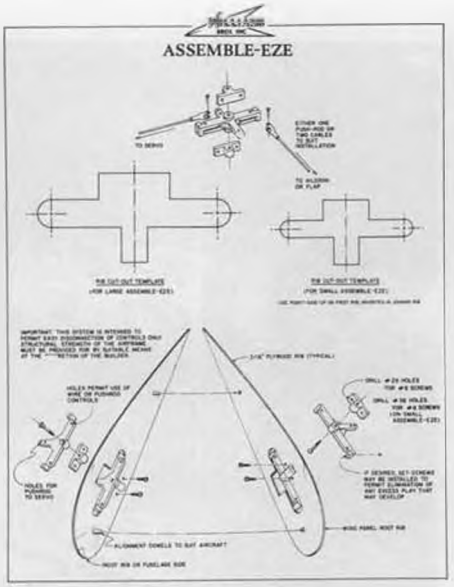
Lightweight electric motor from Peck-Polymers.



Self-feathering, adjustable pitch propeller from Master Airscrew.

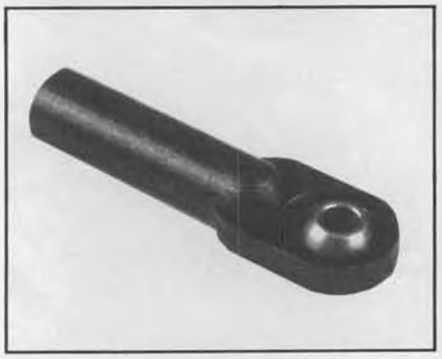


O.S. Max .10 FP from Great Planes.



Wing Control Disconnectors by Williams Bros.

Futaba Attack 2-Channel Radio System.



Du-Bro's Ball Link Connectors.

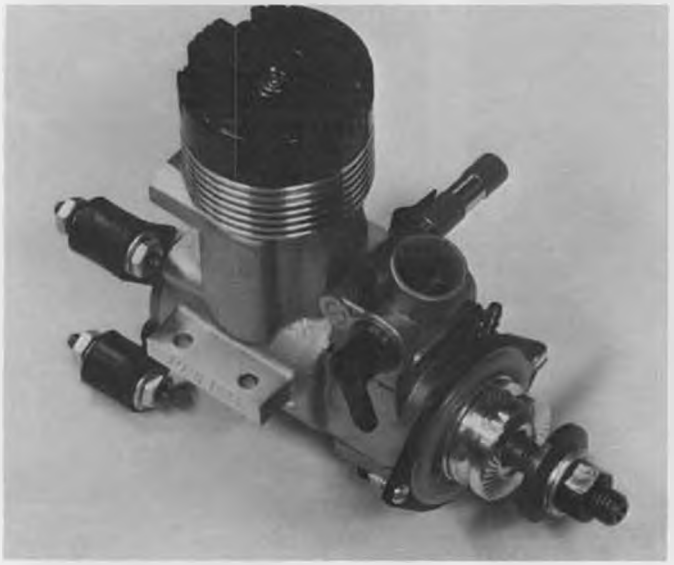
For more information, contact Williams Bros., 181 Pawnee St., San Marcos, California 92069.

* * *

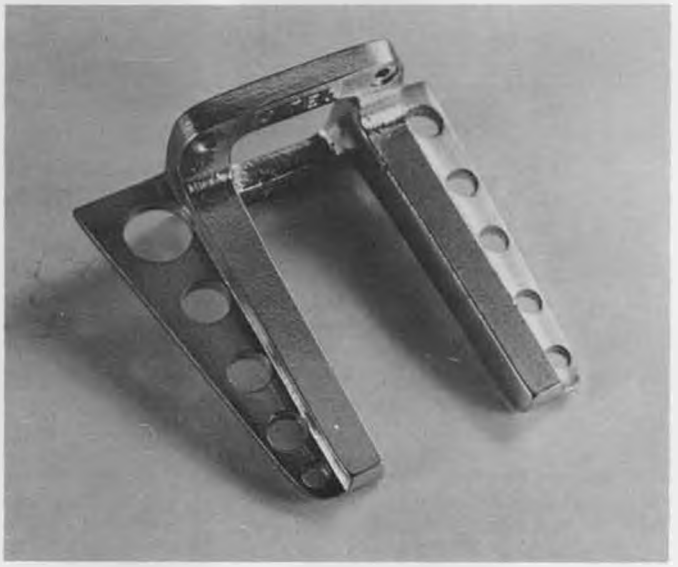
Here's a new product to aid in dampening the vibration from gas engines. It's called Vibra-Damp, and it is from Performance Products Unlimited, 7093 E. Dodge Rd., Mt. Morris, Michigan 48458. In tests with the Vibra-Damp on a .60 two-cycle engine, the product reduced the transmitted vibrational g force from 95gs to 11gs. Included in the Vibra-Damp package are all the hardware needed to mount the engine to the firewall, including a front limiter ring

Continued on pag 99

ARF Chipmunk .40 from Royal Products.



Vibra-Damp vibration dampeners.



Formula I Racing Mount for .40 engines, from J'Tec.

THE FIRST IMS ATLANTA SHOW

By GEORGE P. BURDELL. . . The First Annual IMS/Atlanta show was a rousing success, and it will be back again next year with an even bigger show! This year's event was a must for modelers, as the pictures will attest.

• If you live in the Southeastern United States and didn't get to the First Annual International Modelers Show (IMS) in Atlanta, you missed the start of something *big*. I've been to Toledo a few times as well as the New York City WRAMS show and I used to go to the Flying Bison's show in Buffalo, New York; but I've never seen a show with model *action* as IMS features. It was a flying, floating, fender-tangling live-action model-sport-hobby weekend April 30 and May 1, 1988.

This is a logical expansion of the successful IMS/Pasadena show, and the Atlanta show featured over 130 manufacturers, wholesalers, distributors, etc. who came to show their model products and to meet the buying public.

IMS/Atlanta even featured the California Black Sheep Squadron's show team. About a dozen Black Sheep flew cross-country while five more drove the vans that brought their aircraft carrier and a tremendous variety of models. They featured two shows a day of U-Control electric scale models, sometimes two, three, or four in the circle at a time, and indoor R/C flying by the famous team of Tony and Addie Naccarato who flew their 24-ounce Farman Moustique in a figure "8" course around huge columns in the Georgia World Congress center exhibition hall. Impressive!

Over at the boat pond, sail boats, racing deep-vees, and others entertained the spectators. Of particular interest was a small R/C submarine that regularly submerged until just its antenna tip was above water. The sub featured a tiny horizontal prop on its bottom. When the prop ran, it drew the sub down to submerge. Clever!

The oversize car track featured gas-powered quarter-scale sprint cars that changed the lead every lap. As the Quadras started, the outside of the track filled with spectators to watch the fun. One of the cars later featured a sample of the Davis Diesel Soundmaster muffler—then you could really hear the drive system and some squealing tire noise. The electric cars rolled and spilled through the first turn until the

Sweet six-year-old Terri Maslen of Atlanta built this Delta Dart at the IMS show, and got to take it home along with a copy of Model Builder. Her dad is R/C modeler Don Maslen.

McDaniel R/C's Rhonda(left) and Hazel Sig-Hester try the Q-scale Ni-Starter for fit on the Lycoming in Hazel's full-size Spacewalker single-place plane on display along with the new 1/3-scale Sig Spacewalker model.

Among the exhibitors at IMS/Atlanta was Byron Originals. Design engineer Al Tuttle worked on the P-40 from Byron, which is being shipped to dealers at this moment.

Here's the feather-light R/C Farman on one of its spectacular indoor flights at IMS/Atlanta. Seeing is believing!

pack spread out. Rough and tumble fun!

There were lots of free flight hand-launched glider flying in the center circle. And it was really spectacular to see one of the world's greatest R/C military scale builders flying an all-balsa R.O.G. up to the rafters—this was Florida's Dave Platt. Bob Davis let his free-running Cox CO_2-powered prop/car get loose; it scooted all around the floor and under booths and curtains with Bob chasing after it, smiling all the time.

Best of Show was a giant scale R/C twin-engined OV-10 Bronco military aircraft brought from North Carolina. Competition for B.O.S. was fierce. Leon Kincaid from Florida displayed his newest R/C glider to first place (his Scooter is being kitted by Ace R/C). Atlanta's Tom Dixon displayed to first place his U-Control stunt model with a Magnum .40 customized engine. AMA's Jeff Troy won a silver bowl with his magnificent huge R/C Bleriot cross-channel flyer.

There were lighter-than-air balloons and blimps R/Cing all around the huge hall. Red Garlough came from California to run the swap shop. There were lots of bargains. Eck Calder was running two five-cylinder radials as well as a French flat four in that area. There were two full-size airplanes on display in the hall. There were big manufacturers and new fledgling cellar manufacturers showing for the first time. There were famous modeling people like Nat Polk, John C. Klotz, Eric Clutton, Ted Davey, Barbara Renaud, John Worth and Don Low and Dave Brown, Bob McDaniel, Al Tuttle, Tom Runge, Joe Bridi, Frank Tiano, Bill Northrop, World Engines and Indy and Tower and on, and on . . . they were there.

There were lots of real model bargains in the show's closing hours. Anybody who didn't bring hobby funds with them left kicking themselves!

Next year's Second Annual IMS/Atlanta model show is set for either April 29 and 30 or May 13 and 14, 1989, at the same Georgia World Congress Center, "D" or "E" hall downstairs. As they say in the South: Y'all come, ya' hear! •

This 25-[illegible] Farman Moustique made regular indoor R/C flights around the big hall's vertical [illegible] Addie Naccarato did flawless hand launches for son Tony who piloted.

Geor[illegible] George Perryman regularly flew this autogyro to the rafters. George is now model build[illegible] time since retiring from Lockheed's wind tunnel research division.

Geor[illegible] displays the classic free flight launch form for which he is famous: forward chin, re-leased [illegible] nique model with swept tips, and a gentle forward launch; aaaaah!

Meyers OTW-160

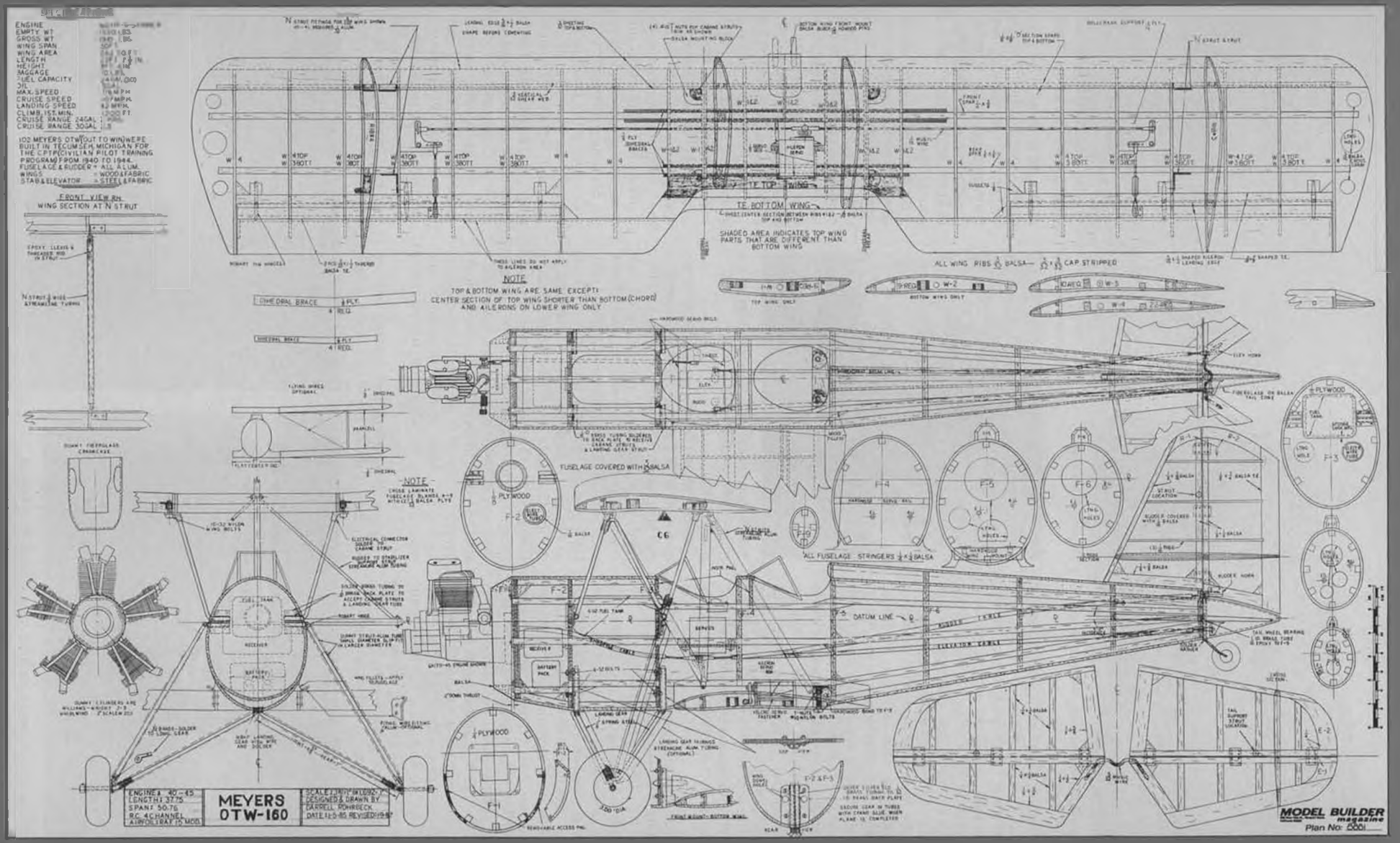
By DARRELL ROHRBECK. . .A desire to recreate in model form a favorite biplane once owned by the author led to this stunning model. Designed for a Saito 4-cycle, it performs flawlessly in the air.

• In 1946 I owned a full-size Meyers OTW-160 biplane. The license number of my plane was NC 26490. It was designed and built by Al Meyers at the Meyers Aircraft Company in Tecumseh, Michigan, in 1941. It was originally fitted with a 120 hp Ken Royce radial engine and was flown in the Civilian Pilot Training Program. This program was created by President Roosevelt in 1938 to train 20,000 college students to fly each year. The C.P.T.P. was instrumental in developing a cadre of pilots who would be needed in the coming war years. One hundred and two Meyers OTW biplanes were built for this program from 1938 to 1942. OTW stood for "Out To Win." After the war, the Meyers biplanes were sold to civilian flying schools, bought for crop dusting, and fitted with 225 hp engines. Some were used for glider towing and sport flying. Presently 55 of these aircraft are airworthy, and they have become expensive collectors' items. After the war NC 26490 was purchased by Doctor Hammel of Tecumseh, Michigan, who was a close friend of Al Meyers. The plane was taken back to the factory, fitted with a 160 hp R-5 Kinner five-cylinder engine, aluminum ailerons, landing gear fairings, and a new paint job. I purchased the plane in 1946, and it was sold in 1949. It was a beautiful-flying plane that cruised at 105 mph and landed at 45 mph. It could loop from straight and level and slow-fly with idle throttle without dropping a wing.

On July 4, 1986, I was asked to display my R/C scale model of the Meyers at a Meyers Fly-In in Tecumseh, Michigan. There were eight OTW biplanes there, and one of them was NC 26490—the plane I once owned but had not seen in 40 years!

My modeling career started at age 10 with rubber-powered free flight and continued into gas-powered free flight and gliders. I recall losing a Comet Zipper at an AMA-sanctioned Nationals contest at Ford Airport in Ypsilanti, Michigan, in 1943, when it thermalled out of sight. After a

Lifting off with the sun glinting on its chrome MonoKote surface, the Meyers OTW certainly must bring back memories for its owner/builder.



FULL-SIZE PLAN AVAILABLE—SEE PAGE 106

At the Detroit City Airport, 1946, the author's Meyers OTW sits awaiting its pilot.

The author poses with his full-size Meyers at the Detroit Airport.

hitch in the Army Air Corps, I continued to build and fly gas models. During that period of time, I had bought the Meyers OTW. On a few occasions, my models were strapped inside the fuselage of the Meyers, and I flew to out-of-state contests to compete. That was the best of both worlds.

I sold the Meyers and gave up modeling to go to college, race sailboats, ice boats, and hydroplanes. Also took time to get married, raise a family, and have a career with General Motors that lasted 33 years. When I retired in 1981, I decided to get back into model airplanes, and the state-of-the-art was radio control. I joined the Fraser R.C. Flying Club, built a Sig Cadet, and learned to fly it. The next project was a scratchbuilt Seamaster 40 designed by Ken Willard, followed by Carl Goldberg's Gentle Lady glider.

Now was the time to make a longtime dream come true—design and build an R/C model of my old Meyers OTW.

My efforts to obtain plans, three-view drawings, or accurate dimensions from various model magazines, model plans catalogs, the Smithsonian Institution, and Meyers Aircraft Company were mostly in vain. However, Walt Mooney had the plans published in a 1968 model magazine for a 15-inch, rubber-powered, almost-scale Meyers OTW. This enabled me to trace his three-view drawing that would be used to record dimensions later. It became apparent that this classic airplane has been virtually obscure to the modeling world, and the only way to obtain plans was to find a full-size plane, measure it, and draw the scale plans myself.

The author today, with his recreation of the full-size Meyers OTW-160.

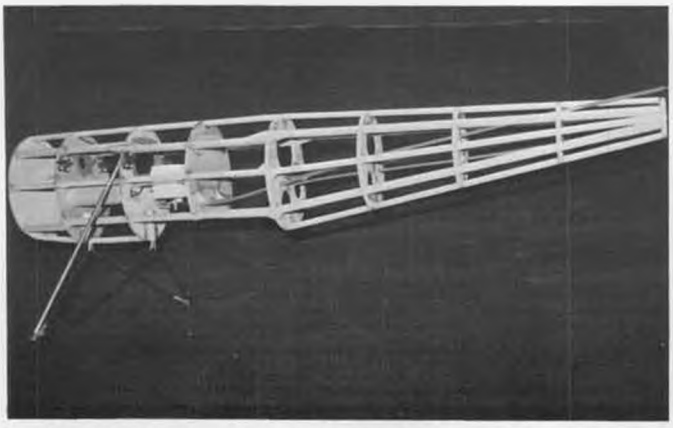
About fifteen years ago, I became acquainted with Everette Payette. Everette is the historian for Meyers Aircraft, an OTW pilot, and freelance photographer. He made it possible to measure and photograph an OTW-160 that was hangared near his home in Monroe, Michigan. With all dimensions and pictures I needed, I decided to make a .40-size scale drawing using a Saito .45 four-cycle engine. It looked more like a full-size Kinner engine cylinder than any of the other engines, and with a slight revision to four Williams scale model cylinders, I could make a neat five-cylinder look-alike. After some calculations and guesstimates, the wing span turned out to be 50-3/4 inches.

When completed, the drawing was exactly 9/64 scale, or 1-11/16 inches to the foot, with a lot of detail. First came the detailed dummy engine, then flying wires, followed by fairings, rib stitching, navigation lights, fairings, exact color scheme, etc. To date, the model has won four first- place trophies in sport scale class, and I chickened out about flying it.

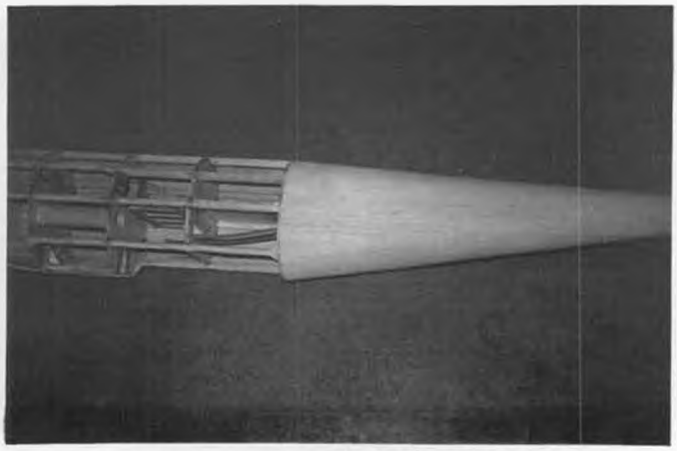
Back to the drawing board! I revised the drawing by eliminating some detail and designing a lighter structure—strictly a flying model! A few months later the second model was completed, and off to the flying field we went. The first takeoff was a ten float roll, and it flew just like the full-scale Meyers: just great, with all trims centered.

FUSELAGE CONSTRUCTION

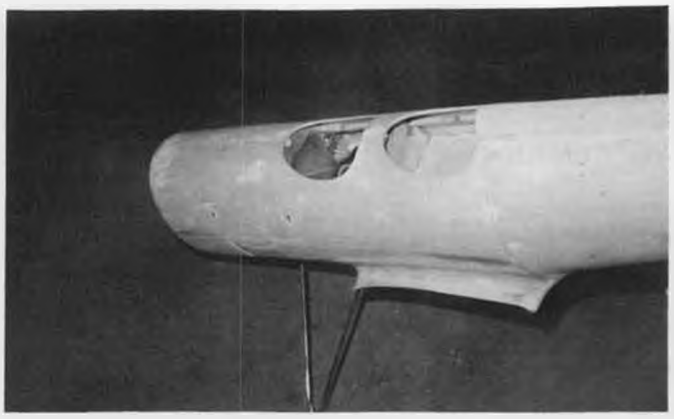
Making the bulkheads is the most time-consuming job in building the fuselage. To make this chore much easier, take the plans to a local print shop where they have a Xerox copy machine. By folding the plans in the right place, you can make copies of the bulkheads, wing ribs, dihedral braces, wing, elevator, and rudder tips. Make a couple extra copies from the first Xerox and you will save a lot of time tracing shapes from the original plan. The #1 bulkhead is 3/16 plywood, #2 and #3 bulkhead is 1/8 plywood, and #4 through 9 are 3/32 balsa plys, cross-laminated. Cut out the Xerox bulkheads and cement them to 3/32 balsa sheet with the grain either vertical or horizontal to the bulkhead vertical center line. Use a low-contact spray adhesive, and the paper template can be peeled off later. Cut out the balsa bulkheads leaving 1/16 inch outside the line. Do not cut out the notches for the stringers at this time. Lay the bulkheads on



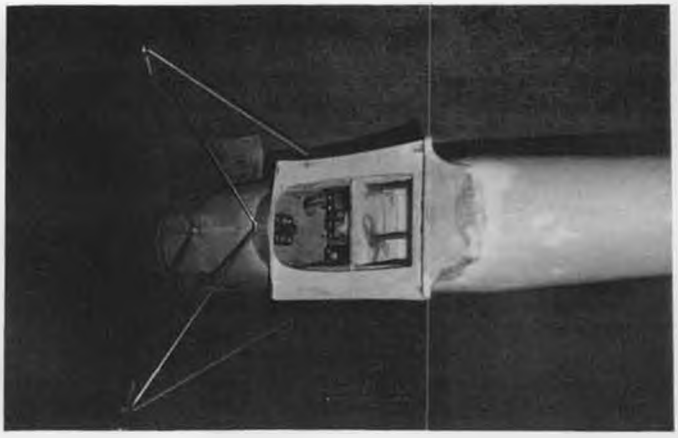
Fuselage framework shown with brass tube fittings that receive landing gear and cabane struts. Nyrod control tubes installed.



The rear half of the fuselage sheeted.

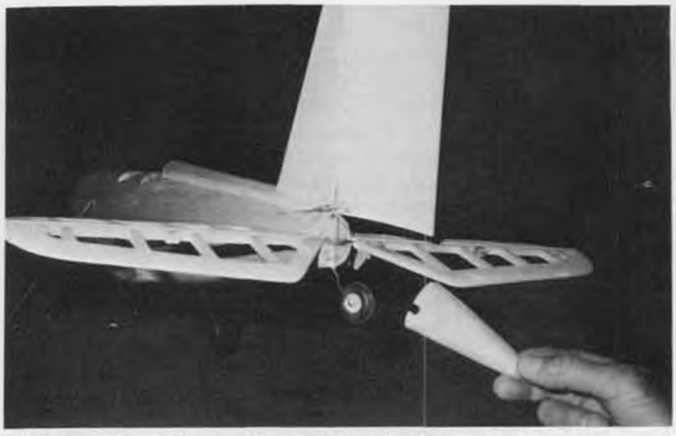


The fuel tank is removable from the front cockpit. Lower wing fillets and front access doors and headrest complete the fuselage.



Wing fillets can be fiberglass or shaped balsa. Servos are shown here.

The top wing can be accurately mounted by making simple jigs that hold it in place while the cabane and 'N' struts are fit.



Tail cone is bonded or screwed into place. Picture shows generous rudder area.

3/32-inch balsa sheet with the grain running in the opposite direction and draw a line around them.

Cut out the second laminates and cement them together except for F-5. Leave F-5 in two separate laminates. Drill two small bolt holes on the center lines of F-1 through F-5, stack and bolt them together, and sand to the line. This will insure straight line surfaces from F-1 to F-5.

Cut out and file the stringer notches, lightening holes, and wiring tube holes, then drill the control cable holes. Fit a six-ounce Sullivan fuel tank in bulkheads F-2 and F-3 and cement 1/8-inch foam all around the edge of the openings for a vibration-free mounting.

The next step is to silver solder 1/8-inch I.D. brass tubes to 1/32-inch brass plates, bond and bolt them to F-2 and F-3 to accept the cabane struts and the landing gear. Allow the tubes to extend 3/32 inch outside of the bulkhead line for sheeting thickness.

The fuselage is built as a front and rear assembly, and then the assemblies are bonded together. Let's build the rear half first. My method of construction was to cut the bulkheads F-6 through F-9 on the vertical center line, cut only one laminate of F-5. Pin the top and bottom longeron in place on the side view of the plans, allow extra length forward. Cement the left half bulkheads to the stringers in a vertical position. Cement the remaining stringers in place. Remove the partial assembly from the drawing and cement the right bulkhead halves to their respective "F" numbers, then cement the remaining stringers in place. Leave extra length forward on the top three stringers. (See Fig. 1.)

Now set the rear assembly aside, pin the right-hand center stringer to the plan, and position F-1, F-2, F-3, F-4 and the single F-5 laminate *vertically* in place with pins or square blocks. Position the opposite left side stringer and cement all the stringers to the bulkheads *except* F-1. The drawing shows two degrees downthrust and one degree right thrust. This can be done by positioning F-1 at the correct angle now or shimming the motor mount later. Your choice! Cement the top and bottom longerons in place. At this point, wet a piece of 1/16 balsa, roll it around the 1/2-inch diameter dowel to form a tube that is

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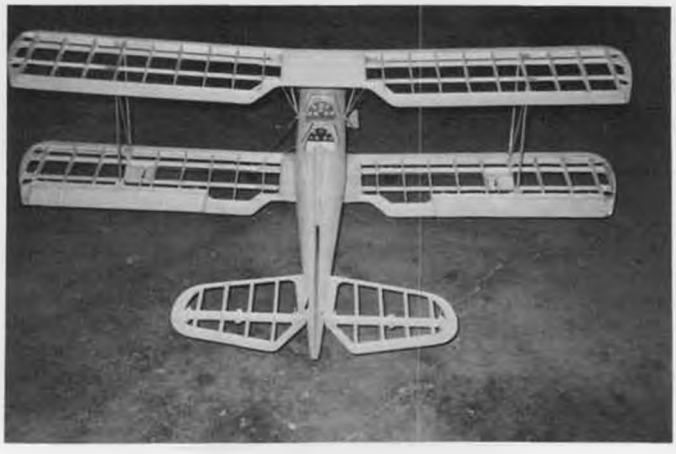
The dummy engine, cowl ring, cabane attachment to top wing, switch and charge plug, and landing gear installed.



The wings and tail structure are lightweight and simple.

BIG BIRDS

By AL ALMAN

• Nino Campano, Canada's most reputed chiropractor, turns out an informative, interesting, and entertaining newsletter called *The Glitch*. In the May/June 1988 issue, Dr. Nino points out that if you haven't been reading the recent Fox Manufacturing Company ads, you're probably missing out on some mighty good information. He writes:

"Years ago Duke Fox authored articles under the title, 'Dukes Mixture.' It was part of his advertising format. For business reasons Duke gave up the column. Last year it was reborn.

"The Duke's advice is as pertinent now as always, and with the flying season at hand, I publish two of his more timely pieces. Read and heed them before you leave home for your next flight." Space won't permit me to reprint the two articles, but all you've got to do is look through your last year's supply of model magazines (nobody throws out model mags; do they?) to find the ads Nino mentioned.

One of the articles explains how to get a good reliable idle and why your engine might not be up to snuff.

The other piece by Duke is about flight trimming your ship, and includes dandy info about prop selection which you might want to read over a few times.

I agree wholeheartedly with Nino that "Duke's Mixture" is welcomed back. Duke knows what he's talking about and lays it right on the line in simple, everyday language.

GETTING SMART

Because Hot Stuff has been a mainstay in my shop for years, I thought I was using it efficiently and effectively, but just the other day I realized that I was making things harder for myself in a few ways.

Although I like the economy of quarter-pound sized Super T and Special T, these bigger containers are stiff, unwieldy, and hard to get into small, tight places. Well, the obvious finally dawned on me: pour what I need from the four-ouncer into a handier and much more squeezable two-ounce bottle. Viva la difference!

And gluing in capstrips, certainly not one of my most favorite jobs, has suddenly become far less of a chore simply by using Hot Shot or Kick-It at the right time. I used to spray the accelerator on after laying the capstrip in place, which works okay but nowhere as well as spraying the capstrip before placing it on the glue-covered rib. This makes for an almost instant bond and eliminates having to hold the capstrip in place for any length of time.

Also, in order to ensure that capstrips end up reasonably centered on their respective ribs, I first make small reference marks on the edge of both the leading and trailing edge sheeting to indicate where the ribs lie.

1/6-SCALE OS2U KINGFISHER

Doug MacBrien (24 Truby Street, Granby, Massachusetts 01033), whose plans for his 86-inch Druine Turbulent, Dalotel, and Kingfisher are first-class, finished testing his new 72-inch Kingfisher and now has these plans available also.

Here's how Doug described the test-flying:

"I've been waiting till I had something to tell you about the new Kingfisher. Finally, the weather cooperated and I got in three flights yesterday off the water.

"Conditions were really super; dead calm, sunny skies, and the temperature about 60 degrees. The model was prepared, the Zenoah G-23 started, and after a bit of taxiing around I gave her full throttle and away she went.

"After about 100 yards I first lifted her off at a steep angle, but then lowered the nose and let her accelerate (that takeoff could have been done better). Anyway, the trim was almost perfect and, except for having a little less power-to-weight than the bigger Kingfisher, she performed just as well . . .with no problems whatsoever.

"I was a bit conservative on that first flight, but after the second takeoff I did loops, Immelmans, snap rolls, slow rolls, and even inverted flight and spins. My friend, Andy Zitnay, recorded it all with a Camcorder, except for the first takeoff which he missed (I don't know if you've ever used one of these machines, but with the telephoto in operation it's pretty easy to 'lose' it).

"This bird is finished in the colors of the

Here's what a typical BIG Bird fly-in looks like. The spectators just love to see those big planes fly!

It's kind of hard to tell that this semi-scale P-6E was originally an Ace 4-120 Bipe kit. Great work by John Riggs.

Doug MacBrien with his 1/6-scale Kingfisher. Zenoah G-23 powered, the plane handles well on water and is quite aerobatic.

Fleet Commander aboard the battleship Pennsylvania in October 1940; top of the wings yellow (silver undersides), silver tail and floats, and dark blue fuse. She's highly visible in flight.

"You can see the cables connecting the water rudder (even with the TE of the wing) via nylon tubing; this worked beautifully. On this model I made the hinges concealed so the flight controls are more responsive (less gap) and the ailerons are very effective when taxiing at a fairly high speed (you can make very sharp turns on calm water by holding ailerons along with rudder). Great fun!

"I've made the tip struts out of 3/16 x 3/8 spruce, and they're much tougher. Aldo designed a practical *sliding* canopy. Incidentally, the sheeted surfaces are all covered with Sig Koverall, using Balsarite, five coats of thinned nitrate dope, Super Poxy Primer, then HobbyPoxy paint sprayed with a Binks touch-up gun. This is the system I learned from the letter in your column last year; it works great!

"The G-23 turns a 16 x 8 Dynathrust at 7250 rpm. It's been run about two hours by now, and the plug is very clean; I've been using the Aero Tech 2 Oil mixed at twice the usual ratio for break-in.

"As I promised, the new plans package has all new photographs, the instruction book is completely rewritten (20 pages, single spaced) with a consolidated materials list (thank God for my computer and word processing!), and the plans are all redone at the new scale. Price is $50, complete with LG springs and shipping. T&D Fiberglass has been making cowls, front canopy, and tip floats for the BIG Kingfisher for some time and will be making at least the cowl and front canopy for this new sixth-scale version.

"I think the emphasis you're putting on noise abatement is very appropriate. We're lucky to have a field in the flood-plain where nobody can build a house, but most fields get closed just because of the noise." I haven't seen these new Kingfisher plans yet, but MacBrien does outstanding work, so these should be on a par with his other drawings.

This six-foot, "Not-So-Scale" OS2U Kingfisher is aerobatic, and the special shock-absorbing landing gear springs, 20-page in-

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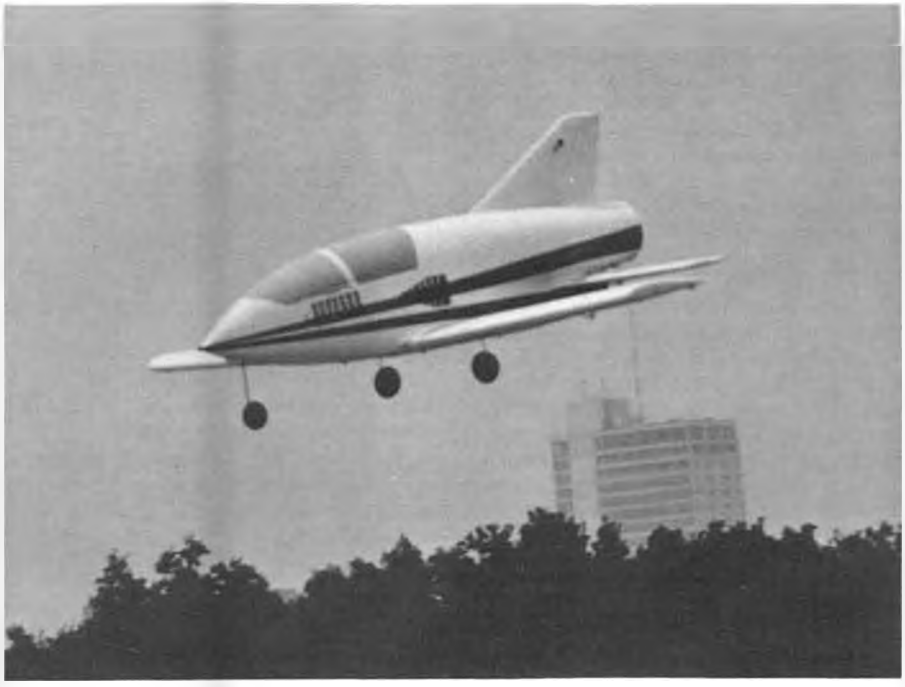
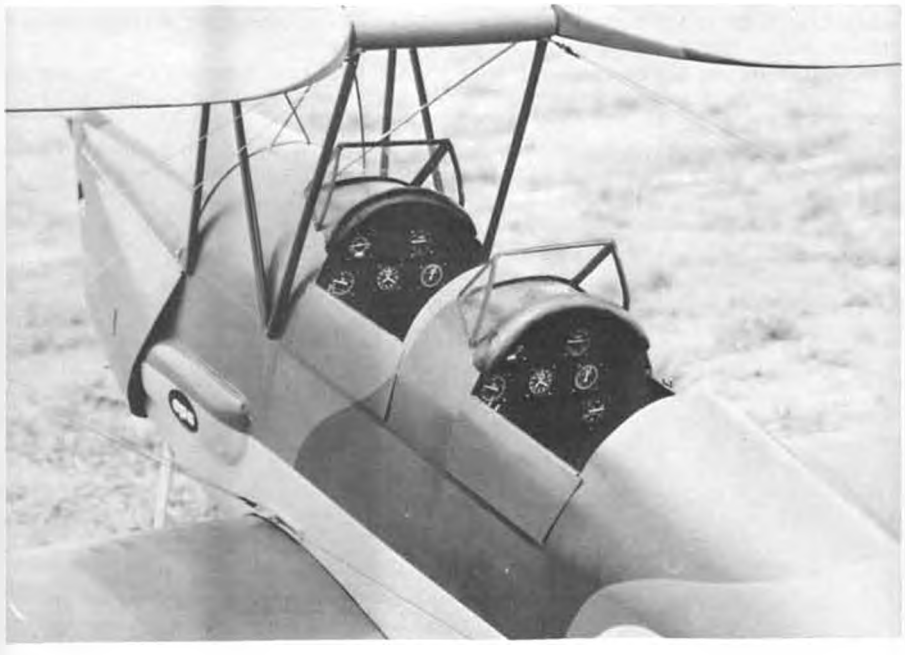


Faster than a speeding bullet, or at least it seemed that way, was Jim Barrett's BD-5 powered by a Byron fan and an OPS .65.



Cockpit detail on the big Gypsy Moth built by Charles Pumilia. Model is 1/3 scale and weighs 24 pounds.

CHOPPER CHATTER

BY DICK GROSSMAN

• This month's column is a test report on the Airtronics Spectra helicopter radio and gyro; the O.S. Max 61 H ringed, side exhaust, long-stroke engine; and a flight test of the Miniature Aircraft USA X-Cell 60 helicopter. As you might have surmised, the reason all these products are combined in one review is that they're combined in *one helicopter.* I'll admit that testing three new products at the same time isn't very scientific. Fortunately, there *is* something old and reliable involved in this test—*me.*

AIRTRONICS SPECTRA RADIO

If you think that the Module 7H radio was Airtronics first entry into the helicopter field, you haven't been around long enough. Truth is, they were one of the pioneers with two helicopter radios in the early eighties before inexplicably dropping out for a couple years. When they came back, they came back strong with that Module 7H; and now they have the PCM Spectra *and* a new FAI competition model, the Quantum.

In recent years, the big three of the model radio field have been Futaba, J.R., *and* Airtronics. There's good reason that Airtronics has regained its popularity among helicopter enthusiasts. The name and reputation never really diminished because Airtronics stayed very strong in the sport airplane, boat, and car fields. But equally important is that Airtronics recognized the top priority of the helicopter flier; namely that nothing is more important than the *servos.* To that end they made their very best servo, the 741, *standard,* and then included *five* with each helicopter radio. These coreless, ball bearing servos were so good that fliers with other brands of radios were buying Airtronics servos and changing the connectors. That's the truth. Now they have an even better (and more expensive) servo, the 735, which they designate their "contest" servo. Statistics-wise they are very impressive, but it's hard to measure *reliability.* So, I'm just going with past performance, trusting my brand-new X-Cell helicopter to these servos.

Author hovers with rich fuel mixture to break in engine.

X-Cell 60's unpainted part of canopy shows fuel tank(arrow).

Now, what about the radio itself? The transmitter has an external plug-in RF module for changing frequencies. The gimbals are adjustable for length and tension. The receiver is an eight-channel dual conversion PCM narrow band receiver. Being eight channels leads me to believe it's the same receiver they're using for the Quantum. Airtronics has made no claims that this receiver will meet all the requirements for 1991, but I hope you don't think that all the radios that *claim* to meet 1991 requirements, really do. The truth is that no one knows for sure what will and what won't. While the Spectra is certainly suitable for a beginner, the very proficient flier will benefit most from many of the optional features. Very similar in appearance to the Module 7, the Spectra is different in many respects. One is that it operates on Pulse Code Modulation (PCM), the first Airtronics radio to do so. Since then, Airtronics has come out with another PCM radio, the Quantum, which appears to me to have been designed specifically for FAI competition in time for the 1989 World Championships. The Spectra retains some advantages over the more expensive Quantum, most significant of which is inverted flight capability.

Here are some of the things I like best about the Spectra:

—A removable modular transmitter battery. PCM radios have a notoriously high transmitter battery drain. With a spare transmitter battery module in your flight box, you don't need a field charger to fly all day.

—A hinged flip-up cover on the *front* of the transmitter makes it easy to make transmitter pot adjustments with:

—The little screwdriver with holder that mounts on the transmitter handle.

—A *loud* low-battery signal (one you can *hear* over the engine noise while you're flying).

—Three bright LEDs that flash, indicating

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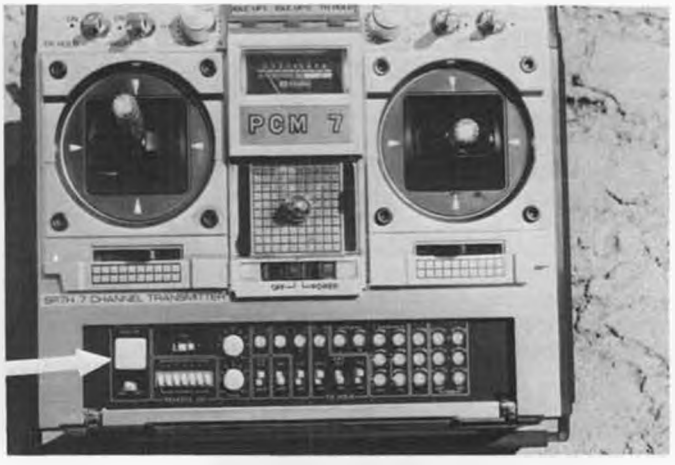
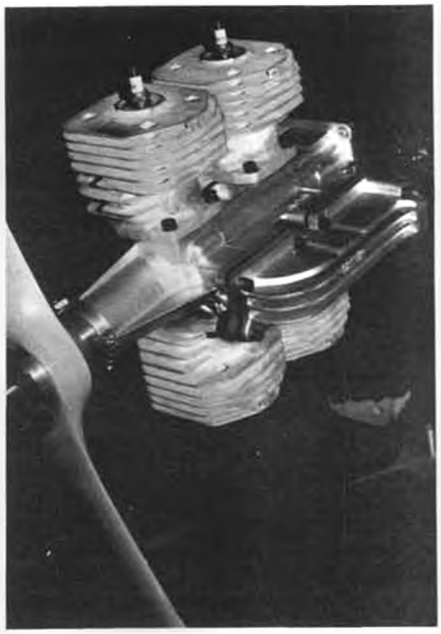
Three-position switch for Idle Up 1, Idle Up 2, and Normal.



Front panel lowered to reveal trimmer dials and fail-safe button, shown by arrow.

European Scene

BY CEES KAIJIM



Seen at Modelbau '88, Dortmund, Germany, was this SW-240B, a four-cylinder two-stroke that goes for about $2200. . . .

• The tenth edition of what must have become Europe's largest modeling exposition, "Modellbau '88" at Dortmund in the Federal Republic of Germany, drew a record number of visitors in the five days the show was on. Just over a 100,000 visitors, modeling enthusiasts not only from Germany but also from many of the neighboring countries, passed the entrances of the vast Westfalen Halls. Inside literally thousands of models, most of them R/C airplanes, helicopters, boats, cars, and trucks, were waiting for their eager eyes. Apart from those beautiful models, most of the smaller German manufacturers were present and many of them sell directly to the public. Hobby shop owners from all over Germany also hire space and do quite a lot of business, mostly at "special" prices. Visiting modelers have the opportunity to buy anything, from a bottle of glue to a big-scale model and from a tiny Cox engine to a 14 cu. in. four-cylinder powerhouse.

What? Yes, indeed, a 14 cu. in. four-cylinder two-stroke that delivers approximately 18 hp. It's made in Germany by a company named "3W"; the full name of the engine is 3W-240B. This company, which started only a few years ago, also produces a 9.6 cu. in. four-cylinder, a 4.8 and a 5.3 twin, and a number of single-cylinder engines. Price, at the current rate of the dollar, is approximately $2200! All engines have electronic ignition with electronically retarded timing at lower revs.

The "Super Flying Man" uses quite a different engine for its propulsion, a .10 glow engine. In fact, it's an R/C parachutist with the propulsion unit on its back, thus able to fly around as long as the two-ounce tank allows.

Staying with engines for a while, the largest I saw was a 400cc (approximately 24 cu. in.) motorcycle engine, complete with its six-speed gearbox. It is used as the source of power for a sailplane winch and installed permanently in a small trailer. There won't be many model sailplanes that this hp winch can't get into the air!

An unusual model was that of a French airliner. It's the "Ciore et Olivier 213," built

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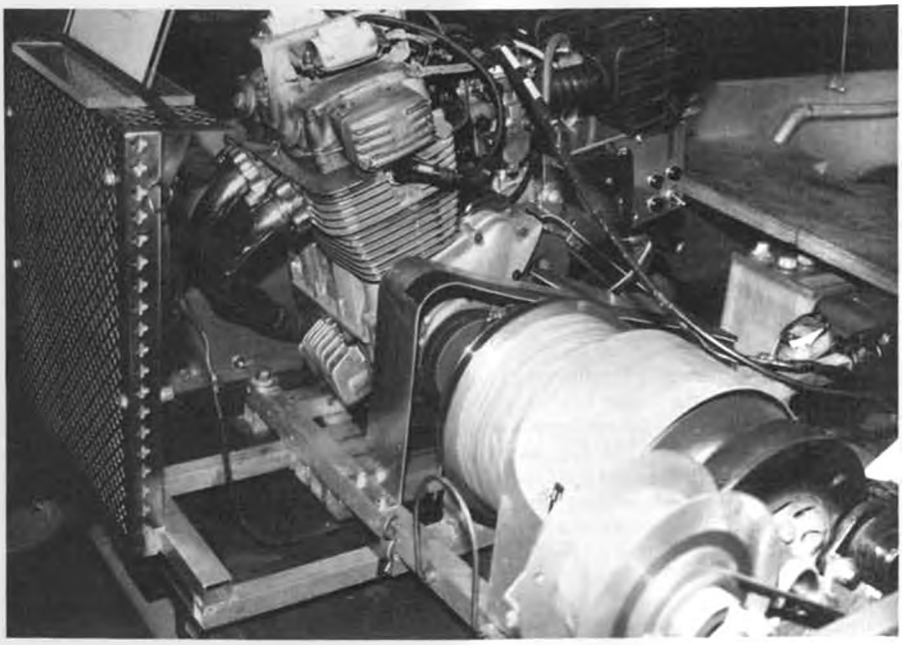
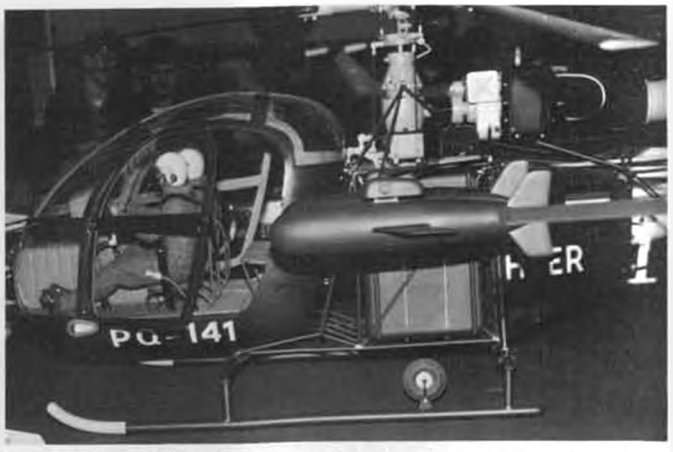
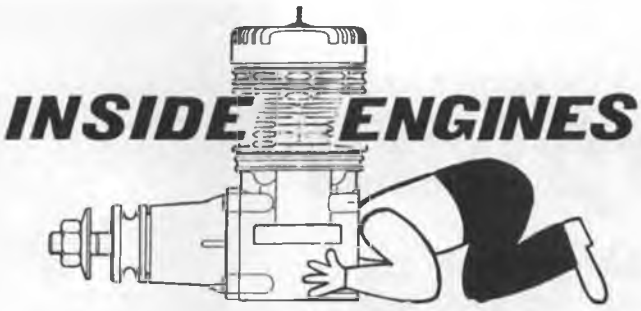


This 40 hp Yamaha 400 motorcycle engine powers a sailplane winch, and takes a model to 700 feet and retrieves the line within two minutes. It even uses the six-speed gearbox!

On display at Dortmund, this Ciore et Olivier 213 scale biplane flys on two ST 2500 engines, and has working interior lights.



Built by Peter Wahl in 3500 hours, including the manufacture of the 5.6 cu. in. engine, this stunning Alouette II has a rotor diameter of 11 feet!



WITH **STU RICHMOND**

Super Tigre's G-40 & G-49

• The purpose of the "Inside Engines" column is to give you a close and rather detailed lo-tech to medium-tech look inside the new and currently available medium- to high-tech engines now in the USA marketplace. The column points out new features and neat new ideas that the makers design into their newest products; engines that can be bought *today* for our models. The column is expected to often be a guide to help you choose the engine that best fits your flying needs as well as your hobby budget. 'Inside Engines" presents quantitative performance figures to further aid your judgment in buying. As explained earlier, many different factors affect model engine performance, but the single best criterion is the *speed range* a given engine will turn a given propeller; the ratio of high rpm to low rpm when the engine is R/C carburetor-equipped. Non-throttled engines naturally will be evaluated only on maximum performance with given props.

My two model-building sons and I get more flying time and pleasure from Super Tigre engines than all other brands. Besides pylon racing with the Super Tigre X-40 (my sons hold the world FAI R/C pylon fast time), Bruce sport flies and tests radios in a S.T. S-25-powered low winger; Brian sport flies with S.T. S-40 engines in a low winger and an amphibian. I use an S-40 for sport and pylon race with a Como .40 made in the Super Tigre factory. So with great enthusiasm I welcomed a chance to inspect the new Super Tigre G-40 and G-49 low-cost Sport series of engines. These engines are specifically made to compete with the current series of .40- to .50-size R/C engines from other manufacturers.

In a recent discussion with AMA's Don Lowe, John Worth, and Dave Brown, I heard John say he thought fewer than 10 percent of the AMA members fly competitively. So it makes a lot of sense to *not* be glued to contest displacement sizes like .20, .40, and .61 cubic inch limits.

The most sure way to increase model engine top end performance is to simply increase displacement; increase the diameter of the piston and/or increase the up and down distance the piston travels. In short, to increase power, add cubes! This month's pair of externally identical R/C engines have had a 25-percent displacement increase in the newer .49 size. Let's look at these engines.

Romauldo Garofali wrote from the Super Tigre factory and said in his letter before the G-40 arrived for testing: "We fit one ball race, bronze bushings on con rod, supply the new swinging muffler, and the glow plug is included. Even though we produce this as our economical engine, you will notice features that are absolutely uncommon on the cheap engine market." Two-dimension art doesn't turn me on much compared to three-dimension art like Winged Victory and most model engines. These new Super Tigre engines feature a sculptured look in the crankcase webbing, and, like their new 2000 series of big engines, additional rakish finning is cast into the cooling fins behind the cylinder as well as into the cylinder head. The cylinder head and rear of the cylinder is where greatest heat dissipation is needed. The crankcase casting has been glass bead shot to further enhance cooling by increasing surface area (looks nice too).

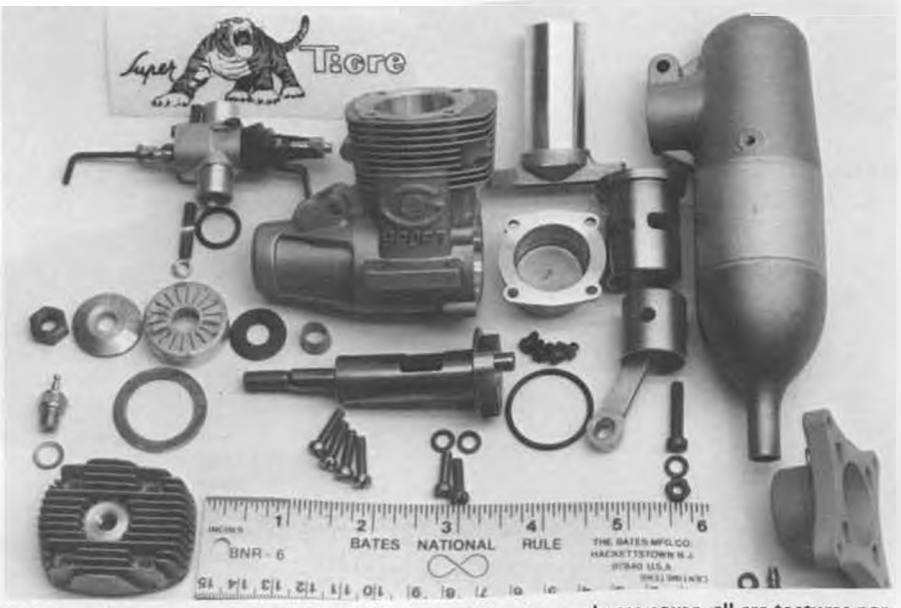
Let's look inside the G-40. The cylinder bore measures .800 inches at the top and .805 inches at the bottom inside diameters, showing modern pronounced taper. Taper maximizes the piston/cylinder seal when combustion starts and allows the piston freer low-drag travel at bottom dead center. The cylinder's weight is 37 grams (28 = 1 ounce), and wall thickness averages .070 inches. All three intake ports are inclined upwards as they are cut into the cylinder (modern Schnuerle design). The piston is of cast aluminum, .805 inches high with no skirt reliefs, and is honed to fit the steel cylinder. The cross-hatched honing marks are a fine aid in holding lubrication between the piston/cylinder, and these marks were still plenty visible after break-in, testing, and even after an hour's test flying. The wrist pin is held in place with a wire retaining clip at each end, as is common with other Tigre engines. The connecting rod's top and bottom sockets are bushed, and the lower socket has twin lube holes drilled. The total weight of the piston, rod, wrist pin, and dual clips is 14 grams. No piston ring is used.

The crankshaft has a .580-inch outside diameter. The shaft's fuel/air intake window is .390 inches wide and .500 inches long, and the passageway through the shaft has a .395-inch inside diameter. The shaft is nickel-plated. The carburetor's inside throat diameter measures .290 inches. This may be an "economy" engine, but the carb shows no shortcuts, and it even includes the new black neoprene boot that keeps its barrel clean as it rotates/moves in/out of the main carb casting through speed changes. The G-40's .290-inch throat compares with .330-inch throat diameter on the highly successful Super Tigre S-40. No, the S-40's bigger carb won't fit this new G-40 Sport crankcase casting. And there's not enough metal left in the casting to bore it out either. If you want S-40 performance, that's the engine you'll have to buy at a higher price to get higher performance! The new swing muffler is a better idea for easy mounting. I per-

Super Tigre G-40 and G-49 Sport R/C engines are low cost products from a factory known for making high performance engines.

The engines have identical outward appearances, and have either "40" or "49" embossed above the word Sport. The G-40 is better-suited for the novice R/Cer as performance figures show a slower idle.

Single ball bearing takes the major running load and serves as a thrust washer too. Main purpose of the rear ball bearing is to precisely hold rear of crankshaft so each stroke is identical in timing.



Nickel plating, glass bead-shot finish, "O" ring seal for the crankcase cover, all are features normally found on more expensive engines, and all are found on the G-Sport Super Tigres.

sonally feel the days of cast aluminum mufflers are numbered. Sheet metal and composites are coming fast and bringing quietude as in our automobiles. The G-40's muffler outlet has a .300-inch inside diameter. The same muffler is supplied with the G-49, and it proved quite restrictive, as the figures show.

At first I thought the restriction in rpm might have come from having the muffler as close as possible to the engine, but moving the muffler out to the end of the round adapter pipe made no measurable difference on the tachometer. If you study the performance figures, you'll see why I was *very* curious to investigate the new Soundmaster muffler sold by Davis Diesel Development, P. O. Box 141, Milford, Connecticut 06460. The Soundmaster SM-S with A1 adapter arrived in time for testing on the G-49, which suffered some performance beyond minimal with its cast aluminum muffler. In all cases of test props, the Soundmaster gave a boost/increase from the standard Super Tigre muffler performance to the high end figures, with better idle with the 9- and 9-1/2-inch diameter props as an added bonus. The Soundmaster was more

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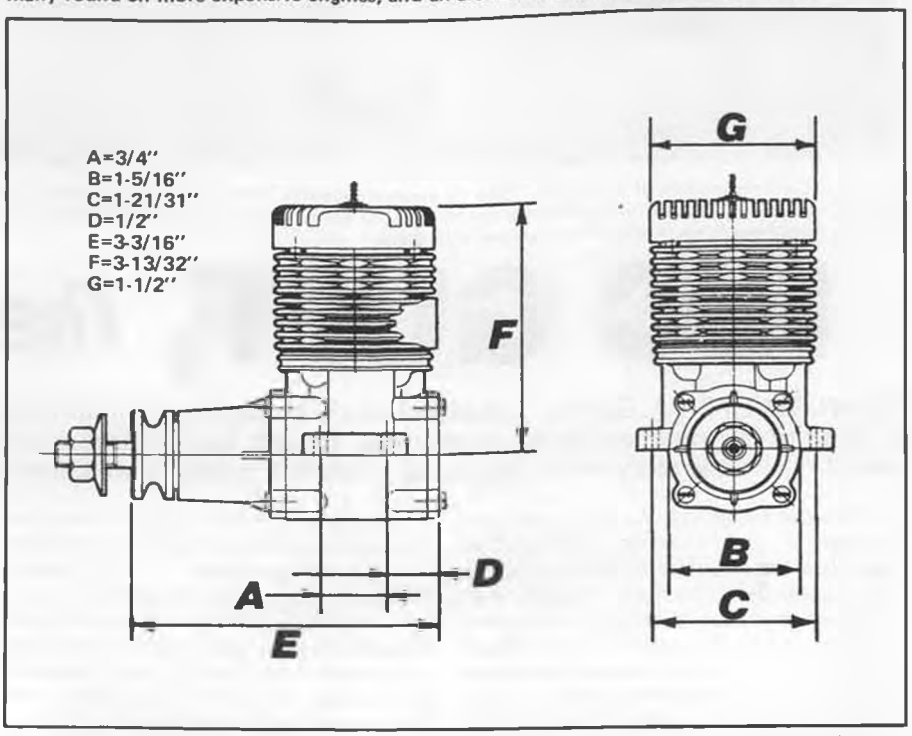
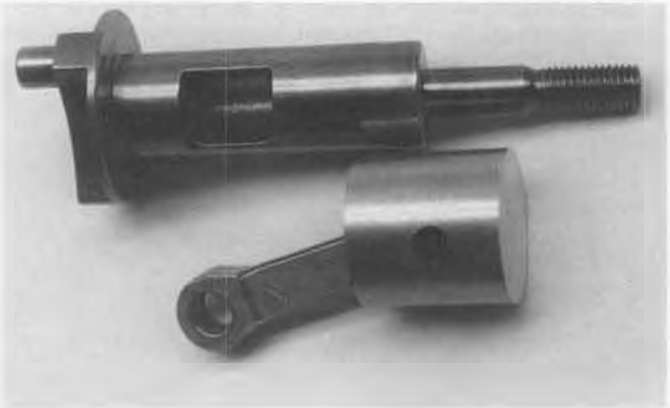


Generic engine is shown above. Dimensions are identical for both Super Tigre G-40 and G-49 Sport engines.



The crank is hard nickel plated to minimize wear as it rides in its front bronze bushing. Piston and connecting rod assembly only weighs one-half ounce. Both engines ran smoothly.

The front bushing has a spiral lube track cut into its inner surface. A small lube sump is also cast just behind the bushing.

The R/C Guff during one of the classic "One tip assisted takeoffs," this one being at its last contest, the 1947 Nats near Minneapolis, Minnesota. Walt is launching, Bill(behind Walt) at the controls. After breaking a tie with Jim Walker, the Goods were awarded the coveted Roberts Trophy for the third time, thus retiring it permanently to them.

R/C GUFF, *The Life Story*

By DR. WALTER A. GOOD. . .The life history of the most famous R/C aircraft of all time, from its beginning in 1935 to its retirement in the Smithsonian Air and Space Museum in 1960, where it continues to be on display. It's also the story of the beginning of the R/C hobby as we know it today. Part One of a series.

• *With the exception of a very small percentage of today's active radio control modelers, the actual heart of the hobby, the radio control system itself, is pretty well taken for granted. . .you buy the complete package in one box, take it home, plug in and connect the charger (or stick in a dozen AA pencells) and everything works. . . right out of the box. . . or even still in it. . . Murphy's law being about the only problem.*

Fifty years ago, in the middle 30s, radio control was a term understood by only a few, about as familiar to the average individual as television was at the time. People maybe read about television (it didn't even have the nickname "TV" back then) in Popular Science, *and occasionally saw a fictional movie about the future in which live pictures were transmitted by radio into a mysterious box, mostly the figment of some movie producer's imagination. And radio control was something strictly out of* Buck Rogers, *and limited to full-scale aircraft or land and sea vessels.*

After World War II, and even after license-free Citizen's Band was established in 1953, radio control modeling was something only available to the electronically inclined experimenter. Modelers bought parts here and there, mostly in radio parts supply stores, traded circuit ideas through the mail or followed occasional articles in the model magazines, built their own transmitters, receivers, and actuators, used gas tubes (no transistors around), big heavy dry cell batteries (no rechargeable nickel-cadmium cells existed), wound their own tuning coils, etc., everything from scratch.

The continuing series that begins in this

Photo 1.

Photo 2.

Photo 3.

Photo 4.

Photo 5.

Photo 7.

Photo 6.

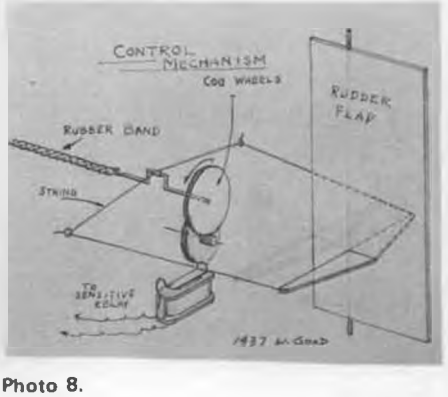


Photo 8.

issue is about the two Good brothers, exact twins Walt and Bill, who were a part of that small pioneering group that experimented, developed, and flew workable radio controlled model aircraft back in the mid-1930s. Ironically, even though it is a fact that they were not the first, the Good brothers could be in many ways compared to the Wright brothers (who also may not have been the first), because in their field, they were the ones who made the news, who captured the attention of the uninitiated public, and who lead the way so others, and eventually anyone, could share the satisfaction and the excitement of remotely controlling a model aircraft, car, boat, robot, or anything else one could care to operate by radio.

This series came out of a conversation we had with Walt Good (with whom we first became acquainted in the mid-1950s), during the 1986 AMA Nationals in the nation's Number One Open Sauna, Lake Charles, Louisiana. We had been watching a modeler clean up and put away his version of Walt's and Bill's historic R/C Guff, somewhat modified and much heavier than the original. The conversation led to an agreement to publish the R/C Guff in Model Builder, *pretty much following the original article in* Air Trails *magazine, and with accurate reproduction of the original plans, to be made available as full-size prints to the modeling public.*

Part of the agreement was that Walt would provide some historic background on the model, along with a few original photos, to dress up the article. Well . . . ! Give a modeler an inch and he'll take a mile, and in this case we will all *benefit! When Walt started digging into his personal photo archives, he came up with an amazing number of fascinating and historic photos, nearly all of which have never been published, and each one helped him to recall bits of history that even he had long forgotten!*

So. . .What started out as a single article featuring the construction of the original R/C Guff, will now be a series of articles taking several months, and featuring a photo/history of the R/C Guff, from its beginning as a modified KG free flight model (with R/C in mind) to its final resting place, as a part of aviation history, on display in the Smithsonian National Air and Space Museum, Washington, DC. The last installment (maybe two) in the series will indeed be the construction article, with plans especially prepared by old timer model and ignition engine conversion expert, Phil Bernhardt. We know you're gonna enjoy it.—wcn

Presented here and in following issues is the story of the ups and downs of one of the first successful radio-controlled model airplanes in the USA.

The story begins in 1935 with a free flight gasoline engine powered model plane which is converted into an R/C model over several years of mixed successes and then proceeds to win four National Championships. Much of the early effort was during the pre-WWII Depression, so only a minimum of expenditure was available.

Photo 10.

Photo 11.

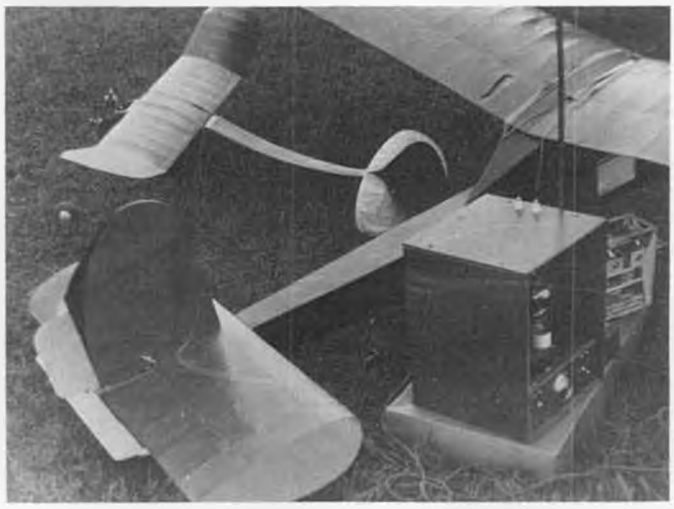


Photo 9.

Bill and I lived in Kalamazoo, Michigan, attended Kalamazoo College, and graduated in 1937 with degrees in Physics. We then went on to graduate schools for our PhDs. Bill's hobby was amateur radio and mine was model planes. So we combined our two hobbies to try to develop a working R/C model plane.

The photographs and the descriptions will lead the reader through our trials and tribulations.

PHOTO 1

My first gas model was started in June 1935 and followed the well-known Kovel/Grant KG-1 free flight design with only a few modifications. (*Plans for the original KG are available from John Pond Old Time Plan Service. wcn*)

Here, in the photo, the structures are ready for covering with sheet balsa and bamboo paper. The antennas are already installed in the wing for future R/C! Neighborhood kids take a careful look.

PHOTO 2

Later in 1935. The first test glide without motor. . . just ballast in the nose.

PHOTO 3

The KG, doped and ready to fly as a free flight gas model with Brown Jr. engine and homemade propeller. Its weight was 5-1/2 pounds; and with 10 sq. ft. of wing area, it was a floater! The wing has an 8-foot span, 15-inch chord. The body was 6 feet long.

PHOTO 4

At the 1936 Detroit AMA Nats, flown in F/F Gas, it placed 36th out of 97 entries on a time of 4 minutes, 58 seconds! Note that a cabin has replaced the original wire "bird cage" wing mount to be ready to enclose future R/C gear.

The model was entered in several 1936 F/F meets. There were also many practice and trim flights. One flight went for 48 minutes, disappearing into a cumulus cloud. It finally came out over the edge of the cloud and landed in a field a mile from the takeoff! Big thrill!

PHOTO 5

It is now 1937, and we are seen with our first R/C receiver and the KG plane adapted for R/C rudder control. The one-tube receiver, relay, and batteries were mounted in the balsa cage. Radio gear was developed by Bill in the Kalamazoo College Physics

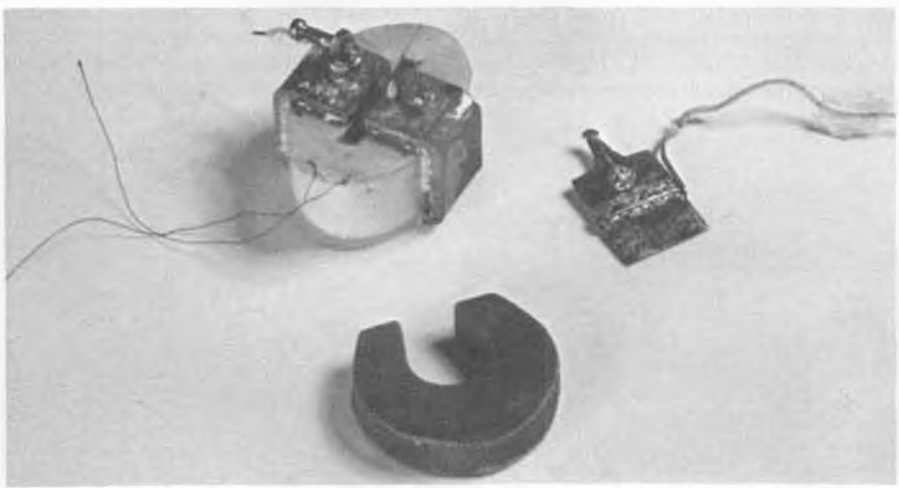


Photo 12.

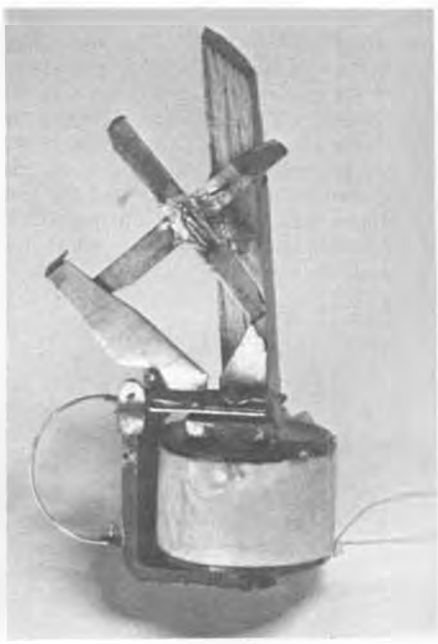


Photo 13.

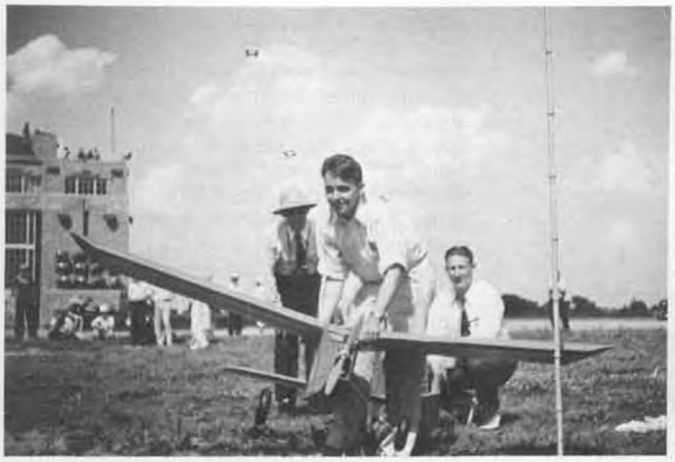


Photo 15.

Photo 14.

Photo 16.

Lab while I made the sensitive relay and rudder mechanism.

The first six R/C flights were made at Kalamazoo airport in May 1937. Most flights were made at dawn, so we could get back to 8:00 a.m. college classes. Airport manager Irv Woodhams said it was okay to use the airport as long as we had R/C. He was more of an optimist than we were! This was to be the site of hundreds of our R/C flights over

Photo 17.

the next four years, sometimes with active light planes on the other runway!

SKETCH 6

This is the rudder control mechanism used in the May 1937 flights. A steady signal allowed the rubber band to turn gears, thus moving rudder until signal was turned off. Then the rudder remained in its last position. It worked, but then the plane turned very slowly, thank goodness!

PHOTO 7

In early June of 1937 I added an elevator mechanism while Bill made another receiver and modified the transmitter to work on two frequencies; one on 56 MHz for rudder, and the other on 60 MHz for elevator. These were in the five-meter Ham band. We reasoned that it would take both to win the first R/C Nats at Detroit. That assumption turned out to be wrong!

Photo 18.

Six practice flights were made in June with both controls. They worked, but we found that the rudder was the important control; the elevator would be used only in an emergency.

PHOTO 8

On the road to the 1937 Detroit Nats; a

Continued on page 101

Photo 19.

Photo 20.

ALL ABOUT ARFS

By ART STEINBERG

• Until the advent of World War II there was no problem in obtaining balsa wood. Balsa is so called because it is derived from the Spanish word for *raft*. It was given this name because for centuries the people living in certain tropical climates have used these buoyant logs for constructing floating platforms. While the greatest producer of balsa is Ecuador, it is also exported from Costa Rica. It is found growing from the southern part of Mexico to northern Venezuela and along the western coast of South America as far south as Bolivia.

Though employed extensively in model building, this use represents only a small fraction of the consumption of balsa. When World War II broke out, balsa was in use not only for life rafts and buoys, but also for insulation and packing of delicate parts and tools. Balsa quickly became scarce on the open market, and a substitute was soon developed, a material we know today as expanded polystyrene foam. EPS foam is manufactured in a two-stage process from expandable polystyrene beads. In the first stage, these small spheres are subjected to high-temperature steam, causing the incorporated blowing agent to volatize and the individual beads to expand. This material is allowed to stabilize and is then fed into a large closed mold. Steam is reintroduced causing a secondary expansion that fuses the beads into a homogeneous block of expanded polystyrene. These blocks are then shipped to manufacturers and distributors in standard lengths of 8 to 24 feet.

Today EPS has become very important in the model building field and is used to a great extent in kit-built, scratchbuilt, and ARF aircraft. EPS possesses certain qualities of interest to modelers, and these encompass the following:

Light Weight. EPS is manufactured in different densities, ranging from 1.0 to 3.0 pounds per cubic foot. However, most EPS used in model aircraft is about 1.0 PCF, comparing quite favorably with the density of balsa.

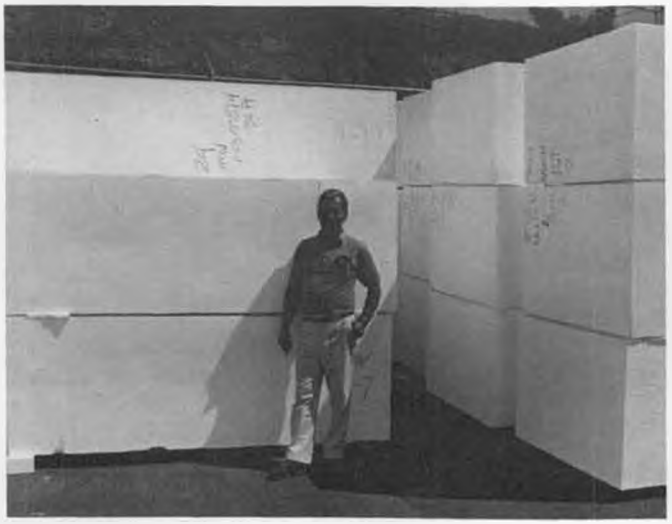
Fuelproof. Methanol-based fuels used by modern glow engines do not have any significantly harmful effect on EPS, but any petroleum-based fuel such as gasoline will dissolve foam quite readily. However, after continued exposure to methanol, EPS does tend to absorb raw fuel and exhaust residues, and this should be avoided by applying some form of protective coating, a subject we will expand upon later.

Bondability. Certain glues and cements work very well with EPS, and these include all water-based furniture-type glues which are commonly referred to as "white glues." Epoxy glues also are suitable for use with foam, but care must be exercised to avoid weight build-up, as these glues tend to be heavy. A number of contact cements work well with foam, but always try a test on some scrap material, as some brands may be destructive. Among those adhesives which should not be used directly on foam are cyanoacrylates and all cements containing acetone, this latter group including old-fashioned model airplane glue which usually comes in tubes. Never apply polyester resin to foam. This is a material which is commonly used in conjunction with fiberglass cloth. Any foam coming into contact with this resin will melt and disappear before your eyes.

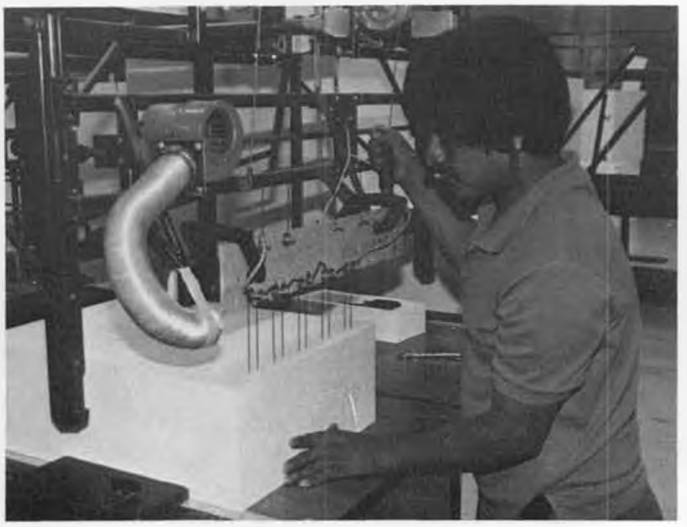
Paintability. Foam can easily be covered with a variety of common paints. Epoxy

Continued on page 96

K-Bee's solid foam Supermarine Spitfire looking as though it has just been rolled out of the hangar. This month's column has an in-depth look at this ARF model.



John LaPointe of Star-Foam Company is dwarfed by blocks of polystyrene foam ready for processing.



A worker operates the industrial hot wire cutting machine at the Star-Foam Company in Vista, California.

MODEL DESIGN & TECHNICAL STUFF

By FRANCIS REYNOLDS

CHAPTER 3

A note about Chapter 2: The author discovered an omission in his copy and brought it to our attention, but not in time before the July issue was printed. Below we are reprinting the paragraph, with the omission noted by italic type—Ed.

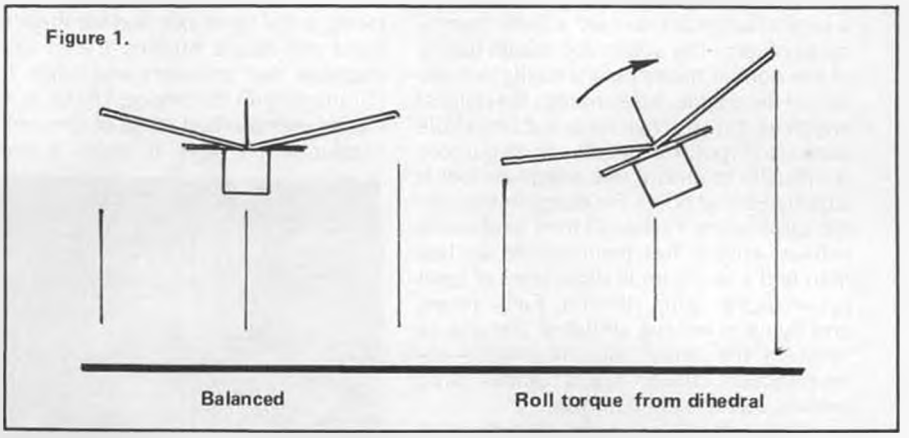
Now locate the approximate CG of your airplane by drawing a vertical line through the wing cross section on your cardboard cutout at a quarter of the way back from the leading edge (the "quarter-chord point"). See where it is with respect to the CLA. If this airplane CG is between 10 and 18 percent *of the total length of the fuselage* ahead of the cutout balance point, your vertical tail size is probably about right. If the CLA is ahead of or too near the CG, add some more fin and/or rudder to your design layout and cut out and balance a new paper doll. Now is the time to fix it, on paper, not on the finished airplane. For more detail on this cutout method, see chapter 11 of *The Design of the Airplane* by Darrol Stinton, published by Van Nostrand Reinhold.

• Last month we kicked off the "technical stuff" part of this column on model design with a basic look at stability in general and directional and longitudinal stability in particular. Now we will finish up on longitudinal and get into roll stability, the interactions among roll, yaw, and sideslip, and all of that neat stuff.

If "neat" isn't exactly the word you would have chosen, don't give up on me yet. I'll try to make it understandable and interesting. Where *I* can't understand part of it, I'll quietly duck out and go on to something easier. I'm not a very theoretical guy. I find abstract things which can't be understood except through mathematical expressions, most frustrating. Airplane stability gets a little difficult for me to understand in spots, but I've found a few simplified ways of looking at it which help. Let me share.

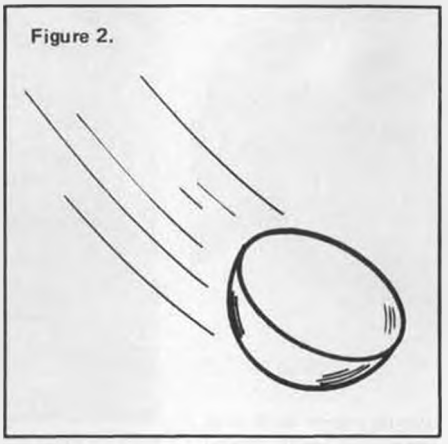
BOWL STABILITY

If you drop a salad bowl from a sufficient height, it will stabilize right side up. Don't take my word for it, try it—if you can talk your wife out of a (non-return) bowl. But you hastily point out to me that parachutes, which are shaped like bowls, are stable with the "bowl" upside down. True, when the chute is loaded; but cut off the shroud lines, starch it so it won't collapse, and drop it. It will descend dome down. I might have read the following comparison somewhere, but I think I dreamed it up "all by my lonesome." At any rate, I find it interesting and useful.



This month the author shows us what elements of model design influence stability.

Imagine an airplane; a good stable free-flight model with polyhedral, for instance. When we look at it from the front and squint our eyes a bit, we can imagine a bowl, the sides of the bowl being the upturned wing tips. In side view it takes a little more imagination, but the decalage (the higher angle of incidence of the wing over that of the stab) raises the front and rear edges of "the bowl" up also. No wonder such an airplane is stable, it is just another bowl. Let's take a flying wing. The dihedral brings the sides of the bowl up, and the reflexed trailing edge brings the rear edge of the bowl up. Sure, it's stable; we can tell by looking at it.



Salad bowls are stable!

Obviously, this is a very simplistic comparison, with the velocity vector in a different direction; but maybe there is more to it than I understand. I hope some of you theoretical types write and help us out.

DECALAGE

We didn't finish covering the subject of longitudinal or pitch stability last month. We talked about airfoils and their effect on stability, and on sizing the horizontal tail and the fuselage length by means of tail volume coefficient. The right size tail alone won't provide a stable airplane, however. We must adjust the wing and the horizontal stabilizer pitch angles (angles of incidence) so these two aerodynamic surfaces will work together properly. It is really the tail back there, acting like the feathers of an arrow, that decides where the airplane is going. Likewise, the angle of the stab determines at what angle of attack the wing is going to fly and therefore how much lift it develops. So decalage isn't mysterious at all, just common sense.

Decalage, then, is merely the wing incidence minus the stabilizer incidence. The

Continued on page 82

RAMBLIN' AROUND AUSTRALIA

By STU RICHMOND. . .This month we find ourselves still knocking around Sydney with Stu as he visits the notables of Australian modeling. Stu's interview this month is with the co-creator of the Magic Muffler.

• We all seem to like getting something for nothing. The idea of getting more useable power from our model engines without increasing displacement or pouring in more nitro is fascinating. For years the Europeans have used tuned pipes, as their nitromethane is ultra-expensive compared to USA prices; and the tuned pipes have given a supercharger action over a quite narrow range of rpm. The action and length tuning of the normal tuned pipe virtually *sets* the rpm of the engine. It determines the point at which we get an actual measurable audible increase in rpm. The needle valve's purpose is virtually to ensure that adequate fuel is supplied at that point. For example, the needle valve on my Como .40 front intake side exhaust engine has been turned far less than *half a total turn* in three years of sport pylon racing using different fuels, props, and flying at varying altitudes! The adjustment of the tuned pipe is critical—my tremendous power boost comes *only* around 20,500 to 21,000 rpm.

In Australia clever engineering development has yielded a *second generation* of tuned pipe design, and here's that story—the Magic Muffler story. I predict the USA R/C sport fliers will adopt the Magic Muffler over the European tuned pipes. Read on and I think you'll see why!

Ranjit Phelan is one of Australia's premier R/C pylon racers. As I sat in Ranjit's (pronounced Ran-gee) kitchen sucking a Swan Export Lager can of glow fuel—drink enough and you're sure to glow—the story of the Magic Muffler unfolded as follows:

Stu: How'd you start model building? And how about the Magic Muffler?

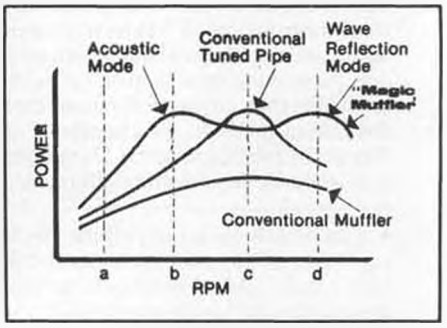
Ranjit: I was introduced to modeling by my mother. My father was in the Indian Air Force. I was quite young and living in India. I used to watch my mother build free flight diesel-powered models. It was natural for me to follow with small rubber-powered Aeroflyte models and also little chuck (hand-launched) gliders. Here in Australia a friend got me and John Chadd (the Magnum fuel co-owner) interested in R/C pylon racing a few years ago, and we three developed the Magic Muffler. It's an acoustic chamber that resonates and when it synchronizes with the engine it helps to supercharge over a *broad* range of rpm, unlike a regular tuned pipe. It yields a broader, wider power band, but it's not as outright powerful as a tuned pipe at a given *single* speed range. It's quite a nice flexible unit that's easy to use.

Stu: It's sold in the US by Condor Hobbies in Irvine, California.

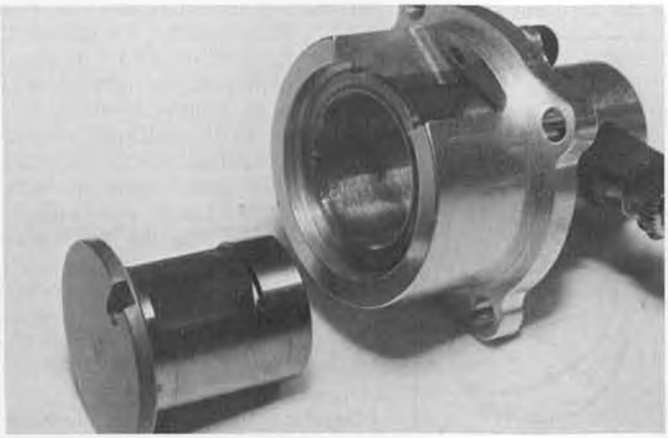
Ranjit: Yes, and it was originally invented by Ian McCaughey back in 1973 for FAI R/C pylon racing with non-nitro fuel. Being new, it didn't quite work as expected. But Ian and I could see the potential of more power being extracted. We developed it because it fitted our models quite nicely. And it reduces noise levels and gives us a power boost too. We are virtually having our cake and eating it too! We've successfully developed a small device that does fit *inside* the model, does quiet the engine, and does increase the power. But modelers are basically conservative and reluctant to change from what they already know.

Stu: Yes, there is a training time for us to accept new innovations like glues, coverings, and carbon fiber products. The CA glues

Ranjit Phelan of Sydney, is one of the world's premier R/C speed fliers. Here he holds his own design rear intake drum valve built for him by O.S. in Japan.

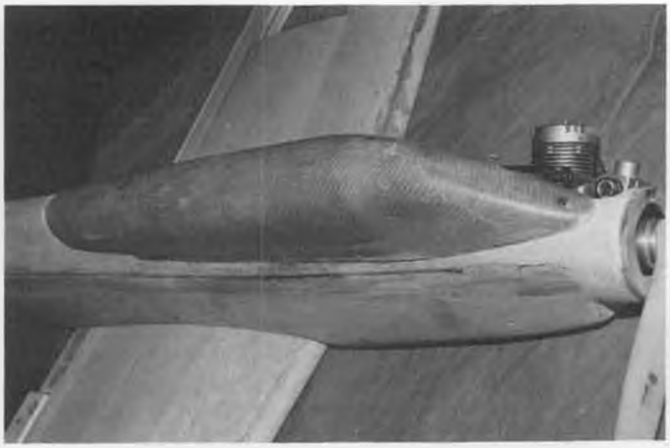


Propped or geared at 'c', the tuned pipe will show more static rpm. But at 'b' or 'd' the Magic Muffler will show more rpm. See this month's column for details on the muffler.



FAI events don't requre stock engines. Prototyping engine work such as this drum intake valve and rear crankcase cover, along with competent testing with modelers like Ranjit, often lead to better engines.

Ranjit's busy workbench shows O.S., Picco, Super Tigre, and other engine parts. Use of metal speed pans in R/C pylon is unusual.



This .40-size Magic Muffler exhausts into an over-diameter exit hole that comes out of the bottom of the fuselage without power loss.

Magic Muffler will be completely covered by the fiberglass canopy of this .40-size sport model being built by Bob Carpenter of Australia.

are almost universal now, and it has taken time.

Ranjit: Yes, I understand the training time. But there are a *lot* of Magic Mufflers now being used in Australia by the sporting fraternity. They work. They're simple. On a racing .40-size engine, if you could get it to rev to 30,000 rpm, our muffler would give a broad power band or increase starting around 16,000 and extending for 14,000 rpm on up to 30,000 rpm. That's a broad power increase. The engine would jump on the pipe noticeably at and above 16,000 and would continue to power to 30,000 if it wouldn't break. It'll develop more power with the Magic Muffler at 16,000 to 30,000 than if normally aspirated.

Stu: Who named it?

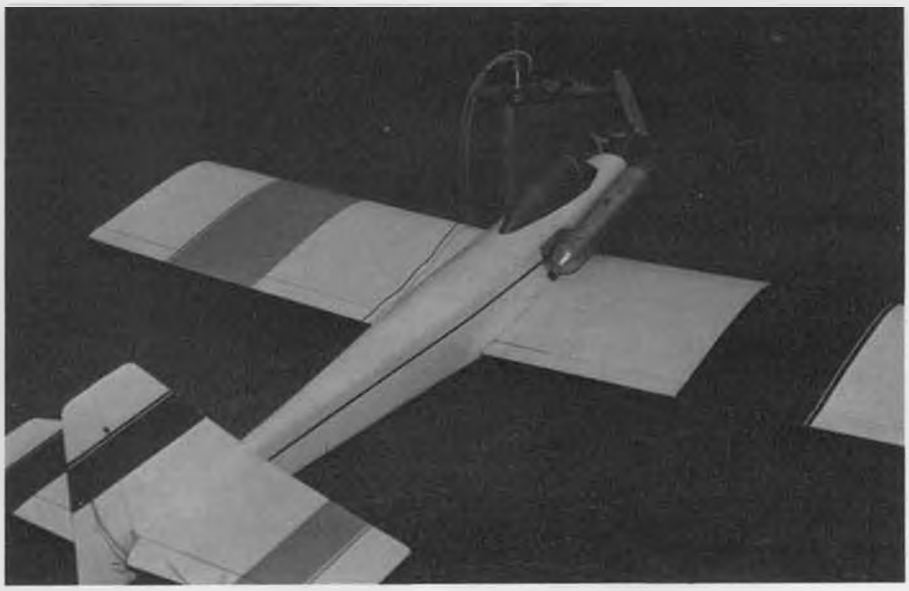
Ranjit: Harold deBolt, actually. He tested it and wrote it up.

Stu: Ranjit, you're the pylon pilot and John Chadd is your caller. Does the will to win in racing still exist in the two of you?

Ranjit: Oh, yes, we're gonna give you Yanks

Continued on page 75

Stu met his editorial counterpart, Brian Winch, in the Sydney ramble. Brian is a clever writer for model magazines in Australia and England. Text tells about this engine.



Stu flew this .40-size Magic Mufflered sport model at the UMAC field outside of Sydney. Model flew serrated knife-edge flight from horizon-to-horizon with ease. These new mufflers could replace nitro fuel in the U.S.

Framed-up Playboy is from an Australian kit. Saito .45 from Japan sells discounted for $219. Super Tigre 2500 goes for only $345! Manager Colin Collyer blinked at the wrong moment!

These two young men wandered into one of the ABC Hobbies stores in Sydney while Stu was visiting. Each left with an Astro rubber kit and an issue of Model Builder, compliments of Stu's hobby fund. It kinda hurt Stu to pay five and a half bucks for the Model Builder!!

PLUG SPARKS

By JOHN POND

• This columnist is going to break one of his cardinal rules and give himself and the Society of Antique Modelers Champs in 1989 a first-class plug. As everyone in SAM knows, the Champs are held on a rotating basis among four areas: East Coast, Rocky Mountain, Midwest, and West Coast, in that order.

This writer has been approached many times by Dick Marra, P.R. man for the Reno Hotel-Motel Assn. and Convention Center. In addition, he represents AMA in all matters of modeling. Marra has been after this columnist to stage a meet at Reno, Nevada, for quite some time. Not quite realizing what was going on, the writer visited Reno in early 1987.

To his amazement, the red carpet was literally rolled out with offers for use of Steadt Air Base, the Air National Guard Strip, and the drag strip north of Steadt. What had brought this on? According to best sources, the Reno Air Races were threatened in 1986 by an unscrupulous contractor who filed to build homes directly in the way of the flight line. If successful, this would have been the end of the Reno Air Races.

The Pylon Racing Assn. appealed to the Washoe County, the City of Reno, the Hotel-Motel Assn., and the Convention Center people to help raise money to purchase the endangered property. Finally, a 2.5-mile square of desert was purchased. The Pylon Races were saved!

Now that this property was owned by the joint group, only one week of the year was the property used for the Air Races. Fifty-one weeks were open to any recognized aviation activity! What a marvelous deal to be offered these flying fields and the Convention Center at no cost! This writer is still pinching himself to make sure he is not dreaming.

AMA was also brought in on the deal as they are also looking for a site for staging Nationals on the West Coast. The final setup was for SAM 21 to stage the West Coast Champs on July 25 and 26, 1988, as a preclude to the 1989 SAM Champs June 11 to 17. AMA would stage an "overfly" in 1988 in the form of a Jamboree while 1989 would see AMA piggybacking the SAM Champs with the Nationals. The latter is a bit in doubt as the AMA District 10 Vice President has been making noises like holding the Nationals in San Diego. No disparagement meant, but there is absolutely no comparison for sites and availability.

Originally slated for four days, Contest Manager Pond has expanded the activity to seven days which will include one full day for a "Grando" Collectogether for the MECA. This meet is to be known as the 1989 *International* SAM Champs as modelers are expected from Canada, Australia, England, France, and Italy. Those models from modelers unable to attend will be proxy-flown by expert USA modelers. Here is the tentative schedule. If you see something we have overlooked (besides Indoor), let us know; we want to accommodate any old timer activity.

June 11: MECA "Grando" Convention Center.

June 11 through 15: SAM Champs.

R/C Texaco—1/2A Texaco, Class A Glow, Class A Ign., Class B Glow, Class B Ign., Class C Glow, Class C Ign., Antique Glow, Antique "Pure," Ohlsson 60 Event, Electric L.E.R., Electric Texaco.

F/F Antique—Class A Cabin, Class A Pylon, Class B Cabin, Class B Pylon, Class C Cabin, Class C Pylon, Rubber Stick, Rubber Cabin, Small Rubber Stick & Cabin (under 150 sq. in.), Rubber Flying Scale, 36-inch Commercial, H.L. Glider, Ohlsson 23 Only, "Slag" Event, Twin Pusher, 020 Replica, Pre-1937 Wakefield, Compressed Air.

June 16 and 17: Nostalgia Champs (all

1. Harold Layser from Pennsylvania, seen at the SPOT-JAM Annual in New Jersey.

2. Joe Csuti's Contest Model, an Ehling design sporting an excellent finish. Photo: Kidd.

3. Frank Lashek cranks up his Buzzard Bombshell. Gene Brown holds. Photo: Kidd.

F/F).

1/2A Gas—Class A, Class B, Class C, Ignition, 1/4A Gas.

June 16: Jimmy Allen Races, Lee Renaud 2cc Event, Wakefield (50th Anniversary).

June 17: O/T Control Line Ignition & Glow, O/T R/C Glider, All balsa R.O.G. (Juniors), Special Delta (Juniors).

EASTERN ECHOES

We don't get much mail from the East Coast on Old Timer activities (we don't consider Florida as East; deep South, man!), so it is always a pleasure to receive mail from Mike Granieri, former SAM President.

Mike reports the SPOT (Society for the Preservation of Old Timers) annual was rained out twice in a row, so the next natural thing to do was to combine it with the JAM Contest. This turned out to be a blessing in disguise as 48 entries (without any club member being counted) turned out for the fun. Contestants came from Maryland, New York, Connecticut, Pennsylvania, and several newcomers from South Jersey.

Photo No. 1 shows Harold Layser from Pennsylvania, a newcomer to SAM. He couldn't have picked a better model to start out with, a 9-1/2-foot M.G. Harold had two maxes, but engine problems on his third flight doomed him to fifth place (same place he took at the Chicopee SAM Champs in 1987!).

A great day of 70 degrees was enjoyed by all, so much so, there were no interruptions in flying. Made for a very busy day for the officials C.D. Jim Clark, Asst. Mike Granieri, Recorded Mariane Clark, and Chief Timer, Joe Csuti.

Although Joe was so busy he didn't get in an official flight, Photo No. 2 shows his good-looking Ehling Contest Model being tuned for a flight. There must be at least four M-G models (in various sizes) scattered about.

The JAM portion of the meet featured a 1/2A Texaco Lee Renaud Memorial Event. Most gratifying to all was the winning of the three first places by out-of-state contestants. Great stuff! Hope they are encouraged to come back again!

It wouldn't be a Joe Csuti dinner unless prime rib and refreshments were served. Credit for this should be given to Dorothy Granieri and Pauline Csuti.

Results looked something like this:

Class ABC Glow

1. W. Geary	Playboy	OS .15	1467
2. C. Stager	Playboy	KB .35	1397
3. F. Lashek	Bombshell	KB .35	1142

Class ABC Ignition

1. S. Boucher	MG-2	McCoy .60	1746
2. C. Thuel	Playboy	Forster .35	1595
3. W. Geary	Zipper	OR .29	1007

Antique

1. S. Boucher	MG	McCoy .60	1736
2. W. Blake			1652
3. G. Thuet	Eaglet	Spitfire	1588

Fuel Allotment

1. G. Murphy	Dallaire	OS .60	1248
2. E. Hoffman	Dallaire	OS .60	1149
3. F. Quedenfeld	MG-2	ST .56	1000

1/2A Texaco-Lee Renaud

1. J. Van Dusen	Mike	1800
2. H. Williams	Clipper	1413
3. B. Brenchly	Cabruler	1378

5. O/T gliding is popular in Italy. Beautiful glider being restored by Fiorento Vavassori.

In wrapping up this report, we should run Photo No. 3 showing Frank Lashek's venerable Buzzard Bombshell. Like old wine, it just gets better with age!

1988 will see these meets again being staged as follows: June 26, JAM Annual; Sept. 11 (Rain date 23), SPOT Contest.

ENGINE OF THE MONTH

Once again we must acknowledge the generosity of Robert McClelland, 3007 Travis St., West Lake, Florida 70669, for the use of this month's engine, the Wensen 36.

Of all the successful engines, the Bill Atwood Baby Cyclone engine was the most widely copied. Although many engines do not look like Baby Cyclones, they are, on close inspection, remarkably close in size, displacement, and general arrangement of porting.

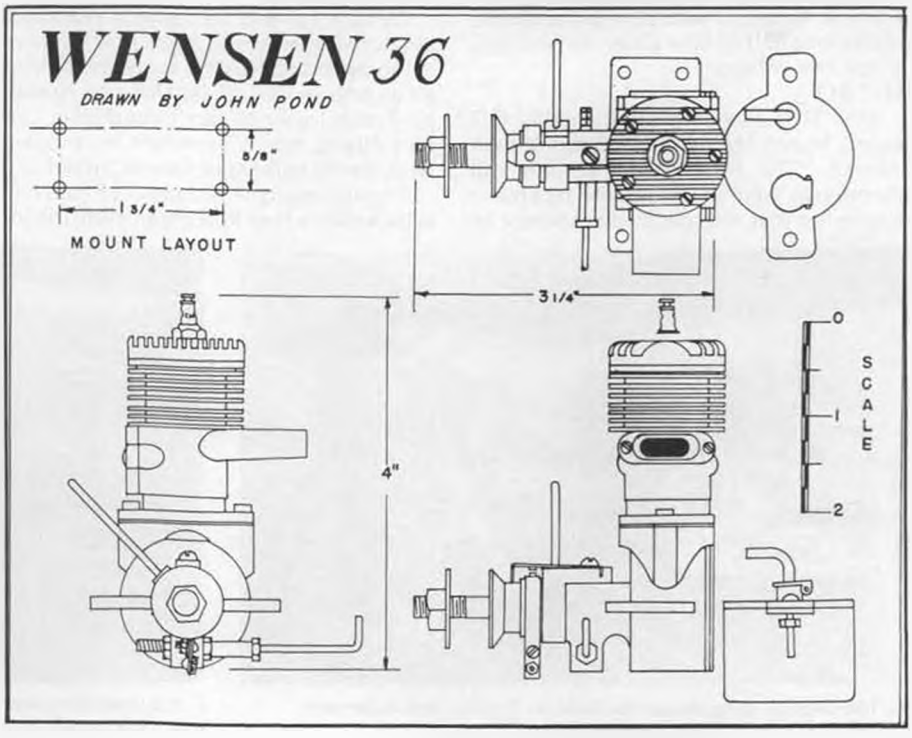
The Wensen 36, introduced in 1946, has been referred by engine collectors as a post-war "improved" model of the Baby Cyclone, out of production for at least six years. Advertisements in *Model Airplane News* were limited to a "one-shot" deal in the April 1946 issue showing the engine in a Model Aircraft Hobby Shop ad and also listed in National Hobby Distributors, both firms located in Baltimore.

On the other hand, *Air Trails* carried 1/16 column ads from February 1946 to June 1946. These ads were carried under the name of Haines Hobby Shop in Reading, Pennsylvania. Engines were offered for sale at $17.75 without coil and condenser and for $20 that included Aero Spark Coil and condenser. It is interesting to note when the McCoy, Pacemaker, and Atwood engines took full-page ads, the advertisements for the Wensen by Haines abruptly ceased. No question about the situation, the terrific demand for good control line-type engines and the general preference for more power doomed the Wensen with its small displacement and gentle-running characteristics.

The Wensen engine showed some improvements over the Baby Cyclone by using cast aluminum in place of zinc alloy castings. An improved version was marketed in 1947 with heavier type castings. However, this was a case of too late with too little.

This rotary valve, three-port engine featured a bore of 3/4 inch (.759), stroke of 13/16 (.812) and displacement of .359 cu. in. The engine, rated at 1/6 hp, showed a top performance of 6200 rpm. Weight was also increased over the Baby Cyclone to nine ounces.

As reported before, the Wensen featured cast iron cylinder, aluminum alloy head, crankcase, and con-rod. The crankshaft ran on bushed bronze bearings. No production



figures are available, but 1000 engines would seem the limit before the more powerful engines drove it off the market.

SPECIAL EVENTS

A natural proliferation of events is following in the R/C Old Timer Events as the boys have pretty well figured out how to get the most time out of fuel and best climb in a limited time.

As mentioned in the last issue, one of the most exciting new events is the O/T R/C Glider event first held at the March 19/20 SAM 26 Annual. When one considers only about three weeks' notice, the turnout was nothing short of amazing. Some, like this writer, were not able to finish in time. Here is what flew:

1. Bob Sliff	Thermic 100	19:50
2. C.W. Patterson	Zaic	8:22
3. John Lupperger	Thermic 100	8:21
4. Ken Myers	Thermic 100	5:08
5. Steve Roselle	Sinbad 72	4:41
6. Ross Thomas	Thermic 100	4:37

As can be seen, most of the competitors selected the big Thermic 100 glider for size. Several others who did not compete scaled their models to size; i.e., Pond with Jasco Floater to 7 ft., 4 in. and Don Bekins with Thermic 50 to 100 size. Unfortunately, neither model was ready to fly.

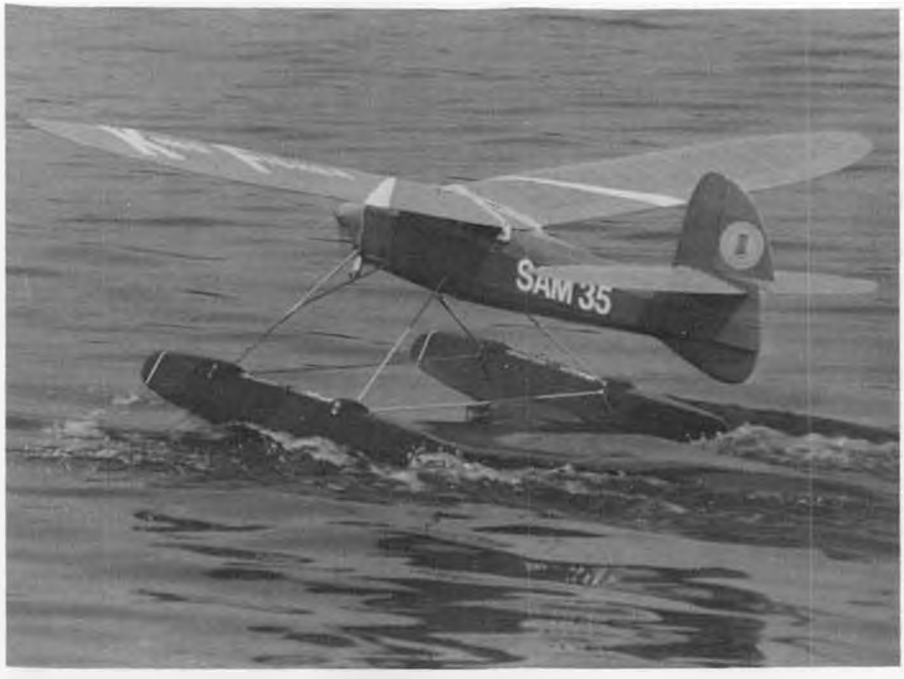
A very disappointing amount of photos failed to turn out as the film failed to advance. We do have Photo No. 4 showing Steve Roselle, newsletter editor of SAM 21 at a Show and Tell Session of the March SAM 21 business meeting. Note that Roselle can disassemble the outer panels and get straight dihedral (as required on the original Sinbad the Sailor plan).

This columnist has repeatedly pointed out how popular soaring gliders are in Europe. As pointed out by Sven Linden of Sweden, old ignition engines are very dear, hence, the average modeler sticks to rubber power and gliders.

It was no great surprise to receive Photo No. 5 from Ferdinand Gale, SAM 62 (Italy) taken at the 1987 National Meeting. Seen is Fiorento Vavassori with a simply gorgeous skeleton of his old time glider. As Ferd says, a true love of labor!

HYDRO

SAM 51 is also pioneering another O/T event, Texaco Hydro, to be staged at their Annual. "The Nifty Ones," as they call themselves, were so encouraged by a hydro fun-fly last year, they decided to sponsor an O/T hydro event. This had been done by Sam 30 many years ago under the direction of Hal Cullens at the Lake Shasta After-Bay. Not enough responded that time.



7. A Joe Ott Kingfisher by Sid Sutherland of England. A very good hydro flyer.

Seen last year in Photo No. 6 is the Sam 21 gang area at the SAM 51 meet. Seen are Ted Kafer and Frank Womack rigging up Ted's PB-2 for floats. This particular model took off, flew, and landed well. Old Timers seem to adapt themselves easily to all forms of flying.

In line with the SAM 51 hydro meet, the English boys, headed up by Sid Southerland of England, are no slouches when it comes to seaplanes. Photo No. 7 shows his Joe Ott "Kingfisher" taking off. Sid reports this model is a fine flyer and makes hydro flying a real pleasure.

SCALING REVIEW

We have run this item several years ago, but everyone seems to forget how to arrive at the correct scale. With everyone looking for an edge in O/T R/C and the new Nostalgia Events (scaling is not permitted in O/T Free Flight), this is important in deciding what size to make your favorite model.

A typical example is shown in Photo No. 8. Looks like a New Ruler, huh? Well, friend, it is simply another Henry Struck design, the Cabin Ruler scaled up to New Ruler size. This model built by former Australian SAM president, Bill Gordon, has proved to be a popular choice both from the standpoint of good looks and excellent performance.

As Walt Roselle pointed out in his recent article in *Seks Talks*, the general consensus dictates one should start with the original plan when scaling up or down. Too many times a scaled plan has been modified during redrawing. To arrive at the correct scaling is duck soup if you have a square root function on your calculator. Best idea in starting off is to decide what class and engine size you want to use. Of course, this is much simpler to ascertain as you must have 225 sq. inches of wing area per 0.1 cu. in. of engine displacement for glow engine operation. Ignition power, of course, is a horse of another color in that, although there is no handicap for use of a large engine, weight considerations must be taken into account. You put an Ohlsson 60 in a Zipper and the glide deteriorates to the point where you must always fly in good thermals.

Having decided how much wing area

6. The SAM 21 gang area at the SAM 51 fun-fly. Ted Kafer with his BP-2 on floats. Frank Womak assists.

4. A Sinbad the Sailor by Steve Roselle for the new O/T R/C glider event, seen at the SAM 21 Show and Tell session. Photo: Dowling.

8. A scaled Cabin Ruler looks like its ancestor, the New Ruler. Bill Gordon, Australia, enlarged this one to equal size.

9. A trio of Frog 45 designs show what scaling can do. Three different types: CO2, F/F, and R/C.

you want, here is the formula:

$$\frac{\sqrt{\text{DESIRED AREA}}}{\sqrt{\text{ORIGINAL AREA}}}$$

For example, say you have a model like a Playboy of about 800 sq. inches and you want to reduce it to 400; then the square root of 400 equals 20 divided the square root of 800 equals 28.28. This divided into 20 equals .70, your scaling factor for all dimensions on the original plan.

Some people make up scale rules to the scaling size. In other words, the first inch is only .7 inch, second inch 1.4, etc. However, this columnist likes to use proportional dividers which are a quick and convenient way to reduce/enlarge a plan.

Probably the simplest way with the new Xerox machines is to have the entire plan reduced by the calculated factor. This is one method the writer favors. Some people shy away from the $1.50 per square foot cost, but, in the last analysis, how much is your time worth?

At the recent Old Warden Vintage Model Exhibition, an excellent example of what Xerox machines can do is shown in Photo No. 9, a trio of Frog 45s with wingspans of 24 in. for CO_2 power, 45 inch for free flight, and 90 in. for R/C. Makes quite a display.

Remember, when you are considering the reduction/increase of a model, the dimensions are not proportional to the area. What is meant is that a 4 x 4 square reduced by half to 2 x 2 gives a difference of 4/16 or a reduction of 1/4 in area than 1/2 as intended in linear size (2/4).

FIFTY YEARS AGO, I WAS

Ever so often, this columnist runs across some interesting memorabilia such as was submitted by Bill Simpson. Although some of the information was run about eight years ago, there is enough "new" stuff to warrant doing the article over.

Bill Simpson starts his letter off by saying while he was researching an article on Mel Anderson, he was advised by Irwin Ohlsson to contact Mel directly. Although rumors had it that Mel was a recluse, was bitter, and did not talk to anyone about models, Simpson was surprised when Mel was agreeable to a visit with the purpose of preparing an article on Anderson.

As it turned out, Mel was on a straight line from Bill's home and his place of employment, so Simpson stopped by after work, meeting Mel and his wife Ruthie. When he asked if he could come by again, there was no problem. Then, for the next four years, Bill would always stop and visit. This continued until they finally sold their home and went into a rest home.

In the interviews, Mel always took pains to make sure his answers were accurate. He was quite conscious of offending anyone with unsubstantiated statements. Many times Bill noted, Mel would check in his extensive library of magazines and books to verify his conversations. Of course, at that age, people have a tendency to be repetitious, and Mel was no exception on his favorite stories. Bill never did find any contradictions. The tough part of any talks was the bankruptcy Anderson suffered with his engines and especially his fuel business (Ohlsson later picked this up).

Perhaps some of Mel's best times were at Baby Cyclone Industries as Major C. C. Mosely granted a pretty free hand to development people. Photo No. 10 shows Mel and the last model he built in 1939 at the Western and Rosecrans Field which is now Gardena. If the reader looks closely, he can see the pit layout which surrounded the field.

Getting back to our story, Anderson needed cataract surgery badly and wept at his frustration. Bill was approached about buying the entire collection. A bargain was struck, and Simpson acquired a huge collection that included the first air engine by Anderson in 1919, the first rotary valve engine in 1932, the first one-piece crankcase and cylinder of 1933, plus a number of Baby Cyclone prototypes made in 1935. Most of the early ones ran poorly or not at all as the cylinders leaked.

Bill also acquired three experimental engines that bridged the gap between Baby Cyclone and Super Cyclone engines. (Joe Wagner says there were actually six or more. Larry Boyer has three or four of these at last count.) Simpson also inherited the prototypes of the Super Cyclone, Anderson Spitfire, Baby Spitfires, Spitzy, and Royal Spitfire engines. Also included were the wood patterns of his early engines, original

11. A beauty by Steve Ditta. His Baby Cyclone-powered Tom Laurie Experimental won 1st at the 1988 WRAM show.

10. Mel Anderson with his last model in 1939 at the famed Western and Rosecrans field, in LA.

12. Robin Pharis with an Ohlsson .60-powered Shereshaw Cumulus at NCFFC Meet.

blueprints of the Baby Cyclone and Super Cyclone along with the original proofs of the ads for these engines. (Major Mosely comments on sides.)

The piece de resistance is the record-setting boat and engine Anderson used in 1936. The engine employed a con-rod machined from a Chevrolet drive shaft (good steel was at a premium in those days). Three ball bearing were employed as were auto-type points. Also used was front and rear down draft rotor carburetors (Atwood used this system in his Atwood Blue Crown). The coil was hand wound from a Model T coil while the spark plug came from a Packard.

To get maximum power, Anderson ran the engine on straight gas. Lubrication was provided by a pressurized balloon which forced the castor oil into the case. This proved to be too much power in tether (circle) racing at the start (boat would cavitate and flip over backwards). Mel circumvented this by using only the rear carburetor to get the boat up to speed. After two laps, the Kodak timer would open up the front carburetor with some amazing acceleration. The boat never lost a contest.

In Bill Simpson's prize collection are two

Continued on page 85

15. Old Timer spark plug, Monty Tyrrell, was the C.D. for the successful NOTAM contest in Victoria over Easter weekend.

13. Good-looking Struck Ho-Cat built by Sid Sutherland, of England.

14. Hot flying combo of Saito 53 and Trenton Terror is a winner for Colin Borthwick.

Old Timer of the Month

Flying Aces Commercial

Designed by: Herbert Spatz
Text by: Bill Northrop
Re-drawn by: John Blair

• You don't often hear the word "commercial" these days when referring to a model airplane, unless the conversation includes at least one genuine old time modeler, and the discussion is about rubber models.

John Blair, of Warne, North Carolina, a frequent O.T. plan contributor, sent us the following note with this month's subject:

For those who may feel that the Pacific Ace has had things its own way for too long, here is an alternative: the Flying Aces Commercial. This is one of those long-legged, ungainly crates that is so ugly it's cute. However, in the words of the construction article in the October 1936 Flying Aces, *the plane is a "dandy flyer." The original model is said to have disappeared into the clouds after six minutes.*

The plan is presented here much as originally drawn; no gussets, braces, etc. A suggested DT setup is included, otherwise any beefing up of the structure is left to the individual builder, which is the way we like it anyhow.

The reference to a particular model as a "commercial" or a "job" first crossed my ears in the mid-thirties, coming from the late Steve Kowalik, to whom I have many times credited my start in building model

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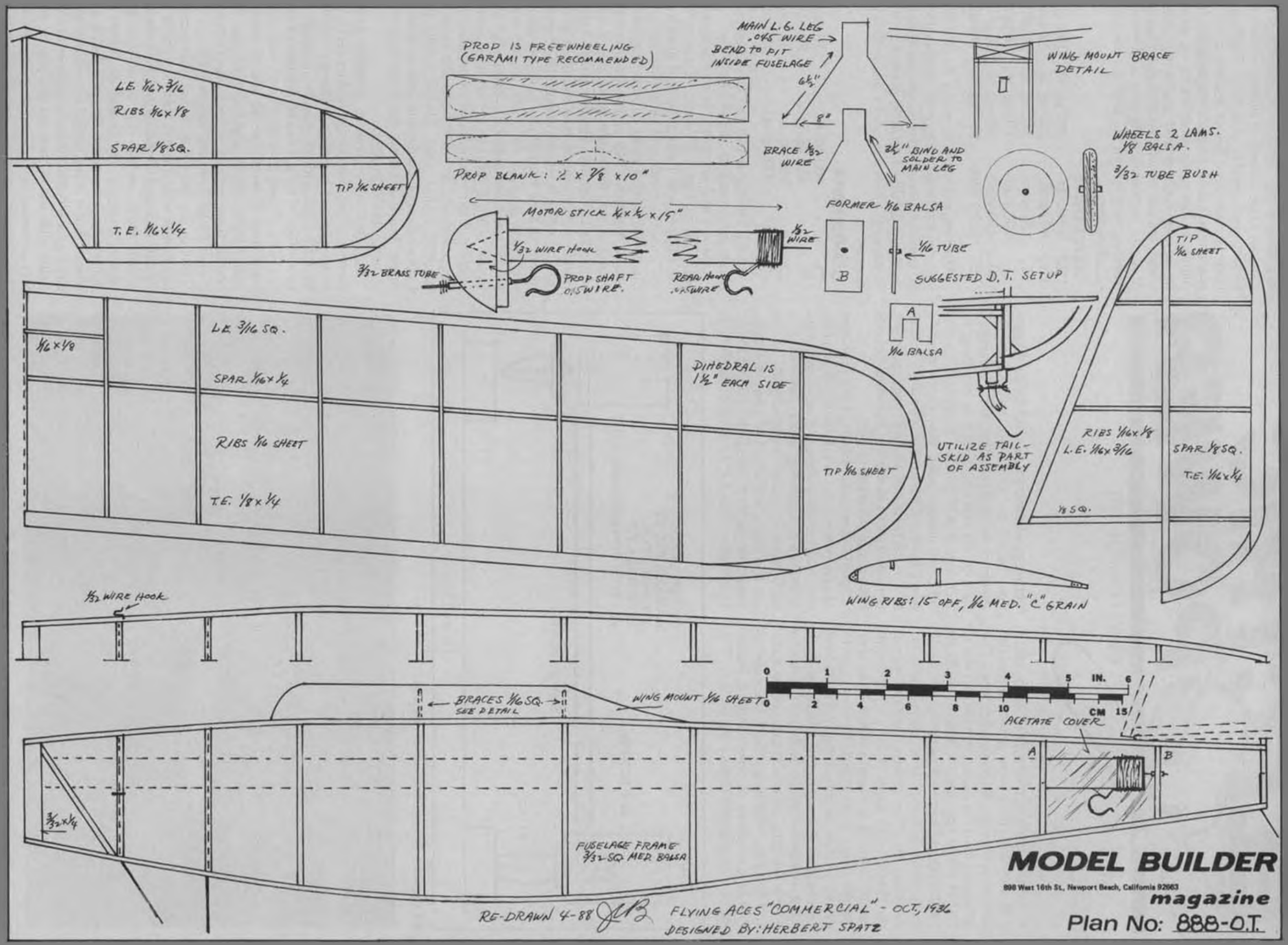


FULL-SIZE PLAN AVAILABLE—SEE PAGE 106

ELECTRIC POWER

By MITCH POLING

• Astro Flight has updated the Astro cobalt 020 and 035. They were powerhouses before, now they are turbo powerhouses! The 035 will turn a 6 x 3 Cox prop on six cells at 17,700 initial rpm on six Sanyo red (SCR) 1200 mAh cells according to my Accutach, at 19 amps. This is a direct connection, no switches, etc. The previous model would do 15,600 at 15 amps. This is a 2,100 rpm jump! There is a 4-amp current jump too, but the flying times should be very close to the same due to unloading in the air and faster climb. A jump of this much rpm is almost unreal in one step; Bob says it is due to a new winding plus a larger commutator and brushes. Way to go, Bob! The cube of rpm is a measure of power output. Power into a motor is volts times current, V x I. The output power increase in the 035 is 40 percent based on rpm, with an increase in power draw of 20 percent, for a efficiency gain of 20 percent, which is amazing. In fact, a gain of 10 percent is almost unheard of! Does anyone see a flaw in the math? I don't, but I will have more time to do testing by the next column and will give you more details. It looks to me like the small cobalts have made yet another leap.

Speaking of motor topics, a question that always comes up is what 020 or 05 or whatever really means. As everyone knows, that is definitely a moving target, since motors have made so many improvements in the last few years, and an 05 of a few years ago would be lucky to equal the 035 of today. The bottom line for the motor numbers is that they refer to the *type of plane* they are expected to fly. There is an informal standard for these classes of planes, according to size and weight, and Astro Flight has done an excellent job of making a list of planes and a table for showing people what planes to use with what motor. It shows figures for both geared and direct drive, which is a real convenience. A quick survey of power, minimum wing area, and recommended weight from the table for the Astro cobalt motors is:

DIRECT DRIVE

020	50 watts	200 sq. in.	20 oz.
035	90 watts	200 sq. in.	22 oz.
05	125 watts	240 sq. in.	32 oz.
15	200 watts	350 sq. in.	50 oz.
40	450 watts	550 sq. in.	94 oz.
60	1200 watts	850 sq. in.	148 oz.

Astro expects you to really build light, you can easily get away with weights up to 30 percent more than this. I do build light, and a typical direct drive 05 plane for me is 36 ounces, a 15 is 64 ounces, and a 40 is 94 ounces.

GEARED DRIVE

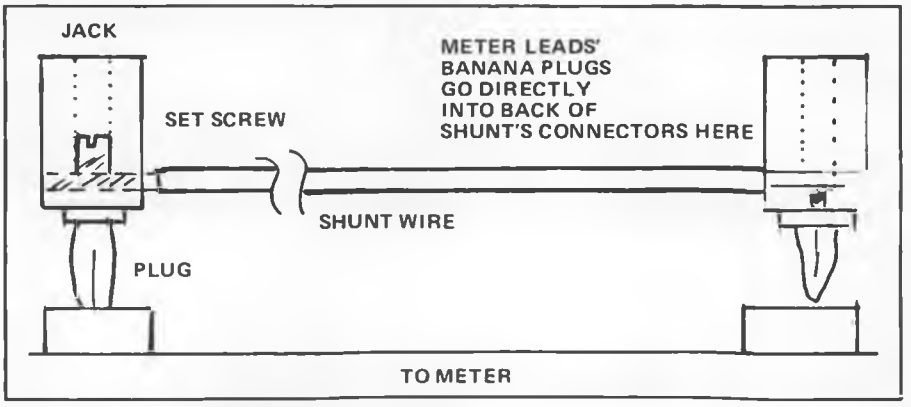
05	400 sq. in.	36 oz.
15	450 sq. in.	52 oz.
25	550 sq. in.	80 oz.
40	700 sq. in.	100 oz.

Again, I feel that you can go 30 percent above these weights and still be okay.

I think I will reminisce briefly and bore you with my first "05" plane. It was called the Clipper, and I designed and built it in 1973, using a motor and battery pack from a Black and Decker grass clipper. The motor was a Mabuchi 540 (some things never change!), and the battery pack was a four-cell sub C General Electric pack. All-up weight was 28 ounces with two channels! It had a 42-inch span, about 280 square inches. It flew beautifully, and you would recognize it as an "05" plane even now. Since I was running on only four cells, I had to use a 9 x 6 prop to get enough power loading. Flights were about six minutes; input power was about 50 watts (the same as the 020 cobalt now). Unfortunately, the Clipper did not survive the several moves I made, but I still have the plans and will someday build another.

But, this does come to another point: there is a "weather factor" associated with these sizes too. I would not like to routinely fly 020, 035, and 05 planes in winds of more than 10 mph. I would not like to routinely fly 15- and 25-size planes in winds of more than 15 mph. The 40 and 60 planes can handle most wind conditions. Of course, there are exceptions, some 05 pylon planes could fly in any weather, etc.

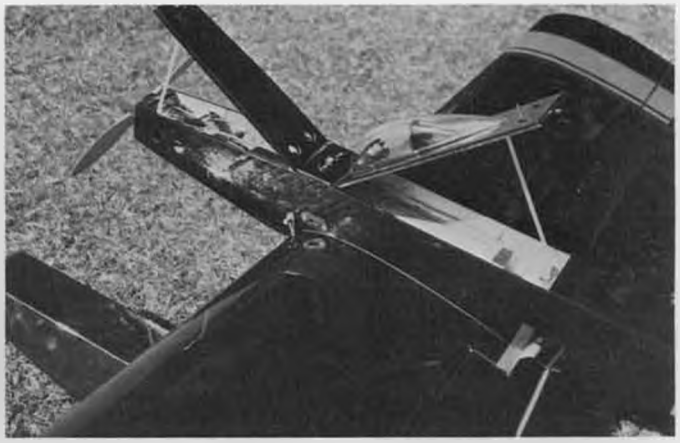
Last of all, there is a "flying field factor" associated with these numbers. I prefer to fly 020, 035, and 05 planes in parks or fields where there are no 40- or 60-size gas planes. I can fly the 15 and 25 planes in fields where there are 40- or 60-size gas planes, but it is not entirely comfortable. I can fly the electric 40 and 60 planes at club fields with the 40 and 60 gas planes and feel comfortable; i.e., "mix it up." It is a matter of flying style, speed, and wind handling that make these differences. So, there is



Ed Westbrook's ammeter circuit/shunt.

Tony and Addie Naccarato's stunning electric B-36 Peacemaker, seen on the cover, May, 1988 Model Builder.

Gage Cauchois' Ridge Rat, usually a slope soarer, here is equipped for ROW. Floats do slow down the Astro 05, so he's going to try a cobalt 15 with 12 cells.



The hatches on Gage's Ridge Rat make accessibility to innards a snap.

some validity in the 020, 035, 05, 15, 25, 40, and 60 designations, especially if you have to consider flying with the gas counterparts.

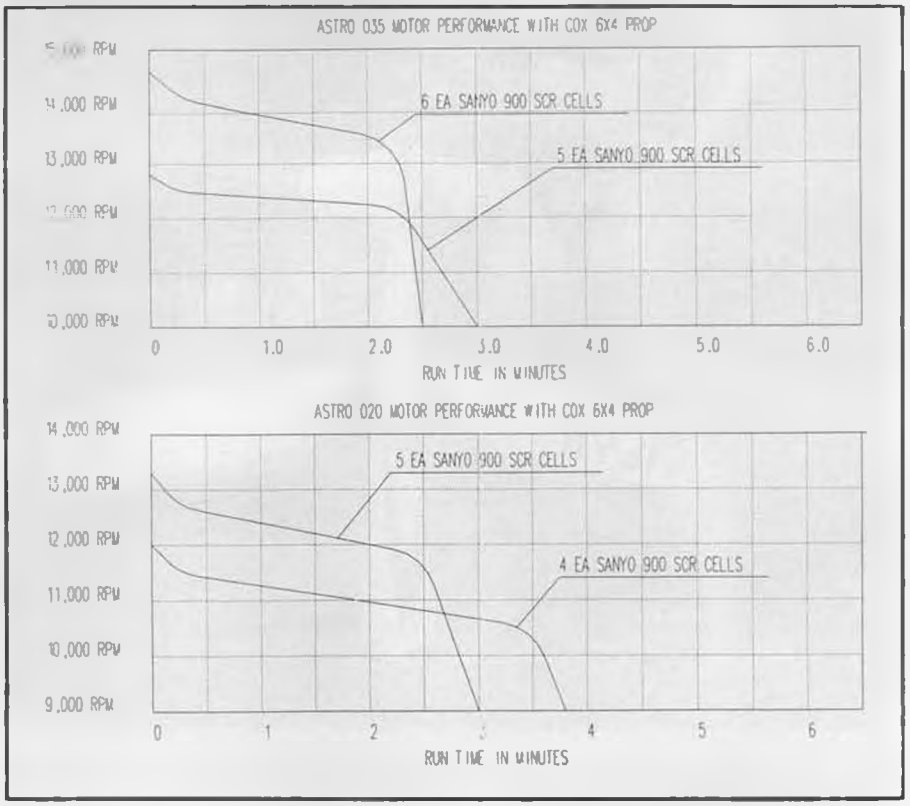
Wattage is an excellent measure of what you can expect from your plane; the usual ratio is 30 to 50 watts per pound. I am pleased to see that Astro now includes wattage with all its motors. Wattage points out something very interesting that Bob Kopski has covered quite well in his *Model Aviation* columns. All of the previous discussion took one thing for granted: the number of cells specified by the manufacturer and the prop specified by the manufacturer. These numbers are not law; they are recommendations or guidelines that the manufacturer finds to work best for general performance and longevity of the motors. About 99 percent of us, including me, follow these guidelines with much success. But, they are not written in stone! Electric motors are much more versatile than that! Recall that my first "05"-size plane flew on four cells; six is the norm now, and eight used to be the norm. Motors can be run with more or less cells than recommended, with very good results. I have flown 05 motors on as few as three cells, and free flighters use up to 12 cells on 05s. The secret is to keep the current below a working maximum in all cases. For ferrite motors this is about 16 amps, for cobalt, up to 25 amps.

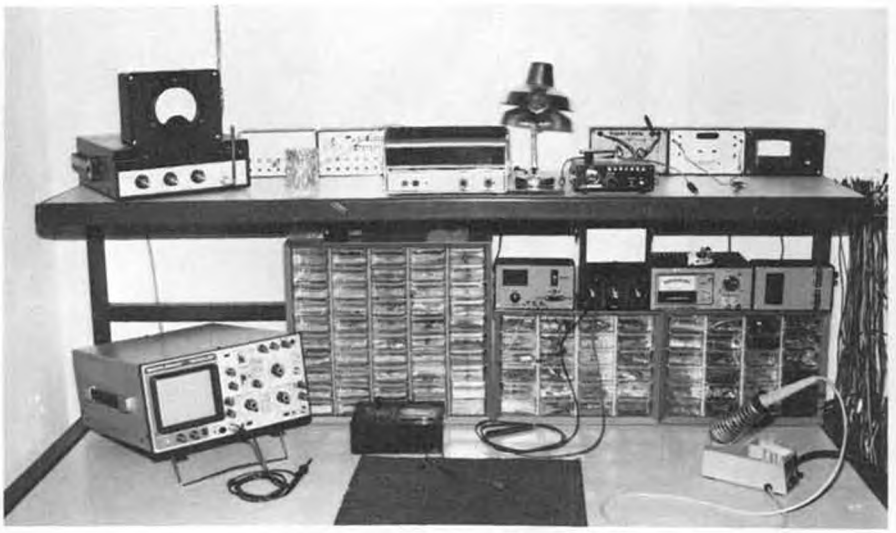
The procedure you follow is: choose what pack you want to use. It will usually vary up to 50 percent from the number the manufacturer recommends. For a six-cell 05, this could be from three to nine cells typically. *Now get a 30-amp ammeter!* If you don't, you have a reasonable chance of frying your motor. Put the ammeter in the line, then start with small props and work up till you have the current that is compatible with the flying time you want. For sport flying this is usually 12 to 15 amps. Note well: if you increase the number of cells in the battery pack, the size of prop you want will *decrease*. For some reason, most people seem to want to think "bigger pack, bigger prop." That is a no-no! Bigger packs (more cells) put more load on the motor, bigger props (more diameter or pitch or both) put a bigger load on the motor. The motor will die!

With direct drive, the easiest direction is

Continued on page 76

Bob Kopski's Exciter, Astro 40 powered.





Electronics Corner

By ELOY MAREZ

• Far away places with strange-sounding names is where our first letter takes us this month. The writer is Grahame Feltis, Papua, New Guinea, and I want to hear from you if you can locate that on your globe—without any hunting! Grahame writes:

"I recently purchased an Ace Voltmaster ESV and am writing to ask if you can help me with a query I have regarding this unit, which incidentally is a kit.

"This unit is set up to measure 4-, 6-, 8-, and 10-cell batteries. I have several 5-cell batteries which I use on gyros in my helicopters and am writing to inquire if you could advise if the unit could be modified for use on 5-cell packs. I would suggest this could be done by changing one of the existing switch positions. As I doubt I would have any use for the 10-cell position, I would suggest this one, although I realize any position could be changed. I presume this could be done by changing the value of the resistors between the switch position and the common input to pin 3 on IC 1; i.e., on switch position 10, change the values of R3 and R4.

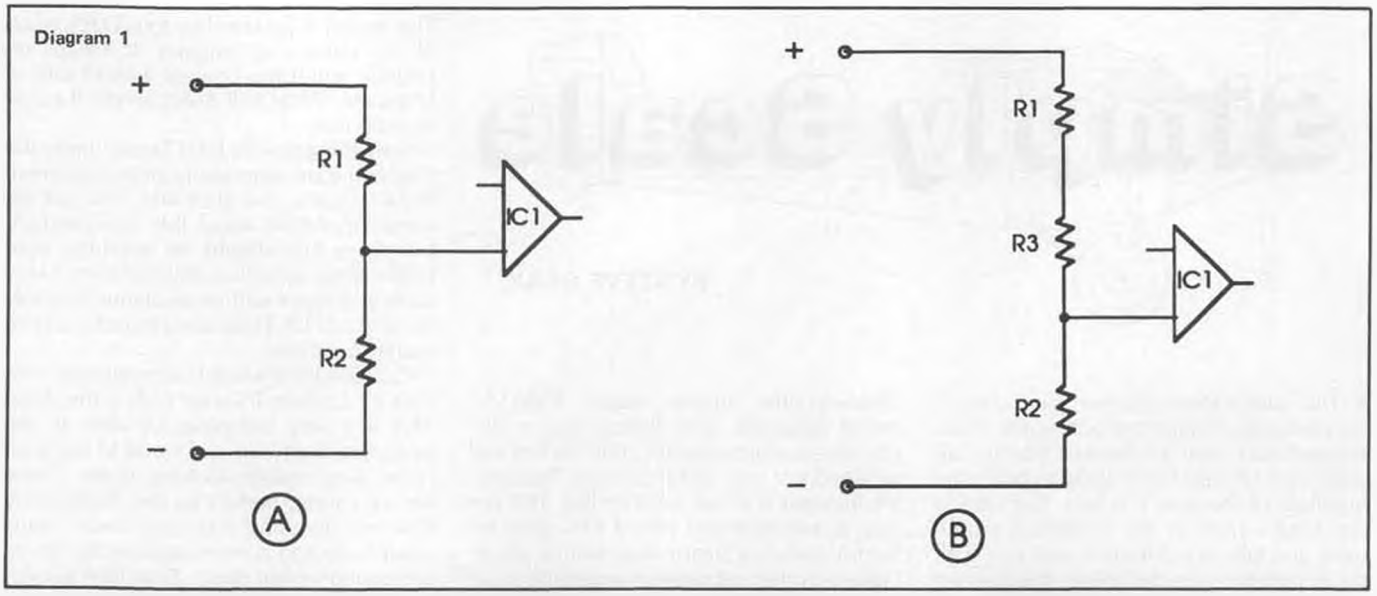
"Although I have read the circuit description and basically understand it, I don't know how the resistor values are worked out, although I have noticed that from position 4 to position 6 the resistor value increases by 2.241K ohm, from 6 to 8 by 2.249K ohm and from 8 to 10 by 2.251K ohm. As these values are very similar, would I be correct in assuming that if I halved the differences between position 4 and 6; i.e., half of 2.241K ohm, and added it to the value for position 4, I would be near the correct value; i.e., 2.241K x .5 = 1.120 + 2K = 3.120K ohm?

"I also have a Tower Hobbies ESV which uses Zener Diodes as its method of operation rather than the Op-Amp in the Ace unit. Do you think one method would be better than the other?" Grahame enclosed a map showing his little spot out there in the South Pacific; hearing from such places always gives me an acute case of itchy wings. And *I* can find New Guinea on a globe, though I have not had the pleasure of visiting. I did spend a lot of time in the more northern part of the big pond, skipping over a lot of it down to New Zealand and Australia. Sigh, maybe some day! Grahame, I do know how to pronounce Pago Pago, and I do know what Qantas (Airlines) stands for, which must qualify me as not being completely ignorant about your part of the world. For those of you with similar interests, I recommend *The Blue of Capricorn*, a really great book by Eugene Burdick. About halfway through it, you start asking yourself if oceangoing sailboats really are all that expensive.

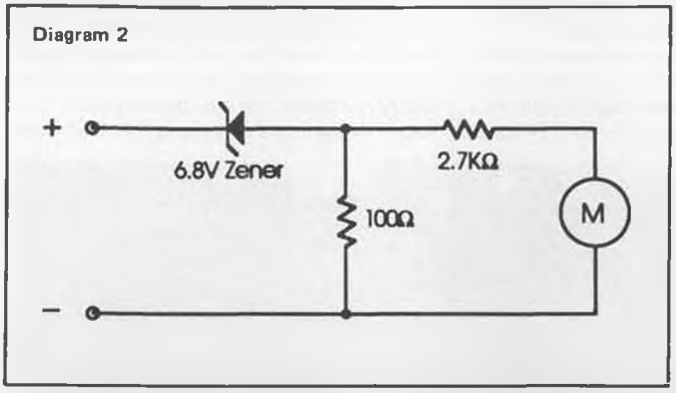
On to more mundane things! Grahame has the Ace Voltmaster doped out correctly, and also has the proper solution to the modification he needs to make it fit his needs. Let's run through it together, as it includes a subject of general interest, voltage dividers, which I don't think we've covered here in EC. It also fits in with our discussion last month of Ohm's Law in all its different forms.

As the term implies, a voltage divider, which consists of different resistors connected in series, is designed to divide a fixed voltage into different percentages of its total value. Refer to Sketch A, which is a

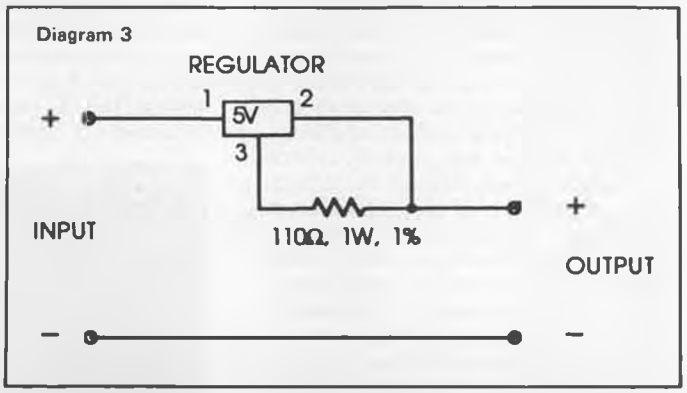
See the model airplane? The last two months have been full of formulas, schematics, and other heavy and dull but necessary stuff. I just wanted you to know I have forgotten the idea behind all this is to fly. See the model airplane!



Examples of simple voltage dividers, as they are used to provide a constant input to the IC in the Ace R/C Expanded Scale Voltmeter. Detailed explanation of this is in this month's column.



A simpler single range Expanded Scale Voltmeter, such as the Ace R/C Min-ESV, uses a Zener diode to establish its low point. Simplicity has its limitations, but these meters do provide valuable information when properly interpreted.



We talked about Constant Current Chargers last month; this circuit just arrived from Indiana, courtesy of Bill Mitch. All schematic drawings this month are courtesy of Laura Novak, Novak Electronics, and her magic Macintosh.

simplified version of the input to the first Op Amp in the Voltmaster. For the sake of further simplicity, let's assign completely different values than those used by Ace R/C.

The divided voltage is found as a percentage across each resistor, equal to the percentage of the total in-circuit resistance. With ten volts applied, and both resistors being of equal value, the voltage measured across either resistor would be five volts. I'm sure you can see it as a percentage; let's use the Law to see just how we arrive at that figure. For this part of the exercise, we'll assign a value of 100 ohms to each resistor.

First we have to figure the total circuit current. Using I=E/R, we find that 10 (E) divided by 200 (R—the total of the two 100 ohms in series), equals .05 amps (I). We would speak of it as "50 mils," but remember that for working the formula, whole values must be used. So we have .05 amps flowing through both resistors. Now, using another form of the Law, E=IR, we can calculate the voltage across each individual resistor. In this case, .05 (I) times 100 (R), gives us a value of 5.0 volts (E).

Let us now change the values of R1 and R2 to 150 and 50 ohms, respectively. The total value is still 200 ohms, so the current remains the same. However, figuring E=IR for the 50 ohm resistor R2 (.05 x 50), we come up with only 2.50 volts. The same calculations applied to R1, 150 ohms, comes out to 7.50 volts, for a total of the original 10 volts.

Position	Range
4-cell	4.5 to 6.0 V
6-cell	7.0 to 9.0 V
8-cell	9.0 to 12.0 V
10-cell	11.2 to 15.0 V

These voltages are referred to as a "voltage drop," and can be measured directly across each component, with positive and negative polarities the same as those of the applied voltage. Now, let's take it a step further, to Sketch B. We've added another resistor, R3. Assigning equal values to each resistor, we would find a voltage drop of 3.33 volts across each one, once again to total the original 10 volts. Or, for purposes of our formula, we can also look at it in another way. Remembering that resistors in series add, we can consider R1 and R3 as being one resistor, in which case the voltage drop across R2 would will be the same, 3.33 volts.

Getting back to Grahame's Voltmaster and Sketch A once again, we have a voltage divider, designed to apply an equal voltage, in this case 2.49 volts, to the input of IC1, regardless of the total voltage applied. It is done quite simply; as the voltage is increased, so the value of R1. Now, in some positions of the range switch, the divider actually looks like Sketch B, for a reason

R1	R1 + R2
2000 Ohms	4440 Ohms
4241 Ohms	6731 Ohms
6490 Ohms	8980 Ohms
8741 Ohms	11231 Ohms

more practical than electronic. You see, resistors are not manufactured in steps of one ohm, only in certain values, which are calculated so that most even quantities can be arrived at by connecting standard values in series. For example, in the 6-cell position of the Voltmaster, a nonstandard value of 4241 ohms is required, which is made up of 4020 and 221 ohm resistors.

Just to check ourselves, let's apply our formulas to the actual values used in the Voltmaster. In the Ace schematic, the resistors are given different "R" numbered designations, as is common practice. However, we will still refer to them here as being in position R1 and R2 as stated above. Starting with the position of four cells, we have R1 as 2000 ohms and R2 as 2490 ohms. In this application, the circuitry past the voltage

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Simply Scale

BY STEVE GRAY

• The Toledo Show this year was the usual successful and interesting outing that I have enjoyed each year for the past fifteen. I always look forward to the show as being the highlight of the year. It is here that I get to see what's new in the modeling world, meet and talk to old friends, and visit with the people who are the hobby: the guys we read about, the manufacturer's representatives, and Joe Average Modeler looking for bargains. I am always amazed at the volume of people who jam the Toledo Arena to check out the show. They come from all over by the bus load to fight their way through the aisles in an attempt to satisfy their hunger for new products and ideas.

This year's show was, as usual, crowded. As I fought my way through the crowds, I managed to stop in at some of the booths. At the Polk's Hobbies booth, I spent some time admiring a German model of a Piper Super Cub. This model kit was unique in that it was an all-metal kit. The model is built of stamped and formed aluminum parts which the modeler glues with a type of epoxy. The model is done in 1/5-scale and looks to be very flyable.

Easybuilt Models, a Canadian kit manufacturer of rubber scale models is expanding into very flyable-looking scale electric models. In addition to the electric semi-scale model of the DeHaviland Beaver they have now, they showed models of a Pilatus Porter, a Pober Pixie, and Bebe Jodel. These new lightweights should allow anyone to easily get into scale electric modeling. They are all designed by Laddie Mikulasko, a well-known Canadian model designer whose designs are always successful.

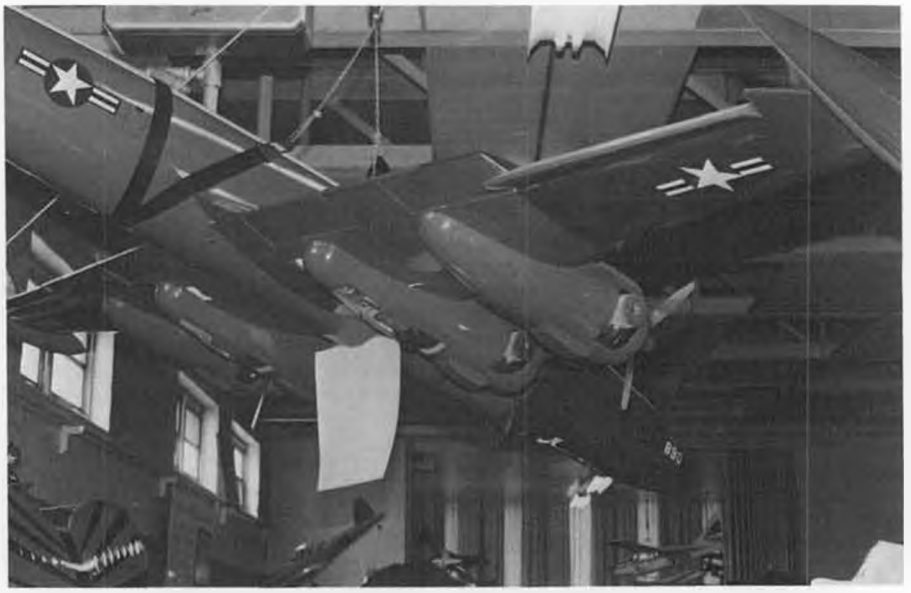
At the Robart booth there was a real eye-catcher of a model radial engine. It was a seven-cylinder engine, model R780, by Power Research. This beauty had a displacement of almost eight cubic inches and weighed just over seven pounds. The overall diameter is about 9-5/8 inches. This engine is awesome and would look great on the front of a big Stearman or similar plane. I have no other information regarding availability or cost, but I would certainly like to know more, as would many of our readers. Perhaps the manufacturer would drop me a line with some more information.

As usual, it was the balsa overcast at the R/C Kits booth which always creates some interest. This year it was a huge model of a Lockheed Constellation done in 1/8-scale. The model is powered by four O.P.S. Maxi 30 1.8 cubic inch engines. It weighs 80 pounds, and it was covered with 14 rolls of Ultracote. What will Bob Campbell come up with next!

Something new by John Tatone under the J'Tec name are some really great instrument decals, bezels, and glass kits. I did not get complete details about this new product, but these kits should be reaching your hobby shop sometime this summer. Many sizes and types will be available in scales from 1/12 to 1/3. These are a must for all you scalers out there.

Carl Goldberg Models showed their new float kit for their 1/5-scale Cub at the show. This is a very complete kit with all the necessary hardware and wood to build up some very realistic-looking floats. These are, of course, perfect for the Anniversary Cub but may find their way under many other scale and sport models in the six- to ten-pound weight range. They look good. I don't think I could have designed a better set of floats myself.

Sig Manufacturing was showing off its new 1/3-scale Spacewalker kit which is now available. Perfect for a Quadra or Zenoah engine, the Spacewalker should make for a really fun plane. Sig has done its usual great job in designing a very complete and value



This year's big model was Bob Campbell's Lockheed Constellation at the R/C kits booth.

Chuck Barsony of Mississauga built this beautiful 1/3-scale Fly Baby.

Ryan FR-1 Fireball by Hal Parenti combines the power of a ducted fan and a regular glow engine. I guess it is classed as a twin.

packed kit. The big box is just chock full of goodies. Some new hardware is also included for hooking up the controls and attaching the wheel pants. The fiberglass wing tips, cowl, and wheel pants are all first-class.

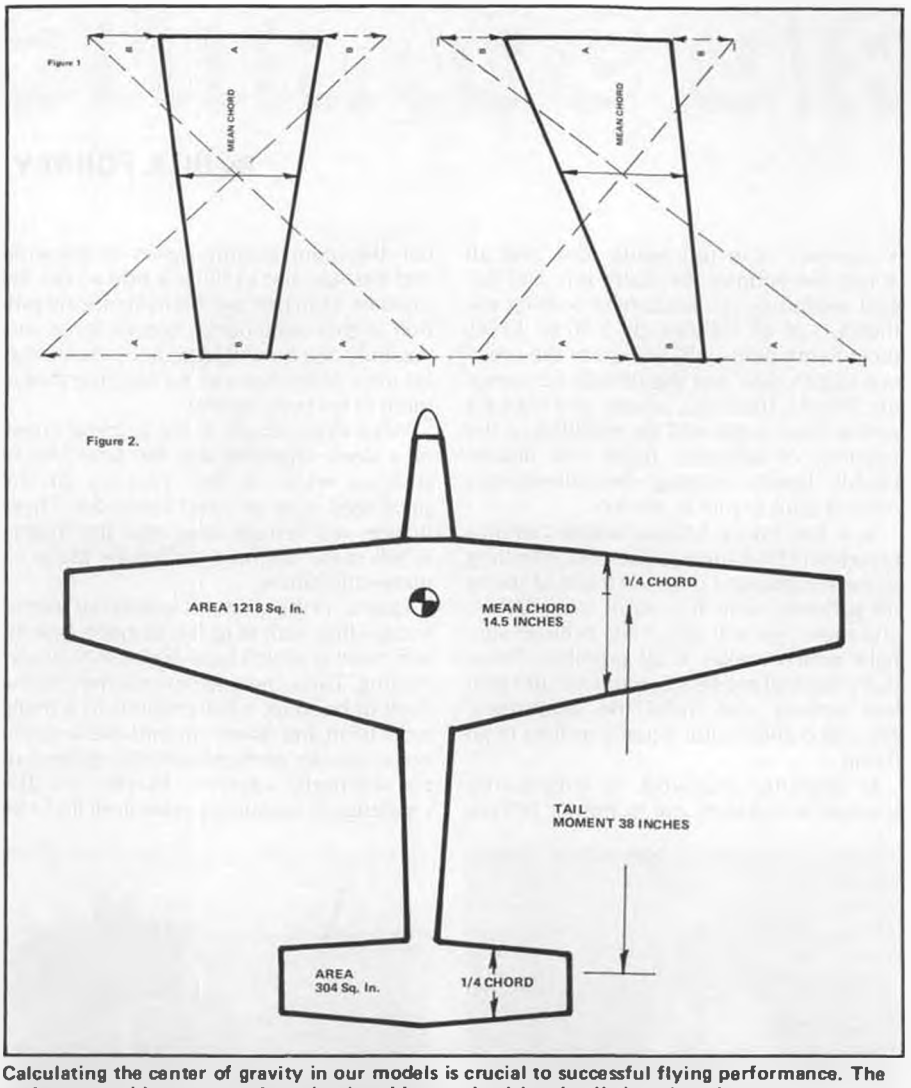
Altech Marketing were showing off their new pumped engines. If you were worried about fuel delivery in the past, you can now lay your fears to rest. Several of Altech's new Enya Engines now incorporate a geared fuel pump and special metering system which, with a direct mechanical link to the crankshaft, will reliably pump fuel to the carb under almost any conditions. It will now be possible to install your fuel tank almost anywhere without worrying about fuel delivery. The tiny gear pump will be available on the .45CX, the 60X, the 60XH, and the R120. I am told, however, that the pump cannot be retrofitted to existing engines and that it can only be purchased installed. The new engines have some different crankshafts and crankcase castings which enable the pump to operate.

Well, as usual, I have only covered the highlights of the Toledo Show as I saw them. I know I missed a lot, but I'll catch some of it next year.

CALCULATING CG

Calculating the center of gravity for a model aircraft has, and always will be, a popular subject for discussion by modelers. Numerous columns have been written on the subject, and I felt it's only fitting that I should add my version to the list.

The position of the center of gravity for our models is of vital importance for successful flight. Where a model balances fore and aft will determine whether a model is a winner or a dog. It surprises me how many people do not make the effort to balance their models properly as shown on the plan in an effort to avoid adding weight. A too-far forward center of gravity will create a model with sluggish elevator response and may make flaring for landing impossible. A rearward position of the CG can be disastrous as it creates instability and makes the model very pitch sensitive. This instability is what causes disaster with a new model. The model with a rearward CG will be very touchy on the elevator controls. Some modelers try to change the touchy elevator by reducing its throw. This does not work very well and is the wrong approach. Nose weight is the only answer to a longitudinally unstable model.



Calculating the center of gravity in our models is crucial to successful flying performance. The author tosses his two cents into the ring this month with a detailed explanation.

Given the choice, I will always opt for having the CG too far forward rather than too far back. Before testing a model, always add some weight to the nose to bring the CG ahead of the recommended location. After safely testing the model, you can then remove weight until the desired flight characteristics are achieved. All of this is well and good for kits and plan-built models where someone else has done the calculating and testing for you. All you have to do is read the plan and balance your model accordingly. But what about the scale modeler who is scratchbuilding? How does he go about calculating an approximate CG to aim for? There are a couple of good ways.

One easy and reliable way is to draw upon the experience of others. Page through those stacks of *Model Builder*

Continued on page 74

Bell Long Ranger with Schleuter mechanics was built by Dave George of Riverview, Michigan.

MBB BO 105 1/7-scale helicopter by Gerry Hicks of Chesterton, Indiana.

R/C SOARING

By BILL FORREY

• Summer is in full swing now, and all across the country the warm July and August mornings are beaconing soaring enthusiasts of all abilities. By 9:30 or 10:00, most flying fields will be free of the previous night's dew and the lift will be pumping. Hawks, buzzards, ravens, and maybe a rare golden eagle will be revelling in the freedom of effortless flight and broken earthly bonds, inviting the adventurous soaring pilot to join in the fun.

In a few hours, billowy white cumulus clouds will be forming all around, revealing to the enlightened observer a tale of strong lift gathered from the warm earth below, and then they will reflect the brilliant sunlight which makes it all possible. These puffy thermal markers confirm the air's restless activity and make the temporarily grounded glider pilot equally restless to go flying.

In soaring, mankind is temporarily granted permission, not to master or contain the unimaginable power of the wind and the sun, but to hitch a ride across the heavens. Man may use his insignificant portion of this tremendous natural force successfully, but he will leave behind nothing, no trace of his passing, no tangible monument to his puny efforts!

What does remain is the graceful vision of a sleek sailplane and the faint hiss of rushing wind in the memory of the privileged pilot or awed bystander. These images will remain long after the mighty winds of the day have circled the globe innumerable times.

I guess it's the scores of wonderful mental images that each of us has of grace, beauty, and serenity which have drawn us to model soaring. Then, once we've experienced the thrill of building what amounts to a flying work of art and flown our bird-like creation across the sky, perhaps many things keep us so willingly captive. Maybe it's the challenge of sustaining powerless flight for almost an hour. Maybe it's the heady rewards one receives; the amazement, the thrill, the satisfaction, the sense of independence, the sublime relaxation of the soul, the feelings of achievement after you have successfully harnessed a small portion of these majestic powers of nature. Whatever it is that "hooks" you once you've soared with the eagles. . .once you have been hooked, you can never be indifferent to model soaring again.

The wonders of silent, powerless flight attract many newcomers to model soaring every year. However, it isn't just the aesthetic appeal which draws in newcomers, the practical aspects of model soaring also attracts them. After all, by its very definition, a glider eliminates many of the economic road blocks which deter the first-timer.

Obviously, a glider has no expensive engine or motor to propel it, a simple bungee and tow line (or even a hand toss!) can get a sailplane airborne. A sailplane burns no expensive nitro-methanol-castor oil fuel, pollutes nothing (not even the silence of a peaceful Sunday morning), and only requires an overnight trickle charge of its batteries for flight-ready maintenance. A sailplane is a lot more stable than a power plane and a lot less likely to auger in and destroy itself in the hands of inexperience.

Melissa Gossert plays her role as transmitter caddy for mom & dad.

Instructors are a necessity if you have no experience in R/C and can save you a lot of grief.

Susan Gossert, Melissa's twin, takes her turn at transmitter duty.

Valerie Gossert with her Gentle Lady.

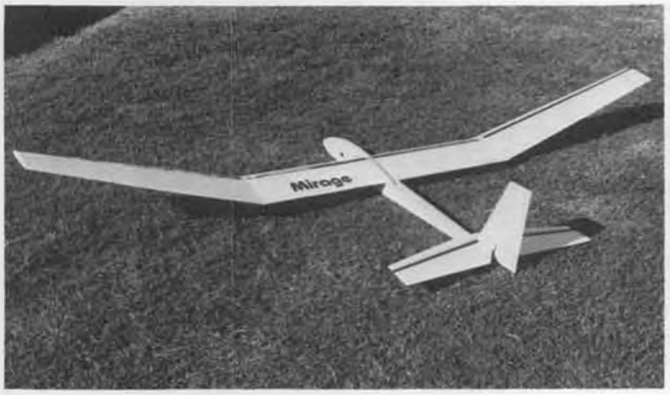
Valerie and Ed Gossert and their first sailplane, a Goldberg Gentle Lady. Good choice for an R/C sailplane trainer.

Another good choice for a first glider is the Dynaflite Wanderer. Two-stick radio can be a problem when looking for an instructor.

Goldberg's Sophisticated Lady is a good first or second model. Same basic construction as the Gentle Lady, with laminated vertical stab and extended sheeting on the wing, and a canopy with cockpit.

It's a good idea to get a friend to launch your glider for you, even if you have a lot of experience. Model is a Paragon.

The Paragon again. A beautiful flyer, it would be a good second or third model. Easy to control, and a quality kit too.



Dynaflite's Mirage makes a great light air sailplane. Flies slowly and predictably with good handling. Good second or third model.

Dynaflite's Sensor designed by Mark Smith. A contest ship when you have the basics down pat.

A sailplane gives a novice a lot more time to think and react to situations causing a lot less stress and confusion. All of the above attractions of model soaring have undoubtedly drawn in hundreds of fledgeling glider guiders over the past winter and spring.

However, as good as it looks compared to other forms of radio-controlled flight, even learning to soar can have its pitfalls. The absolute beginner is likely to struggle without the help of (1) an advisor and (2) an instructor (or at the very least good written instructions).

TIPS FOR BEGINNERS

To take this one step at a time, one would have to start at the *very* beginning: (1) assume the beginner *has* nothing (except possibly basic tools), and (2) assume the beginner *knows* nothing about model soaring. This way we can assure the newcomer the best possible chance to succeed.

Astro's ASW-15 held by Mike Reed, its builder/flier. An older design, it has a plastic fuselage which is one less thing to build. V-dihedral wings are less responsive than polyhedral wings when they have normal amounts of dihedral.

WHAT MODEL TO CHOOSE

The beginner market is by far the biggest market in R/C sailplanes. Every major kit manufacturer offers at least one acceptable first-timer's kit. Some are easier to build than others, but their flight performance is nearly equal. All have flat bottom wings for slow flying speeds and ease of construction. All have simple, boxy fuselages and flat tail surfaces, again, so they are easy to build.

The models which I would recommend for the absolute beginner are the Carl Goldberg Gentle Lady, the Bob Martin Models Pussycat, the Dynaflite Wanderer or Drifter II, the Airtronics Olympic 650, the Sig Riser, the Midway Model Co. Sensoar, the House of Balsa 2 X 6 ("Two by Six"), Midwest Model Co. Soarer, the Off the Ground Models Skyhawk, and the Hobby Shack injection molded foam Spirit of 76. The Spirit of 76 has the unique advantage of fast field repairs with 5-minute epoxy.

The above listed kits are very simple to build. Someone who has never built before will have little difficulty completing the kit to a flyable condition. Only an ability to follow directions is required here.

If a person has some modeling experience behind him or has good woodworking skills, the field of kits opens up a little more to include some T-tail models such as Goldberg's Sophisticated Lady or House of Balsa's Two Tee. Bigger models are also recommended such as the Pierce Aero Paragon (118-inch span), the Airtronics Olympic II (99 inches), Sig's new Riser 100 (100 inches), the Dynaflite Windrifter (99 inches) or Mirage (99 or 112 inches), the Astro Flight Super Monterey (99 inches), Joe Bridi's EZ-1 (78 inches) and EZ-2 (98 inches), and the Buzz Waltz R/C Design El Primero Grande (100 inches).

For those prospective modelers with a little more money and a little less building time there are prefabricated models which are almost ready to fly (ARF). These trainers include the Robbe Model Sport Finikofi (63 inches), Rofly (64 inches), RC Start (96 inches), and RC Uno (80.5 inches), all of which are available through hobby dealers or importer direct. From Hobby Shack there is the EZ 1800 and EZ 2000 with spans of 73 and 78 inches respectively, available through Hobby Shack (obviously) and also through your dealer. Similar to these models would be the RPM Elite 1.8 (73 inches) through your local dealer. Through Hobby Lobby there is the British-made Terry Edmunds Apex 98 and Apex 74, and the MFA High Sierra (78.7 inches). From AMS Imports in Reno there are the Aircraft Modelltechnik kits made in Austria: the T-tail Sunrise (94 inches), and the Angel 1600 (62 inches) and Angel 2000 (78.5 inches). All of these are well-suited for beginners and require minimal assembly.

WHAT RADIO TO CHOOSE

Buy a four-channel rig with rechargeable batteries. The brand isn't too important, but the four-channel part is. Here's why. Any instructor you find (98-percent probability) will fly single stick (the right hand stick) in what is called Mode Two. If you get a two-channel rig with two sticks, you will put him in the awkward position of having to rethink his instinctive flying habits using his right *and* left hands. This is not good on an unflown, untrimmed glider.

Robbe's ASW-17 looks like a lot of fun. ARF construction means less building time, but at a higher cost. Flat-bottom airfoil offers good thermalling ability.

The rechargeable batteries will save you money in the long run, and the extra servo will come in handy later on when you decide to install a third function (i.e., spoilers, flaps, or releaseable tow hook).

A FEW BUILDING PIT FALLS

There are a few things to watch for when you are building your kit glider. First, it is important to build it free from unwanted warps. The only desirable warp is called "washout," and it occurs only in the last three or four rib bays of the wingtips. Washout is when the trailing edge of the wing is higher than the leading edge of the wing. How much washout is needed will depend on the design, so go with the manufacturer's recommendations. If your wing is otherwise twisted, the glider won't fly well at all. You can create or remove minor warps with your heat gun by twisting the warp the other way and reshrinking the covering material until the twist-caused wrinkles disappear.

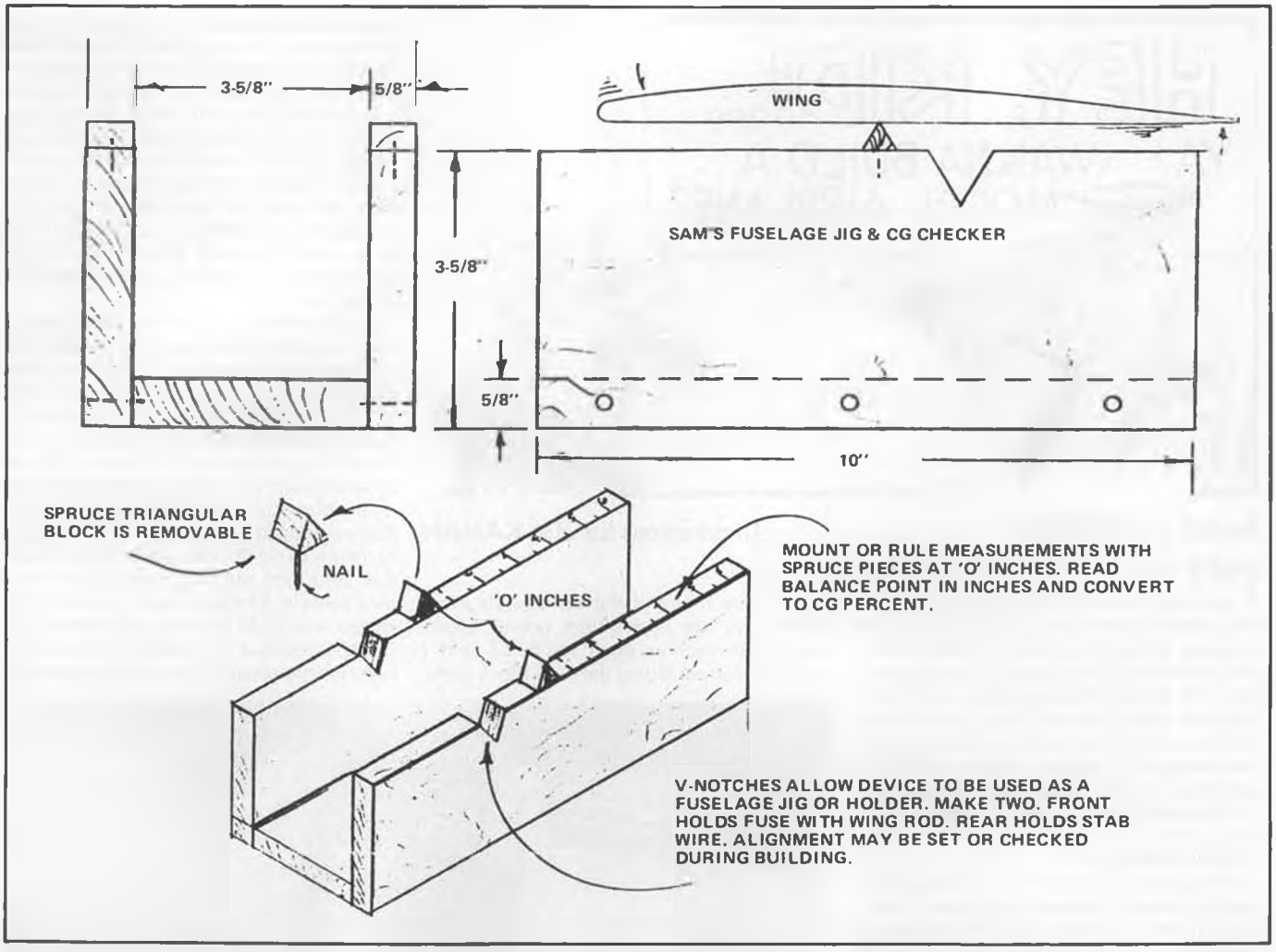
Second, it is important to build it strongly. The worst offenders are weak wings. A weak wing will fail when you least expect it (but usually on tow), and the parts that rain down will most likely be destroyed on impact (including your expensive radio receiver, servos, and Ni-Cds). If you are building a kit with an I-beam spar (in cross section the spar looks like the letter I), it is very important to get those shear webs glued to the top and bottom spar caps without any gaps. If you have completed the wing already and you have small (less than 1/64-inch) gaps, you can go back and lay in a filet (radius) of extra glue to fill the gap. This is still not as strong as a properly built web. If more than 1/64, make another (gapless) web to go along side the first one. Note that the grain of the wood is vertical (unless the kit manufacturer says differently). If your wing joiner plywood has gap-osis, better call in a model builder with lots of experience to fix it, as joiners are high stress members.

Third, make sure that there is no plastic covering material glued between the stab and the fuselage. You may think you have glued it well, but that plastic is acting like a mold release and the joint is no good. You need wood-to-wood contact in *all* your joints.

Keith Kindrick and his Gemini MTS contest ship. Very strong wings. Handles well. Many build this 100-incher up to 112- or 120-inch span.

Ed Holder and the Airtronics Cumic Plus, a contest ship you can build as a 100- or 118-inch span model with or without ailerons.

Fourth, make sure those servos are firmly mounted inside the fuselage. If you use wood rails to mount them, make sure to double glue them in or even add gussets.



Even on moderate impact landings these rails can pop loose, so check them after each flight. Also, before your first flight make sure the servos are making the surfaces go the right direction. The elevator surface must deflect upwards when the transmitter's elevator stick is pulled back towards you, and the rudder surface must deflect to the right (viewed from the rear) when the rudder stick is moved to the right. Make sure each surface is deflecting as much as the instructions say is enough.

Fifth, make sure the sailplane balances at the CG point marked on the plans (or described in the instructions). Do this before you get to the field because any wind will make this task difficult. You can get fancy and build a nice CG-finder (see illustration) or just use your fingertips.

Sixth, before you go to fly, make sure you have a full charge on those batteries. Instructors hate radios that go dead in mid flight! So do the owners; dead Ni-Cds equate with dead aircraft.

There are other less serious pit falls that one can run into, but these are the big six.

BEFORE YOU FLY

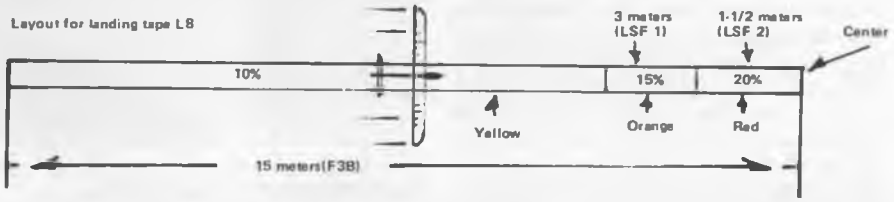
Try to arrange for a qualified sailplane instructor to be present with you when you fly for the first time. Your first flight is by far the most risky, so have everything going in your favor.

Have your instructor preflight your ship

Continued on page 102

LANDING OPTION—PROVISIONAL RULE L8 (EXPERIMENTAL)

This provisional rule would allow a broader interpretation of the general landing options statement (12.1): 'Landing points shall not be in disproportion to possible flight points." Landing option L8 provides bonus points to be earned as a percentage of the task, *not* flight time. A 15-meter tape would be divided into three ones; 10, 15, and 20 percent:



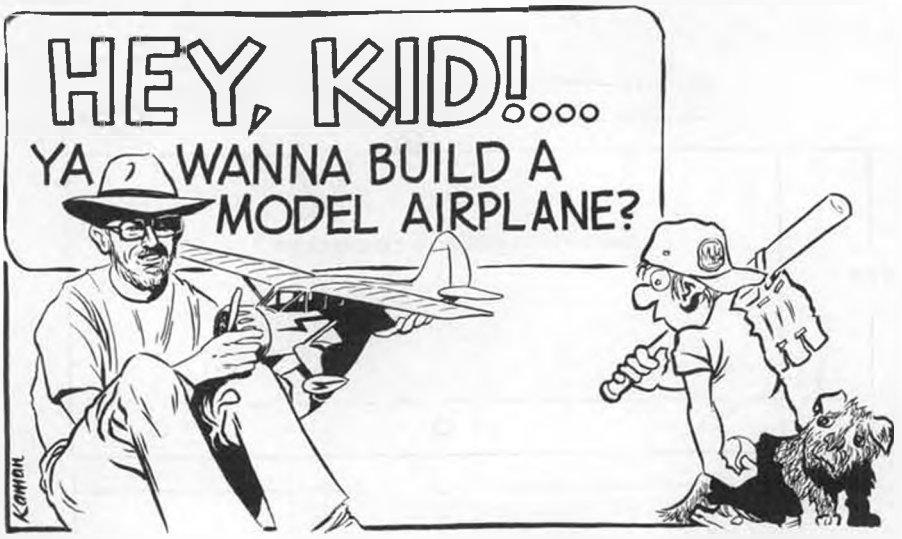
Example: flier attempting a 7-minute task lands at 4:15 in the 15-percent one. He records "4:15" and "15 percent" on timer card. Score keeper applies 63 landing bonus points to his score from table below:

(Task in Minutes) Landing Zone	5 and Under*	6	7	8	10**
10% under 15 meters	30	36	42	48	60
15% under 3 meters	45	54	63	72	90
20% under 1-1/2 meters	60	72	84	96	120

*Task T4, cumulative duration also
**Task T6, triathalon also

Advantages:

—Quickly measured and scored without complication for *any* task.
—Novice fliers won't get buried by veteran's landing points.
—Veteran can still be challenged and rewarded for superior landing skills.
—LSF landings identified and thus promoted.
—Preserves landing emphasis for 2- to 4-minute tasks.
—"Pay" end of tape readily identified by flier if color coding used.
—Generally in agreement with NSS-EAP 20-percent rule for landings.



By BILL WARNER

Illustrations by JIM KAMAN

PART 10

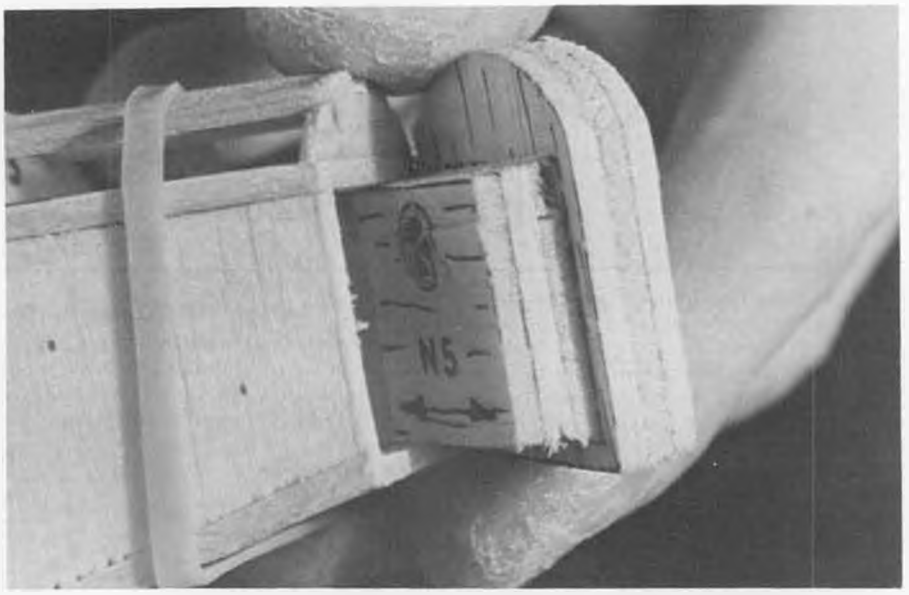
• Last month, we boxed up the fuselage, and, after a month on the shelf, it should be all ready to go! An all-over sanding with a piece of 400-grit wet-or-dry "sandpaper" (the stuff with the black surface used in automotive paint work) will help you find any weak spots. Better now than later. Reglue any weak parts. Adding a little extra glue at each joint will help the model greatly, but don't overdo a good thing as weight is still your enemy.

THE NOSE BLOCK

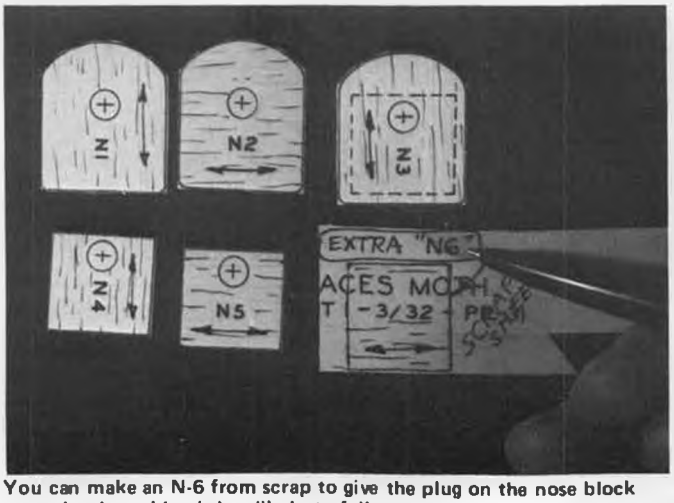
This part of the model is *very* important, and often poorly done! Once upon a time, back in the "Golden Age" of modeling, people used to put the motor rubber inside the model before it was covered, with the nose glued on solidly. That sort of limits you when putting in winds, and changing a motor usually took place after it had snapped under high winds and made its own access hole in the side of the model. We do things a little differently these days. Making the nose removable lets us stretch-wind motors by pulling them to double their length while winding, which allows more turns and less breakage. Motors can now be changed *before* they break, and by adding thin strips of balsa between the nose and the fuselage you can change the thrust angle to cure many of the ills models have when they are under high power. More about that when we get to the flying field.

When you are gluing the nose block parts together, pay attention to the grain direction of the wood. You may have noticed sheets of plywood which have the grain going one way on the top layer, then at right angles to it on the next layer, with the third layer back to the original direction, etc. This adds a lot of strength to the wood, as it tends to split *with* the grain rather than *across* it. Whenever you have to laminate two or more sheets of balsa together in model building, it is usually a good idea to "cross" the grains, as it adds strength in both directions to the part.

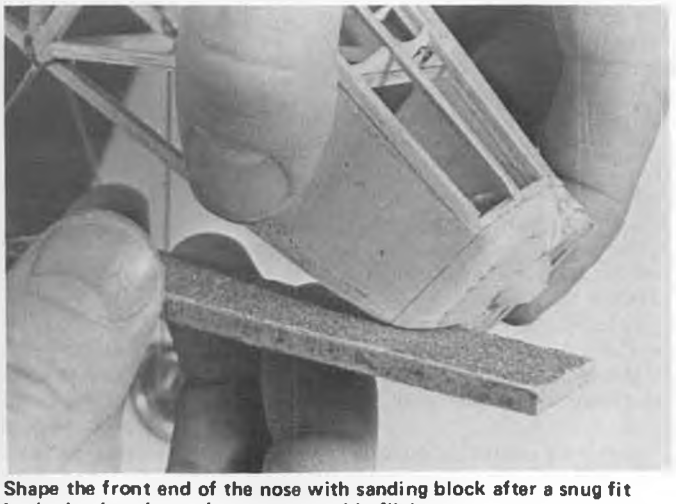
A snug-fitting nose block being important, I usually "harden up" the inside of the fuselage where the block fits in with a little glue skin. As nose blocks sometimes tend to fall out under flight conditions, I usually make the part that fits into the fuselage a bit deeper than shown on the plan, in this case by adding an "N-6." You won't find that part on the plan, I just made it up. Another thing that will help keep your nose block plugged in tight is to cut the plug just a little bit oversize, and then sand it carefully down to a nice push-fit. Use your sanding block. The easiest way to do this is to assemble all the "plug" parts (N-4, N-5, and N-6), and just fit one dimension at a time. Let's say you de-



Test fitting nose plug, first top to bottom, then side to side. Front part, showed glued on here, can be added later for easier sanding.



You can make an N-6 from scrap to give the plug on the nose block more depth, making it less likely to fall out.

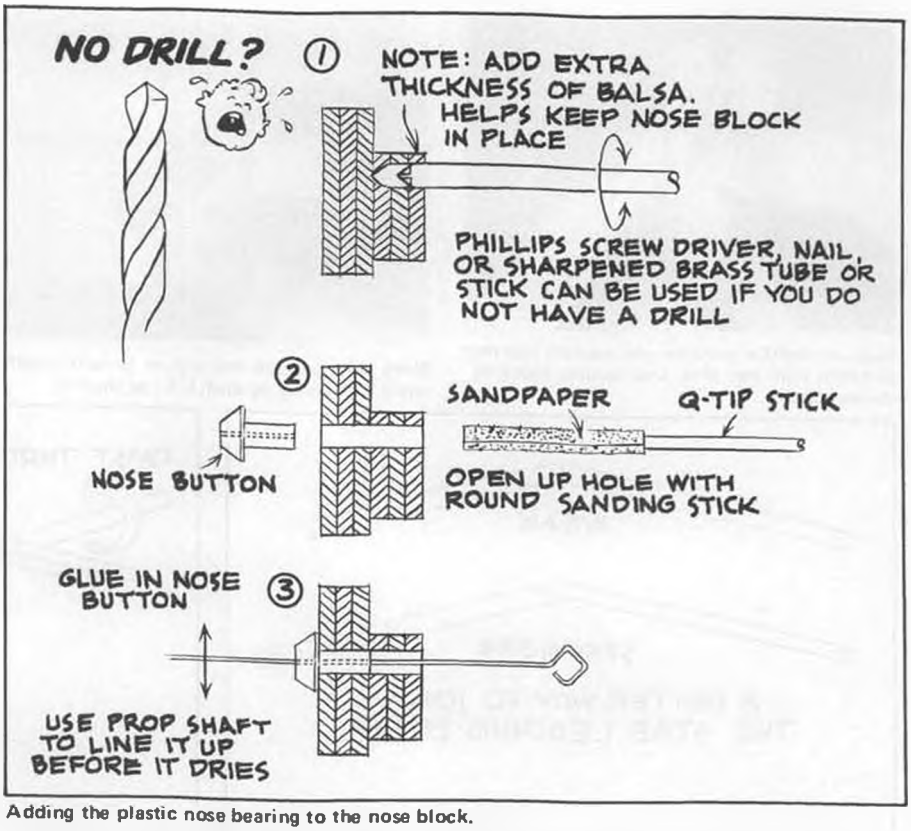


Shape the front end of the nose with sanding block after a snug fit is obtained, so it won't move around in flight.

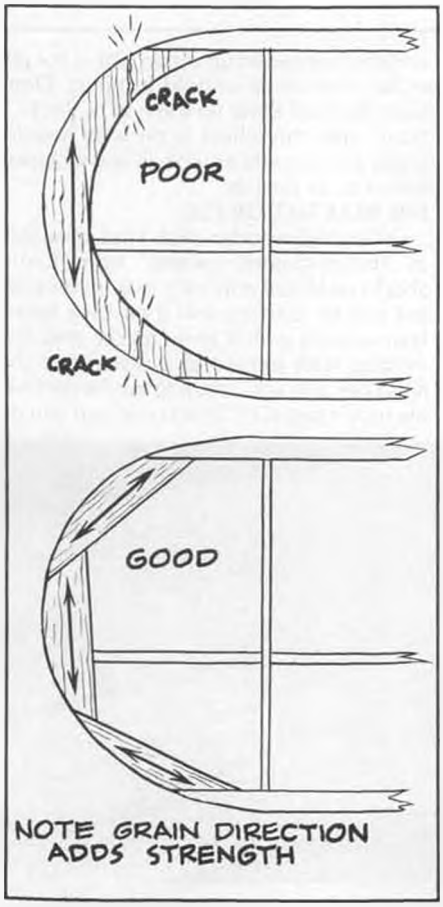
cide to do the up-and-down dimension first: keep sanding and trying it from the corner until it will slide snugly in lengthwise. Then do the side-to-side fit. When it just shoves in and does not fall out, shove it about 3/4 of the way in and then glue the front part of the nose block to it (but *not* to the front of the fuselage). This will let you line up the front part to match the front of the fuselage.

After it is dry, remove it and put in the hole for the plastic nose bearing. If you don't have a drill to make the hole, a little patience twisting a sharpened tube, hardwood stick, or Phillips screwdriver through will get you a hole. It can be enlarged with a little sandpaper glued around a bit of Q-Tip dowel (round piece of stick). Glue in the nose bearing, using your trusty Testors "green tube" (cellulose cement, fast-drying, for wood models) and line up the bearing with the help of the prop shaft. You can add about five degrees of down thrust and about two degrees of right thrust now if you want. You will probably have to add it later during test flying anyway. If you don't want to worry about that now, it's okay.

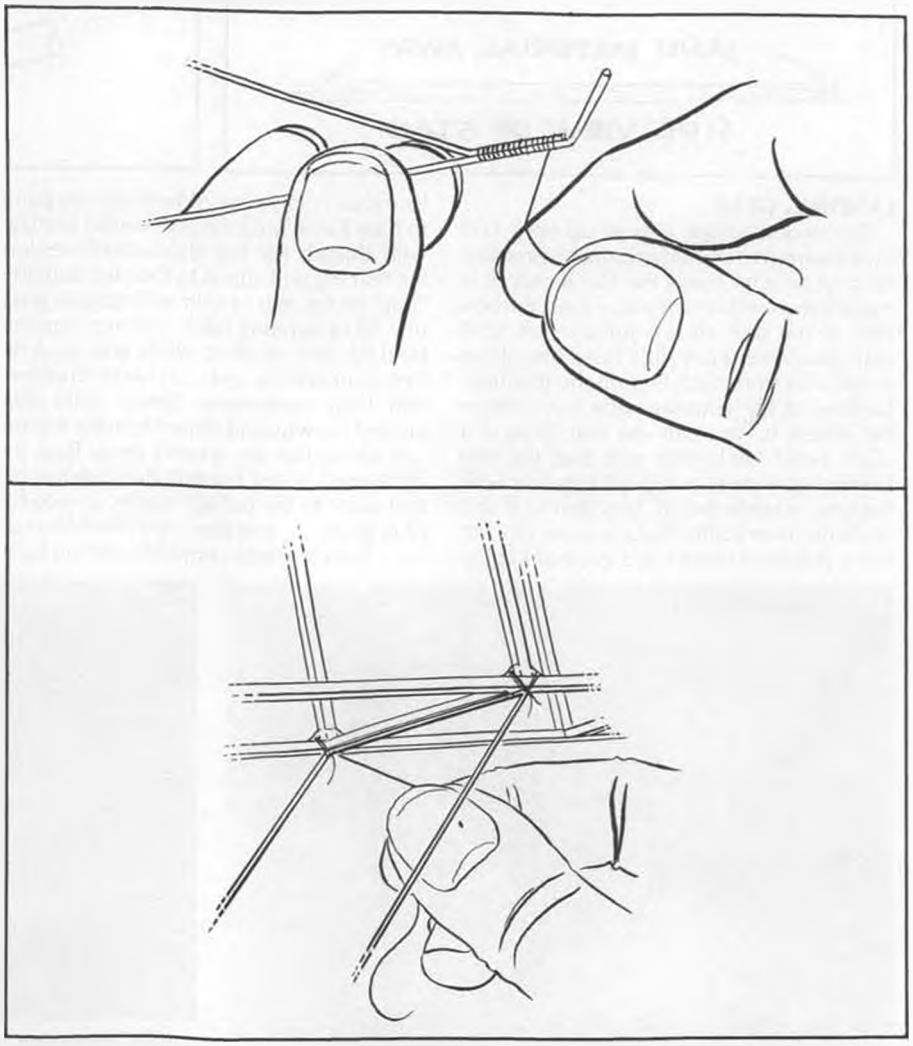
Shape the nose block by inserting it in the fuselage and using your sanding block to blend the sides of the fuselage and the block, and curve all the lines toward the nose button until the shape looks right. Then sand with fine sandpaper (220 to 400 grit) until it looks professionally done. Fill the raw balsa with a mixture of clear dope and talcum powder, and sand again when dry, which will give you a mirror-smooth surface to paint.



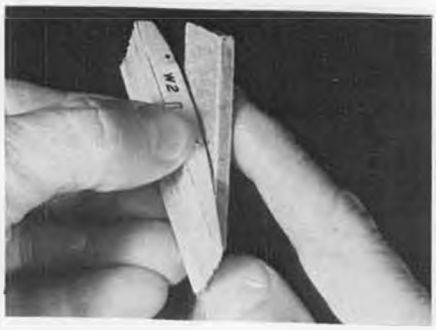
Adding the plastic nose bearing to the nose block.



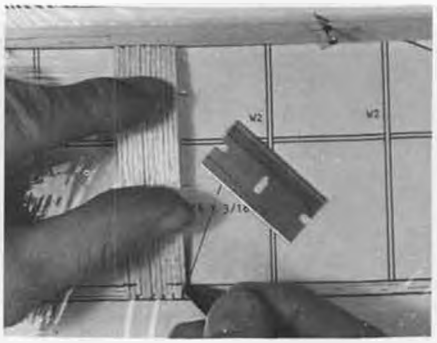
Sheet balsa breaks easily with the grain. This is why we build up the wing tip.



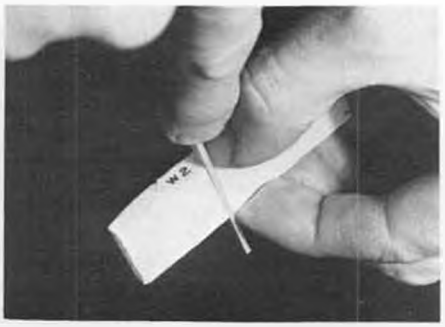
Bind the landing gear wire with polyester thread and glue well. Thin wire and Sta-Brite solder can be used also.



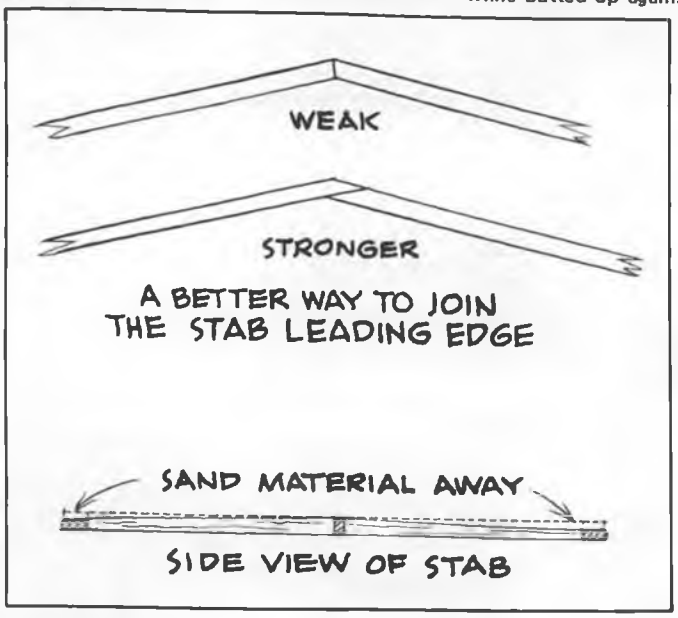
Even up slightly oversize ribs stacked together and held with two pins. Use sanding block as shown here.

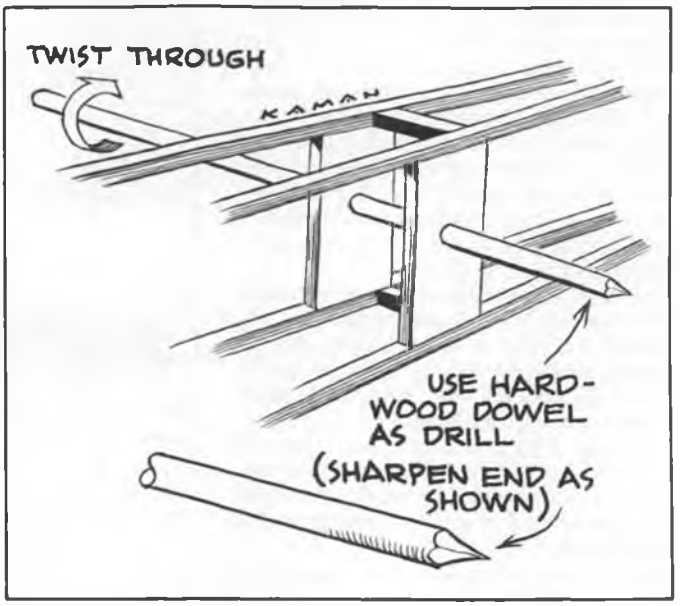


Mark the rib stack and cut to correct length while butted up against L.E. as shown.



Make a notcher from a piece of 1/16x1/8 spar stock using sandpaper along the edge. Sand-in nothces on rib stack.





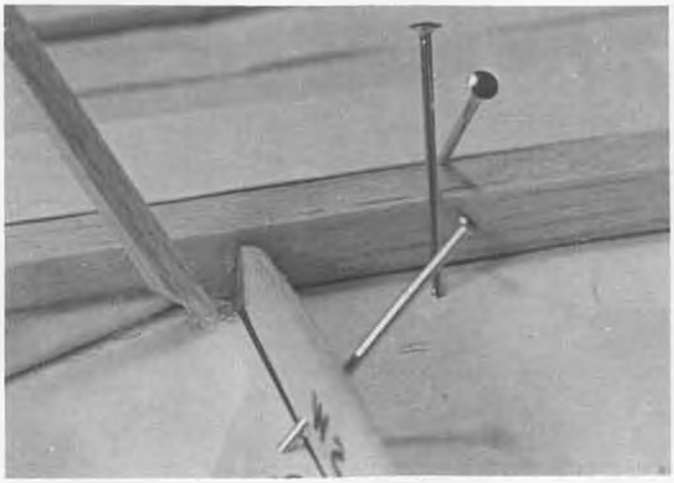
LANDING GEAR

The undercarriage is bent up from .031 music wire, and should present no problem for anyone who made the Sky Bunny. It is made in two sections. If you inspect the bottom of the part shown full-size on your plan, you'll see a tiny little bend line about a half inch from each end on the rear legs. Looking at the cutaway wide view where the wheel is, you can see that there is a slight bend backwards and that the two landing gear parts are glued together with the help of some thread. Very thin wire and Sta-Brite silver solder make a super job, but using polyester thread and good old cellulose glue is adequate. Where you are going to have fun is tying the gear on the fuselage with thread! For the short-nosed version, the rear leg will attach to the next available "bay" to the rear, which will require just a tiny bit of bending back. Having someone hold the gear in place while you wrap the thread around the gear and lower longerons will help immensely. Smear extra glue around the wire and thread to make it solid.

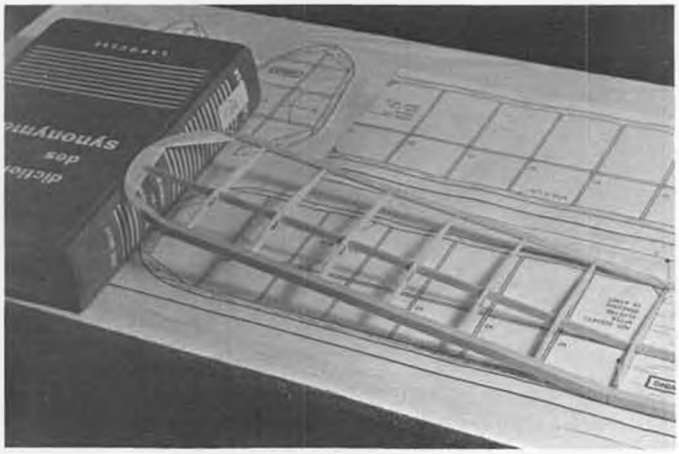
It seems like the wheels never have the right-sized holes! Usually they are too big and have to be drilled bigger, a wooden plug glued in, and then re-drilled the right size. The kit wheels, however, are too tight, and can be opened up a little with a hot pin or bit of music wire held in pliers. Don't burn yourself! Bend up the end of the L.G. "foot" after the wheel is on with needle-nosed pliers or add a glue ball and wrapped thread to do the job.

THE REAR MOTOR PEG

Q-Tips, the wooden-stick kind (available as "Head-cleaner swabs" from Radio Shack) make not only nice rear motor pegs but can be used to drill their own holes. Four whacks with a knife on the end and twisting with some end pressure into the balsa can give you a tight fit for the removable motor peg at F-7. This is one part you do



Note pin positions used in building wing. Use a stick to add glue "fillets" for extra strength.



Adding dihedral to right wing panel. Main spar, shown in photo, may be left off until later to make joining easier. Don't forget to sand an angle on end of L.E. and T.E. Double glue for strength!

not want to have loose because if it slips over to one side, it may let a tightly wound motor come rapidly up through your fuselage, doing a good deal of damage. I often make a little ball of glue on one end of the motor peg and let it dry. Then, when I use it to hold the motor, I shove it all the way into the ball, which lets the other end stick out the far side, with less chance of coming out. You can also loop a rubber band over each end of the dowel when installed, passing either over or under the fuselage. In any case, I recommend always making the peg longer than shown on the plan. If it fits loosely, go around the inside of the holes it fits in with a little glue and let dry to reduce the hole size a bit.

GUSSETS

Remember what a gusset is? A little corner brace of somewhat triangular shape added for strength in vulnerable spots. There are six of 'em on the fuselage, and you can glue 'em in now and sand them level with the sides when they are dry. It usually helps to knock the point off each one with a sanding block so it won't interfere with the glue fillet you added and make a lousy fit. You'll notice that these add strength (added gluing area) to the places where the longerons were cut. If you just kinked, rather than cut your longerons, they will probably not be necessary. On many models, you'll find fuselage gussets where the landing gear attaches, which is where I'd put them on a heavier model.

WINDOWS

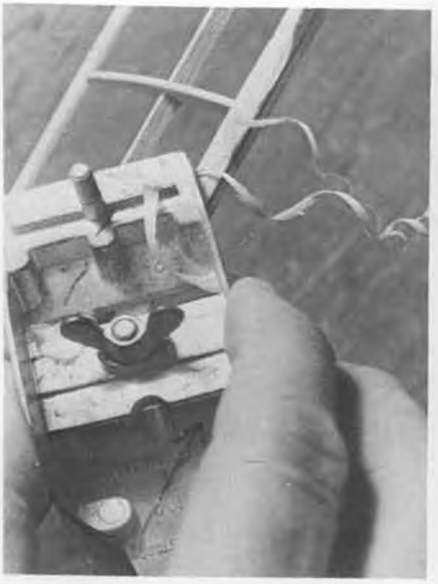
Some modelers prefer adding the thin plastic sheet windscreen and side windows at this time, adding the tissue to cover the edges later. This makes a very neat job, but much care has to be used when putting on the covering tissue so as not to smear on the plastic, and if trimming is necessary on the tissue, the plastic may get cut by accident. The structure which can be seen through the windows may be tinted with dope or colored enamel before applying the windows. Adding a fake "instrument panel" to F-4 adds class to the model, as it is always a delight to look inside and see more than raw balsa. You can draw your own instruments and use a black background or Xerox the one from the magazine.

TAIL PARTS

Build the tail parts directly over the plan. Note that the S-1 and S-2 parts are glued together instead of just cutting one curved tip from balsa sheet. Can you guess why? I'll give you a hint: it has to do with grain direction. Right! There's no way the grain on one piece could be going the right way for the *entire* tip, no matter how you sliced it; so you make tips up with short lengths of straight grain to conserve strength. The wing tips are the same, and so is the rudder tip. There are better ways to do it, but this will work fine for us.

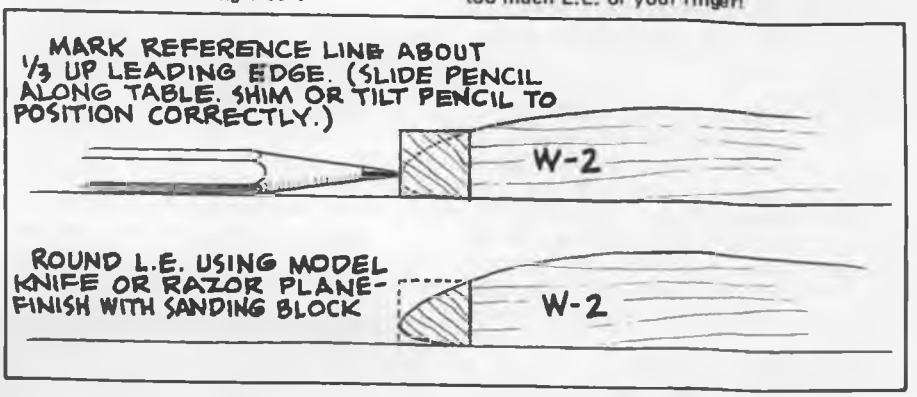
'X" pin down the L.E. and T.E., *noting that the sticks you use are 1/8-inch wide, lying on the wide side.* Add all the other sticks *standing on edge.* You cannot see that they, too, are 1/8- by 1/16-inch (twice as wide as they are thick), but they are. The plan tells you that, but maybe you missed it, just as-

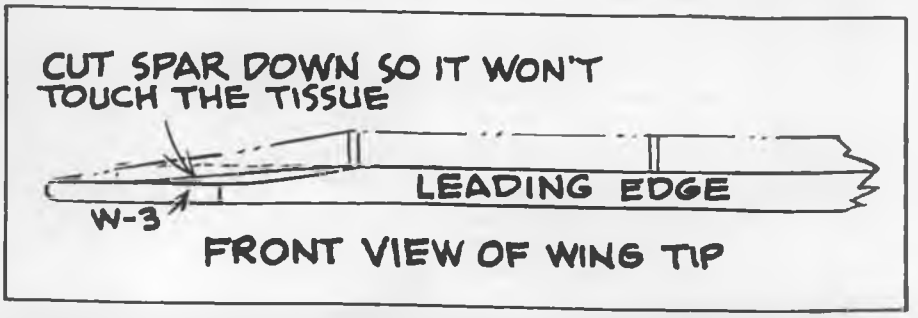
Continued on page 79

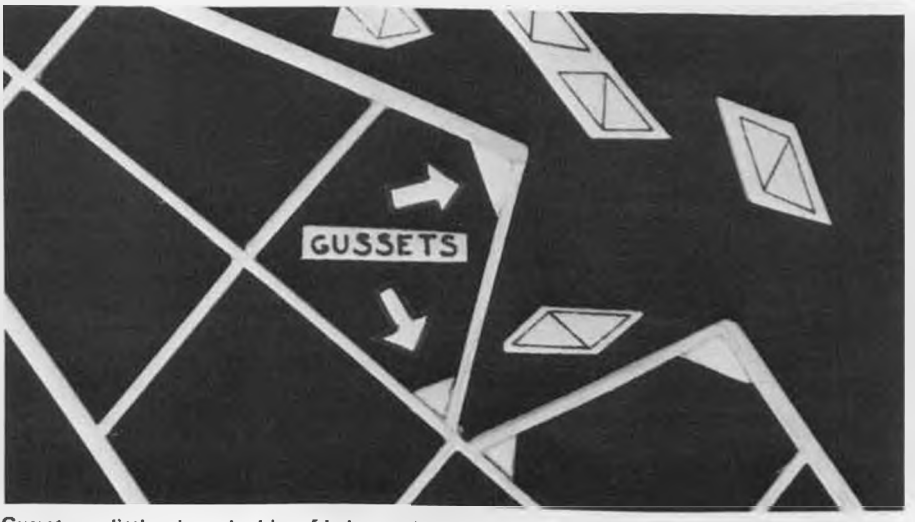


Shaping the leading edge with a razor plane. Note angle of the tool and also reference line. Follow with sanding block.

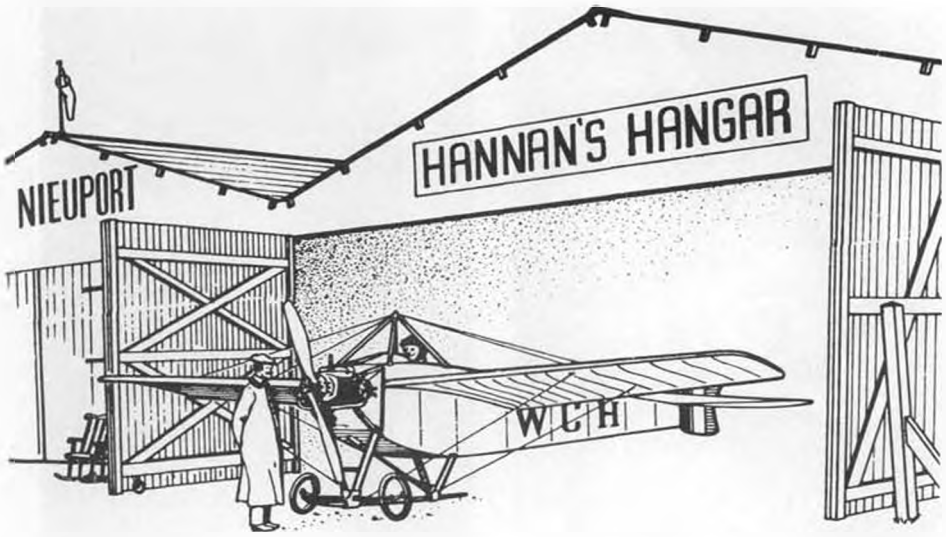
Shaping leading edge with razor blade. Follow with sanding block. Be careful not to take off too much L.E. or your finger!







Gussets are little triangular bits of balsa used to add strength at weak points. They are laid out on printwood with correct grain direction for strength.



"A sense of dignity is highly overrated."

• Our lead-in line this month is by Walt Mooney, who feels no qualms whatsoever about the joys of "playing with toy aeroplanes."

WALT'S FAVORITE COMIC STRIP

Calvin and Hobbs featured model building as its theme for several weeks during April. The boy and his pet/toy tiger found continuing frustration in trying to assemble a plastic kit model. And, judging from the realistic comments in the cartoon strips, it would seem likely that its artist/author, Bill Watterson, has tried building a few models himself.

FROM LEGEND TO LIFE!

Myth became reality with the Project Daedalus man-powered plane flight which took place near Greece during April. Greek pilot/powerplant Kanellos Kanellopoulos covered some 74 miles at an average speed of 18.5 miles per hour to exceed all previous pedal-powered plane records by a substantial margin.

The flight from Crete took 3 hours and 55 minutes aided by tailwinds over the open sea and fell only slightly short of the planned landing when a structural failure caused it to drop into the ocean only a few yards from shore. Happily Kanellos was not injured.

The 112-foot wingspan craft was constructed by members of the Massachusetts Institute of Technology, with important design contributions by Mark Drela, a Peanut Scale plan contributor for *Model Builder* magazine!

CHESTER PLANS OFFERED

Vern Clement's latest masterpiece in draughtsmanship is a one-inch-to-the-foot scale Chester "Goon" racer. This six-view plan is remarkably complete, incorporating such details as plotted spars, ribs, and bulkheads. Even the Dzus fasteners are delineated in a fashion seldom-seen in technical drawings, and the individual instrument markings are legible! Full information about this and other offerings is available for $3 from: Vern Clements, 308 Palo Alto Dr., Caldwell, Idaho 83605.

AUTOGIROS ARISE

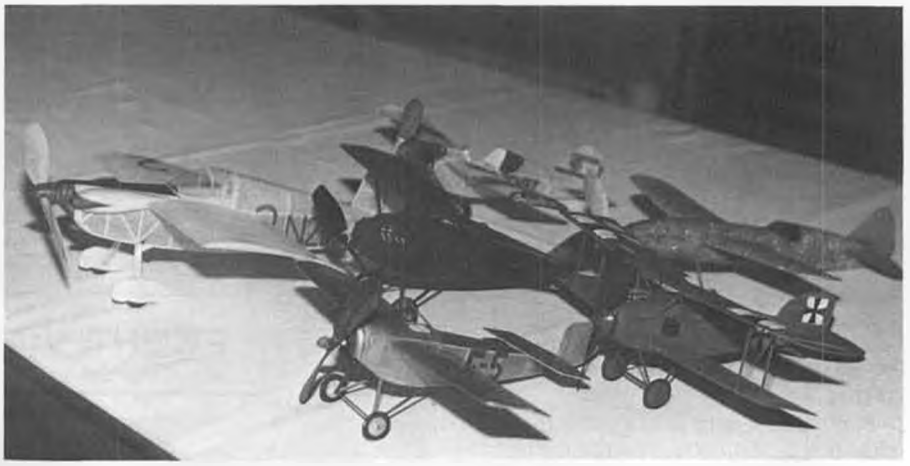
The movie "The New Adventures of Pippi Longstockings," which features a rescue scene with Steve Pitcairn's PCA-2 Autogiro, is scheduled for July release.

A much older (1934) film, "It Happened One Night," starring Claudette Colbert and Clark Gable, also features a brief sequence with an Autogiro, a Kellett K-3. Watch for this Oscar-winning movie on your local television listings.

AND MODELS TOO

A revival of model Autogiros (designs licensed by Cierva) and autogyros (other brands of rotorcraft with unpowered rotors) is underway. A recent Flightmasters West indoor contest attracted some half-dozen rubber-powered examples, and Bill Young displayed his large electric R/C Pitcairn PCA-2 and Comper C-25 control-line Autogiros.

A touching sideline to this meeting: Somehow, two small birds had found their way into the gymnasium and fluttered around among the rafters trying to get out. Although Bill and Phyllis Warner managed to open a window near the ceiling, only one bird saw it and flew outside. The other continued to fly and was quite obviously growing weary in trying to escape. Finally, when the contest was nearly over, the little creature landed in the middle of the gym



Pistachios from Czechoslovakia. How many can you identify? Photo: Lubomir Koutny.

George Perryman's Little Biddy Speckled Bird Whirly with square rotor on underside of fuselage. It holds AMA Category I and II autogyro records. Photo: David Raymond.

The late Loren Williams with his magnificent Jumbo Scale Taylorcraft L-2B. See text. Photo: Dick Seifried.

floor and stood there looking weak and confused. Dick Baxter quietly opened a door at the far end of the building while every person in the room, *by shear force of will and compassion* urged the little bird toward freedom. Slowly he ambled in the direction of the doorway, stopped to examine a model and/or its toolbox, then briskly strode outside and flew away, while everyone gave a heartfelt sigh of relief!

SAL SLOW-ROLLS SEDAN

Famed model builder Sal Taibi has taken particular pride in driving the same Chevrolet automobile to contests for many years. Recently, while towing a trailer loaded with models, a tire failed causing the car to roll over. Happily, Sal and his wife emerged unhurt except for minor scratches. Some of their models were *not* so fortunate.

TAKE YOUR CHOICE

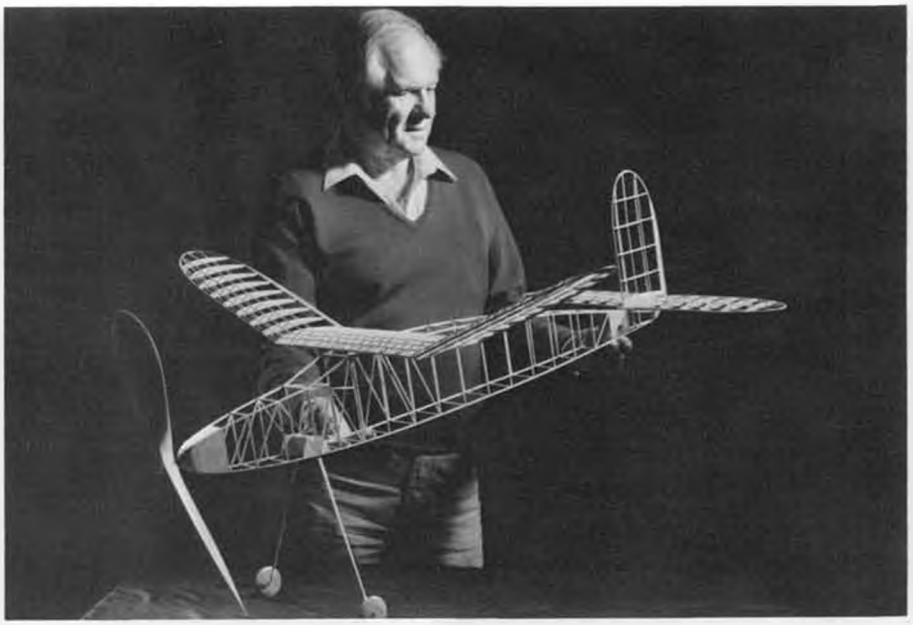
Ed Whitten and his New York-based indoor fliers are trying to satisfy all their members' tastes in types. One month's flying session is set aside for traditional "lightweights," such as Easy-Bees, Pennyplanes, and Manhattan Cabins, while alternating sessions are reserved for "heavyweights," such as Peanut Scale, Bostonians, and Coconut Scale. They are even listing a special award for "The most-beautiful-Peanut-that-didn't-get-such-a-great-time." Something for (almost) everyone.

FLYPAPER

FlyPaper, the newsletter of folded-paper flight arrived recently, and appears to be off and running in good health. Among the features were a tribute to the late Ralph Barnaby, who was a balloonist, pilot, engineer, author, and lifelong paper glider enthusiast; an article about Voyager and reviews of paper Voyager models; and various tidbits relating to paper flyers. If your interests include cutting and folding, subscription information may be obtained by writing to *FlyPaper*, Box 47186, Wichita, Kansas 67201. Please send a pre-addressed, stamped return envelope.

NFFS AWARDS

The 1988 Free Flight Hall of Fame award recipients have been announced by the National Free Flight Society. They are: Frank Cummings, a top competitor in many free flight categories from the late 1930s through 1965, when he was a member of the USA Indoor Team; Walter Erbach, an especially creative modeler who has specialized in ornithopters and indoor flying; Tom Hutchison (posthumous award), an accomplished model designer, competitor, and educator; Elbert J. Weathers (posthumous award), a leading light in free flight modeling on the West Coast. Among his many notable designs, the "Mystery Man" may be most remembered; and Robert "Bob" White, an enthusiastic free flight competitor who crowned his modeling career by winning the 1987 Wakefield Cup. The NFFS awards are to be presented during the 1988 Nationals Symposium.



Jack Jela and the structure of his 1936 Chet Lanzo Duplex, constructed for the Wakefield 50th anniversary event in England. Photo from Bill Winter.

LOREN WILLIAMS

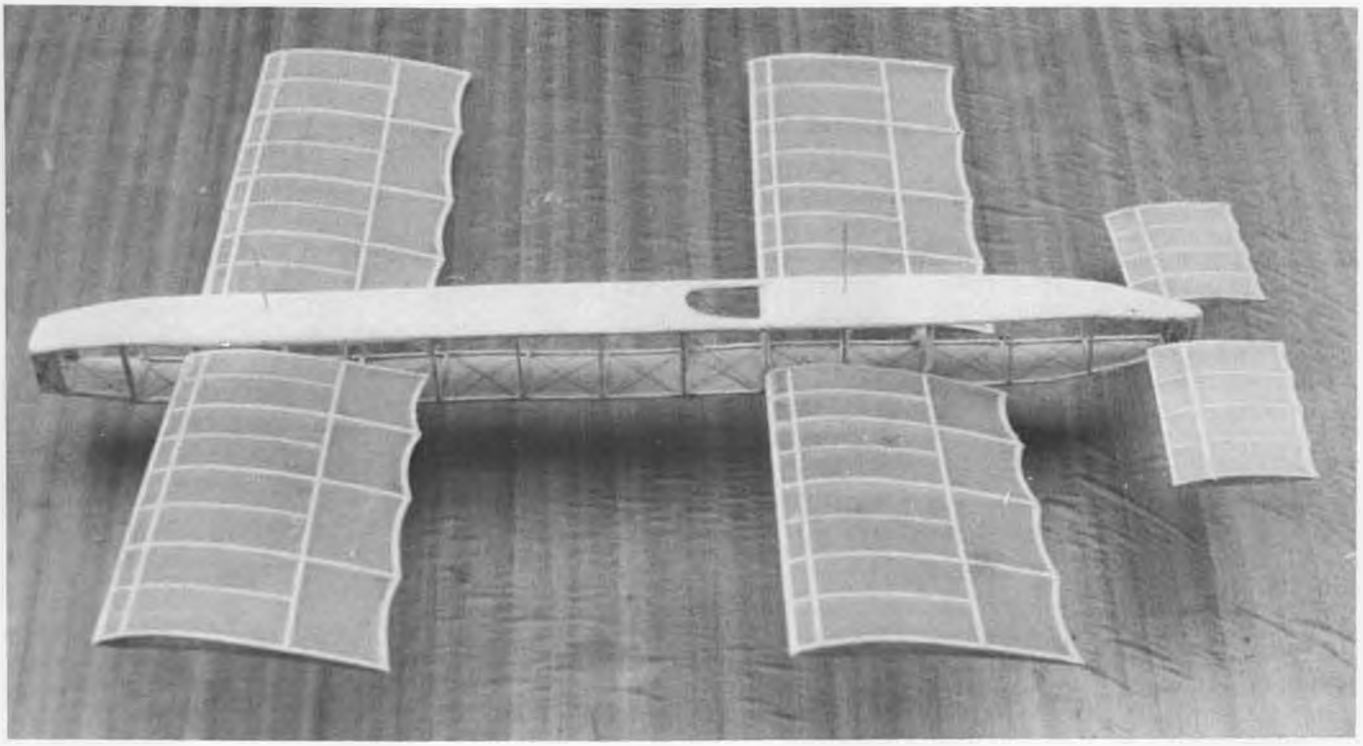
Another skilled model builder is no longer among us. Loren Williams, longtime

Continued on page 70

Dick Tichenor's R/C Stinson L-5 with invasion markings, features realistic pilot wearing headphones! Photo: Tichenor.

Don Campbell's busy bench. He builds hobby horses as well as free flight and control line models!

Dan Nielsen's R/C Autogiro has successfully flown and is a study model for proposed scale Pitcairn.



ASTRA Kapferer

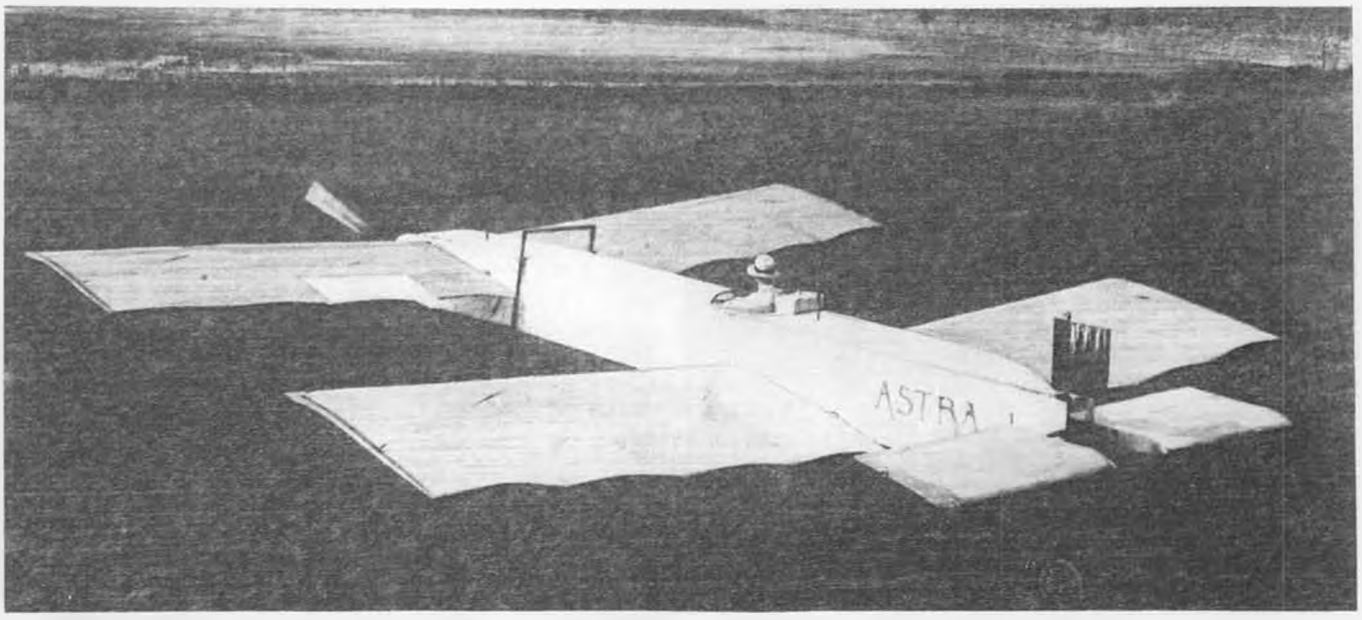
By BENNO SABEL. . .A rare, and certainly seldom-modeled monoplane, the Astra was an interesting tandem flying machine developed in France in 1908. The author's model flies well. . . .

• Henri Kapferer was one of the engineers who constructed the Air Ship "Ville de Paris," that was built by the Astra Company, Billancourt. It has been my wish to show this interesting tandem flying machine, dating from the French pioneer period (1908) to a broader hobbyist public. I had four bad photographs, but exact measurements and data, so that the model should be a 95-percent correct reproduction of its real counterpart. This reconstruction is easy to build, so there should be no difficulties in constructing it. Two different versions concerning the REP motor are given; one with 5 (24 hp) and one with 7 (35 hp) cylinder.

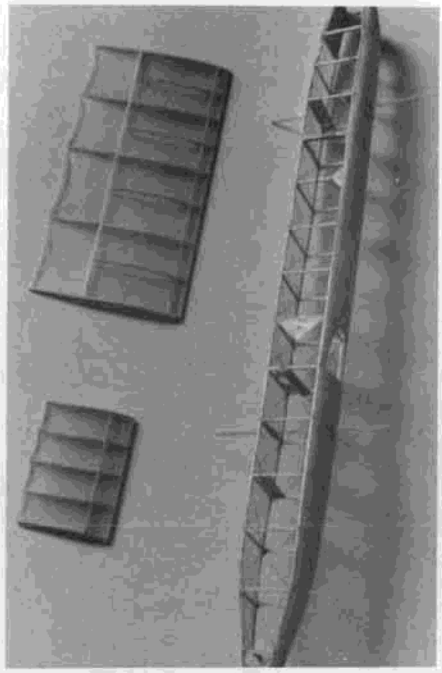
The weaker engine first used a two-plated propeller; the stronger used a four-plated propeller. Good drawings of the REP motors exist, but they don't show the arrangement of the exhaust pipe. The undercarriage might be not 100-percent correct, as there is no good photograph showing it. It looks a bit like a Voisin type.

Concerning statics, the original with its long fuselage is a quite ideal design. The model also shows good flying abilities. Whether the original did fly I don't yet know; unfortunately there is no photograph showing the machine actually flying. Perhaps the U.S. has a hobbyist who will build a life-size model! It would surely be a great sensation on aviation days.

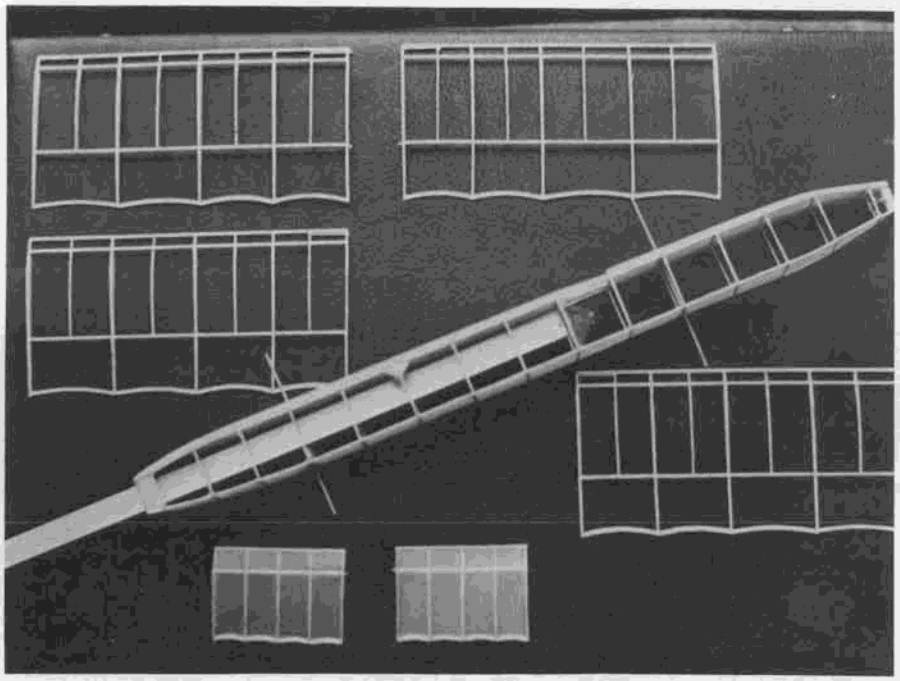
An earlier Kapferer machine had been



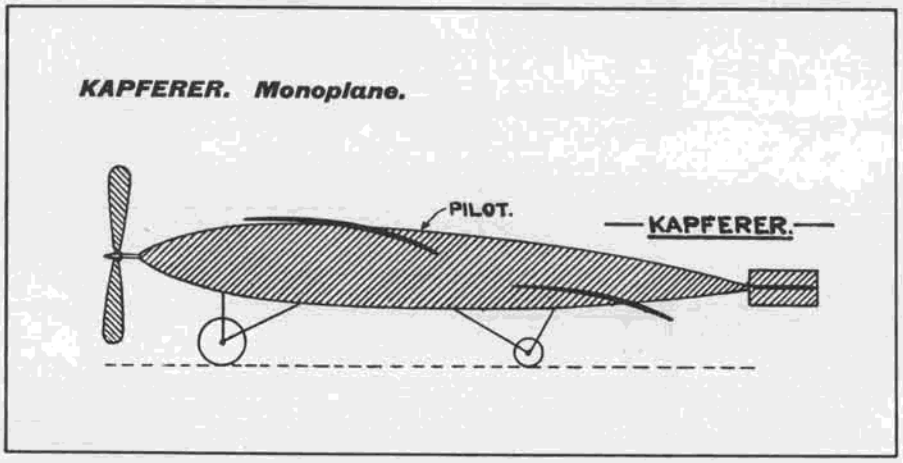
A copy of a copy photograph shows the full-size Astra with pilot posing in snazzy hat.



Delicately braced fuselage sits alongside half of a wing and stab of the Astra.



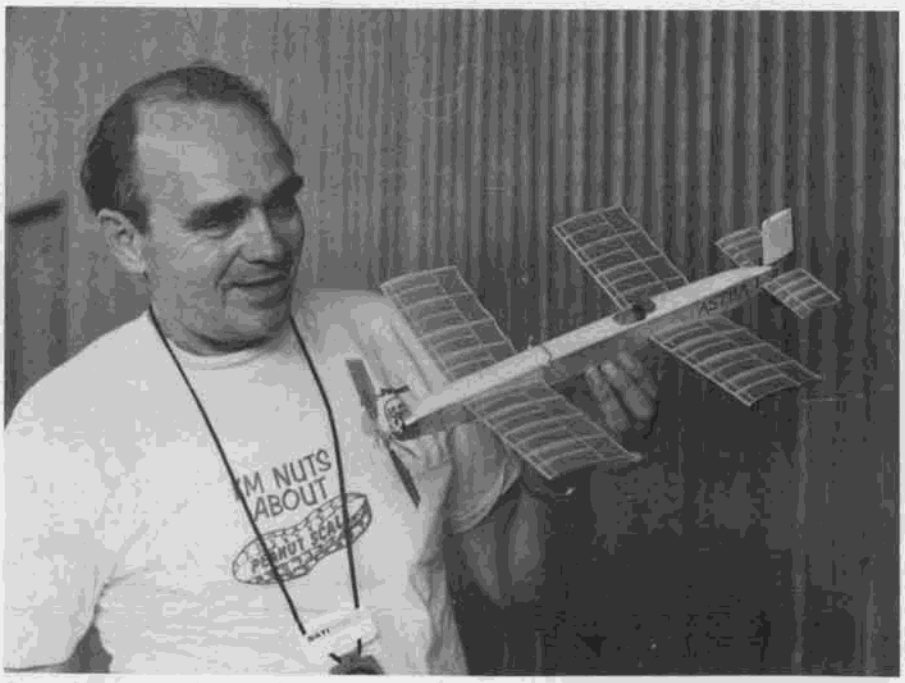
All the parts of the Astra laid out for covering.



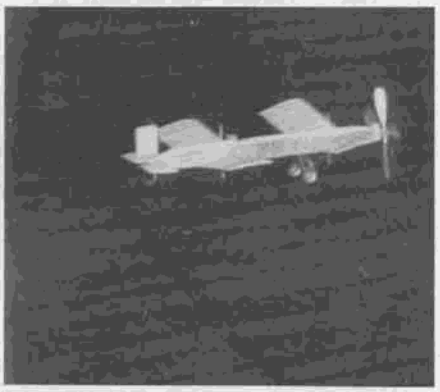
built by Voisin in 1907. This machine most probably had been built by Astra, possibly the first airplane built by this company.

My model did its first flights at the 1985 contest in Flemalle, Belgium. Because of slightly twisted wings, the flights were no longer than 37 seconds. Later, in a 1987 contest in nearby Frankfurt, the results were slightly better, but the model soon was damaged in a crash on the lower ceiling. I think that the flying limit will be at about 80 seconds, if light weight and long rubber are used. I do not recommend moving the rubber peg further back, as the model would then need ballast in the front. After building my model, as you can see on the photograph, I discovered on a rare back view photograph that the plane had actually a second lower fin. The older photographs showed the plane from an unfavorable angle with the lower fin in darkness. Bill Hannan in a letter to me considers the Astra Kapferer's fin "very small," and he was right; it was just the upper part!

My technique for winding the rubber, as shown on the plan, I can only recommend. I use it without risk for nearly all my models. •



The author shows off his finely detailed Astra.



Best flights so far with twisted wings are over 30 seconds. With adjustments, author thinks it could remain aloft for more than a minute.

1908 KAPFERER III of Henri Kapferer

ASTRA KAPFERER Typ LANGLEY

PEANUT Plan u. Rekonstruktion v Benno G. SABEL

Dimension

Span 8,7 m, Long 11 m, Aera 32 sqm total, G 410 kg

Motor: 7(5) Zyl. 35(24) HP R.E.P., 1500 U/min, Prop. 2,4 m ϕ

REFERENCES

1909 AEROPL. S 240/43, Dimen. u. FOTO 1
1909 LES AEROPL. S 25+93, Dim. u. REP Mot.
1909 JANES, S 114, FOTO 2, Dim. not ok.
1908 May DZ f L. S 271, FOTO 3 (double Fin)
1910 LES AEROPL. de Gastón, REP Mot.
u.s.w.

330 mm — 8,7 m — MW

2 m (75,86) 76

lower 0,8×1 mm — 8 sqm. — 1×1 mm — Grasstube

100% POLYAMID black — 1×1 mm — 0,6 mm 16× — 0,8 mm 20×

DIHEDRAL 5/8" 16 mm — Condensator paper — ideal !!! III = 2 — Papertube 16× laminated

Ing. Robert Esnault Pelterie — 151,5 mm — 2×(0,8×1) mm

max. 6×(1×1) 400 mm long = ca. 50 sec. rubber 2,5 g

blade of grass 1ϕ mm

BALSA 4× 3× — 0,3ϕ Wire — Epoxy — Grasst. — Silver Paper — 1/32" Dia. MW Wire — 1/8" Balsa — MW

7 Zyl. — Balsa — EPOXY — 1/8" — VERGASER

Frankfurt/M. 27.11.87 Benno G. Sabel

3ϕ mm Soda Plastik 1/8" ϕ — EPOXY — 1/64" — brass

5×3×330 Bamboo mm (Steel) Alu

Original !

Condens. Pap. — 1×1 mm — 1,5×0,8 mm — Grass tube 1ϕ

4Z 3Zyl. — 7 Zyl. REP Motor 35 HP (5 Zyl. REP 24 HP)

Cellon 1/64" thick — Epoxy — Paper — silver — Nylon — 0,4 mm Balsa — 1/64"

22 — 15° — 1mm Balsa — silver paper — Z — 3ϕ — 1/32 — Pap. 0,5 — Bamboo 1/16"

(2 bladed by 24 HP) — 4 bladed Prop. — Bamboo 2 mm DIA — Alu Tube 3 mm DIA

© 85 — X — Tube 4× blue foam — 16× — Tube 4× — Strawhat Foto foam — PROTOTYPE WT. 12,5 G LESS MOTOR — RESERVE GASOLIN 20 L

M.W. — Z — 30 — 0,8 - 1/32" — 6ϕ — +8,5° — S — +6,5° — WHITE — ASTRA I

Oplastik — VICE Rigging — Nylon — 1×1 Balsa — +1° (+2°) — Grasstube — 1/64" Balsa — Original of Benno

cut out — 0,3 ϕMW — Epoxy — PECK-POLYM. — 0,8ϕ — centre — 5 Zyl. — 1/32" Ply — 10 — 0,5 ϕ mm — EPOXY — 0,3 ALU — Balsa — 0,3 MW mm ϕ — 12ϕ mm 1/8" — 3/64" Ply

79 mm 3 1/8" 3 FIELDS — MW 0,4 mm — Bamboo — POLYAMID — EPOXY — 7/8" DIA — 2× — Cellon 1/64" — MWire — FIN — 417 mm — only right — 11 m — 1/64" Ply Horns — Grasstube — EPOXY — M.W. — 7/16" DIA — lower Horns — 1/64" Ply — M.W. 0,4 mm 1/64"

68 — 53 — 8 — 11,3 — 35 — 23

SCALE 1 : 26,3636

Free Flight

By BOB STALICK

• The reasons to read everything in *Model Builder*. I have been aware for many years that this hobby has many facets that are applicable to other forms of the hobby. For example, many of the developments that benefit one part of the hobby do the same for another part. Hot Stuff and other cyano adhesives are not the sole province of free flighters. Hints and tips from the non-free flight columns in this magazine are downright usable to us. I would venture to say that the same is true for the non-free flighters as well. For example, not too long ago, I was reading Pond's column and ran across a picture of Ed Mate, who was posed with a picture of his Meteor, which he believed was a legitimate Nostalgia ship. That was in May 1985. Nice-looking ship, I thought, as I went to other sections of the magazine. Little did I know that soon I was to play a part in the qualification of the Meteor as a bona fide Nostalgia model. It all happened suddenly. First, there's this letter from Ed, and then a card from Nostalgia guru Bob Larsh. The gist of these communications is that in order for Ed's Meteor to be considered eligible for Nostalgia competition, it must be presented (printed) in a nationally distributed commercial magazine.

Well, here comes this three-view and a passel of pictures. If I print the model in *Model Builder*, Larsh and co-guru Ralph Prey will accept. Who am I to stand in the way? Besides, it's a neat-looking model that deserves to be presented. Read on for the story of the Meteor I.

AUGUST THREE-VIEW: METEOR I
by Ed Mate

"The Meteor I started as ideas and sketches after the 1949 Nats. This Nats was not very successful. I was flying a modified Zipper in ROW and B gas and Claude McCullough's Blazer in C gas. Those days my dad and I would join Claude and fly together with him. We knew him since the 1947 Nats when I flew his "Brigand" O.T. to a first place in C gas Junior. Claude's Blazer was not as successful for some reason. He had problems with his ship also at this Nats.

"This lack of success prompted me to start designing the Meteor I. The thinking was to embody the good things I saw at the 1949 Nats. Davis was flying his Hogan; Bilgri was flying a modified Comet Sailplane; Mathews, his FuBar; and Mahieu, his Zeek. These were all good ships, and you will see some of each of them in the Meteor. Of course, the Buck Rogers (or Meteor) tips were mine. George Perryman finally admitted at the 1987 Nats that after the sharks, I was first with them. This was a controversy until then. The ship was completed in late

George Perryman's flying buddy, David Raymond, who does all of George's plans drawings, showing off Super Maxer Speckled Bird.

George Perryman with his Great Speckled Bird, at left, and the new Fat Speckled Bird. Where does he get the perpetual grin?

The fuselage on this PeeWee 30 looks a little crooked, George, and what's with the wheel pants?

George's PeeWee 30 Bird looks like the rubber-powered ships he builds. This is his first gassy in a while.

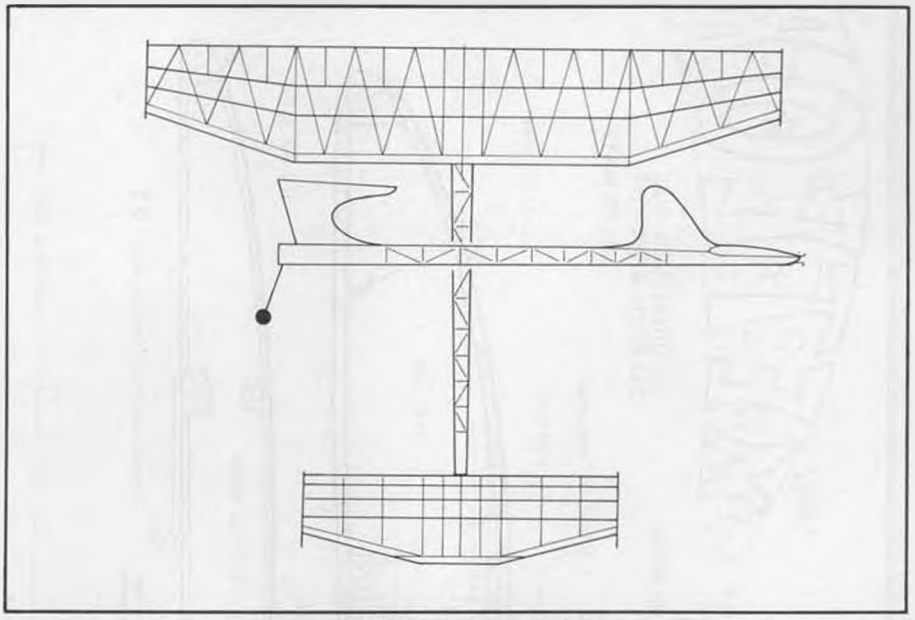
1949.

"As the numeral I implies, there are more; five in all, until the next one. Four of them are within the NosGas qualifying date. I hope to get at least number III into the works at a later date. Number III was the best of all and lost at the 1971 Nats because of a frozen shutoff timer. The worst part was that I lost an Oliver Tiger .15 with this plane." A quick look at the three-view will show a model that is unusual in its construction. I would like to take a few paragraphs to point out some items for your consideration.

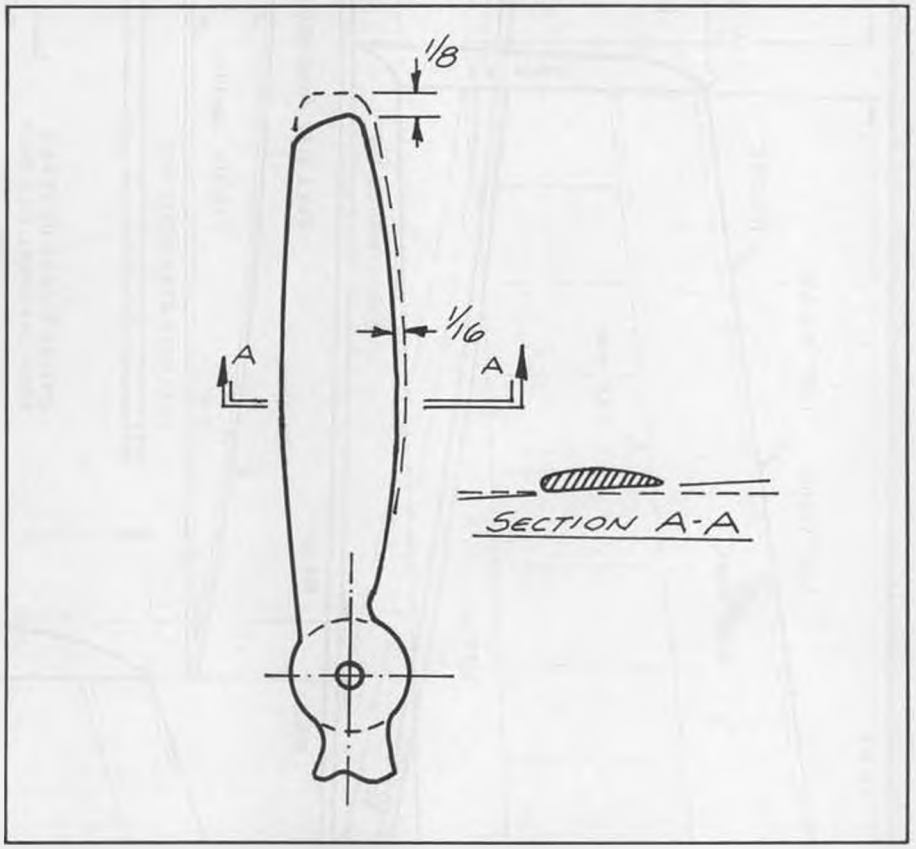
The Wings: First off, the wings are constructed with a sheet trailing edge (both the top and the bottom), and it tapers slightly from root to tip. The leading edge is sheeted, and the non-sheeted parts of the wing ribs are cap-stripped. The trailing edge is swept one inch, and the leading edge is swept 3.5 inches. The Meteor tips are 1/8-inch sheet and mounted mid-rib so that the covering material spans the space between the tip rib and the Meteor tip. Note that the tip is reinforced with 1/8-inch spruce. Both tips are washed out 1/8 inch, and the right main panel is washed in 3/32 inch. All other panels are flat.

The Stabilizer: The stab is built similarly to the wing. It has greater sweep than the wing. Note that the three-view shows two different systems for d.t.ing this model. The original Meteor I had a silk parachute d.t. system. Ed noted that the chute was nine inches square ala the Hogan design. A modification for the better is shown on the stab root rib, and that is to utilize a "pop-down" stabilizer. In this case, the d.t. line is threaded through a tube (Nyrod or equivalent recommended) in the fuselage, and the line is fastened to the front and top of the stab. The stab is rubber band loaded so that when the remote fuse (on the other end of the d.t. line) releases the line, the stab pops down at approximately a 60-degree angle and the ship d.t.s (somewhat noisily from my experience with this system).

The Fuselage: The fuselage to the Meteor I is a bit more complicated than many. It utilizes a 1/8-inch sheet balsa keel with 1/4-inch sheet at the pylon and firewall area. To this keel is cemented a 1/8-inch sheet bottom (called a floor in the three-view). Then bulkheads, which rounded at the nose gradually changing to triangular at the pylon trailing edge continuing to the rear of the fuselage, are cemented on either side of the keel. A 1/8 by 1/4 spruce longeron is cemented in place into the bulkheads ap-

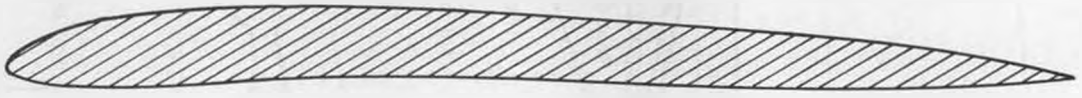


MYSTERY MODEL

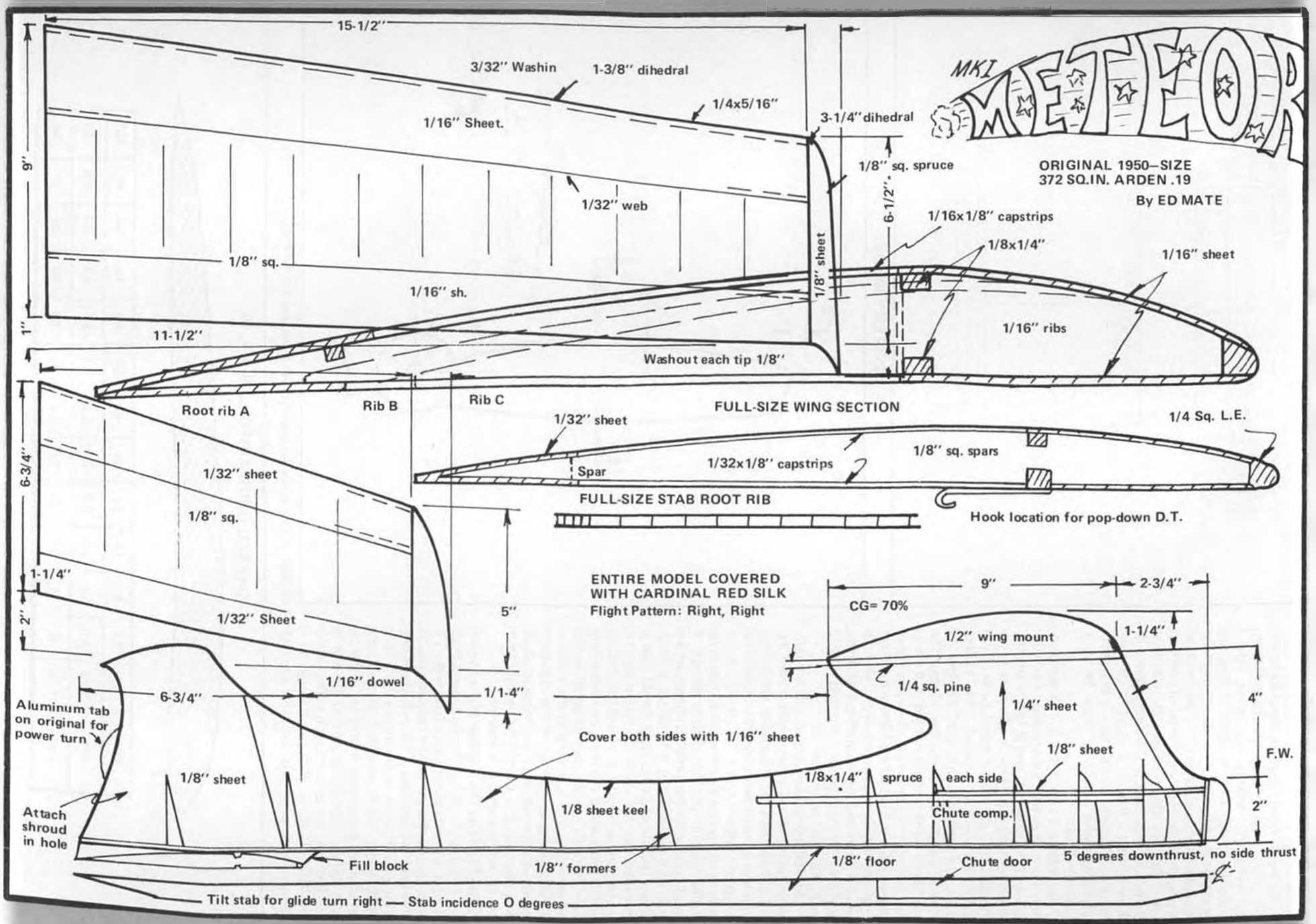


Gil Morris' Cox propeller modifications; see text for details.

DARNED GOOD AIRFOIL—R.A.F. 15



STA	0	2.5	5	10	20	30	40	50	60	70	80	90	100
UPR	1.56	3.9	5.0	6.1	7.0	7.0	6.6	6.1	5.5	4.8	3.9	2.8	.94
LWR	1.56	5	2	0.0	5	1.0	1.0	7	.33	.06	.09	.2	.94


MKI METEOR
ORIGINAL 1950–SIZE
372 SQ.IN. ARDEN .19
By ED MATE
15-1/2"
3/32" Washin
1-3/8" dihedral
1/4x5/16"
1/16" Sheet.
3-1/4" dihedral
1/8" sq. spruce
6-1/2"
1/32" web
1/16x1/8" capstrips
1/8x1/4"
1/16" sheet
1/8" sq.
1/16" sh.
1/8" sheet
1/16" ribs
9"
1"
11-1/2"
Washout each tip 1/8"
Root rib A
Rib B
Rib C
FULL-SIZE WING SECTION
1/32" sheet
1/4 Sq. L.E.
1/8" sq. spars
1/32x1/8" capstrips
Spar
FULL-SIZE STAB ROOT RIB
Hook location for pop-down D.T.
6-3/4"
1/32" sheet
1/8" sq.
1-1/4"
2"
1/32" Sheet
5"
ENTIRE MODEL COVERED
WITH CARDINAL RED SILK
Flight Pattern: Right, Right
9"
2-3/4"
CG= 70%
1/2" wing mount
1-1/4"
1/16" dowel
6-3/4"
1/1-4"
1/4 sq. pine
1/4" sheet
4"
Aluminum tab
on original for
power turn
Cover both sides with 1/16" sheet
1/8" sheet
1/8" sheet
F.W.
1/8x1/4"
spruce
each side
Attach
shroud
in hole
1/8 sheet keel
Chute comp.
2"
Fill block
1/8" formers
1/8" floor
Chute door
5 degrees downthrust, no side thrust
Tilt stab for glide turn right — Stab incidence O degrees

proximately 25-percent from the top of the fuselage, and the entire fuselage is covered with 1/16-inch sheet. After sanding, the entire model was covered with red silk.

Ed noted that the original weighed about 20 ounces, and he suggests that really select lightweight wood be used in the fuselage construction. The original model was flown with an Arden .199, but Ed plans to power his new one with an Oliver Tiger Mk.111. and use a Tatone timer instead of the AustinCraft used on the original.

From my point of view, I think that this ship at 362 square inches might be just right for a Torp Green Head .15, if the weight could be brought down a few ounces.

There you have it, a bit of history for your consideration and a new model for you to ponder as you look through the files for that perfect Nostalgia ship to cause the guys at the field to scratch their heads over.

AUGUST MYSTERY MODEL

Okay, Nostalgia buffs, try this one out. Billed as a "South of the Border Soarer" by the magazine article, it was covered in an extensive feature that contained scale up information on how to build the design for engines up to .64 cu. in.! The ship in the article was a 1/2A version, and it beat the Dixielander by a solid five years in the utilization of the very high undercut pylon. So, smart guy, you think you know the name of it? Okay, send your best guess ASAP to Bill Northrop c/o *Model Builder* magazine. If you are first in line with the correct answer, you could win yourself a free, one-year subscription to my favorite magazine. Try it.

DARNED GOOD AIRFOILS—R.A.F. 15

"Strictly speaking, the R.A.F. 15 is an old time biplane section, characterized by good lift characteristics at low speeds coupled with very low drag values and a reasonably small center of pressure movement. It should prove excellent for model biplane wings, especially those of semi-scale layout. The modern "flat" spar arrangement should provide ample strength in bending.

"Another possible use of R.A.F. 15 is for a lifting tail plane section for both rubber and power models. In this respect it should have appreciably better lift characteristics than the normal thin Clark Y-type airfoil without any marked increase in drag." Text from *Model Aircraft* magazine.

A WORD FROM THE "OL' PERFESSOR," GEORGE PERRYMAN

I know that many of you who know George cannot imagine how he can possibly say only "a word." So I took a little bit of poetic license. George takes a number of words, as you can see from this excerpt from a recent letter.

"I feel remiss is not having sent some pics sooner. Enjoy your column very much since it's both informative with a bit of wit! (*I'm glad he didn't say "half-wit."*) Since my retirement from Lockheed after 35 years, I am doing real model work instead of those heavy wind tunnel models. Had the best contest season in 1987 for me anyway, and flew in 24 different events. That's a heepa models. Got two or three even to fly.

"I've enclosed a pic of my effort at a companion model to the Great Speckled Bird. In this part of our great country we aren't blessed with large open flying sites. Very seldom at contests here is there enough room to turn the GSB loose on the boys. I have been flying my Lanzo Stick (1940 design) for about 14 years as an O.T. and Mulvihill. About nine years ago, I vowed to build a 'modern Lanzo' so I could fly in wind, rain, or whatever. I have finally done it with the Fat Speckled Bird. This is sort of a tribute to my old friend, Chet (Lanzo). The GSB is better for light wind and longer required maxes, but with a foot less length and large stab, the FSB is easier to handle in bad weather. I decreased the aspect ratio slightly and used firmer wood than in GSB, but the gross weight is nearly an ounce less. So it goes up briskly and can't tell much glide difference. A three-foot motor instead of four-foot is easier to wind. It won its first contest last weekend, so I'm tickled so far." George does go on (as you could imagine) in his letter about his experiments with variable pitch and diameter props and his first gas model in years, the Pee Wee 30. Some of George's pix grace this issue of *Model Builder*. I have known George for about 15 years, and although we only see each other about every three or four years, it seems as though we only parted a few days ago. I still recall asking him where he got the speckled tissue he uses to cover most of his models, his retort, "I use regular tissue, I just use polka-dotted dope!"

Here's a young version of Ed Mate posing with the Meteor I in 1951. Note that the floating tabs are now gone.

The Meteor I by Ed Mate. Note floating tab, used on left wing of orginal model. Later designs, including this month's 3-view, omit this feature from the model.

A 1949 photo of Ed's Meteor I under construction.

GIL MORRIS'S COX PROPELLER MODIFICATIONS

Elsewhere in this issue of *Model Builder* Free Flight, you will find a sketch of how Gil Morris modifies the Cox Grey 6 x 3 propellers for better performance. This little article comes from the *CIA Informer*.

"I have found that I get significant improvement in engine and airplane performance over any other prop combination I've tried by reworking a 6 x 3 Cox grey prop as shown in the sketch.

"First, you shave off about 1/16 inch from the trailing edge, and then file the bottom at an angle until the trailing edge is again sharp. Also, nip off 1/8 inch from each tip. You then end up with a 5-3/4 by 2-1/2-inch prop. The reduced helix angle of the prop wash makes it easier for me to trim my 1/2A, and I also get better altitude.

"Be sure that you treat both halves exactly the same, otherwise you will experience vibration, even if the prop is balanced." I should point out to the readers that Gil's 1/2A models are well known for being high climbers. Gil is a champion for lightweight structures as well as modified engines and hot fuels. Heavier models may not fare as well with the modified prop described above, but if you want to compete with the winners like Gil, then use his formulas. They work!

IN FREE FLIGHT VOCABULARY

"Tree" is a four-letter word, according to

Continued on page 71

the INSIDERS

INDOOR FLYING REPORT

By DAVE "VTO" LINSTRUM

INDOOR WORLD CHAMPIONSHIPS NEWS FLASH
Johnson City, Tennessee, May 28 through 30.
F1D Microfilm Models

1. Jim Richmond, USA
2. Cesar Banks, USA
3. Jack McGillivray, Canada
4. Theo Andre, Netherlands
5. Sylwester Kujawa, Poland

14. Bud Romak, USA
22. Steve Brown, USA

Team Results

1. USA
2. Canada
3. Switzerland
4. Poland
5. Hungary

Richmond won the World Championships for the fifth time with a two-flight score of 86.06 minutes.

Team score for the USA team for three fliers was 225.29 minutes.

• Not many people will believe that an indoor model made it all the way from Crete to Santorini (74 miles as the albatross flies), but that did happen in April, when the human-powered Daedalus aircraft repeated the historic flight of Greek myth. We are certainly glad they did not fly too near the sun, like Icarus of old! John Langford of MIT and his sidekick, indoor modeler Mark Drela (noted for microfilm and EZB flying), created a gossamer craft with a 112-foot span, 29-foot length that weighs a mere 70 pounds empty! They had more than $1 million in corporate and institutional grants, so it probably is the world's most costly indoor model! We could not get a photo by press time, but we know you have seen media images of the high aspect ratio, pod and boom tractor design. It is interesting that the distance flown over the Aegean is about twice as far as the 37 miles flown over the Mojave Desert in tests; this proved to be a new record.

We are sure that "Insiders" readers and indoor fliers worldwide join us when we salute the Daedalus team for their ten years of effort. We wonder who will be the first indoor modeler to build a flying scale version?

HINT OF THE MONTH

Did you miss this last month? It was not there because you, dear reader, did not send any hints! Come on, guys and gals, we need some feedback! This month, our HOTM is simple: use time management to get your models built. A lot of insiders have unfinished models or fewer flying models because they procrastinate. The key is to build a little bit each day. Bill Warner of the Flightmasters suggests 15 minutes. John Oldenkamp uses an hour a day. Try it; it worked for us!

Nancy Beitz gets some good advice from ace flier Rich MacEntee. Nancy's WWI SE5A bipe is almost finished.

VTO built this WWI Peanut bipe Bristol Scout from the Nowlen Aero kit. Great flyer!

Hold that pose! Here Linstrum displays longest Phantom Flash ROG; his modification for Indoor Federation ROG event.

OBSCURE AIRCRAFT

It seems that Ed Heyn of Norwood, Massachusetts, builds *only* obscure aircraft! We have a photo of his Boland Tailless this month, but check out his other models: Halton Mayfly, Swallow TP, YAK 3, Avia B-135, Albatross L-66A, Georges Special, Huntington Governor, Lincoln AP-Bk, Ikarus AK-2, Fokker V-23 and V-25, Daimler L-11, Albert, Pemberton-Billing PB-9, Hergt monoplane, Graham-White Type 20, and Ponnier Racer. Wow! Ed is the king of obscure aircraft. Thanks, Ed, for contributing so many to the list!

LIDBERG NOCAL SCALE

Al Lidberg (A.A. Lidberg Plan Service, 614 East Fordham, Tempe, Arizona 85283) has some new obscure and commonplace aircraft in his new lineup. See the photos and this description by Al:

"As promised, here we go with three new NOCALs:

"Mitsubishi A5M2 'Claude.' A lot of older builders will recognize this one, and we've all seen it in WWII movies; it's the predecessor to the 'Zero.' The model uses an easily made three-bladed prop, has wheel pants, and ROGs well.

"Polikarpov I-16/10 'MOSCA' (FLY). This one is noted as the first monoplane fighter with cantilever wing and retracting landing gear (in 1933). Its Gee Bee-like appearance plus lots of wing and stab area make up a good-flying 'different' model.

"Napier-Heston JA5 'Racer.' The N-H was built in 1940 to go 500 mph; with those nice proportions and curves, it looks like 500 mph standing still!

"The NOCAL instruction sheet now carries expanded info on: building and flying indoors, pre-shrinking tissue, use of pastels

An obscure aircraft: the 1912 Boland Tailless. Span is 18 inches, power is 2 loops of 3/32 FAI rubber. By Ed Heyn, Norwood, Mass.

or colored pencils for highlighting and giving these flat models a three-dimensional look (as shown in the pictures), and sliced ribs.

"The NOCAL plans are $1.50 each, and the catalog is still $1.50."

WHAT IF THE RULES WERE DIFFERENT?

This item by Hewitt Philips in NFFS "Free Flight" is food for thought regarding AMA Indoor Rules.

This article is confined to a discussion of indoor, stick-type, rubber-powered endurance models. Present indoor rules provide for a large number of model types, but many of these types do not seem to be the most suitable for contest events or for maintaining interest in the hobby. Many of the newer model categories are so restricted that they do not present a design challenge to the builder. Interest in indoor endurance models might be increased by formulating rules that avoid this difficulty.

In this two-part article, the factors influencing endurance and their relations to the problems of establishing rules are reviewed. In Part I (this month)*, the effect of design factors on endurance and, in particular, the effect of wing loading and methods of controlling it are discussed. In Part II, the influence of other restrictive specifications in the rules are considered, and some suggestions are made for events that present more of a design challenge.*

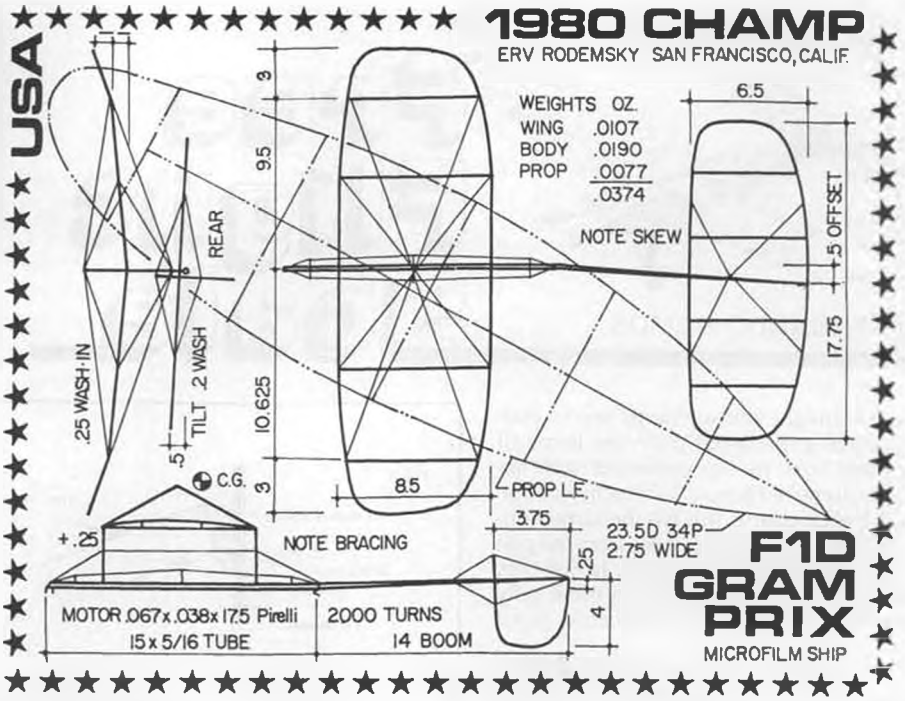
PRESENT MODEL CATEGORIES AND A REVIEW OF FACTORS INFLUENCING ENDURANCE

The indoor flier should find little to complain about in terms of variety in the existing AMA rule book. A total of seven competition classes are available, as follows: H.L. Stick Model (AMA Stick), FAI Indoor Model (F1D), Intermediate H.L. Stick Model, R.O.G. Stick Model (Baby R.O.G.), F. F. Indoor Pennyplane, Novice Pennyplane, and Easy B.

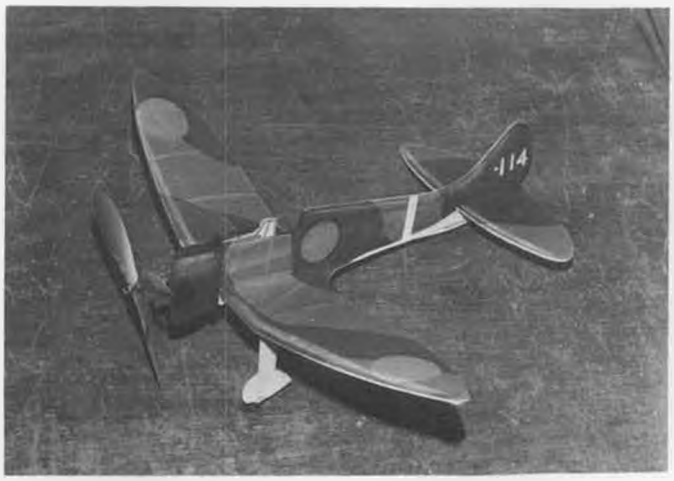
The rules range from almost completely unrestricted, in the case of AMA Stick (which is required only to be heavier-than-air) and rubber powered, to a highly restricted, almost one-design class, the Easy B. It is interesting that the more recently a contest category has been adopted, the more lengthy and restrictive set of rules are given in the rule book.

A set of desirable features of a contest category might be listed. Among these desirable features are the following: endurance should be reasonably long, but not too long; model should be sufficiently small to transport; model should not be too difficult or time-consuming to construct; dangerous or difficult-to-obtain materials should not be required; model should not require extreme expertise in construction and handling; model should not be unduly

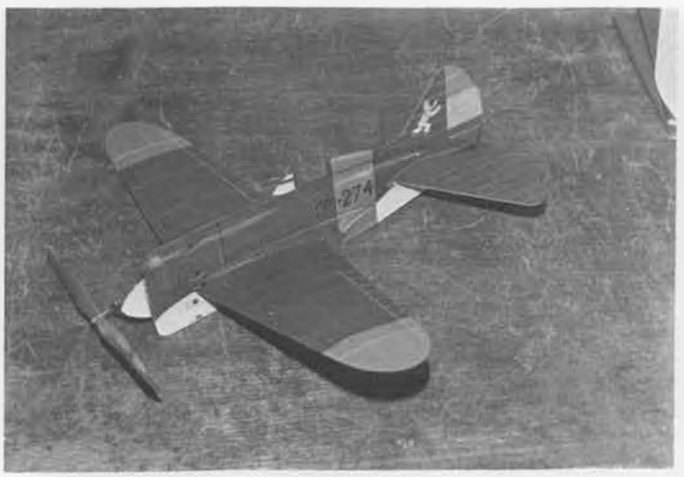
Continued on page 69



Atlanta's Ken Grubbs in his workshop with his C3PO Bostonian Indoor. He learned to fly on an Aeronca C-3.



Al Lidberg's NOCAL scale Mitsubishi A5M2 Claude was WWII forerunner of the Zero.



This skinny profile FAC scale by Al Lidberg is the Mosca (fly), a WWII Soviet plane.

Free Flight Scale

By FERNANDO RAMOS

The Silver-Streak motor from Peck-Polymers. Weighing only 2.6 ounces, this 035 powerhouse draws but 6.5 amps with 6 cells turning a 6-3 prop at 12,000 rpm. See text for more.

• Bill Hannan, whose energy seems endless, keeps coming out with new items all the time! First, he has come out with another volume of *Peanuts & Pistachios*, number three! Of course, this has the same wonderful flair that can only come from the pen of Bill. Naturally, the art work is first-rate, and for those of you who love these nifty minuscule models, this publication is for you.

Even though many associate Hannan's Runway as being Bill's business, it is actually run by his wife Joanne. She has a flyer that comes out regularly keeping you informed of all the latest aviation paraphernalia. As an example, there are six booklets called Wind-Sock Datafiles. Datafile No. 1 is on the Albatross DIII; No. 2, the Sopwith Pup; No. 3, the Albatross DV; No. 4, the Bristol Fighter; No. 5, the Fokker Triplane; and No. 6, the Sopwith Camel. They are $7.95 each.

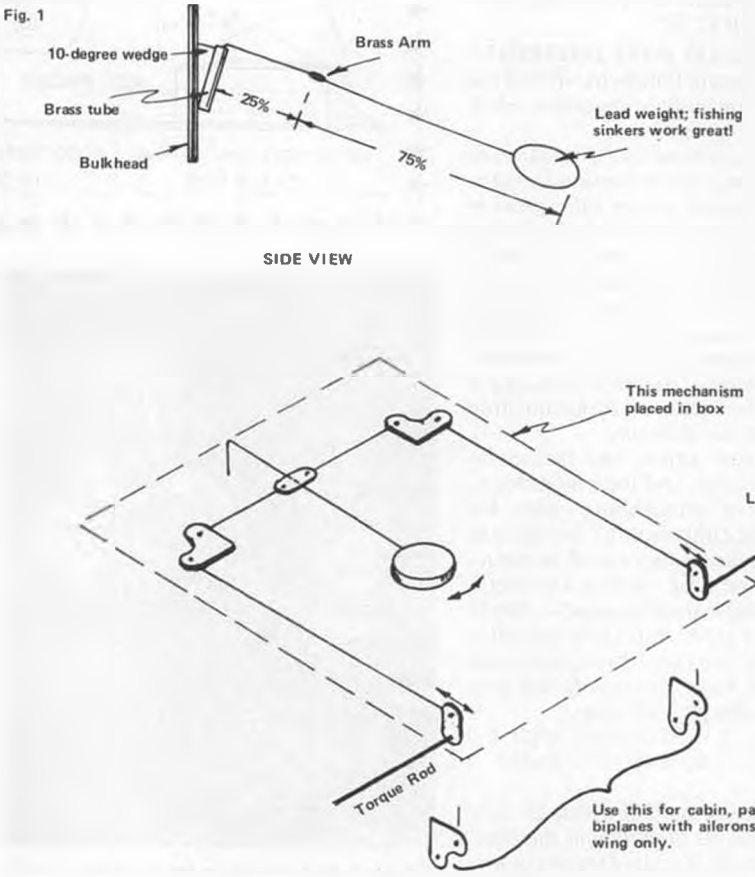
Hannan's Runway's address is P.O. Box A, Escondido, California 92025.

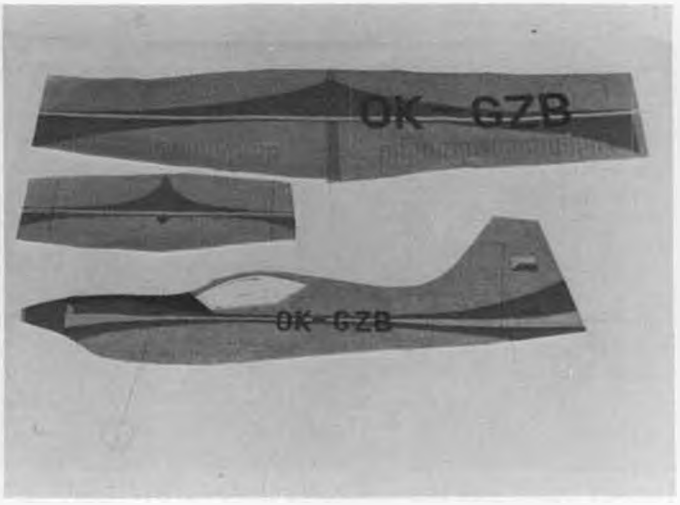
Scale Model Research of 2334 Ticonderoga Way, Costa Mesa, California 92626, has an unbelievable collection of color photos for hundreds of airplanes. They have over 50,000 photos in stock. All pictures are taken with the modeler in mind to show these wanted details like landing gear, cockpit, struts, color, and markings, etc. I was able to get a couple dozen photos of the airplane I'm presently modeling, and they are extremely useful.

They carry a good cross-section of airplanes covering many WWI and WWII, ex-

Continued on page 78

Fig. 1





New NoCal plans from Al Lidberg include the two shown above. See text for details on this interesting class of rubber models.

Control Line

By JOHN THOMPSON PHOTOS BY THE AUTHOR

• In the June issue of *Model Builder*, you read a description of the successful Pacific Northwest tradition, the Northwest Sport Race Drizzle Circuit.

Now it's time for the results of a very special season.

The Drizzle Circuit completed its 10th winter of racing on April 10 with the 50th contest in the series.

True to the tradition, modelers from around the Northwest converged on Delta Park in Portland, Oregon, for the contests on the second Sunday of each month. Competition involved Northwest Sport Race and Northwest Super Sport Race. Competitors flew three heats in each class, with the top scorers (based on heat placement) advancing to feature races.

Turnout for Series No. 10 was excellent, as was the quality of racing, which was smooth and closely contested until the final race was over. All of the top three "trophy" positions in each class were undecided going into the fifth and final day of racing!

It also was the fliers' good fortune to have beautiful weather for most of the contests, finishing up under sunny skies with 75-degree temperature and no wind.

The championship in Northwest Sport Race went to Dave Green of Astoria, Oregon, for the third consecutive year and the fourth time in all.

However, Green was unseated in Northwest Super Sport Race in the most exciting finish in series history. Dave trailed Wayne Drake of Troutdale, Oregon, by one point going into the feature race of the final contest. As it turned out, Drake finished first, Green third, and the championship went to Drake by a scant three points. The upset ended a streak of five years for Green in Super Sport Race.

Racing is a team effort, and all the placing teams had their pilots and pit crews sharing equally in the glory. Here are the season's top placing teams:

Northwest Sport Race: 1. Dave Green (pilot, Bill Varner); 2. Wayne Drake (pitman Blake Jensen); 3. Salter & Salter Racing Team (pitman Dick Salter, pilot Rich Salter); 4. Jim Cameron (pit crew Bill Varner and John Thompson); and 5. Nitroholics Racing Team (pilot Mike Hazel, pitman John Thompson).

Logo of the Metrolina Control Line Society, North and South Carolina.

Northwest Super Sport Race: 1. Wayne Drake, 2. Dave Green, 3. Salter & Salter Racing Team, 4. Nitroholics Racing Team, and 5. Tie between George Mickey (various pilots) and Salter-Hall Team (pitman Glenn Salter, pilot John Hall).

The top three placers in each class received trophies, and Dave Green received trophies for fast-heat times in both classes. In addition, the first-place teams each receive a perpetual trophy to take home for a year.

Here's a rundown of the winners of the Drizzle Circuit for the past ten years: 1978-79 NWSR (old rules), Mike Hazel; 1979-80 NWSR (old rules), John Thompson; 1980-81 NWSR, Dick Salter and NWSS, Mike Hazel; 1981-82 NWSR, Dick Salter and NWSS, Mike Hazel; 1982-83 NWSR, Greg Beers and NWSS, Dave Green; 1983-84 NWSR, Dave Green and NWSS, Dave Green; 1984-85 NWSR, Beers-Cole Racing Team and NWSS, Dave Green; 1985-86 NWSR, Dave Green and NWSS, Dave Green; 1986-87 NWSR, Dave Green and NWSS, Dave Green; and 1987-88 NWSR, Dave Green and NWSS, Wayne Drake.

I would happily report on the special activities of any region. Please send me any information, reports, calendar of coming events, etc. which might be of interest.

WONDERFUL WOOD

From the Associated Press wire at the newspaper where I work, comes a bit of information about our favorite building material.

In Ecuador's Andes Mountains there grows a towering hardwood tree that matures in less than a decade. A man can carry a 30-inch diameter log from this tree on his shoulder. A board foot sawed from that log, afloat in water, will support more than four times its eight-ounce weight.

Fred and Joyce Margarido, speed fliers from Fremont, California, at a past Northwest regional CL Championships.

Racing teams before the start of the Nortwest Sport Race Drizzle Circuit's 50th contest.

Top 3 teams in NW Drizzle Circuit: Rich Salter, Dick Salter; Dave Green, Bill Varner; and Wayne Drake, Blake Jensen.

Dick Salter, pitman for son Rich, launches a super sport racer. Photo: Jim Cameron.

According to *Wood Magazine*, Spanish colonists settling in Ecuador in the 16th Century named the remarkable light and buoyant wood balsa, meaning raft. And for generations before it was sold commercially throughout the world, Ecuadorians lashed balsa logs into rafts to transport goods to market.

Growing wild or on plantation, a balsa tree begins as a pinhead-sized seed. Spurred by the equatorial climate, it shoots up to an 80-foot height and a 30-inch diameter tree in 5 to 7 years. Strangely, balsa accomplished this rapid growing without sapwood, relying instead on the pith to carry nourishment.

Loggers must fell mature balsa trees at once. If left to complete with surrounding vegetation, they form a tap root similar to a cactus. In a bizarre twist of nature, the world's most buoyant wood becomes saturated with water, making it commercially worthless.

Before inflatable gear became available, balsa was used extensively for lifesaving floatation devices on ships, as the wood contains about 92-percent dead air space. Now it's sold for making model airplanes (*yes!*), for insulating freight cars, and for shock-absorbing packing.

WELCOME BACK

A welcome is due to Ronald Cunningham, of Bellingham, Washington, who wrote recently to tell us that he has returned to miniature aviation after a long time off.

"As a note of background, let me tell you that after a 30-year career as an airline pilot, I'm now back starting to enjoy the hobby that led me on that long aviation road. As a youngster in the early fifties I loved models and particularly control line." Ron notes with some chagrin that much has changed since he left the hobby, and he asks a few questions which I will try to answer.

"Most hobby shops I visited are into a lot of things, but certainly not control line flying. Most magazines and most hobby shops are not into carrying a lot of inventory on control line products. What I would like to see is a list of catalogs or manufacturers, by name and address, where I can purchase good quality, hard-to-find control line products." Well, Ron, you have observed what CL fliers have learned to live with. There is an influential element of the hobby "industry" that has decided that CL does not exist. Well, as you and the rest of us know, it does, and in recent years it has been growing in spite of the lack of mass-manufactured products.

There are still some manufacturers which continue to make and distribute CL items. The best "catalog" of these is included in your hobby magazines such as *Model Builder*. Write to all of the mail-order hobby distributors and ask for their catalogs. You will soon see which of them support CL flying. A couple still carry fine supplies of what's available.

Second, you often can "sensitize" your local hobby shops to the existence of your hobby. They may honestly wish to serve, and may be glad to order what you need, but do not know you and others are reviving the hobby in your area. You probably will have to overcome one difference from the old days: Many of the old-time hobby shop owners were modelers themselves, and they knew the hobby. Most hobby shop owners nowadays are business people who know only what their suppliers sell them. You have to become a part of their education process. There remain, however, tucked away in unlikely corners, fine hobby shops run by old-time modelers, such as, Eugene's Toy & Hobby in Eugene, Oregon, which hauls its whole inventory to the field for Eugene contests and stocks and orders anything CL fliers ask for.

However, the real supermarket for CL supplies in this day and age may be the network of special-interest organizations that serve the hobby as competition coordinating bodies, lobbyists, information clearinghouses, and product exchanges. A list of these organizations and their addresses was in the June edition of *Model Builder*.

Each of the organizations has a fine newsletter which carries listings and advertisements for garage businesses which supply kits and supplies of a wide variety for all kinds of uses. The big manufacturers may have forgotten us, but the little ones are cranking out what may be the biggest-ever variety of products. You just have to know how to do your research.

"Sometime around 1946 or '47 I saw my first control line flying at the local baseball park. I was hooked. Two models there caught my eye. The first was a yellow Cub. I ended up flying one (full-size) not too many years later. The second was a control line autogiro. I'll never forget it racing ahead, building speed until the rotor had enough rpm to lift off. It was a good flyer. I have looked high and low for two years now for a set of plans for something similar. Any ideas? If not, possibly you could ask your readers if they could help me in my search. I would love to build one if I can find the plans." First of all, I would suspect that there is a Cub kit out there intended for R/C that could be converted to CL use (Sig, for example, makes an R/C Cub kit; write Sig for a catalog). Second, I would expect that the magazines have published plans for this common design.

The autogiro has been a popular subject for CL experimentation. I can recall at least two CL autogiro plans in the magazines in the past decade. I would suggest writing to *Model Aviation*, *Model Builder*, and *Flying Models* and asking for lists of their available plans.

Maybe our readers can come up with some specifics.

Readers also may be able to provide more specific answers that I can for the following question.

"I have seen articles in the magazines the last few years talking about one-line and three-line systems. I understand that the one-line was something of the past, but I sure would enjoy reading something about the historical aspect of the system; how it worked, who manufactured it, and finally what ever became of it. Did it not work or did the system just die a normal death with the advent of R/C as so much else has? I would also like to know something of the other systems. Is there something other than three-line, maybe four, five, or more?"

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Well, Ron, you'll be happy to learn that the one-line and three-line systems are alive and well, and that there have been other numbers as well.

In fact, I believe the late Oba St. Clair's pioneering "Miss Shirley," believed by many to be the first working CL model, originally used four lines. *Model Builder* published a two-part series about this famous modeler and his invention a few years ago.

The one-line system evolved into the primary system for CL speed competition. It operates by twisting of the line (via a handle which applies a mechanical advantage to spin the line many times), and the twisting line operates a torque unit in the airplane. You can see it in operation at any CL speed contest. This system has been around since the 1940s. The equipment still is available through speed suppliers such as those listed in *Speed Times*, the newsletter of the North American Speed Society.

Any historians out there want to fill us in on the details? *(I'll bet Dale Kirn will be getting in touch on this one! wcn)*

Second, the three-line system is in widespread use by CL carrier and scale fliers, and any others interested in having a throttle. In these systems, a special bellcrank and handle, usually sold as a unit, are used. The upper and lower lines on the handle operate the elevator as in a conventional two-line system, while the third, middle line, operated by a trigger on the handle, operates the throttle. We've seen variations in use that add a fourth or fifth line to perform other scale functions. Scale modelers now are turning to using insulated lines to carry electrical current and operate multiple functions through two lines and on-board servos.

Three-line equipment is available in some hobby shops and through the Navy Carrier Society newsletter, *Hi-Low Landings*.

Thanks for your questions, Ron. I'm glad to do what I can to answer any questions. Any I can't answer certainly can be answered by our readers.

NEWS TO USE

I enjoyed receiving the newsletter of the *Metrolina Control Line Society* of North Carolina, edited by James "Col. Ace Grits" Duckworth of Stanley, North Carolina. The newsletter's address is Rt. 2, Box 68, Stanley, North Carolina. A copy of their club logo is enclosed.

Club officers are: President, Kermit "De Judge" Payne; Vice President, Patrick "Eagle Eye" Robinson; Secretary-Treasurer, John "Loop" Hogan; and Safety Director, Neville "Speed" Montagriff.

It appears from the publication that it serves a wide geographical area. The newsletter runs plans, photos, hints and tips, meeting minutes, cartoons, advertisements, etc.

I'm saving my copies for future column ideas.

Send your club's newsletter, too, and I'll pass along your good ideas to your fellow modelers.

SHHHHH!

Let's face it, the argument over mufflers is going to create almost as much noise in the coming years as are our airplanes themselves (no, wait, that's music, right?).

Unfortunately, our planes aren't music to our neighbors' ears, and we find ourselves constantly retreating to the country to get away from neighbors. I have to drive 45 minutes each way to our flying site, which certainly cuts down the number of days of flying for me.

Here in the mailbag we have a letter from Pat Leonard, new editor of *Flying Lines*, the Northwest's CL newsletter.

"I keep hearing rumbles about a blanket muffler rule. Yuck! I'd like to make my tiny voice heard before disaster strikes. The very *idea* of making mufflers mandatory makes me mad!

"But the stupid thing will probably come to pass as 'they' are pushing it *hard*, and why? It does not affect the sport flier. The AMA can't tell you or me what to fly in our local ballpark. In this situation I use a large enough prop that the noise doesn't bother me and nobody else seems to mind either. (When a friend was using a Fox .35 and a 10-6 prop, I was sitting in the car 15 feet from the flying circle and I had to *roll down the window* to tell if the engine was running right!)

'What I'm getting at is that the idea of a blanket muffler rule affects only competition, which is not flown in sensitive areas anyway.

"I'd like to try my hand at fast combat, racing, and maybe set a speed record, but I feel

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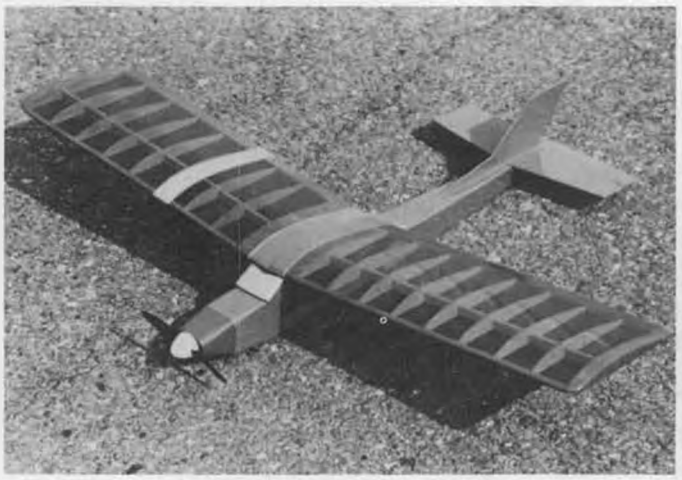

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THE ASTRO CHALLENGER NATS WINNER

Bob Boucher's Astro Challenger won the 84 Reno Nats its first time out and has been winning electric sailplane contests all over the country ever since. Powered by an Astro Cobalt 05 Geared Motor turning a 12 inch folding propeller, the Challenger climbs almost out of sight in 45 seconds, and can repeat this climb three or four times on a single battery charge. The distinctive wing planform with elliptical tips maximizes aerodynamic efficiency and minimizes tip stalls. It's gentle and forgiving nature make it perfect for beginners too. Kit features all machine cut and sanded balsa parts. Wing Span 72 inches, Wing Area 612 sq.inches, Airfoil Eppler 193 Flying weight 39 ounces. **Kit#1020..... $ 49.95**

THE PORTERFIELD COLLEGIATE

The Porterfield Collegiate makes a great sport scale electric model. It's gentle and forgiving nature make it perfect for beginners, but at the same time it can be quite responsive in skilled hands. The large wing and light wing loading lets the Porterfield climb steeply to and land short. Just what you need for flying in your neighborhood park or schoolyard. Beginners to R/C should install the Astro Cobalt 15 Geared Motor. More experienced flyers can install the Astro Cobalt 25 geared motor for very realistic scale like maneuvers. Wing Span 69.5 inches, Wing Area 690 sq inches, Airfoil Eppler 193, Flying Weight 4 to 5 lbs.

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that the difficulty of starting a pressure-fed engine with a muffler on it (particularly hot) will discourage all but the bravest competitors. Or maybe all but push these events right out of AMA, whereby many control line events might be flown without a sanction! (Lousy solution.)

"And what about 1/2As? (Which I dearly love.) Would they need mufflers, too? I certainly hope not. Many people, myself included, find them tricky to deal with under the best of circumstances!" I'll try to comment on Pat's letter.

First of all, I haven't seen a muffler proposal among this year's CLCB proposals yet, but wouldn't be surprised to see one; they have been defeated two rules cycles in a row.

I don't particularly look forward to the effort of setting up mufflers on all my competition planes, either, but I'm not terribly worried about it either. In anticipation of such a rule, I've already done some research and experimentation and reach the conclusion that mufflers are not something to be feared. My advice is: make the muffler work for you!

The muffler will gradually make it possible for you to sneak back into some of the places where model flying is banned now. In some cases, mufflers can make your plane perform better, or at least smoother, than with the open-faced engines.

"They" who are pushing for mufflers are your fellow hobbyists who are concerned about our future in this hobby. They believe, and I hate to admit that they probably are right in the long run, that the day will come when we have no choice but to bow to the will of our increasingly crowded society and quiet down.

It also needs to be said that working with mufflers is not that difficult. The hardest thing about mufflers is mounting them securely on the engine and making the mounting such that in the events where crashes are likely, such as combat, that they will break away without damaging the engine.

Engines start fine with mufflers, and they restart fine. There is a loss of power; but if everyone has one, it's no problem. There are many muffler makers, including some specifically for CL use, such as S.S.T. Products and a variety of style. Stunt fliers and Western Associate Modelers competitors in all events except jet have used mufflers successfully for decades.

One advantage for some beginning competitors might be to break them of the habit of trying to prime hot engines. (Priming hot engines is one of the major reasons that new competitors can't get their racing and combat planes to restart. It's *not* a good idea in most cases.)

One can't speak for future proposals, but no muffler proposal in the recent past has proposed mufflers on 1/2A engines.

I guess my bottom line is: even though we don't really *want* mufflers, we can live with them. Since we may be forced to use them, wouldn't it be a good idea to start planning and researching how to do it now, so that we're ready when the time comes?

Pat makes one excellent parting comment: "More people should write into magazines! It's *fun*. You get to express your viewpoint. Why, by reading *and* writing you get *double* your money's worth!"

COMING UP

Contest flyers pour in from all over. Often they are too late to make the magazine deadline. A few exceptions:

The Dallas Model Aircraft Association of Texas offers the *Southwestern Control Line Championship* September 3 and 4 at Dallas Hobby Park, NW Highway at Garland Road.

Events include Mouse 1, Goldberg, Quickie Rat, Goodyear, and Rat racing, FAI, 1/2A, Fast and Slow combat, Precision Aerobatics, Old Time Stunt, Navy Carrier, Sport and Profile Scale, Record Ratio, .21 Sport and Sport Jet speed. For information, contact Bill Bischoff, 7550 Christie Lane, Dallas, Texas 75249.

The Vancouver Gas Model Club of British Columbia plans the 44th annual *Internationals* on September 3 and 4 in Richmond, B.C. Events include Precision Aerobatics, Novice Stunt, Record Ratio Speed, Navy Carrier, .15 combat, Balloon Burst, Northwest Sport Raced, Goodyear and Scale. For information, contact the VGMC at Box 82294, Burnaby, B.C., V5C 5P7, Canada.

The Seattle Skyraiders present the *Raider Roundup '88*, also known as the Washington State CL Championships, September 17 and 18 at the Boeing Space Center in Kent, Washington.

Events include Fast, Slow, 1/2A and Fox-Doo combat, Northwest Sport, Northwest Super Sport, Sport Goodyear, Class I and II Mouse Race, Balloon Bust, Navy Carrier, Old Time Stunt, Precision Aerobatics, Speed, Profile and Sport Scale. For information, write the *Skywriter* at 15559 Palatine Ave. N., Seattle, Washington 98133.

As always, letters, photos, drawings, questions, and technical tips are welcomed. John Thompson, 1505 Ash Ave., Cottage Grove, Oregon 97424. •

European. . . . *Continued from page 19*

from 1927 till 1934, powered by two 450 hp Renault engines and carrying 14 passengers. The 12-foot model of this beautiful biplane is powered by two SuperTigre 1.5

cu. in. engines and weighs 44 pounds. Even the interior has been duplicated, including working lights.

An "Alouette II" helicopter with a rotor diameter of just over 11 feet is also quite exceptional. German Peter Wahl put 3500 hours in this project, and that included the homemade 5.6 cu. engine. Weight is approximately 80 pounds.

Well, in order to leave enough space for the pictures of the articles and models described, I'll stop here. If you ever have a chance to visit Europe in the spring, be sure to put the next Modellbau exposition on your agenda! •

Insiders. . . . . *Continued from page 61*

fragile, in particular, model should not be destroyed by collisions with girders or with other similar models; model should be repairable at a contest; model should be graceful and beautiful; and model should present the contestant with a design challenge.

Checking to see that the model meets the rules should not be too difficult.

Obviously, different fliers will have different opinions as to the relative importance of these requirements. While reading the remainder of these articles, however, the reader is invited to consider how well each of the existing AMA competition classes meets these requirements.

THEORY OF ENDURANCE OF RUBBER-POWERED MODELS

In order to formulate rules in a rational manner, it is necessary to have a knowledge of the approximate manner in which the design parameters influence the endurance. This theory has been given previously, but was published so long ago that it is considered desirable to repeat some of the important results.

One conclusion from this theory is that the endurance varies inversely as the square root of the wing loading. The same relation holds whether the wing loading is expressed as the total weight (WT) divided by the wing area or the model weight (WM) divided by the wing area, provided the ratio of rubber weight to total weight remains the same. As a result, the endurance may be increased as much as desired simply by making the wing loading lighter.

All the other design features that influence the endurance, such as aspect ratio, propeller diameter, rubber-weight ration, etc. have good values, depending on the particular set of rules. As a result, changes in these parameters one way or the other from the best values can be expected to have relatively minor effects on the endurance.

In order to check the validity of the relation that endurance varies inversely as the square root of the wing loading based on model weight, data for the endurance of models can be plotted as a function of 1/WM/S. If the formula is correct and the other parameters are about the same on all models, the data should lie on a straight line through the origin.

In figuring the wing loading, the wing area plus half the tail area was used, inasmuch as the tail usually operates at about half the lift coefficient of the wing. It is interesting that the F1D, Intermediate Stick, and Easy B records fall on exactly the same straight line through the origin. Probably the loss of efficiency associated with the lower aspect ratio of the F1D is equivalent to the lower efficiency due to the smaller size of the Easy B. Counting AMA Stick and Novice Pennyplane, however, the data show a more rapid increase in endurance than indicated by the formula, showing that the larger models in general probably benefit from other effects such as larger propeller efficiency or flight at a higher lift-drag ratio. •

Big Birds. . . . *Continued from page 17*

struction booklet, construction photo book containing 32 pictures, and an 8 x 10 B&W print of a flight of Kingfishers on floats are included with the plans (four sheets). Also, Doug swears that the conversion from wheels to floats is quick and easy and takes only ten minutes.

MODIFYING BIG BIRDS

Even though I know how creative we can be when it comes to modifying or changing existing designs, I'm still often awed by the results.

A perfect example of this kind of handiwork is John Riggs' Zenoah G-38-powered semi-scale P-6E. Hard to believe that this birdie started life as an Ace 4-120 Bipe kit,

but with patience, planning, Coverite, Ultracote, and a set of Sig's Ryan STA pants, John transformed a boxy, plain-looking, functional biplane into a real beauty. And, of course, she still retains the excellent flying characteristics that have made the 4-120 bipe so popular.

So if everything seems to have gotten rather ho-hum and boring, why not put some pizzazz back into your life and perform cosmetic surgery on that next kit you're planning to build. A little creativity is sure to get you out of the doldrums. After all, nowhere is it written that your bird has to look like the picture on the box.

IMAA RALLY OF GIANTS

This will be the International Miniature Aircraft Association's 8th Annual Fly-In Festival, and we're doing everything we can to make sure that it'll be the best one yet.

This year our annual fly-in is being hosted by IMAA Chapter #51 at Alderman Airport, St. Clairsville, Ohio, for five days of fun and flying from August 24 all the way through to August 28.

Alderman Airport features a 2800-foot paved runway and a closely mowed 500-foot grass strip and offers unlimited camping for motor homes, trailers, campers, and RVs. Overnight storage/charging will be available, concession stands will be on site, and exhibitors will be showing their wares under a Big Top.

These IMAA Fly-Ins always turn out to be a great social affair, and, as always, the flying is relaxed and low-key because it is a fly-in and not a contest.

For a flyer with all the info and registration form, write to: Charlie Singer, IMAA # 48, North 22nd Street, Wheeling, West Virginia 26003, (304)277-1476, or drop me a line.

AND FOR 1989?

Just found out from IMAA President Jim Van Loo that we've received three very tempting offers for next year's 9th Annual Fly-In Festival site. The good people in Montgomery, Alabama, would love to have us pick their fair city. Likewise, the guys from Odessa, Texas, are also fired up to host our 1989 Annual Rally of Giants. And the third invitation is almost unbelievable. We've been asked to hold our Festival at the "Mecca," otherwise known as Oshkosh. This seems to be an offer that can't, and shouldn't, be refused. So, I hope we can take a rain check in regards to the Montgomery and Odessa sites.

Of course, my druthers don't mean anything because the IMAA Board of Directors has to vote to make it official, but I just can't imagine us not taking advantage of this fantastic opportunity to enhance the image of model aviation.

If we do go to Oshkosh for 1989, we're probably going to shoot for the tail-end of June or the very early part of July. We should have this all wrapped in a few months.

QUIP OF THE MONTH

After a highly bonked landing, the engine wouldn't run for the next flight. The modeler raised the bird and jerked it to straighten out the kink in the fuel line. A spectator who had just come up asked, "What are you doing that for?" The pilot replied, "The instructions say to shake before using." Al Alman, 16501-4th Avenue Court East, Spanaway, Washington 98387; (206)535-1549. There's plenty of nice weather left, so why not build a set of floats and try flying off water; it's a real gas and a great change of pace.

FLY SAFELY!

Hannan. . . . . *Continued from page 51*

active competitor and scale modeler has passed away, following two operations.

Known for his beautiful craftsmanship and high-performance models, Loren was a familiar figure at Mile Square, Lake Elsinore, and Taft contests. Our condolences to his family and fellow modelers.

FILLON'S FLYERS

Emmanuel Fillon, the 1937 Wakefield Cup winner, offers model plans in wide variety. Among them are a set of 22 reduced-size drawings of the 1937 Wakefield entries; a comprehensive assortment of Peanut Scale construction plans featuring unusual subjects from France, England, and the USA, mostly of the Golden Age era.

Among Fillon's non-scale designs are a rubber-powered helicopter, a rubber-powered jet (with a squirrel-cage-fan propulsion unit), and the "Big Bozom," which is a sort of Bostonian. An International Money Order in the amount of $3 (available from most post offices) will bring you a sample plan and complete list. We think you will be fascinated by Fillon's style of design and drawing. M. Fillon, 60 Rue du Bocage, 83700 Saint Raphael, France.

AVIATION IS WHERE YOU FIND IT

Bill Dahlgren, of Glenview, Illinois, tore the top off a box of oranges and sent it to us. Why? Because he was intrigued by the illustration on it of the U.S. Navy Macon dirigible and its hangar. Looks as though it may date back to the days when that airship was new; however, the design is still in use.

Soon after the Macon orange-carton lid arrived, we received a wine brochure which also featured products with aviation-theme labels. The Chardonnay bottle displays the Wright Flyer at Kitty Hawk, while

the Cabernet Sauvignon shows a "Gathering of Eagles," consisting of a Wright Military Flyer, a LePere WWI biplane, a Martin B-10, Boeing P12E, and a North American Mustang. Why would wine be packaged with an aero theme? That's easy. . . because the firm, Chandelle of Sanoma, is operated by the son and grandson of H.H. "Hap" Arnold, student of the Wright brothers and Commander in Chief in the U.S. Army Air Force during WWII!

THAT QUOTATION AGAIN

Regular readers may recall our December 1987 column lead-in line "Life is short but art is long" attributed to Goethe, but later disputed by Ted Ballin who felt the credit belonged to Hippocrates.

Subsequently, Bill Feeny from whom we gained the original attribution, wrote in to point out that the quotation (or slight variations thereof) could quite correctly be credited to Hippocrates (460-400 B.C.), Geoffrey Chaucer (c. 1343-1400), Johann Wolfgang von Goethe (1749-1832) and Henry Wadsworth Longfellow (1807-1882)!

To which Bill Feeny (still writing and drawing in 1988) adds in an Irish accent: "Art is long and life is shart. Hannan's readers are pretty darn smart!"

BOOK REVIEW

Black Rainbow is a book with a difference. Written by model builder/author/artist/decal designer Lloyd S. Jones, this novel is unusual to say the least. Although a work of fiction, the research and reality behind its creation shine through in ways that may delight some readers and disturb others. Witness this quote: ". . .there must be a level of our society that is even beyond our politicians in the Federal government, that there are things going on that are above the level of accepted technology." Is this a science fiction book? Not according to its author who grew up in the neighborhood of Lockheed Air Terminal, in Burbank. The plot revolves around a highly classified stealth fighter and the people involved with it—and each other. Interwoven are advanced technology, romance, parapsychology, and model building. . .a remarkable combination. Sound interesting? Details on ordering the book are available from Aeolus Publishing, Ltd., Box 2643, Vista, California 92084. Please tell 'em you learned about the inexplicable "Black Rainbow" from the mysterious *Model Builder.*

EASY BUILT MODELS

Ian L. McQueen wrote us regarding the Canadian Easy Built model manufacturing company who is producing about 100 different kits, mostly of pre-WWII design. Many of the products are scale models originally manufactured by Modelcraft Hobbies, as well as Easy Built Models; however, they also market sport flyers.

Ian McQueen visited the factory and reported that kit sales amount to about 80,000 per year, a very high quantity in today's terms. He points out that the days when every kid knew how to build stick-and-tissue models are long gone, and proprietors Don and Ron Wilson recommend these kits to modelers with at least some building experience.

It is our understanding that Polk's Hobby is the outlet for U.S. sales of Easy Built models; however, foreign customers may order directly from the factory. For a complete catalog, contact Easy Built Models, Box 12, Grimsby, Ontario, L3M 4G1 Canada.

SIGN-OFF

From aerodynamicist/hydrodynamicist Bruce Carmichael: "Computers are great, but it still takes *intuition* to make things work." •

Free Flight. . . *Continued from page 59*

Flyoff.

THE WORDS FROM THE RUBBER WORKS, OR WHAT'S NEXT?

I recall vividly the cries from the rubber model fraternity when Pirelli disappeared from the scene. Nothing could take its place. And for a while nothing did. Then FAI rubber came down the pike, and, after different formulas gradually improved the quality, it became the standard for the hobby. Champion Model Products got into the business selling rubber strip, and the world seemed a safer place. Now comes word from George Schroedter of Champion that the company who made both Champion and FAI rubber has been sold to a new owner. Recent batches of rubber have been "not-so-good." Rather than go to bat with changed owners, George has explored new

sources. One especially promising source has been Chinese rubber. Recently, George purchased some Chinese rubber and sent it to Fred Pearce for testing. The results: the samples ran from 3603 up to 3715 ft. lbs./lb. These are excellent figures, and they suggest that this rubber compares with the very best batches of Pirelli.

George has ordered a large quantity of this Chinese rubber, named "Panda Rubber." It should be available by the time you read this article. Most of the rubber will be in 2mm strips, although George reports that he may receive a limited quantity of 4mm and 6mm as well. The cost appears to be in the neighborhood of $12 per 500-gram skein postage paid in the U.S. George is taking deposits on orders now. If you are interested, I would suggest you contact him ASAP with your order. Write to Champion Model Products, 880 Carmen Court, LaVerne, California 91750 or you could call him at (714)599-3348.

A FRIEND HAS PASSED THIS WAY

I just read in the SCAMPS newsletter, *Gas Lines*, that Pete Vacco passed away in April of a heart attack. Pete was Hobby Woods, a balsa cutting shop that did all kinds of special wood sizes especially suited for free flight modeling. Pete supported the hobby well, as he was a frequent donor to free flight contest organizers. It was not his first heart attack, as he had had several earlier. I talked with him during the summer of 1987, just after he had got his cutting operation back into form following a devastating fire that wiped him out. He was in good spirits then and was hard at making up for lost time. I join with many who knew him in wishing him good flights and many thermals.

NEW FREE FLIGHT NEWSLETTER HITS THE NEWS

Just when you thought it was safe to open your mailbox, up pops another newsletter specializing in free flight activities. This one, *Flyoff*, is produced by the Brooklyn SkyScrapers and is a first-class operation. Eight pages on glossy paper containing opinion, three-views, technical articles, pictures, and the like. The SkyScrapers have never, according to *Flyoff*, produced a newsletter during their 52 years of existence until now. The editor is Bob Hatschek, who is ably assisted by Lydia Wagner, Joe Wagner, and Bill Colish. Cost is $10 per year in the U.S. and $15 per year overseas for five issues. Interested? Send a tender to editor Bob Hatschek, 316 Grosvenor St., Douglaston, New York.

IN FREE FLIGHT VOCABULARY

"Warp" is a four-letter word, according to Flyoff.

UPDATE ON THE FUEL-PROOFING CHART

Received a nice letter from Bill Johnson, a dyed-in-the-wool free flighter, who adds some comments to the fuel-proofers chart carried in the February 1988 issue of *Model Builder* Free Flight. Bill notes that K&B Poxy has quite a bit of dilutents in it already. When you mix it with lacquer thinner, most of this will flash off, but it will leave products behind that are not cross-linked with the curing agents and, therefore, will be attacked by the nitro in your hot fuel. "I have

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Each and every supplier of raw materials has been hand selected to become more of a partner with us in the fuel business than a mere supplier. As a result, only the finest quality methanol, nitromethane and lubricants are shipped to our blending facilities. But this is just a start. The freshness of the methanol and nitromethane are guaranteed during our storage with a special nitrogen gas displacement system that continually protects these materials from moisture contamination . . . the fuel you receive is as fresh as the day the raw materials were delivered to us.

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Byron Originals Fuels are available in both a Synthetic/Castor Blend and a total Synthetic, each in various nitromethane levels to suit your individual needs and the needs of your engines. And each blend provides top performance and maximum protection in all types of engines.

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found," Bill continues, "that using the two most widely used epoxy formulations straight out of the bottle gives me a couple of years of fuel proofing, especially if I use two coats.

"Another trick that works," according to Bill, "is to let mixed epoxy stand for an hour or so before using. It is said that this removes the entrapped air from the compound, but maybe it also helps the ability of the epoxy to cover better. Also, if you can stand the weight, putting epoxy on in one thick coat seems to be the best method of filling in pores. The same is true of nitrate dope filling the pores with one coat." Bill requests that he would like to see more info on free flight trimming. "Why not publish hypothetical trimming problems and get input from some of the experts, like yourself? (*Me?*) It is said here in New England that Henry Struck can make almost anything fly, but we are never favored by his or other old timers' comments. A few articles over the years have been published, but they don't always work." Well, that sounds like a challenge to me. Maybe it's time to dust off the old Bullet Bob feature. What say? I would be pleased to pose a few questions for discussion of the "experts" here in *Model Builder.* Better yet, if you have some questions that you would like to pose, drop me a line c/o *Model Builder.* If sufficient interest exists, we'll give it a try.

THAT'S IT

Running too long this month, so must wrap it and tie it. Thanks for the many pictures. Stay tuned, more next month. In the meantime, catch a thermal for me. •

Simply Scale. . *Continued from page 41*

magazines you have finished reading and can't bear to throw out, and find examples of models similar to the one you are building. They don't have to be exactly the same model but could just be similar. Note the position of the CG on each model as a percentage of the chord, and, after looking at a few designs like your own, you will have a very good idea of where to position the CG. As an example, if you are scratchbuilding an Albatross WWI biplane, you will look for other biplane designs having no stagger on the wings, with thin airfoils and smallish tail surfaces. You may find plans for the Curtis's Jenny, Avro 504K, and a Sopwith Tabloid. These planes will all balance very similarly. Mark your CG at about the same point. Add a bit of extra weight to the nose for test flying, and you're in business. I know it's not very scientific, but it got me by for years.

The other way to do it is a little more scientific, but, I hope, still easy for everyone to do. Before going ahead, it must be understood that many factors go into calculating an accurate CG for a given model design. Some of these are important. We don't want to be agonizing over this too long. After all, we have to have time left over to build the model. Some of the important factors to consider are: planform of the wing, airfoil, tail area, tail moment, retractable landing gear type, fuel tank position and size, and the desired flight characteristics.

The planform of the wing itself can contribute to the longitudinal stability of a model. A low-aspect ratio wing with a relatively long chord will be less sensitive to CG location when a high-aspect ratio wing with a relatively short chord. Whether or not a wing is swept back, elliptical or even swept forward can affect stability. The most practical effect of wing planform though will be in determining how easy it will be to find the mean chord line for that wing. This line will need to be known when placing the center of gravity as it is on this line that it is calculated. Figure 1 shows how to locate the mean chord for wings of different planforms.

Some airfoils have an impact on CG location. Although most airfoil shapes do not change the way we calculate CG location appreciably, some special airfoils do create some special considerations. If the airfoil is a reflex-type where the curve of the camber line curves upward at the trailing edge, the part of the airfoil which is reflexed upward must be discounted as being part of the wing chord dimension. These airfoils are usually found on deltas and flying wings, although it has been the practice of some modelers to use them for models of aircraft with smallish tail surfaces. This type of airfoil lends more longitudinal stability than conventional airfoils. Airfoils with their thickest part far forward also require special consideration. This type of airfoil is found on the Cap 21, for instance, and the CG must be adjusted ahead a bit to compensate for the model's tricky handling characteristics. Most of the airfoils we use, however, do not require much special consideration.

Tail surface area, mainly the horizontal stabilizer, does have an impact on CG location. The larger the tail area, the more rearward the CG position can be; whereas, the smaller the tail area, the more forward the CG must be. The damping effect of large horizontal tail surfaces will be, of course, greater than that of small tail surfaces.

The length of the tail of an aircraft or tail moment also has an impact on CG location. If the tail moment is long, the tail will have greater leverage and therefore will be more effective in stabilizing the model. It is also true that long-tailed airplanes often can get away with smaller horizontal stabilizers.

The type of retractable landing gear and the fuel tank position and size must also be considered where applicable. Take, for instance, the Zlin Aerobat; this model has a long nose, short tail, and retracts which fold straight back into the wing. The fuel load up front and the weight shift caused by the landing gear changing position must be considered. The CG on this aircraft must be calculated for the worst instance. This would be with gear retracted and an empty tank. The CG will have shifted back under these circumstances and the model must still be flyable.

We can use a formula to calculate the center of gravity fairly accurately for most models. The formula is:

Formula I

$$CG = \frac{\text{Chord}}{7} + \frac{3 \times \text{Stab Area} \times \text{Moment}}{8 \times \text{Wing Area}}$$

Chord is the mean chord as calculated in Figure 1. Wing and stab area are usually easy to calculate. Moment is measured as the distance between the 1/4 mean chord point of the wing and the 1/4 mean chord point of the stabilizer (see Figure 2). CG is measured on the mean chord back from the L.E.

If the parameters in Figure 2 are used, the formula works as follows:

Formula II

$$CG = \frac{14.5"}{7} + \frac{3 \times 304 \times 38}{8 \times 1218}$$

CG = 2.07 + 3.16
CG = 5.23 inches

Try this formula for some of your existing models, and you will notice that it works quite well.

In closing, please remember to check that CG on a new model or after making changes to an existing one. We wouldn't want people flying around unbalanced now would we? •

Ramblin'. . . *Continued from page 29*

a good caning at the next FAI Pylon World Champs!

Interesting, huh? Let me tell you more about this clever muffler. It is designed to utilize both the principles of acoustic resonance and of pressure wave reflection. Acoustic resonance is used to give more power boost in the lower rpm range, and pressure wave reflection (as used in ordinary tuned pipes) is used to boost the higher rpm. Both modes interact to increase and broaden the power band of your engine. During the process, the exhaust noise is also dissipated by traveling a relatively long distance within the enclosed channels prior to exit. The result is a quiet and powerful tuned exhaust system which is less critical of engine load and atmospheric conditions than conventional tuned pipes. Its small size makes it much easier to install inside a model, thus reducing drag and increasing the silencing even further.

The muffler's data sheet says:

"The Magic Muffler's chambers are precisely calculated with regard to shape, size, location, materials, and thickness to manipulate the exhaust pressure and exhaust sound to supercharge and superscavenge your engine at certain precalculated rpm ranges.

"The exhaust of a two-cycle engine actually pulses in operation. By directing these pulses into a specially designed enclosed chamber a pumping action can be created which does two things almost simultaneously. First, it produces a strong sucking action on the exhaust port which draws more fuel through the carburetor, into the crankcase, up the bypass, and into the combustion chamber (with some 'slopover' into the muffler). It then supercharges by ramming the fuel charge back into the combustion chamber to create a more dense mixture. This process gives you increased rpm plus more power-torque in the higher power range.

"The acoustic mode works simultaneously by using the noise to create resonance in the muffler which also causes a pumping action at lower rpm. The two modes then "bridge" to give you a very broad power band; superior to any other device currently on the market. When running 'on the pipe' you'll be using more fuel, but you can cut down or eliminate the expensive nitromethane and still see impressive power gains. You'll also see a cooler-running engine which means less wear and longer life for piston, cylinder, and glow plugs. We strongly recommend that you experiment with different props and/or gear ratios after fitting your Magic Muffler. The benefits will be quite noticeable in the improved vertical performance of pattern and

sport aircraft, the faster acceleration of cars and boats, the increased low-end torque of helicopters, and the increased power of racing engines." While "guesting" at John Chadd's home in the Sydney area, I rambled down into his workshop where a giant CAP 21 was under construction. The best R/C pylon callers are usually experienced modelers as is John who is the caller for Ranjit Phelan. John's interests wander from pattern to 1/2A pylon racing on into scale, and his 17-year-old son Phillip is coming along to be a keen model builder too.

Although Australia is massive in size, about like the USA, their population is only 14 million compared to our 240 million. They have almost 6,000 MAAA (like AMA) members but lots of hobby shops. One major chain is ABC Hobbies who seems to be like K-Mart in the bigger cities; they're everywhere. I was taken into an ABC store in Sydney to meet the manager, see the stock, and visit. With the exception of Dremel and DuBro, there are very few USA products for sale in Australia. Most come direct from the Orient and are test-marketed before being shipped into the USA's lucrative and competitive hobby marketplace. There was *much* to see that I've still not seen in the USA shops. Australia's major kit makers are Price-Rite who makes a fine quality series of old-timer kits for R/C assist and Aeroflyte who seems to make a vast line.

Two model magazines are published "down under." *Airborne* is published by John Rogers six times annually, and *Australian Radio Control Modeller* is published by Murray Scott six times also. Magazines from England seem to be carried by all the hobby shops too. Quite astoundingly, I found *Model Builder* in every hobby shop I visited down under except one! The latest issues received there were always about five months late by the cover date. The selling price was usually $6 per issue, which reflects the sea transportation and *awful* taxes imposed on items imported into Oz. A future interview about pricing is sure to astound you! And I got the straight facts direct from the hobby importers for you.

It was kinda fun to find *Model Builder* in their hobby shops. Seems my stuff is being read, and, as such, I found the welcome mat was out all over the area for me. Seems a lot of modelers all over the world enjoyed "Ramblin' Through Europe." One of the wonderful evenings in the Sydney area was spent with Brian Winch who does in the hobby exactly what I do for hobby dollars—he writes engine and other articles for the model magazines in Australia and in England. Since we write for competitive magazines in England, it was especially nice to be invited to his home for dinner and tour his engine and model building workshops for the evening. He was deep in analysis of a made-in-England magneto installed on an O.S. four-stroke cycle engine. Interesting project, interesting evening, interesting ramblin'.

Next month we visit Ivor F., Australia's premier model builder; see the world's biggest collection of model airplane magazines; and more. Don't let yer subscription expire! •

Electric . . . . . *Continued from page 37*

to decrease the cell count so you can increase the prop size. Remember what I just said, if the battery goes up, the prop must go down, and if the battery pack goes down, the prop goes up. Just remember it as "what goes up must come down." This is particularly useful for the 15, 25, 40, and 60 sizes. I like to use the 15 on 10 cells (it is rated for 12) because it can easily turn an 8 x 4 on ten cells. It will overheat if it is asked to do that on 12 cells. Or, you can do as Bob Kopski suggests, and use it as an 05 on six, seven, or eight cells. It will turn quite large props then, 9 x 4 or more. I like to use the 40 (rated for 18 cells) as a "super 25" on 14 cells, it will turn an 11 x 8 prop!

You can go the other way and use larger packs than rated on direct drive; the 40 is quite tolerant of this, and I have used 21 cells with no problem. Other motors are not so tolerant. The 15 would go to very small props, like a 6 x 3, if you go to larger packs, such as 14 or 16 cells. It would really wind up. But a 6 x 3 would not be the prop I would choose for a 15 plane! However, this certainly would be the way to go if you need very high rpm, such as in a ducted fan, and would be well worth trying.

Geared motors have an even wider range of possibilities, since you are starting with a fairly large prop to begin with. A typical geared 05 will turn an 11 x 7 on six cells. If you went to five cells, you could easily turn 12- or even 14-inch props. You would have lots of static thrust, but slow forward speed, just the thing for vertical takeoff planes! Or, you can increase the cell count and go to smaller props. I have not tried this on a 05, but I think you would probably go as high as 12 cells on a geared 05. This would get you down to 7 x 4 or 8 x 4 props. You would be running the "05" motor as a "15," with just about the same power output. Use a sturdy gear box if you do this, like the Astro ones, or the gearbox may give up! Also watch for heat buildup and keep the motor

ventilated. The only real limit to this is motor efficiency, that is, heat. Since a smaller motor uses smaller brushes and wire, this can start to build up. On the other side, electric motors are most efficient at high rpm, so you are actually gaining somewhat in theoretical efficiency (that is, efficiency that ignores mundane things like resistance and heat). You also will have to think about how many rpm the motor can handle without throwing a winding. Most will go to 25,000 rpm without problems, many will go up to 33,000. This comes out to about 12,000 rpm output for most gear boxes; try for somewhere between 2.0 to 2.5 reduction.

So there you have it, how to make a motor behave like whatever you want! By the way, I often get questions about the 05 motors used in offroad cars. Most who read this column know that the offroad stock 05 motors make excellent aircraft motors; use a 6 x 4 or 7 x 3-1/2 prop on six cells, and enjoy, or try some of the tricks I just talked about!

You do have to have a 30-amp ammeter to do all these neat things, and Davey Control Systems makes one that is just right for $24.95. You can get it from CS Flight Systems, 31 Perry St., Middleboro, Massachusetts 02346. You can make your own. Ed Westbrook sent in the way he did it. He converted his Radio Shack Model 2-187 DVM to a 20-amp meter (easily modified for any current range). He used a two-foot shunt of #14 wire (sold in hardware stores as zip cord) and two plugs. You could use #16 if you wish, use a little less wire. You can use the volt or ampere plug in on the meter. You do need a regular ammeter in series to adjust the shunt; the one in your charger will do just fine. Set the current at two amps, then trim the shunt until the meter shows .2 amps (or .2 volts if on volts). When you do the trimming, always unplug the shunt from the meter, otherwise the meter will get the full current load, and that could blow out the meter. When you are done, you have a 10:1 shunt and can read 20 amps. If you want to go to higher currents, a 100:1 shunt would do fine. You would use .02 volts of amps to represent 2 amps in the calibration. My Radio Shack analog meter has a maximum of 250 milliamps (.25 amps), so I would go for the 100:1 reduction to see 25 amps (100 x .25). The shunt will be short, two inches or less. I do use such a shunt on my Accutach; it works very well.

You may not have an ammeter at all, if so, you can make a rough adjustment using an 05 ferrite motor on six cells with no load. These motors draw about 1.5 amps, so assume 1.5 amps and calibrate the shunt accordingly. This is "ballpark" but will be good enough for most motor/prop testing. Enjoy!

Tony and Addie Naccarato's B-36D Peacemaker was featured in the May *Model Builder*. Addie built it from scratch; it is powered by six Astro 05 cobalts and 42 sub C Sanyos. All up weight is 18 pounds; span, 108 inches. I have seen video tapes of the flights and takeoffs. To put it short and sweet, it is beautiful. Takeoff is impressive, acceleration is very fast, and climbout and flight are very realistic. The sound of the six motors in the air is much like hearing turbines. Tony is the pilot and does a superb job of flying. He even took it off and did a go-around using four motors, though he didn't do it on purpose! I saw the video of that takeoff and flight, and it was not at all obvious that only four motors were pushing, except for a longer takeoff run. Two motors had become disconnected. There isn't a speed control; the motors are turned off and on in pairs. It is a thrill just to see the tape; I sure would like to see it fly.

Bob Kopski sent a photo of his Astro 40-powered Exciter. Bob says it performed very well until its demise in a midair two years ago. He is thinking of rebuilding it. I hope he publishes plans for it. It looks very good to me, in fact, better than most 40 planes I have flown. There is a need for some plans

or kits for the 40-powered electrics, which I feel is the answer for flying at club fields, general float plane flying, and in windy weather.

Gage Cauchois sent photos of his very pretty float plane. It is a Ridge Rat, usually used for slope soaring. He is using an Astro cobalt 05 on 7 sub C cells and an 8 x 4 prop. The water rudder is fixed to the tail wheel bracket and is out of the water on step for no drag. The overall weight is 52 ounces. Gage says the flying and ROW are very good, but the floats do slow it down quite a bit. He will probably go to a cobalt 15 and 12 cells. This will really make it zip, with not all that much weight gain. I would bet it will not be more than 60 ounces (3-3/4 pounds, very reasonable for a 15 on floats). Note Gage's very neat double hatch arrangement so he can access everything. The floats, by the way, are from my Aqua Sport plans, available from RCM. Nice work, Gage! Enjoy the electric flying season. Till next time! •

F/F Scale. . . . *Continued from page 62*

perimental, antiques, and modern types. Send $2 for a catalog listing everything they have available. You won't regret it!

Carlo Godel recently purchased Tom Thumb Sky Tracings. This is another fine plan service, which includes scale and sport R/C plans. Most of these lend themselves to F/F, making a nice sport scale model. Send Carlo a self-addressed envelope for his offerings and mail to 5726 Case Ave., No. Hollywood, California 91601.

Al Lidberg of 614 E. Fordham, Tempe, Arizona 85283, is hard at it again. Along with his numerous other conventional scale F/F plans, he has three new NOCAL profile scale models. One is the Mitsubishi A5M2 "Claude." Many older builders will recognize this one, and we've all seen it in WWII movies; it's the predecessor to the Zero. The model uses an easy-to-make three-bladed prop, has wheel pants with a spring landing gear.

The second model is the Polikarpov I-16/10 "Mosca." This Gee Bee-like airplane is noted as the first monoplane fighter with cantilever wing and retracting landing gear. With all that area, it should, and does, fly well. The third addition of the Napier-Heston JA5 "Racer." The NH was built in 1940 to capture the 500-mph record. A first flight forced landing, and the pressures of WWII prevented any further development, but it is still a good-looking plane, even if it did not succeed.

The price of these nifty plans is a mere $1.50 a piece. The price of Al's catalog is still only a buck!

Bob and Sandy Peck of Peck-Polymers have been in the model business since 1970, and during those 18 years they have only produced quality products. The following new item is no exception. It is the Silver-Streak 035 electric motor. The Silver-Streak is much more than just another motor. It is outstanding performance for its size, weight, and, most important, it uses less current. Weight has always been a problem with electric-powered aircraft, and the Silver Streak has made it possible to reduce a considerable amount of the total flying weight. The motor weighs only 2.6 ounces and draws only 6.5 amps with six cells and turning a 6-3 propeller at 12,000 rpm. What this means is that you can use a battery with half the capacity for the same running time of other motors. Using smaller battery saves a major part of the total flight weight. Also, it can use lightweight Deans plugs because of the lower current.

This makes it the ideal motor for the person who wants to fly smaller models. A model with lower wing loading is safer and easier to fly. Recommended for mini R/C or F/F models with a 30- to 48-inch wingspan.

The Silver-Streak motor is $19.95 or a complete system for R/C or F/F is $62.95; there is also a full line of matching accessories.

You can order direct from Peck-Polymers, P.O. Box 2498, La Mesa, California 92044. Their thick catalog is $2.00.

The Flightmasters have been in existence for over 30 years! For years it was in the forefront of F/F Scale activity, but as the membership got older, others moved away, and still other dear members passed away, so the club was split up. In essence, there is a southern branch in the San Diego area, and one in each of Orange and Los Angeles counties. Even though there is a monthly meeting from September through June at Loara High School, 1765 W. Cerritos, Anaheim, California, every second Wednesday of those months, the attendance averages only about 15 to 20 members.

Typically, the work load is on the same few active members. Fortunately, these gentlemen are willing to put forth the effort required to keep this organization going. I'm sure you are familiar with this pattern found in many clubs. Last year the Flightmasters held their annual contest as usual, but it was the first time ever in the month of December instead of September. Why? It was decided to lump this annual event with the usually scheduled Jumbo/Peanut Contest. This assured modelers from the Los Angeles area who enjoy flying Jumbo, but none of the other scale events. There were also many modelers from out of the state.

The whole point of this dissertation is that to my knowledge there is no other scale contest in the state of California that offers what this annual provides. Yet, in recent years a number of models have dropped from 100+ to around 40 or 45. So, why the lack in attendance? I'd hate to think that the age of the membership is so old that they can't get out of their rocking chairs! Sure, we are all busy, but that isn't any excuse. I think

there is more to it than that, but it's hard to pinpoint. Certainly we don't have too many youngsters or young men stepping in.

So, what the Flightmasters have thought of doing is this: They are going to have their annual contest alternate with the Flying Aces, that is every other year. Since the F.A.C. is having their big bash this year, the Flightmasters won't be having theirs until 1989. Also, instead of September or December as the normal time for the contest, it will be in August. The logic here is that those modelers planning a trip to the West Coast for vacation can plan to take in the contest. And for our friends in the Pacific Northwest, they can easily plan to attend every other year rather than each year. Another consideration will be to use the concept of the Flying Aces, and to use their rules. They encourage unconventional designs and lots of flying! Last, but not least, we hope to get plenty of advance publicity so that the West Coast can also have a sensational F/F Scale contest. Stay tuned.

Now, just a brief comment about pendulums in F/F-powered models. Those of you who have read this column for any length of time know that I will not build a scale F/F model without the use of aileron control via the pendulum. It is so much fun and so rewarding to see a model fly overhead with the aileron pendulum doing its job.

The object of these comments is not to show you how to make and hook up a pendulum, because I've done it a couple of times over the years. However, to describe, perhaps, an easier method of installation. In preparing a model for the Flying Aces Nationals coming up this July, I came to the realization that there had to be an easier way to install the mechanism required. I struggled for hours getting everything aligned and working properly. I had to use hemostats, long tweezers, etc. to help get parts into the bowels of the fuselage. On second thought, let me describe briefly how the whole unit is set up and how it works. Most scale models tend to be lacking in spiral stability. Of course, I am not referring to Piper Cub-type airplanes, but biplanes or low-wing airplanes that tend to be more difficult to trim out. Invariably they tend to spiral (usually to the left) under power generally resulting in a crash. If you have tall grass around and the model has survived, side thrust or rudder tweaking may take the spiral from the power mode. Then what happens to the glide? Did the rudder tweaking cause another unwanted spiral in the glide?

I have found that the pendulum operating the ailerons eliminates a great deal of chance one takes with a powered F/F scale model. It isn't a cure-all, but if all other factors have been considered, then the chances of a great flight are enhanced. What do I mean by factors? There are several. First, all flying surfaces should be perfectly aligned to the fuselage. Second, the CG (center of gravity) must be where the plans show (how to find the CG of a model you've designed will be a future article). I prefer to add structure or make the tail as light as possible to eliminate having to add any weight. Ballast is nothing but dead weight which can be detrimental in a hard landing. Third, I always add down and side thrust to the engine to start with, usually about two degrees for both.

Now back to the pendulum. Figure 1 shows a plan view of the setup. It is a little time-consuming getting the bell cranks made up, but it isn't too bad. The pain comes when you can't reach into the fuselage too well and get all the parts situated. So, here is my idea: Make a light balsa box that will fit snugly inside the fuselage where the pendulum mechanism would normally go. Make all the pendulum parts and install them inside of the box. When finished, place the box inside of the fuselage and glue in place. Only two holes have to be made after the fact, and that is where the torque tube to the ailerons go through the fuselage.

The advantage is that all parts are accessible; and if there is some kind of bind, it can be remedied quite easily before installing into the fuselage. Give the pendulum a try; you'll like it! •

Hey Kid. . . *Continued from page 49*

suming that this stab was like the last one you built. It's not; it's thicker in the center part, and you will have to sand a camber or curvature in each of the ribs that goes from the L.E. to the T.E. of the stab so that it will blend in with the lower height of the L.E.

and T.E. pieces. If you look carefully at the side view of the stab in the side view of the fuselage, you'll see what I mean.

Don't forget the gussets. Note which way the grain runs on each gusset for strength purposes as shown on the plan—from side to side.

You can make the tail assembly removable and adjustable by "keying" the stab/rudder assembly to the fuselage instead of gluing it on, and holding it on with a rudder band. The "key" which fits in the last open bay of the fuselage forms a triangle, and you can make a 1/4-inch deep triangular key to fit closely into it, and then glue the key to the bottom of the stab. As there is only a thin stick in the center of the stab as shown on the plan, you should add a wider piece of sheet in its place to take care of the key. A hook on the underside of the key can be used to hook a rubber band on to pull the stab downward and hold it in place. I usually hook the other end of the rubber band around the tailskid coming through the inside, but any kind of a hook will do. One nice thing about this method is that you can add a shim under the rear of the stab to get the Moth to fly. With that long nose or plastic prop, it dives a lot, and slipping a 1/8-inch thick shim in at the rear of the fuselage is easy if the stab is held on with rubber bands.

The rudder is made 1/16-inch thick, but it could be made stronger by using the same method of construction used in the stab. I think that if I was going to do that, though, I'd build the rudder on the back side of the plan (trace the outline while holding it up to a window). This would give you a camber on the *right* side of the rudder or vertical fin, which would pull the tail slightly to the right, helping you climb in a left turn. Don't glue the vertical to the horizontal tail until they are covered (unless you just want to tack them together to check the fit or to take a snapshot of the all-stick plane). I always do that because I think models are beautiful that way, and I hate to cover up all that neat structure!

BUILDING THE WING

The wing is pretty easy, being of a "constant chord" type, meaning that all the ribs are the same size. After cutting all the ribs (W-1s, W-2s), leaving them a little oversize, and always getting in the habit of leaving them a bit long so they can be trimmed to fit, stack them all up, "squaring-up" the stack against the table, and against a straight edge at the leading edge. Make sure none are out of line. Then put two pins through the stack without letting any ribs slip; one in front and one behind. Don't worry too much about the pin holes, as they will help equalize the pressure inside your wing when it heats up on a hot day. A pin hole in the tissue anywhere along will let out excess pressure. Now even up the stack with your sanding block, making sure the rib on the right side does not get sanded smaller than the rib on the left side! Sand them to length, trying the stack over the plan after every few strokes so as not to get them too short. Mark the position of the main spar on *each* side of the stack, and sand in the notches using a notcher (made by gluing sandpaper on the edge of a piece of spar stock). Line it up carefully with your marks, and try to keep it straight while you are sanding. Don't go too deep. Try a bit of spar stock (1/16- by 1/8-inch) in the slot to check for correct fit. Suggestion: Try your notcher on a piece of scrap first just to make sure it's not cutting oversized.

The two W-1s which go in the wing center section should be sanded just a little less than the W-2s if you want to "let-in" the balsa sheet planking on the center. I usually just leave them the same size and lap the sheeting over the L.E. and T.E. instead of fitting it down inside. After it is blended in, you won't even notice. I'm lazy when it comes to things that don't matter much.

Pin the L.E. down and add the ribs to it, angling a pin through each to hold it in place. You can use a little 90-degree "square" made of balsa or cardboard to check and see if each one is straight up and down, if you wish. Add the T.E. and wing tips, making sure that the mismatches are fixed without bending anything. If you did the ribs right, the T.E. should fit perfectly. If not, then you'll have to go with the shortest rib and make all the others that length, settling for a bit narrower chord wing. Again, don't try to fill mismatches in with glue. Either make another part or fill in with scrap.

ADDING THE DIHEDRAL

The wing is made in three sections: two

outer "panels" and a center section which fits on the fuselage. The outer panels attach at three points: leading and trailing edges, and main spar. After completing the center section (you might even want to do the sheet covering now), sand a little angle on the L.E. and T.E. of the wing panel so that it will match perfectly when propped up at the correct dihedral angle (1-1/2 inches under each tip). *Double glue* when attaching these "butt-jointed" parts, letting the first coat soak into the end grain. When it is well-dried (a few hours), turn the wing over and add the main spar pieces into the notches. It will be a lot easier adding them now than trying to make all three points line up when putting in the dihedral. Again, double glue the ends of the spars where they join to fill the end-grain with glue. These are "load-bearing" members, and filling in space with glue or scrap is no substitute for a good fit and double-glued joints.

An extra brace can be added on the back side of the L.E. and T.E. and up against the side of the main spar if desired. Hard balsa will work; Popsicle sticks, coffee stirrers, or 1/32-inch plywood will work great. Keep the grain going in the same direction as that of the spar. Obviously, a little of the rib will have to be cut away to make room for the new strengthener.

ROUNDING UP THE EDGES

You are going to need to make the L.E. "un-square," or rather rounded in front to smoothly carry the camber curve from the top of the wing around the underneath. You can start by making a line about a third of the way up the front of the L.E. to use as a guide. Study the shape you are shooting for on the side view of the fuselage drawing. Then, using a sanding block, go to it. Actually, I use a razor plane made especially for hobby work which makes short work of tasks like this. If you work carefully so as not to take off too much, you can whittle off much of the "meat" (not your thumb!) before using the sanding block. Finish the job with your trusty 220-grit garnet paper.

If you have not yet sheeted the center section, you can do it now. Note that the grain runs from side-to-side (or "spanwise") for strength. The purpose of the sheeting is to take the pressure of the rubber bands which are used to hold the wing on. We use rubber bands which are used to hold the wing on. We use rubber bands so that in a crash the wing will move backwards on the side that hits, taking up some of the impact without breaking. Taking the wing off also makes the model easier to store and transport.

SHAPING THE L.E. AND T.E.

The easiest way to shape the leading and trailing edges of the wing is to move the part to be worked right out to the edge of the workbench. This way you can have more freedom to move your razor plane, sanding block, or carving knife. Before you start shaping the L.E., you should make a reference line with a pencil about a third of the way up all along the front. That will be the point where you start from in curving the shape up into the profile of the rib and down to the lower surface as shown in the drawing. The razor plane works well if you have access to one. Always shove it along with the blade shearing it at an angle instead of cutting "dead ahead." I have gotten used to doing it the hard way, with a model knife taking off the worst of the "meat," and finishing the rough shaping with a sanding block (80 grit).

The T.E. should be shaped down to a triangular section so that the line of the rib continues all the way back to the edge. Don't make it sharp; leave some to round off. Also round the edges of the rudder and stab if you have not done so already.

Next month we are going to cover, and perhaps make a dethermalizer if you'd like to try one. That brings the model down out of those big "trash lifters" that are used by Hung, the God of the Thermal, to steal your models.

Again, the address to send to for a Flying Aces Moth kit and perhaps a Lacey M-10 peanut scale model kit that we are going to build after we finish up this project is: Peck-Polymers/Beginners, Box 2498, La Mesa, California 92041. If you want to build the balsa-propped, long-nose version, a presawn, ready-to-carve, eight-inch prop blank can be had from OldTimer Model Supply, P. O. Box 7334, Van Nuys, California 91409. If you couldn't wait and made your Moth already and want another project like it, I recommend the Pacific Ace from Schlueter Models, 3508 Poinsettia Ave., Manhattan Beach, California 90266 (20- and 30-inch versions available). •

Electronics. . . *Continued from page 39*

divider is designed to work at a voltage past a given value, that being the low point of each of the different ranges. These are the values that must be used in our calculations.

Thus for the 4-cell position, we will first figure the circuit current as 4.5 (E) divided by 4440, which equals .001 amp. The second step, .001 (I) multiplied by R2 2490 gives up exactly 2.49 volts, measured from battery negative to the top of R2. Applying the formula to the other ranges gives us the following voltages across R2: 6-cell, 2.59 V; 8-cell, 2.46 V; and 10-cell, 2.48 V.

The deviations from the 2.49 in the first position is not desirable, and the exact resistor values necessary to obtain 2.49 can be easily calculated by working the formula backwards. The values used are there for the reason previously mentioned; the exact resistor values are not available. In this case, the accuracy of the instrument is maintained by a meter face that starts off the range in use at a slightly different physical zero point. This is a good design feature, otherwise each range would require separate calibration, which is hard to do without proper equipment and not a good idea in kit equipment.

Final approach! We will start off the new range at 1.1 volt per cell, or 5.5 volts. We then know the voltage (5.5); the current (.001) is known from our previous calculations. We solve for the total resistance with another version of the formula, R = E/I: 5.5 divided by .001 equals 5500 ohms. Subtracting the standard value (in this circuit) of R2, 2490 ohms, leaves us with a value of 3010 ohms for the new R1. In this case we are lucky, as 3010 is one of the exact values in which one-percent tolerance resistors are available. Not only that, but that value is one of the two used in the eight-cell position of the Voltmaster; it is readily available from Ace R/C. Precision resistors are not exactly easy to buy in the quantities we tinkerers need them in!

Now Grahame asked about Expanded Scale Voltmeters using Zener diodes, specifically the one available from Tower Hobbies, one I do not have any information on. However, such instruments are somewhat similar in operation and I do have the schematic for the Ace R/C Mini-ESV, as

shown in its nine-volt version. This type of ESV makes use of one of the characteristics of the Zener diode, which is that when it is connected in series with the voltage source, it will not conduct until the applied voltage reaches and exceeds its rated voltage. In the circuit shown, current will not flow through the Zener and into the rest of the circuit until the applied voltage reaches at least 6.8 volts. At that point, the majority of the current flow is through R2, it being the lower resistance. R1 is chosen to control the amount of current through the meter.

Though considerably simpler, this circuit would require more complex switching in a multi-function instrument, and does not operate with a constant load current throughout its entire range. The reason for that is that as the battery voltage drops, so will the current through the R2, R1 plus meter, parallel path. A more sophisticated ESV such as the Voltmaster uses more extensive circuitry to provide a constant load at all voltages, and is preferred for more accurate measurements.

Thanks for the travelogue, Grahame. I hope we helped to make things safer for those whirlybirds!

COINCIDENCE NUMBER 4876

At least! This has happened before. I get a request for information from one reader and I receiver the answer from someone else at about the same time. Last month, the subject was constant current chargers. The issue is not yet out as I write this, so William Mitch, of Hebron, Indiana, could not know that, but look at what he sent us:

"Here's a little circuit someone may be interested in. Use your twelve-volt wet cell charger with it. I built mine on a small piece of perf board and mounted the resistor on the regulator. This way, they are both at the same temperature. This little unit is good for flight packs or transmitter."

I HAVE TO GO PACK NOW!

No, I'm not off to New Guinea just yet, maybe next time. But I am about to leave for another beautiful tropical spot, Costa Rica, for the Sixth Annual Fun-Fly there. You'll be reading about it soon after my return. In thinking about this year's event, I did have an interesting thought. Last year we had the pleasure of meeting and flying there with two nice young men, Habib Rehman and Ibrahim Akram, who had come all the way from Pakistan. Check *that* on your globe; that has got to be a record for travel to a Fun-Fly, which is more impressive when you consider that they also brought along a third-scale Saab MFI-17. Don't tell *me* we don't have fun!

Adios, they are calling my flight . . . . •

Old Timer. . . *Continued from page 34*

airplanes. Well, "job" was simply his single-word reference to most any model, but "commercial" seemed more or less to imply a sport rubber model, sorta scale-like, but smaller than competition models.

I dropped a note to John, asking his opinion on this, as well as to whether he used the motor stick as shown on the plans. We'll finish this article with his response:

Got and enjoyed your note. However, you may have done the wrong thing by asking me questions. I have been accused of delivering a lecture on clock-making when someone only asked for the time!

Be that as it may, "commercial" models. My reading in my old time model mags tells me that this term describes a class of small (20- to 30-inch) models (of which the Pacific Ace is probably the classic example) which were intended to be realistic in appearance and resemble the full-scale commercial planes of the period (Curtiss Robins, Stinsons, Travelairs, etc.), which were just about all single-engine, cabin monoplanes. These models were intended for "fun" rather than for contest flying; a valid concept, as witness the fun we are still having with them.

As for motor sticks, if there is any advantage in using one, I haven't found it. The primary argument (for strength vs. weight) won't wash. A decently designed fuselage will carry a given motor for considerably less structural weight than will a stick plus minimum framework. I just don't think that some of the old timers were aware of the tremendous strength of balsa under compression. The motor stick was just plain overkill. The other claimed advantage, protection against blow motors (on account of winding outside the fuselage), can easily be overcome by using a winder extension and blast tube. In short, if motor sticks were so great, we would still be using them.

Even so, I built the Commercial with a stick, just because it was part of the design of this particular model. Yes, the "pointy" joint is plenty strong. Double-gluing with Ambroid works just fine. I think the stick would break in the middle first.

I don't really like the stick, though, for one main reason. It strictly limits the length of the motor. Any more than minimum slack is asking for trouble from the rubber wrapping around the stick and locking up. Since one of my standard trimming procedures is to vary motor length, this is a definite "minus" to me. However, for fun flying in a restricted space, this may not matter. •

Technical . . . *Continued from page 27*

amount of decalage we need depends on the type of airplane. If we are talking about a rubber-powered or gas free-flight model, the decalage is quite important because it, combined with the CG location, determines whether the model climbs, flies level, or dives.

If our airplane has a controllable elevator, decalage is of less concern, because we can make the plane do what we want it to do, in spite of moderately inappropriate decalage angle. Further, most full-scale planes have adjustable stabilizers (adjustable decalage) to permit optimization of the angle in flight, to reduce pilot stick force required.

On aerobatic ships with symmetrical air-

foils, including full-scale, R/C pattern, and control line combat and stunt, the designer usually specifies zero decalage. This doesn't mean that the wing is going to have to fly at zero angle of attack. Remember that the CG is ahead of the center of lift, so we must use a little up elevator to keep the nose from falling. That little bit of up elevator effectively gives us positive decalage and therefore a positive or lifting wing angle in flight, whether we are flying upright or inverted.

In a canard, with the stab in front, the stab incidence is greater than the wing incidence (again conforming to our bowl comparison). On a flying wing, the decalage is less obvious; but it is there, actually in the wing alone, in the form of that reflexed trailing edge.

LIFTING TAILS

If the center of lift of the wing of any airplane is right at the center of gravity, then obviously the plane is balanced in pitch and the tail has no load on it, either up or down (I'm ignoring airfoil pitching moments here). Usually we have the center of gravity ahead of the center of lift of the wing. Therefore most airplanes must fly with an aerodynamic *down* load on the stabilizer to balance the simple beam represented by the weight (down), ahead of the wing left (up), and the tail.

On canards, the forward stabilizer or "canard" is a true lifting "tail," since the CG is ahead of the wing lift. Tandem wing" airplanes (rare) have more or less equal-sized wings fore and aft. The CG is between the two wings, so both of them must lift. This again is a "lifting tail" airplane.

A lifting tail has also been used on some (most?) powered free flight model airplanes. When I built a few free flight models in the late 1930s, "lifting tail" was the "in" way to go, but I couldn't have told you why, and still can't. If the competition rules limit the main wing area, then I can see a lifting tail as a way of getting more total lifting area; but beyond that? Has it something to do with providing the near vertical climb with power on, then a very flat glide after engine cut out? Help please. If one of you theory-wise free flighters would mail me a short dissertation on the subject, I will try to publish it.

My hat is off to good free flight model designers, by the way. It takes a lot more smarts to design an airplane to fly by itself, yet fly like we want it to, than to design an R/C ship where the pilot can bail it out of any mischief it may get into. To design a really good R/C model, such as a winning pattern job that doesn't get into mischief, again takes an excellent designer with lots of experience. Note I said "experience" not "education." Education and technical ability surely help, but in the real world, I feel that cut-and-try, and learning by our mistakes is more valuable than the "book larnin." The formal knowledge will keep up from making some of the mistakes, however.

Incidentally, in order for a lifting tail to lift, or support a load, the CG must be moved back. Some free flight models have the CG at 2/3 chord or more back from the leading edge. The stabilizer on such a model will usually have a cambered airfoil in the normal upright position. I have seen ordinary (non-lifting tail) airplane designs with *inverted* cambered airfoils in the stabilizers, to provide the down load normally required to balance the airplane. This is usually quite unnecessary because the down load on the stab in a normally balanced airplane (CG at 25 to 30 percent) is so small that a flat stab or one with a symmetrical airfoil is very adequate.

Here I have been giving rules for longitudinal stability without much explanation as to why these rules apply. To completely understand longitudinal stability takes technical study that we won't get into. Well, okay, if you really must know: the slope of the CM vs. CL curve must be negative under all stable flight conditions.

LATERAL STABILITY

As I touched on in Chapter II, "lateral" stability also gets somewhat complex, so we will first look at roll and yaw and then lateral. The main sources of roll stability are dihedral and high wing placement with respect to the CG. This latter "pendulum stability" has been used on a number of sport planes and free flight models. It is effective in getting roll stability, but it has certain dynamic disadvantages and would never be used on an aerobatic plane. In this roll discussion I will restrict myself to dihedral.

A simple way to understand how dihedral provides roll stability is to consider the projection of the wing area on a horizontal plane. In Figure 1 we can see that when the wing is level, it casts an equal "shadow" on both sides, therefore the lift is equal on both sides and the plane will remain level in roll. If the plane is rolled to some angle, as shown, the wing shadows are no longer equal in area, and the difference in lift will roll the plane back to level.

Dihedral also provides roll control through yaw, by a different mechanism. If a plane with dihedral is yawed, the yawed-forward wing will have a higher effective angle of attack than the yawed-back wing. This will cause the forward wing to lift more than the other, and the plane to roll into the yaw, producing a banked turn. This is the reason why "rudder-only" or R/C models without ailerons can still make coordinated turns and why such planes have more dihedral than full-scale planes and models

with ailerons. To see the greater angle of attack on a yawed-forward wing with dihedral, look at a high-dihedral model from the front but at an angle of 30 to 45 degrees off to one side. Adjust your height so you hardly see any of the bottom of the wing angled away from you. You will still see lots of bottom on the wing toward you!

Therefore we need the rather large dihedral on free flight and rudder-only models, to make them stable and controllable. But what about full-scale planes and R/C models with ailerons? One factor in deciding how much dihedral to use is the type of airplane. Low-wing planes frequently have significant dihedral, but high-wing planes have less, if any. The reason for this is the pendulum effect inherent in high-wing planes, which provides roll stability and reduces the need for dihedral.

Not only do many planes fly fine with no dihedral, but some fly even better with negative dihedral or "anhedral." (Modelers use both "anhedral" and "cathedral" to mean negative dihedral, but my unabridged doesn't show an aeronautical meaning for either word, so I guess we are on our own.) Don Lowe, in his "Flying Lowe" column in *R/C Modeler* magazine, has reported on certain pattern ship designs that are improved by the addition of a little anhedral. This comes about because of the complex interactions between roll, yaw, and side slip.

Some of these interactions show up in the classic spiral stability/Dutch Roll trade off. To explain what happens, but not why it happens: If there is too little dihedral but too much fin and rudder area, a plane is inclined toward spiral instability, as some free flight designers and fliers have discovered the hard way. If the design has too much dihedral and/or too little vertical tail area, the plane is apt to Dutch Roll, which is a general weaving around of the nose of the airplane in flight.

PHILOSOPHY OF DESIGN

You have read, in this chapter and the one last month, many words like: "a bit, some, a lot, more, less, too much," and "too little." These are qualitative like specific numerical amounts would be. There are two reasons why I'm speaking in generalities: The first is Bill Northrop's and my wish to keep this "Model Design & Technical Stuff" column at a level which most of you will understand most of the time. The second is the fact that airplane stability is an inexact science.

The aerodynamics text books are full of complex formulas which will yield exact answers for specific design cases, if we are smart enough to know exactly what we want. Usually we aren't. Formulas are like computers; "junk in, junk out." Design is al-

ways a series of compromises. It is certainly valuable to know if more or less dihedral, for instance, is going to solve a problem in a particular design or make it worse; but very seldom can we go through a computation and know exactly how much of anything to incorporate for a perfect design. In spite of all the aeronautical science we have, airplane design remains to a large degree a game of cut-and-try based on personal and other designers' experience. The easiest way to design a good-flying airplane is to copy the design of a good-flying airplane.

Of course, it is a lot more fun to design something different; that is, the way progress is made, but recognize that we pay for this progress along the way by sometimes designing bad-flying airplanes. I've designed a lot of bad airplanes and will probably design a lot more. Why? Because there is a delightful sense of achievement when you finally solve all the problems on a design and have a good flyer that is your own creation.

TO CONTINUE FLYING

I know quite a few modelers, most of them old birds like myself, who have stopped flying models. That's pretty sad, you know. I've talked with some of them about it. "Why don't you fly anymore?" Usually they are still interested in modeling, but: "I'm too busy." "I'm too lazy." "Don't know, just don't get around to it." Etc., etc. These people have a contribution to make to modeling. We need them. Furthermore, *they need modeling*. There is a saying, usually referring to the body and exercise, which applies equally to the mind: "Use it or lose it." Model flying exercises both the body and the mind.

I have found a way to solve the problem of not getting around to flying, that works beautifully for me. It is a self-imposed commitment or challenge I have given myself. I must fly a model airplane (in my case, R/C) *at least* once a month the year around. It works! I don't find it a burdensome chore because I love to fly; I just need a little push sometimes. So far I've flown every calendar month for the last six years. I intend to fly every month for the next sixty years. (I will then be not only the oldest model flier, but the oldest human.) Try it; you will like it.

Next month we are going to derive two new and useful model design tools. Until then, designing stimulates the brain (use it or lose it).

Francis Reynolds, 3060 W. Lake Sammamish N., Redmond, Washington 98052; (206)885-2647. •

Plug Sparks. . . *Continued from page 34*

audio tapes in which Anderson recorded his entire modeling career.

Mel died in 1986.

READERS WRITE

Received a most interesting photo (No. 11) from Steve Ditta of New York showing an excellently constructed 1938 Experimental by Tom Laurie. This 84-inch wingspan model is powered by a Baby Cyclone and weighs 4-1/2 pounds all up.

The model, which won first in the Static Display at the 1988 WRAM Show is completely silk covered and finished with nitrate dope. Of course, such a beauty would be radio controlled; this time with a Futaba R/C system.

MORE READERS

Morton Ross of 17 Valley View So., Morristown, New Jersey 07960, writes to correct this columnist and draw attention to a rather obvious oversight. Morton says (and rightly too) the photo showing Clarence Bull's Lanzo Bomber as a typical problem in O/T Contest Flying.

As can be seen in the photo, Bull was competing with a Cox Medallion in 1/2A Texaco where the rules very specifically call for rear reed valve types such as the Black Widow, Golden Bee, etc. This writer clearly missed this item.

Ross further says:

"Despite the stated objections of SAM, there will always be those whose contest *attitude is to win*. So long as the experts scrupulously follow the rules, I, for one, enjoy their presence and expertise at a contest.

"About five years ago, I attended a contest in Massachusetts, about a three-hour drive from home. I was beaten in 1/2A Texaco by a modeler employing a Tee Dee 020! I didn't come to win, but I sure hated to see a 'loophole' that allowed this model to compete. This also brings to mind that the New Jersey 1/2A Texaco Rules have a glaring error as they allow a Cox QRC as legal. This engine has a very large tank (more than the 8cc allotment) and has a throttle (prohibited in SAM).

"Despite the controversy, the present SAM rules are excellent. I am not in favor of alcohol being allowed in free flight models, but I would support the organization and follow their rules even if I hated them. I would try to persuade others to agree and change them. That's democracy!" Ed. Note: Ross hit the nail on the head. Too much of individual state rules despite the national vote for national rules. If you don't support them, all you have are quarreling minorities!

AND MORE READERS

Saw my old buddy Lyman Armstrong, 203 Morton, Yuba City, California, at the re-

cent NCFFC April contest. At that time, he had in tow with him, Frank Hauser, who many of the old timers will remember as the designer of the "Nationalist." Frank was also known for his leadership work in the old Twin Cities MAC where he ran many a meet.

While Lyman was at the NCFFC meet, he took a picture (Photo No. 12) of Robin Pharis, who is seen holding the Ben Shereshaw Cumulus powered by an Ohlsson .60. The model, originally built by Ray Vandewalker, was inherited by Robin, who actively flies this model. It's really great to see the model fly again and in the hands of a modeler!

SAM 35 ENGLAND

Sid Sutherland, 52 Broadwalk, South Woodward, London E18 2EW, sends in a flock of interesting photos, mostly on old timer-hydro types.

As can be seen in Photo No. 13, Sid has built a Henry Stuck "Ho-Cat" that has not been flown on water to date. However, the lack of water has not stopped Sutherland as he has flown the model from a take-off dolly. He has also hand-launched on grass. (Ed Note: Hydro models will take off and land on wet grass.)

The Ho-Cat is powered by an O.S. .40 four-stroke and flies very well in all wind conditions (and they have wind in England!) using a three-channel radio. Dihedral is one-inch-per-foot of wingspan (a standard figure when nothing else is available) and find this is a good yardstick based on old single-channel days.

Sutherland goes on to say he feels because O.T. hydro models handle so well, they are an excellent way of getting into the water flying fun. Other water babies he has are a Seamaster (Ken Willard design) and a Top-Flite "Kittiwake." Sid admits he is hooked on water flying.

SAM AUSTRALIA

Latest word from Colin Borthwick of Queensland is contained in Photo No. 14. Colin reports his Trenton Terror with a Saito 53 (a bored out 45) is a real performer never having failed to make a "max" on a twenty-second engine run, this, in 26 flights!

In the first competition for the Trenton Terror, he used 30-second motor run and easily took home the hardware. The model climbs vertical and does not give up. Good combo!

In Photo No. 15 is seen Monty Tyrrell of Melbourne who was the Contest Director for the big NOTAM O/T meet at Nagambie, Victoria. Trevor Boundy, 45 Brooklyn Ave., Frankston, Victoria 3199, reports.

NOTAM, a Victoria group, is a schism of SAM Australia as the Victorians feel the New South Wales boys have been rather arbitrary in their rules interpretation. Processing has degenerated to nit-picking. This is always a problem: just how close are we going to demand the replicas be to the originals? The difference of opinions has led to two SAM Australian groups. Unfortunately, both organizations held their big annuals about the same time. Other states, such as Queensland and South Australia, are a bit bewildered by these events and have carefully refrained from attending either meet. Truly a shame as the Old Timer Movement has taken over model aviation in Australia.

Getting back to the NOTAM meet, we will feature the winners if for no other reason than to acquaint the American modelers on what the "Oz" people are using. Of interest in their SAM rules is the retention of the 60-percent allowance of four-stroke engines. However, they do limit the maximum displacement to .65 cu. in.

RESULTS:

Texaco

1. Geoff Lawson	Powerhouse	OS .60 4C	3036
2. Lyall Ford	Flamingo	OS .60 4C	2876
3. A. Kennedy	MG	Frog 250	2759
4. Graham Sinclair	Krupp	OS .60 4C	2480
5. P. Donovan	Lanzo RB	Enya .46 4C	2459

Duration

1. A. Kennedy	Playboy	McCoy .60	1315
2. P. Donovan	125° Playboy	Saito .65 4C	1189
3. Geoff Lawson	117° Playboy	Saito .65 4C	1167
4. Graham Sinclair	Playboy	Saito .65 4C	1093
5. L. Mostert	110° Playboy	Saito .65 4C	1010

Note: 7 out of the first 9 places employed Saito .65 4C for power

2CC Event

1. L. Ford	66° Miss America	OS .10	2520
2. A. Kennedy	50° Powerhouse	MVVS 1.5	2244
3. L. Mostert	Playboy Cabin	PAW 1.49	2087
4. P. Donovan	60° Playboy	PAW 1.49	2022
5. G. Lawson	66° Miss America	S.T. .11	1963

1/2A Texaco

1. P. Donovan	Lanzo Bomber	1131
2. S. Mostert	Lanzo Bomber	1110
3. T. Boundy	56° Flamingo	238

Control Line Stunt

1. D. Kerr	Demon 1955	166.5 pts.
2. A. Beggs	Smoothie 1948	154 pts.
3. M. Tyrrell	Mercury Monitor 1950	154 pts.
4. P. Harrison	Demon 1955	153 pts.
5. D. Cope	All Australian 1959	134.5 pts.

This meet, called the Blue Ribbon O/T, saw near perfect weather for four days. An interesting Hand Launched Glider Event was held on Friday with a limit of one hour to register six official flights; the best two to be selected for score.

Trevor Boundy reports the meet was a huge success; more so, when one considers the short organizational time. Hopefully, there will be two big National meets in Australia that do not conflict.

FREE PLUG DEPARTMENT

At the recent April NCFFC Contest at Waegell Field, this writer was informed by Loren Schmidt he was retiring from the partial O/T kit business as his full-size "Smitty's Airplane Repair Service" was proving to be too demanding of his time.

In his place Harry Klarich of Klarich Custom Kits has bought the business and appurtenances to continue production of kits for any old timer model. Harry can be reached at 2301 Sonata Drive, Rancho Cordova, California 94570. Please enclose a large SASE for price lists.

THE WRAP-UP

After reading the report on Arthur Beckington in this column, Monty Tyrrell of Mel-

Experience The Cox 3-Channel Thrill

Fly With The New CADET III

Give yourself the added thrill of 3-channel control. Outfit your plane with the high quality, inexpensive and compact Cox Cadet III.

Primary flight controls on a single stick, plus a third-channel, fully-proportional slide lever enable you to fly with new performance capabilities.

Affordably priced, the Cadet III enables you to inexpensively upgrade your small aircraft to include throttle or electric motor control. And, increase your sailplane flying precision by adding third-channel spoiler activation or tow release.

The Cadet III system includes two Micro Servos and operates on the new 72 Mhz frequencies. Available with "AA" or "AAA" size airborne battery box, the Cadet III uses readily available alkaline dry cells.

Experience the Cox 3-channel thrill. Ask your local hobby shop for the new Cox Cadet III.

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bourne, Australia, had this parallel to report in Australia.

"In the era of 1919, a fellow named George McKenzie, living in a small town called Rainbow, designed a home-built biplane somewhat resembling an S.E.5, a famous WWI British Fighter. He incorporated Friese ailerons (something that had not been invented yet!) based on good old farming know-how. The tailskid was made from a hickory buggy pole!

"The initial flight was a disaster as it was flown by a con artist posing as an air ace from France. He didn't even know how to fly! George rebuilt the plane, learned to fly himself, and used the home-built as a private transport until the early thirties.

"Around 1948, George, then a middle-aged man, became interested in models and decided to build a model. Having read all the specifications, he built himself a Wakefield model. The Geelong Club ran a big contest at this time for various designs. Surprise! George McKenzie won the Wakefield Event.

"He had come out of the past as an aviation-type and then disappeared into obscurity. Model and full-size aviation must be full of types like that. George, if alive, would be close to 90 now. I wouldn't be surprised if he turned up for an Old Timer Contest . . .then disappear again!" •

Inside Engines *Continued from page 21*

quiet or less irritating on the test stand, too. Interesting.

Some manufacturing economy is realized in casting the cylinder heads rather than totally machining from bar stock like the S-40. Only four bolts hold the cylinder head in place, like Super Tigre's world record holding X-40 pylon speed engine. The cylinder head sits on an .008-inch soft copper gasket which forms the compression seal with the top lip of the cylinder. These may be "economy" engines, but there's a brass insert in the cylinder head to hold the glow plug to minimize thread stripping with repeated changes of the glow plug. First-class engineering!

These new engines use one ball bearing at the crankshaft's rear, which takes the major running load and makes the combustion stroke more uniformly timed. It also serves as a thrust bearing while the engine is running. More manufacturing economy is realized by omitting the front ball bearing and casting into the case a brass sleeve bushing that is .350 inches long to support the front of the shaft. When you see the machining in and around this sleeve, the *lube sump* that is cast in behind it, and the lubrication track that is cut into its inner surface, you start to wonder if these are really economy engines or just well-built sport engines designed to run at 15,000 rpm and less. By shining a surgical flashlight in the crankcase's rear opening, I was able to illuminate and photograph the lubrication track that's cut into the front sleeve bearing. You can see the spiral tends to inhibit forward liquid flow. I've seen two different sleeve bearing low-cost O.S. engines gall their bronze bearings either due to too tight of an initial manufacturing fit, too little lube value in the fuel, or lack of a lube track as these Super Tigres use in their bronze sleeve bushing. Both the .40 and the .49 Sport engines tested here continually had a bubble of fuel around the front nose of the crankcase casting as they ran, indicating good and adequate lubrication flow.

If you take the two prop tips of a sleeve-bearinged engine and alternately wiggle them back and forth, you *should* feel free play. That looseness allows lubrication flow that prevents metal-to-metal damage. If the fuel you run has 100-percent synthetic oil, I recommend *one ounce* (only one!) of any castor oil be added to the first gallon of fuel through the engine to help finish or seat close tolerance fits inside engines.

The small .290-inch carb throat diameters and the exhaust outlet diameters of .300 inches are purposely used to make this new pair of Super Tigres user-friendly, cost-effective sport engines that are easy starting and running. Both engines were *only* hand-started on the test stand, and the G-40 made several flights in a PT-40, where it was also hand-started. Good compression seal due to taper technology gave easy hot restarts. The engines are packed in simple, one-piece boxes and come with brief, but exact, instructions and safety warning. The G-40 came direct from the factory in Italy; the G-49 was supplied by Great Planes Model Distributors who supply Super Tigre engines to the USA hobby shops. Repair service is from Hobby Services, P. O. Box 4021, Champaign, Illinois 61820. At the time of testing, the G-40 retailed for $119.95, and the G-49 cost $10.00 more. Only the G-40 was disassembled for pictures. In the photo of the parts, in the lower right corner is an accessory from Performance Specialties, Box 4003, Carlsbad, California 92008, which is a precision cast combination Super Tigre backplate and firewall engine mount available for many different engines.

The supplied Super Tigre glow plugs were used for muffler-off break-in running with 10-percent nitro hobby shop fuel (synthetic Klotz oil) to which one-ounce of castor oil was added. All test figures are with Master Air Screw black props and with K & B #4520 idle bar glow plugs. Cast and machined tapers were found on the crankcase cover and the outside cylinder walls. These minute tapers made for easy assembly and disassembly of the engine. Both engines were squeaky tight as their pistons went through top dead center, due to taper. The K & B Sportsters similarly squeak; it's perfectly normal. Both Tigre engines were primed lightly, choked twice, and the prop was firmly held with the Ni-Starter in place

and turned through compression until a firing "bump" was felt. The G-40 hand-started on the third flip. The G-49 took five flips. There were lots of one- and two-flip hot restarts.

at the sport flier's models, but the engines reflect flawless performance, nice styling, and nice value. If there's anything "cheap" about them, it might be the new one-piece cardboard box they come in! As the chart

SUPER TIGRE G-40 SPORT PERFORMANCE
(.40 cubic inch displacement)

Prop Size	Low Speed	High Speed	Speed Range
9 - 6	2500	13,350*	5.34 to 1
9-1/2 - 6	2250	13,200**	5.86 to 1
10 - 6	2100	12,500	5.95 to 1
11 - 6	1900	11,150	5.87 to 1

*15,200 without the muffler
**My Super Tigre S-40 turns this 9-1/2 - 6 at 15,200 for comparison.

SUPER TIGRE G-49 SPORT PERFORMANCE
(.49 cubic inch displacement)

Prop Size	Low Speed	High Speed	Speed Range
9 - 6	3450	14,500*	4.20 to 1
9-1/2 - 6	3200	14,600	4.56 to 1
10 - 6	2600	12,900	4.96 to 1
11 - 6	2200	11,400	5.18 to 1
11 - 7	2000	11,100	5.55 to 1
11 - 7-1/2	1950	11,000	5.64 to 1

*15,250 without the muffler

Each engine weighs 12 ounces. The supplied muffler with adapter weighs four more ounces; the SM-S Soundmaster muffler weighs five ounces.

Super Tigre high-performance model engines have won biannual world championships in '81, '83, '85, and '87. The new G-40 Sport and G-49 Sport represent new economy engines from this same factory aimed

with speed ranges shows, the G-40 seems best suited to the absolute beginner to R/C who needs the lowest possible idle speeds for slow landings. The G-49 has an overall rpm gain at slight expense of the idle and would better suit the more advanced flier.

A speed range of 4:1 is barely satisfactory, a speed range of 5:1 is average, a speed range of 6:1 is excellent, and a speed range above 6:1 is superb performance.

The DDD Soundmaster SM-S muffler was tested only on the G-49, and in each prop size it increased rpm over the stock muffler by an average of 350 rpm for high speed, and lowered the rpm slightly which enhanced the speed range figures while being *noticeably more quiet*. •

Choppers. . . . *Continued from page 18*

if Idle Up One or Two, or Throttle Hold are activated. An experience very similar to wrestling a live alligator results from starting a helicopter with the Idle Up 2 switch inadvertently turned *on*.

—A flush-mounted on-off slide switch that won't accidentally turn the transmitter *on* when you put it in your car or *off* when you're reaching for the dual rate switch.

—High and Low pitch trim levers, and a mid-range pitch knob—all externally mounted for easy in-flight adjustment. I don't know of another radio that has that.

—End-point trimmer dials for aileron, elevator, rudder, throttle, and most important, collective pitch.

—Nicest feature of the month: when using Idle-Up 2, which is normally used for aerobatics, tail rotor compensation is disconnected *and* you can preset a different neutral position for the tail rotor by using the RUD P.S.T. trimmer dial. *What does this mean to you?* It means that when you're flying around in forward flight, your helicopter won't be "crabbing" across the sky from

all that right tail rotor you had to put in for hovering. It also means that when you're inverted in a roll and you pull the collective stick down because you want all the negative pitch you can get for just an instant, your tail won't be flopping all over the place because the tail rotor compensation is thinking you're just going up and down. Now, what makes this feature so unusual? The fact that *it isn't mentioned anywhere in the instructions!* I found out about it strictly by accident.

Another feature, *Rudder Preset Trim*, is used in connection with Throttle Hold. The RUD P.S.T. dial that was used to set tail rotor neutral position for Idle Up 2 now does the same for Throttle Hold. Since Throttle Hold is generally used only for autorotation, the purported use of this feature is to compensate for any yaw induced during the autorotation. You may wonder, as I did, how this works since the tail rotor in a model helicopter *disconnects* in an autorotation. The answer is: generally, *it doesn't work*. You should know that in *full-size* helicopters, the tail rotor does stay connected in an autorotation to give yaw control. During the 1987 World R/C Helicopter Championship, several competitors used a "driven tail," on their models (a tail rotor that remains connected in autorotations) to improve their scores for that maneuver. In a controlled auto, enough momentum can be generated so that sufficient rotor speed is available at touchdown, despite the additional drag of the tail rotor, drive wire, and accompanying gears. Let's not think about what might happen in an emergency auto.

Anyway, with the new FAI rules requiring a "180-degree" autorotation, we probably will see more driven tails. In that case, the Rudder Preset Trim feature will be a useful option. However, both Throttle Hold and Idle Up 2 will use whatever rudder setting is made with the RUD P.S.T. dial, so you have to find one position that works with both of those functions or limit your use to one or the other. It's "either-or" like many of the options on the Spectra. For example, there is one switch for choosing either Gear or Rudder Dual Rate. Another "either-or" is Pitch Curve I and II. A selector switch on the upper left side of the transmitter, allows you to switch between two separate collective pitch setups (which can be set with the trimmer dials under that hinged cover). There is a method of setting this up so that Pitch Curve II will automatically be selected whenever throttle hold is activated. In that case, Pitch Curve II would be set only for autos, with maximum top end pitch, and maybe -2 to -4 degrees on the low end. That leaves Pitch Curve I for normal flying—but with the danger of accidentally bumping the switch and moving it to Pitch Curve II.

It's possible to use one pitch curve for normal flying and one for aerobatics. Let's say you want +9 and -5 for aerobatics. Now, both the Pitch Curve II switch *and* the Idle Up 2 switch must be activated at the same time. I would have preferred that Pitch Curve II would *automatically* be selected by activating either Throttle Hold or Idle Up 2, with *no* manual selection possible.

Pitch trim for normal and inverted. Trimmer dials allow you to move the entire pitch curve up or down. Actually, this is usually the *only* pitch trim on the less expensive helicopter radios. For the Spectra, its twofold purpose is to help you center the pitch curve within the mechanical limits of the collective system and to enable you to match the normal and inverted pitch curve for inverted flying.

Inverted flight switch. (Did you know that the hardest part of inverted flying for a former fixed-wing pilot is remembering *not* to reverse elevator and rudder when the craft is inverted?) When setting up collective, you must decide right away whether or not you're going to be flying inverted. You can't set up with the invert or inhibit and then switch to active because the collective pitch servo travel is cut by about a third. You have to move one hole out on the servo arm when setting up for inverted flight.

On the X-Cell I, set the recommended +9 degrees on the top end, +4 degrees at hover, and -3 degrees at low stick. The upright pitch curve that is obtained by using the high and low end point trimmer dials is "mirrored" when inverted is selected. Top or low end adjustments cannot be made to one and not the other. However, there are *separate* pitch trim dials for upright and inverted. You will see in a moment what an advantage this is and why you will hardly miss not having separate end point adjustments for setting up your pitch curve.

The following is a summary of the steps I used in setting up the upright and inverted pitch curves:

	Full Stick	Half Stick (Hover)	Low Stick (Idle)
Upright	+8	+4	-3
Inverted	-2	+2	+9

Shifting the INV pitch trim dial I was able to get:

Inverted	-6	-2	+5

Close, but no cigar. Back to the upright setting, and a few turns on the links gave me:

Upright	+6	+2	-5

Now my inverted settings are:

Inverted	-8	-4	+3

Perfect! Now I simply use the NOR trim dial to shift the upright pitch curve to:

Upright	+8	+4	-3

Flight testing will enable me to zero in to the exact settings I need. For instance, I may only want -7 degrees for full throttle at inverted. I can correct this with the INV pitch

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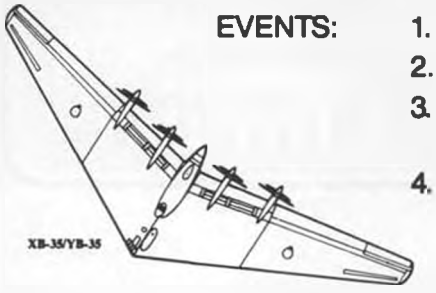

EVENTS:

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trim, but mid-range and low pitch will change also. Some radios allow end point adjustments for both upright and inverted, but you can't shift the entire curve. I think this arrangement is better for setting up inverted and upright within the mechanical limits of the chopper.

Fail Safe: A feature that came into existence with the advent of Pulse Code Modulation; it's name makes it sound a lot more comforting than it really is. There are three choices with the Spectra. One is called "hold." If a good signal is not received by the receiver, the servos simply hold their last position. This is what I use because I hope the loss of signal will only be temporary and therefore the flight of the chopper will be affected as little as possible. Second is the "position mode," in which the servos will go to a preset position. For an airplane that probably would be: throttle at idle, a little up elevator, and maybe some left rudder. I'm at a loss to figure out how to set up a helicopter. Anybody got any ideas? The third choice is to simply inhibit the Fail Safe feature altogether. Incidentally, the fail safe settings are retained in the *receiver* memory, so if the receiver battery is removed or allowed to completely discharge, that memory will be lost. What amazed me was how the memory is retained when the battery is only turned off! The special PCM switch harness "leaks" a little current to the receiver, keeping the memory alive!

I certainly want to talk about the Airtronics SM-340 detection Typo gyroscope. People were talking about how good this gyro was long before I had a chance to try it. It's also less expensive than most of the other gyros out there. On-off or high-low selection can be made through an extra channel in the transmitter. It is recommended that a separate battery, 500 to 900 mA, be used to power the gyro to eliminate electrical feedback into the receiver. It's hard to evaluate the performance of a gyro. Like the story of the guy who claimed his job was keeping elephants off the street and when told there aren't any elephants around, his reply was simple, "that proves what a good job I'm doing." You can't see a gyro doing its job because the better the performance, the less there is to see. The Airtronics gyro performs very well in eliminating extraneous tail movement, without any tendency to "wag."

THE O.S. 61 H LONG STROKE ENGINE

I started with the O.S. pump and 8H carburetor installed, and I was sucking air into the carb. Maybe I got a faulty pump or carb, or maybe I did something wrong installing it. I don't know, but I wasn't about to destroy a helicopter tying to find out. I pulled the pump off, plugged up the crankcase pressure tap, and put on a stock 6H carb. Now the engine works great. I'm sure everyone has heard things about the O.S. Long Stroke—some good, some bad. I can only relate my own experience.

I am using the ringed side exhaust, which I recommend over the ABC for helicopters. Most of the vibration problems with the Long Stroke have occurred in the ABC engines, and seem to be related to the tightness of the head that sometimes exists before the engine is completely broken in. The ringed engine starts easier and has more power than you're ever going to need, believe me. I am not getting any vibration at mid-range or top-end, and the transition is smooth. The needle valve is a little sensitive, but it holds a setting well so that's no big problem. I suspect that the Magna-Pipe tuned pipe I'm using helps the engine "clean out," and is one reason I'm not experiencing any mixture problems at mid-range. My understanding is that O.S. will be offering this engine with the 7H carb, which has a mid-range mixture adjustment. But with the setup I've got, the 6H carb works just fine. The only problem I haven't worked out yet is a tendency for the engine to stay "up on the pipe" when coming down from full throttle. I don't know if it's the carb or the pipe or both, but I'll find out.

THE X-CELL FIRST FLIGHT

Maybe a new engine and those fancy servos gave the X-Cell an unfair advantage. Trying like the dickens to avoid cliches, I will describe my first flight with the X-Cell. (On the subject of cliches, I would like to formally apologize for the following which appeared in my column in the April issue: "With a 61 engine in a 9-pound helicopter, its power can only be described as 'awesome.'" It wasn't until I read that same cliche in *three* other magazines that I realized that *I* had written it too.)

Back to the X-Cell. I had set the pitch at +8 top end, +4 hover, and -3 low stick. When I punched the throttle, the chopper

jumped up so fast that I thought for sure that either I had too much pitch or was way too lean. Neither was the case. It was perfect. Since I'm breaking in the engine, it's set on the "rich" side; but the helicopter is still doing 60 mph in the straightaways. The X-Cell is very stable, and the tail locks in better than anything I've ever flown. I've got the cyclic and tail rotor throw set to maximum, a practice I follow with a new helicopter to assure I've got enough steering to correct any major errors in setup. My X-Cell can spin like a top even with the gyro on, yet it hovers easily, even with all that steering. Being so light, it seems to be more affected by strong wind gusts, and I found myself overshooting landings because it doesn't come down as fast as I'm used to. A light helicopter or airplane generally flies better, but *different* than a heavier one.

So, reviewing the whole package—helicopter, engine, and radio—I'm very pleased. Very pleased. •

Meyers . . . . *Continued from page 15*

cemented in the holes between F-2 and F-3. This tube will carry the wires from the servos and switch to the receiver and batteries in the front compartment. Complete the front half of the fuselage by cementing the remaining stringers. Now comes the important part, bonding the front half of the fuselage to the rear half. Position the two assemblies on the drawing over the top view. Use a combination square or triangle to align the vertical center line on F-1 and F-9. Make a gage block 3/4 inch thick to elevate the rear half at F-9. When the stringers have been trimmed and matched, bond the two halves together with a long-setting, void-filling epoxy. Complete the structure by installing all the reinforcement angles and sand the structure to a true elliptical shape.

LANDING GEAR

The landing gear is made from 1/8-inch music wire. Use the actual length dimensions shown on the drawing. Insert the bent gear parts in the brass tubes in the fuselage, wrap the joints with copper wire and solder them. When complete, remove the gear until final assembly. I used Ace three-inch wheels; they are super light weight. The dummy shock absorber strut is made from two diameters of slip-fit aluminum tubing.

ELECTRICAL

This is the time to install the servo tray, which is made of 1/8-inch plywood, mounted with bolts as shown on the plan. The control cables, switch, fuel tank, and fuel lines should also be installed now.

Now let's complete the fuselage by sheeting it with 3/32-inch balsa. But first obtain a three-foot length of 4-inch diameter and galvanized furnace flue pipe. With a little squeezing, the thin sheetmetal tube can be shaped to match the elliptical shape of the fuselage and used as a form to pre-bond the balsa sheeting. Soak the patterned balsa sheets in hot water, swab with ammonia to promote bending, wrap around the flue pipe, and secure with rubber bands. Applying the sheeting to one side with cyano glue and the second side with white glue and pins works really well.

When the sheeting is completed, cut out the headrest bulkheads H-5 to H-9 and pin them to the fuselage top view on the drawing. Apply the sheeting to the sides first and then the top. Fit and cement the completed headrest to the fuselage.

Draw the cockpit openings on the sheeted surface and cut them out. Slit 3/16 black rubber tubing and slip over the cockpit opening for a combing. The windshields are made from 1/32 acetate and 1/8 electrical tape to simulate the frames. Bond the combing and the windshields with RC-56 Wilhold on final assembly; it dries clear. Cut out and make the doors for the battery and receiver compartment access. The engine cowl ring, tailwheel installation, instrument panels, etc. will just about complete the fuselage, except for the lower wing fillets, but that comes later.

WING CONSTRUCTION

The top and bottom wings are structurally the same, except that the center section of the top wing is shorter (chord) than the bottom wing and ailerons are on the bottom wing only. If you have made zerox copies of the four size wing ribs, it will be a simple matter to make 1/16 plywood or aluminum master templates. Make all the ribs to the W-4 size, stack, and sand them together. W-1, W-2, and W-3 can be cut shorter as required, and the notches for the dihedral reinforcements can be notched larger. Make sure to measure the wood used for spars and dihedral braces so that the

notches in the ribs will be correct for a good fit. Select hard, straight balsa for the spars and leading edges. Pre-shape the leading edge and cut the spars to length; always leave a little extra length for final trim. Don't be like the guy who said, "I cut it twice and its still too short!"

The airfoil is a modified RAF-15 and is scaled down from the master template of the full-size aircraft, courtesy of Mr. Pard Diver who has been the chief mechanic for Meyers Aircraft Corporation since the first Meyers was built. It is a high lift airfoil with considerable under camber. So when the ribs are set in place on the spars, make sure the bottom of the ribs and the spars are flush. I use cyanoacrylate glue to build the whole wing except for the epoxy dihedral joints. The construction of the wings is quite conventional. Build the outer panels, then the center section. The lower wing battery box and ailerons, cabane and "N" strut fittings are fabricated to finish the wings.

RUDDER AND FIN

Construction is conventional. Taper the rudder at the trailing edge as shown. Sheet both parts with 1/16 balsa. Bond the fin to the fuselage on final assembly.

STABILIZER AND ELEVATOR

This is conventional flat construction. Groove the two halves of the elevators and epoxy 3/32 music wire to join them. Allow clearance at the center bend to clear the tail wheel bearing tube in the up and down position. Bond to the fuselage on final assembly taking note of the two degrees incidence angle. Support the rudder and stabilizer with struts as shown. Shape a balsa tail cone to F-9.

FINAL ASSEMBLY

Install the hardwood block and "T" nuts in the fuselage to accept the rear bottom wing bolts. Shape a hard balsa front mount for the lower wing, but leave the hard wood dowels out until the wing is accurately positioned parallel to the horizontal datum line.

Construct the wing-to-fuselage fillets by the method of your choice. I covered the fillet area with masking tape and clay modeled the fillet shapes. With a coat of shellac and wax on the clay, two layers of medium weight fiberglass were laid up over the clay. The fiberglass and clay were removed, and the fiberglass was trimmed to fit. The part was then bonded to the fuselage. The cavity between the fuselage and fillet is filled with scrap balsa and seated to the wing with a lightweight filler like Model Magic, allowing 1/32 inch for a silicone rubber final seat. Use Saran Wrap taped to the center section of the wing as a separator.

Positioning the top wing accurately is very important but not too difficult if support jig templates are used. Cut out two 1/4-inch plywood templates from the side view of the wings. Cut them so that the leading and trailing edges rest on the templates, but extend the templates inside the ribs so that the templates can be clamped to a rib. Also extend the template forward of the leading edge and aft of the trailing edge to keep the wing from moving back and forth. Double check the top wing attitude to the bottom wing with a height gage. Both wings are at zero degrees incidence.

With the top wing held in position, bend and fit the 1/8-inch music wire cabane struts. It is not necessary to cement the struts into the fuselage tubes. The electrical terminals used for the top strut wing mounting can be purchased at Radio Shack stores. With a fine-toothed modeler's saw, slit the trailing edge of streamlined aluminum tubing, purchased at your local hobby store, and slip it over the 1/8-inch music wire. Bond the tubing back together with epoxy. It's easy to do and looks good.

The outer "N" struts are made by first making a side view cardboard template of the upper to lower wing strut fitting hole pattern. Check the template right to left wing. Cut and fit the streamline tubing over the template. Bend a piece of 5/32 music wire and epoxy it into the tubing joints. Epoxy the clevis in the tubes with the "N" struts in place between the wings. The "N" struts use a structural requirement to distribute the wing loading. (See Figure 10.)

ENGINE

A Saito .45 was used with excellent results. The carburetor choke assembly was removed to enable the engine to be moved rearward 1/4 inch. This brought the balance point right on the center of gravity as shown on the plans. Choking the engine with a finger works as well.

If you decide to build the dummy engine, I suggest shaping a styrofoam model of the

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crankcase from the drawing. Lay up 1/16-inch fiberglass thickness over the model and melt the styrofoam from the fiberglass with lacquer thinner or gasoline. Purchase four #205 Williams Bros. dummy cylinder kits. Assemble them and cut them off at the bottom to match the length of the real cylinder. Lay out and cut holes in the crankcase to accept the cylinders after the crankcase has been trimmed to fit the real engine and screwed to the motor mount. After sanding and painting the crankcase, the dummy cylinders as well as the real engine can be sprayed with a flat black high temperature paint (800 degrees F) that is fuel proof and available at K-Mart stores. The real engine actually dissipates heat better when painted black. However, if you add the dummy engine, which will weigh about 2-3/4 ounces, it will be necessary to mount the battery pack against the #5 bulkhead under the floor of the rear cockpit to maintain the correct CG balance point. The CG is accurate and critical.

COVERING

The full-size Meyers had an aluminum fuselage, rudder, and fin. I used chrome Super MonoKote to simulate the aluminum surfaces. Chrome is not the easiest of the MonoKote coverings to use because the amount of stretch or shrink is very minimal. However, this fuselage and rudder has all straight line surfaces and a beautiful job can be done. The covering will look only as good as the surface it is applied to, so sand the sheeted surfaces true and finish sanding with 180- or 240-grit sandpaper.

By using a cotton sock on the iron and starting in the center of a panel and working outward, the film went on fine. The most important part of covering with chrome MonoKote seems to be the correct heat range. Adjust the iron temperature on a scrap sample first and apply just enough heat to obtain good adhesion without bubbles. As the iron is worked to the outer edges of the panel, insulate the already adhered part from the iron heat by use of a 3-x 5-inch index card held between the back of the iron and the MonoKote.

The simulated panel lines were indented with a very dull knife and a flexible plastic ruler. The rivets were indented with a dull pencil. The brightness of the chrome can be slightly dulled to make it look more like polished aluminum by lightly rubbing the surface with white rubbing compound—easy does it!

The wings and stabilizer were covered with silver and black MonoKote using the same color scheme and NC numbers as the full-size plane I used to own.

FLYING

The initial flight was a sheer delight and made the whole project worth while. This was my first experience flying a R/C biplane, and none of my planes before sported a four-cycle engine. My preflight jitters and dry tongue were unfounded because it taxied with excellent control. When I headed her into a slight breeze and advanced the throttle, she rolled about ten feet and was flying before I had given her full throttle. She climbed out smartly, gained altitude, and when I leveled her out, she flew straight and level—hands off—with all trims in neutral. She does loops, rolls, and hammerhead stalls just like the full-size plane did. She practically lands herself. The only adjustment required was to increase the aileron movement to 5/8-inch deflection for a faster roll rate.

While the plans are very detailed, this is not a beginner's building project; however, a beginner could easily fly it. The plane weighs 5 lbs., 4 ozs. with the dummy engine. The wing loading is 15.5 ozs./sq. ft. If you decided to build it, *keep it light*! The effort will pay off in performance. Few models at the flying field have commanded so much attention for its classic design and realism on the ground and in the air. •

ARFs. . . . . *Continued from page 26*

types, polyurethanes, and water-based paints are excellent, but, as with cements, be sure to do a test on a piece of scrap foam.

Actually, foam has so many attributes which make it ideally suited to model aircraft construction that we could write a book on this subject alone. Some additional features of EPS include easy repairability, plus the ability to be formed in molds into complex shapes, insulation qualities which also help absorb engine vibration, and comparatively low cost when compared to other materials.

Over the years, a number of ARF model manufacturers have used varying amounts of EPS in their products. The widest use for foam has been in wing construction. Some wings are furnished with balsa sheeting while others are sheeted with thin obechi wood, various plastic materials, or in the case of smaller wings, left in the uncovered state. In order to have sufficient strength for R/C use, larger foam wings must be reinforced with either sheeting or internal spars.

Back in the seventies, Midwest Products Co. introduced a small, all-foam airplane called the Cardinal. The wing on this model was an excellent performer, and I noticed that it began to appear in the kits of at least one other manufacturer. The wing was furnished in one piece and had no external or internal bracing. I flew one of these just as it came out of the box and was very pleased with it; but eventually the foam became fuel-logged, and the plane was retired. I came into possession of another one of these Cardinals, but this time experimented in fuel proofing the surfaces. I discovered that I could apply artists' acrylic paint right out of the tube with my fingertip. This paint can also be diluted with water and painted on with a brush, but both of these methods leave brushmarks, bumps, and streaks. If you have some spray equipment, it can be diluted and sprayed on for a smoother finish; but any of these procedures will result in a fuel-resistant and protective coating on foam. Besides, a tube of this paint really goes a long way, as I am still using the same container of white acrylic I purchased around 1973.

Another good paint I found for foam came from a craft shop, is made especially for use on foam, and comes in a standard spray can. I was amazed at the wide range of colors available, as it is supplied in as many as a hundred or more shades. Unfortunately, this paint does not seal the foam surface and should be considered useful for decoration only. However, after drying, all you have to do is give it a seal coat of polyurethane or a very light coat of thinned epoxy for complete protection.

Another thing I learned from this model was how easy it is to accomplish a field repair on foam with five-minute epoxy. Anyone who has flown foam models knows that after many hard landings, the fuselage has a propensity for snapping at the narrowest point, just ahead of the tail surfaces. A quick repair with five-minute epoxy will get you back in the air in just a few minutes, but if you have allowed the foam to become fuel-soaked, forget it. Other techniques will then be required, and this involves extracting the fuel and oil from the foam before using any kind of glue. But that is another topic, and we will leave that for a future column.

This long-winded preliminary dialogue finally brings us to the main topic of the month, the all-foam Supermarine Spitfire. For some years I have been acquainted with Sure Flite Enterprises and their line of foam ARFs. Some of my flying companions have brought these models to the field, after having finished them in military paint schemes, and I was very impressed with their flying qualities. The Sure Flite people are often found exhibiting their products at various model hobby shows around the country, and they usually display their models all decked out in scale colors. I noticed that these display models had a very authentic flat-painted finish and the foam felt really hard and smooth to the touch. When I asked how the foam had been brought to that state, I was informed that the bare foam was simply coated with *gesso*, an artist's material, allowed to dry, then sanded smooth. Gesso is available from art supply shops and is used to prepare a canvas before painting. It dries hard and does not sand very easily, but a smooth finish is eventually obtained. The sanded surface can then be painted, and, since the foam is now well protected, almost any kind of paint can be used. The models I saw finished in this manner really were handsome. They had none of that foam look about them, and were indistinguishable from built-up scale models. As a dyed-in-the-wool ARF enthusiast, I felt unwilling to put all that work into a foam airplane, so I just mentally filed the information for future reference.

Recently a fellow by the name of Ken Thornton came up with an idea to improve foam ARFs, and he made a deal with Sure Flite to hand-finish all the airplanes in their line and put them on the ARF market under

his own company name, K-Bee's Modeling. Ken sent me one of his warbird models, a specimen of the Supermarine Spitfire, and it is a most unique R/C airplane. Before I go any further, I feel I must comment on the packaging. I notice that many kit reviewers like to start off by telling you the measurements of the kit box to the exact inch, and the number of colors used in printing the label on the box. I haven't yet figured out what possible bearing this has on the contents of the kit, but perhaps some modelers are interested in that kind of extraneous information. At any rate, I would like to say that when UPS deposited two plain cartons on my doorstep, I thought somebody must have shipped me a Volkswagen and a BMW motorcycle! These cardboard crates were enormous! Upon opening them, I found that one box contained a complete fuselage with tailfeathers already mounted, and the other box held a one-piece wing, also entirely finished. Then I realized why the cartons were so large. The components were packed in protective rubber foam and could have been shipped half way round the world with absolute safety. And all this was done for only a 50-mile trip!

Anyway, I soon lost interest in the packaging, as I began to appreciate what an outstanding ARF this was. At first I thought it had been given the gesso finish as described previously, but this was not the case. The fuselage and the wing of this foam model had been entirely covered with 2-1/4-ounce fiberglass, while the tail surfaces were covered with a lighter 3/4-ounce material! Now this is really the ideal way to finish a foam surface because it retains the light weight of the foam while imparting to it a strong, rigid surface. Over the fiberglass K-Bee's Modeling applies a three-color paint job in a really authentic-looking flat military finish. The paint scheme is in brown and green camouflage, with the undersurfaces done in sky blue. An excellent set of decals were supplied, and these took only a few minutes to apply.

At this point, the Spit was looking a lot like the real thing. Flexible nylon pushrods came fixed in place in the fuselage and the wing, and they appeared to work quite smoothly. All control surfaces were nicely hinged and moved easily, and control horns were already mounted on all control surfaces. The sturdy wire landing gear struts had to be mounted in place on the underwing. These were of the torsion-type and went into slotted hardwood blocks using nylon brackets and screws that were furnished. The tailwheel strut came already mounted, and steering action was activated by the rudder. The canopy had already been installed and painted. I was slightly disappointed about this, as I would have liked to install a scale pilot, but this option was not available with the canopy already firmly in place. This model is so attractive that it certainly deserves a little dressing up in the cockpit area.

From here on in, the rest of the hardware is supplied by the builder. This includes fuel tank, wheels, wheel collars, motor mounting bolts, throttle wire and tubing, and a spinner.

With the model came a very interesting letter from Ken, and I would like to quote some interesting parts:

"Having built many or most ARFs in the past 12 years like yourself, I became interested in developing my own line in the ARF field. Many of the older and even some of the recent models could be folded up in flight. This was terribly frustrating to me, and this cannot be done with my models. If crashed or damaged, they can be touched up or repaired almost like new. Recently, while getting ready for 'War Bird Mania,' a sport scale static and pylon racing event, I crashed my new Spitfire; scale paint job, Rossi engine, and all one week before the event! Four days later it flew. The tail was broken completely off, and the engine was ripped out. At the event one week later, the same plane scored an 80 in sport scale static points, and finished second overall in the contest. My friend, flying another Spitfire of mine, took fourth overall.

"All of my paints are standard Pactra Formula U colors and can be touched up quite easily to match. The glass is 2.2-ounce weight on the fuselage and wing, with 3/4-ounce cloth on the tail. The entire glassing and finishing process adds 7 ounces to the airframe. To me, this is remarkable, since I've added this much weight with plastic shrink covering. The paint and glass work is all done by hand, and every effort is made to produce the highest quality model.

"The Spitfire is my personal favorite of the line. This is the model that started the whole thing two years ago. During the development stages we flew the model with a wide variety of power plants; from a K&B .35 to a .61 O.S. FSR two-stroke, and a .48 Surpass to Saito .80 four-strokes. My personal favorite is the .48 Surpass O.S. with

mini four-channel radio gear, 4-3/4-pound weight, and 3-blade Graupner prop. Really scale flight is the result, with up to 117 flights so far. We are working on a new option on the Spitfire. Lightening of the tail of the fuselage and sharpening the entry of the leading edges, wing and tail. This means you will no longer need from four to eight ounces of lead in the nose for proper balance. This does take 3/4 pounds off the total weight; however, its crashability (if there is such a thing) suffers. Also, one of two scale paint schemes with documentation and three-view is available. This option is what we used in the 'War Bird Mania' event with Picco and Rossi .40s. The four-pound weight with small radio gear was very impressive. This option is $25 without documentation and $40 with pictures and documentation." As we can see, this is a model which has undergone extensive research and development and has proven itself in competition. Ken's comments about needing weight added to the nose were no joke. Additional weight in the nose is so imperative that the kit includes an eight-ounce chunk of lead just to drive home the point. Now we know why Ken has used big engines in the Spitfire, the extra weight is needed, and the power increase doesn't hurt one little bit.

When it came to choosing an engine for my Spitfire, I paid close attention to the building notes, which stated: "The firewall is set up for a small case standard .40 two-stroke engine, and this power is quite adequate for all maneuvers. Larger engines require enlarging this opening with a Dremel tool or whatever." The thought of doing extra work to squeeze a big engine under the cowl went against the grain, but I was beginning to have visions of this 50-inch wingspan warbird streaking through the sky at breathtaking speeds, so I decided to try an experiment. I weighed my O.S. .61 FSR ABC with J-Tec muffler, then compared it to the weight of my O.S. .40 FSR ABC with standard muffler attached. The bigger engine weighed 7-1/2 ounces more, just about the weight I expected to add with the smaller engine! At this point I had just about decided to install the O.S. .61, when some nagging doubts began to bother me, and I chickened out. After all, the vast majority of modelers would probably be installing a .40-sized engine rather than a .60, so my final decision was to go along with the smaller two-stroke. I had one other question in mind, so I dragged out my Rossi .40 and weighed it with a J-Tec muffler installed. It came out to a hefty 18 ounces, versus 14-1/2 ounces for the O.S. .40 with standard muffler attached. Previous tests assured me that the Rossi would have a significant edge in power over the O.S., and the extra 3-1/2 ounces would also be quite welcome. The Rossi was just a hair too wide to slip into the wood motor mounts, but a light touch with the Dremel sanding drum easily took care of that problem. The engine was securely mounted with Du-Bro socket head wood screws, one of the greatest labor saving devices to come down the pike in a long time.

I had a preconceived notion that the fuselage would only accept a small fuel tank, but I was pleasantly surprised to discover that even a 13-ounce tank slipped in with ease. Even so, my final choice was the customary 10-ounce tank that always seemed to work satisfactorily with .40-size engines. Next I installed an Airtronics seven-channel Championship radio with standard servos. Micro servos would have saved weight, but I felt there would be too much stress on the control surfaces to take the risk. Adding a 2-3/4-inch spinner completed the job. All that was left was to charge the radio and get out to the club field.

The Sure Flite version of this model has been quite popular among some of my flying buddies, so I conferred with them and arrived at the following conclusions. These were based on four different Spitfires, all powered with .40 two-stroke engines of various manufacture. All pilots agreed that this was a stable, easy-to-fly model, possessing excellent handling and stability *when properly trimmed out*! In this case, proper trimming for flight consists mainly of paying attention to putting sufficient weight in the nose to eliminate the natural tail-heavy tendencies of this short-nosed model. Secondly, the landing gear must be bent forward sufficiently to eliminate nose overs and to insure accurate tracking on takeoffs. If these two requirements are met, any average sport flier will have no difficulty in handling this snappy little model. Mine handled just like all the others, except that the Rossi .40 provided a higher top speed than the other engines of the same displacement, but this was to be expected.

Also available from K-Bee's is a Piper Cub (which is really a clipped-wing version) supplied in standard yellow, red and white, or blue and white. Other ARFs include a Cessna, a P-39 Aircobra, and their latest, a P-40 Warhawk. The warbirds are all available in either military or racing colors.

To obtain further information on these delightful ARFs, contact K-Bee's Modeling, 6278 Via Ribazo, Anaheim, California 92807. Their phone number is (714) 974-3122. •

Counter. . . . . *Continued from page 9*

recommended for .60-size engines. All of the components of Vibra-Damp are com-

pletely fuel proof. For information, write to Performance Products Unlimited.

* * *

Du-Bro Products has some handy items that are virtually indispensable for modelers. One of these items is the 2-56 Swivel Ball Links for 4-40 Rods. These high-quality ball links have burnished brass swivel balls for smooth operation. There's a Du-Bro ball link, threaded link, or other accessory designed to make your modeling efforts pay off in glitch-free performance. See your Du-Bro dealer, or write: Du-Bro Products, 480 Bonner Rd., Wauconda, Illinois 60084.

* * *

Royal Products's PDQ Chipmunk .40 is 90-percent factory assembled, and comes with all necessary hardware, including wheels, tank, motor mount, pushrods, and more. The recommended engine is a .40 to .45 two-cycle, or a .60 to .90 four-cycle. All surfaces are prehinged, and an illustrated, step-by-step instruction manual is included. The Chipmunk is an easy-flying model, with a high degree of maneuverability. See your Royal dealer, or write: Royal Products, 790 W. Tennessee Ave., Denver, Colorado 80223.

* * *

J'Tec has available a new design Formula I Racing Mount in cast aluminum that has been precision ground and will fit any .40 racing engine. The mounting beams have built-in webs which enable the mount to be fiberglassed to the fuselage, making the mount and fuselage one solid unit. Vibration on rear intake engines is virtually

eliminated, and increased rpm are a direct result. See your hobby shop, or write: J'Tec, 164 School St., Daly City, California 94014.

* * *

Futaba's Attack 2NBR radio has servo-reverse switching and a battery eliminator circuit. The system comes with two S-28 servos and a BEC receiver. This two-channel stick transmitter system is available at your hobby dealer carrying Futaba products. •

Walt Good. . . *Continued from page 25*

very typical pre-war AMA Nationals conveyance, complete with a flat tire on the trailer! R/C plane was in the box on the roof of the car.

PHOTO 9

At the 1937 Nats, our plane is shown with the 100-watt transmitter and the two receivers (balsa cage on right). All gear was well demonstrated on the ground for the judges, but the rain arrived when it was our turn to fly, so we had no flight! We placed fourth on the basis of ground performance alone! Disappointed? Yes! Discouraged? No!

The small F/F gas model in the background is my version of a Thracy Petrides model which I later modified to become the Guff F/F model. It did well in 18 meets during 1938 and 1939, but that's another story.

PHOTO 10

Here is Bill with the 100-watt R/C transmitter used in both the 1937 and 1938 Nats. It required 110 volts AC from the power line which is seen snaking back through the hangar door. The control box in his hand shows one of the two push buttons; one for rudder, and one for elevator.

PHOTO 11

The R/C ship got a new (and final) fuselage design for 1938 to allow for easier access to the airborne radio gear, which at that stage needed constant care and adjustment. It was rare to make more than two flights without retuning the receivers or adjusting a relay. Note also the six-inch M & M Airwheels which replaced the original balsa ones.

PHOTO 12

A new type of balanced-armature sensitive relay was built to minimize engine vibration effects observed on earlier flights. This was a great improvement in control reliability under power.

PHOTO 13

A new rudder actuator based on the four-spoke escapement principle replaced the 1937 unit in order to gain specific rudder positions very quickly; full deflection in 1/10th of a second! The four-stop sequence was: (1) right rudder, (2) neutral, (3) left rudder, (4) neutral, (1) right rudder, (2) neutral, and so on. It weighed one ounce and was mounted in the base of the fin where it was linked directly to the tiller of the rudder as shown in Photo 14.

PHOTO 14

The rudder area was enlarged for 1938 and proved to be more effective than in 1937, but not dangerously so. The elevator actuator was omitted this time so we could concentrate on learning the rudder alone. The NC 7388 on the fin was not an AMA number, but was added in Bill's Ham language, where 73 meant "best regards" and 88 meant "love and kisses." We hoped it would bring good luck!

PHOTO 15

Now we are at the Detroit Wayne County Airport preparing for our first official R/C flight. From left to right: Dad Lester Good, me with plane, and Ham helper, Paul Kreilick. Bill was not able to attend either the 1937 or the 1938 Nats. We used the same 100-watt transmitter as before, and it was plugged into the 110 volts at the hangar in the background. We felt confident because we had made over 30 test flights with the new equipment, but the wind was quite strong at 20 mph and the other R/C entries were holding back. We decided to go!

PHOTO 16

I am signaling to Paul to press the transmitter button for the final radio check; all okay. I reminded Paul not to push the button again because the rudder sequence was at neutral and the next step would be full left. Besides, he had not been checked out as a pilot! (*Note the old hangar building in the background. We believe it is the same one that can still be seen at the modern Detroit airport. If you fly there and rent a car, the courtesy shuttle bus takes you right by the old hangar on the way to the car rental parking lot. wcn*)

PHOTO 17

Here is the actual launch with Ralph Littler on the left tip and me on the right. As soon as the plane was free, it climbed steeply into a stall and dropped the nose into a dive; all this time I was running full speed back to the transmitter. After picking up speed in the dive, the plane made another climb into a loop. It hit the ground at the bottom of the loop just as I reached the transmitter! Too late!

PHOTO 18

Sad Walt and friends looking at the damage which didn't appear too great at that moment, at least from this angle.

PHOTO 19

Then we explored the receiver department and found it in shambles, as shown in this photo. Two more lessons were learned the hard way; the pilot should end his launching task close to the stationary ground-based transmitter in order to grab the control box quickly, and in the future the receiver and its batteries should not be mounted in the same balsa cage! The cage was mounted in sponge rubber, but that was not good enough for that impact. Before it was flown again, the batteries were lashed to the fuselage floor.

PHOTO 20

All of the other R/C entries had opted not to fly because of the bad weather, so I was presented the first-place trophy, but it was not a very satisfying win. (See *Air Trails* January 1939.)

TO BE CONTINUED NEXT MONTH. •

R/C Soaring. . *Continued from page 45*

for you. This is important because he can spot things you don't know may be wrong with your plane. The major things to check are: correct CG location, correct surface deflection, firm tow hook attachment, correct tow hook location (slightly ahead of the CG for the first flights), wing strength, proper wing alignment and trueness, proper stab alignment, proper elevator and rudder trim, and radio range. This last one is very important, so if your radio came with instructions on how to perform this check, be sure to take them with you to the field.

Your instructor should give your model its first few hand tosses over a soft grassy field. If the model is out of trim in any way, this is the way to spot it, not after you've let it go on the unstoppable (merciless) hi-start! If the CG is right, any weird right/left or up/down trim corrections can be made easily using the adjustable clevises which come with most glider kits. It is best to have everything in trim on the plane with the transmitter's trim tabs in neutral. This will allow in-flight trim adjustments to suit flying conditions.

When everything is in order, it is time to launch!

THE INITIAL HAND LAUNCHES

Again, it is best to have a qualified instructor help you on your first few flights. If your radio has the "buddy box" or trainer cord adapter on the side, it is ideal if you can find an instructor with the same brand radio similarly equipped. With this setup, he can let you fly more often holding your own transmitter while affording him the ability to instantly take over the controls should you get into trouble. If he doesn't have this cord, perhaps you could order one and have it available for the first few flights.

Lacking this buddy system, you are going to have to pass the transmitter back and forth awhile. Don't be too sure you can fly yourself out of trouble. If the instructor says, "Give it to me," hand him the transmitter without question. He is experienced enough to anticipate trouble long before you suspect it.

If you are unfortunate enough to be a lone eagle. . .well, here's the best way to go about learning to fly.

After you have preflighted the sailplane to the best of your ability, it's time to test glide. Find a large field with medium to high grass (no bushes!). Pick another day if the wind is more than a gentle breeze. Face into the breeze. Right-handed guys will hold the transmitter in the left hand and the glider in the right. Lefties will be at a slight disadvantage here and will have to learn how to control the primary functions (rudder and elevator) from the right stick. They will hold the glider in the left hand and the tranny in the right.

(As a side note, one of the most gifted fliers I know is a lefty. When Joe Wurts flies R/C hand launch contests, almost nobody can touch him. He throws with his very strong left arm and he has learned to hold and control the tranny with his right hand and fingers. His launches are deadly accurate because of his ability to control the rudder and elevator at all times. His right-handed competition is momentarily without radio correction until that right hand has thrown the model and returned to the sticks.)

Lift the glider well above your head so that the tail will clear your noggin when you throw. Give it a slightly downwards toss with about a third of your full strength. We are trying to achieve flying speed and a gentle descent at the moment of release. Make sure you release with the wings level and the nose pointed just below horizontal (three or four degrees). Believe it or not the glider will fly pretty well all by itself if you have done your preflight carefully.

You may have to give *slight* up or down correction. By slight I mean maybe 1/4-inch stick movement (or less). Remember, keep your flying speed up by flying in a gentle descent, and that to point the glider's nose down a little you have to push the stick forward a little. Chances are you will not need to give much if any right/left correction provided (1) the wings are not warped, (2) the rudder is centered, and (3) you threw with the wings level to the ground. Concentrate on keeping the plane on a steady descent to the ground. It will want to fly anywhere from 50 to 150 feet out depending on how you threw.

Once you've mastered flying speed, you can start gentle turns. Toss the glider. Give it left stick (about 1/8 inch). The model should start a gentle left turn. As soon as you see it banking, let go of the stick. The model will straighten out on its own if it has some altitude to work with, but if it doesn't, give it an equal amount of opposite rudder control to straighten out. Progressively increase the control movements until you are able to make a gentle, shallow S-turn before landing. You now know your left and right turns from behind the model.

Behind the model? Does it make a difference? YOU BET! When you are behind the model right is right and left is left. When the model turns toward you, that is reversed, right is left and left is right. Think about it.

More beginners panic from this reversal than just about anything else. They think that they've become victims of radio failure, gusts of wind, and numerous other reasons. Because they often become disoriented, over control sets in and matters worsen.

The best way to learn how to overcome this disorientation is to remember this one simple rule: pushing the stick left raises the left wing, pushing the stick right raises the right wing.

HOW TO HI-START LAUNCH YOUR MODEL

A hi-start is a launching device which uses (from one end to the other) an anchor stake pounded into the ground through a welded steel ring, a section of rubber tubing (25 to 50 feet long) firmly tied to the ring, a length of braided or twisted nylon fishing line (150 to 300 feet) which is tied to a second steel ring which is tied to the flying end of the rubber tubing, a parachute or streamer, and a lightweight, smaller ring which slips over the tow hook.

This device is stretched out until it pulls with sufficient strength to lift the sailplane skyward like a kite. This pull tension will vary with the rubber being used and the glider's ability to withstand the stress without folding its wings. A good first tow might have a pull tension of about two times the glider's weight. This should boost the glider up enough for a one-minute flight.

When using any method of ground-based glider towing (hi-start, winch, or hand tow), it is always safe to have an experienced person throw the model for you (wings level, nose inclined 20 to 30 degrees). This will allow you instant reaction time in case the glider goes off to the side or too steeply.

The typical beginner glider is very stable on tow. A tow hook position five to ten degrees ahead of the CG is a safe place to start (go with the manufacturer's location if different) and will yield a near optimum climb angle of 60 to 75 degrees. It is the tow hook location more than anything else which will affect the angle of climb, provided adequate pull tension is available and the elevator trim is not way off.

The vertical stab (fin and rudder together) will keep the model going straight up the line provided the wing is warp-free, the rudder trim is correct, the model was thrown straight and not banked off to one side, and you are directly down wind of the anchor stake. All that is really needed once the plane is on its way up is an occasional right/left correction. This is done gently so as not to overcontrol and send the plane zigzagging every which way but loose (and it may even come loose!).

If the plane is (for example) 10 to 20 degrees off course, it is time to start correcting. Do this by giving 1/8- to 1/4-inch rudder command in the opposite direction until the model responds and is pointed almost vertically, then release the rudder stick. The model will continue coming around for a second or two and should settle down in the vertical path again. It will have a natural tendency to fly towards a point directly above the anchor stake. Let it. If the model veered hard enough to one side, the wind direction may force the model to come back beyond the vertical and back toward the intended original flight path. You can, once it has come back to that intended flight path, give it a slight opposite rudder command to keep it from overshooting the straight and vertical, otherwise leave it alone and chances are it will turn back from the overshoot on its own.

When the hi-start rubber runs out of pull, the model will have already leveled off on its own. Your airspeed and lack of line tension will pull the parachute and ring off the tow hook freeing the sailplane. The parachute will open and cause the line to drift down wind towards your launch point. Ignore where it lands, just fly the plane.

CONTROLLING THE MODEL IN FLIGHT

A few things to keep in mind while learning to control the model are: (1) gliders *always* fly slightly "downhill" if they are to maintain sufficient flying speed (gravity is your engine, if you fly "uphill," your engine will quit, then the plane will stall); (2) when flying towards yourself, remember the principle about lifting the lower wingtip by pushing the rudder stick to that side; (3) when making a turn, your wing is no longer level, therefore it is no longer lifting directly opposite gravity, so give a slight amount of up elevator to increase the wing's lift (this also keeps the nose of the glider from dropping); (4) if you wish to exit a turn, give opposite rudder until the model is almost level (it will finish the exit without need of further rudder command); (5) do not overcontrol (causing erratic flight paths); (6) do not undercontrol (allowing the plane to fly you). The sailplane will fly the longest if you can manage to resist the urge to fly it all over the place. Every time you give it a command, you are causing a little increase in the model's total drag. This causes slight altitude losses and shorter flight times.

When landing, set up your approach into the wind to decrease your ground speed and prevent the wind from flipping your model on the ground. Plan way ahead of time. Let the model settle in by itself, don't force it down using down stick, don't try to flair it out by using up stick. If you want, use a little up trim to keep your glide speed just faster than a stall. This will give you gentle landings and minimize wear and tear on the model.

USING LIFT TO EXTEND YOUR FLIGHT

Once you have mastered the control aspect of flying, it's time to work on prolonging your flights by using thermal, wave, or slope lift.

Without going into great detail about what a thermal is, let me just say that it is a rising body of warm air which may be used to gain altitude.

There seems to be two basic models to explain this natural phenomenon. The first is the most obvious because it is sometimes visible by means of the dust particles which are easily lifted into the air. In an extreme form, these thermals are called dust devils and resemble miniature tornadoes. Most of the time they are not strong enough to lift sufficient amounts of dust to be visible.

Another type of thermal is viewed as being a vortex ring. A manmade vortex ring is sometimes seen when an explosion is set off and a mushroom cloud of hot gases and dust is formed. The head of the mushroom is a round body of hot material which is cooled at the top, flows outward due to the rising hot gases below it, cools further, curves below the main body, is sucked under it by the vacuum caused by the swiftly rising body of gas, and then is reheated by the hot stem thus forming the vortex ring as it completes one circuit. The stem cools as the explosion dies, but the ring has sufficient internal velocity to carry on awhile. As I see it this is the same principle as a "bubble" thermal or a vortex ring thermal, albeit a bit extreme.

I believe (note I said "believe") that this is a more common type of thermal on calm days, whereas the swirling column of rising air may be more common on breezy days.

Wave lift is closely related to slope lift in that both are caused by a deflection of flowing air. The deflecting body is usually a

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AEROINDEX: Comprehensive index to EVERY plan ever published in *Model Builder*, including detailed descriptions; just $4.75, postage included. Aeroindex, P.O. Box 5124, Hamden, Connecticut 06518.

WANTED: Ignition model engines and race cars, 30s and 40s vintage. Don Blackburn, P.O. Box 15143, Amarillo, TX 79109; 806-622-1657.

IMPORTED DIESEL ENGINES: Aurora, KMD, K-Mills, M.V.V.S., P.A.W., Pfeffer, Silver Swallow and Replica Taplin Twins. Also M.V.V.S., P.A.W., RADUGA, and Silver Swallow Glow engines. $1.00 Catalog. CARLSON ENGINE IMPORTS, 814 East Marconi, Phoenix, Arizona 85022.

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ATTENTION all model builders. I have a plan for model aircraft. May be possible for you to win the air competition. This is specifically for military. Write: Mr. Hassan Siddique. 215 Garden Block, Garden Town, Lahore, Pakistan.

CONTROL LINE kits from your plans repli-kit. c/o C.J.'s Hobbies, 2602 Hwy. 44 West, Inverness, Florida 32650, (904) 726-8890

WANTED: Ignition model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

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ridge, a rise, or a hill of some kind, although large buildings and even a row of trees have been known to cause the same effect. The analogy of wave lift is often seen in rivers where a submerged rock causes the flow of water to bounce upwards. Often this is enough of a disturbance to cause the water to drop quickly and creating a trough downstream of the rock. Then the surrounding water pressure pushes the trough back up into another "bump" in the water, and so on, each succeeding wave less powerful than its predecessor.

In full-size soaring, smooth lens-shaped wave clouds called "lenticulars" are often formed in the sky when a wave is present. I have seen these clouds stacked up like pancakes at different altitudes. However, at our altitude, wave lift is normally invisible, until you enter it.

Slope lift is simply wind blowing up a hill or slope. If the wind blows up faster than your glider sinks, the glider goes up.

Using these other forms of lift is in principle the same: find air that is going up faster than you are coming down, and your plane will rise. Stay in this air, and it will continue to rise. This means either circling in it or zigzagging across the flow of rising wind.

What you are looking for when you are flying is an upwards deviation in your steady descent. This deviation may look like your plane has leveled off (even though the nose is still in a descending attitude), or it may look like it is rising quite rapidly. If you have never seen this before, watch a low flying hawk or buzzard sometime. It is best if when you first see him he is flying straight ahead. Keep watching him. He will probably hit a thermal before too long. Watch how the bird's entire body goes up without having to flap his wings. Now

watch how he circles in that rising air, gaining five, ten, fifteen feet with each circle. Before too long he will exit the thermal and continue on his way.

Learn to circle like a vulture, smoothly and slowly, and you will go up like a vulture. Practice for graceful, flowing turns without stalls or unnecessary course corrections. Be efficient in maintaining the flying speed where your glider sinks the least. Most beginner's gliders are so stable they are practically free flight models, capable of flying themselves. Try getting your plane to circle on trim tab settings alone sometime. I've set up my Paragon this way innumerable times and actually been able to walk away from the transmitter for minutes at a time, the Paragon just circles away by itself, going up without my help. Who says flying thermals is hard to do?

That's about all I have room for this month as far as beginner's info goes. It should be enough to get you started. If not, search out your local fliers for additional help.

LETTERS FROM READERS

The following is a letter from Ed Gossert of Lancaster, California, which I received last December. His experience is a little unusual because his entire family takes an interest in R/C soaring and because they fly in a desert. His choice of glider is a Goldberg Gentle Lady, one of the gliders I have listed above as a great first-time model.

"Greetings from the Antelope Valley! I have been reading your column in *Model Builder* for a year now (plus back issues of *MB* back to '85, so I guess I've really been reading you for three years now?). Your writing is the best of all the model pubs that feature sailplane columns. I particularly enjoy 'Airfoil of the Month' and discussions of technical items. Your contest reports are not tedious, and each month leaves me wanting more, more, more! Maybe the publishers of *MB* should consider a magazine dedicated entirely to sailplanes! Anyhow, you are the best! Keep up the good work, and don't change your style!

"On to the pictures! First is my lovely wife, Valerie with my Gentle Lady and myself. This was taken 12/27/86, just before the first flight of the GL. (This same plane has lasted a year now, with over 500 flights, nearly 30 hours of flight time, and has gotten me through LSF level II) Valerie designed the trim scheme on the wings. We were up until 1:30 a.m. the previous night struggling with trim sheet and striping tape. It does look nice, even if I say so myself!

"Next shot shows Valerie retrieving GL from her first flight. Look at that smile! She really likes sailplanes. Picture three is Valerie taking a turn on the sticks. With coaching from the local experts, she got a 32-minute flight. Not bad for someone who had no interest in R/C aircraft previously. Again, look at that smile. Valerie's flying time was cut short for most of '87 with being pregnant with our third child, Andrew. But, she has inherited Gentle Lady and intends to achieve LSF level I this coming year. Last pictures are of our first and second children, both six (yes, they're twins) getting into the act as transmitter-bearers. Sailplanes are definitely a family affair in this family.

"My motivation to write this letter is to tell you of the soaring activities going on here in the Antelope Valley. There are about six of us who seem to show up on a more or less regular bases. Four of us are Gentle Lady drivers, and there is a Wanderer and Drifter II. I flew from January until July without ever seeing another sailplane, but now they seem to be popping up all over. R/C sailplaners are such great people. The power flyers I've come in contact with seem to be kind of aloof and difficult to be around (some have been downright grouchy and rude!). Every sailplane pilot I've come in contact with has been laid back, easy to be around, and generous with equipment, praise, and advice. Once, the joystick in my transmitter broke, and another sailplane pilot, who had never seen me before, offered to let me use one he had on my frequency. Whoever shows up first and stretches his hi-start offers its use to anyone else who shows up. I always arrive home from a flying session relaxed and happy.

"Anyhow, there is a small but growing group of soaring junkies up here in the desert starting to get together on a somewhat regular basis. It's a little soon to tell, but the potential to form into a club or such exists. Three of us are working on LSF goals, also. Come up and soar with us sometime!

"I have a few questions for you. What would be a good second sailplane, once a Gentle Lady has been mastered? Something not too expensive, but capable of competition? Also, how does one find out about competitions? Do you have to belong to a club? I have never been to a contest; it sounds like fun, and I would like to see how it is done, but I only find out about them when I read about when it was, in your column.

"I reckon I've taken enough of your time. Thanks for listening. One last thing. Comment of one of our regulars to a power flier who came over and asked, 'What do you have to watch out for when using this hi-start?' Answer, 'Snakes!' Respectfully, Ed Gossert, LSF #5999 (Proud of it!)" Well, thank you for the kind words and invitation to come fly, Ed. I don't often get up that way, but the next time I do I'll try to call ahead.

There are many, many different kinds of models that you could choose to take a step beyond a Gentle Lady that is competition capable. It would take too much room to cover all the possibilities, especially since I don't know how far up the economic scale you want to go.

Some nice models are the Airtronics Sagitta 600 (78 inches), Sagitta 900 (100 inches), and the Cumic Plus (99 inches or 117 inches). In the Pierce Aero stable are the Gemini MTS (99 inches) and Paragon (118 inches). Midway Model Co. has a very nice

two-meter called the Gnome 2M (76 inches). Robbe has several semi-scale ARF models and a plane called the Argo (101-inch ARF) which looks nice and won the 1983 International Best Glider of the Year Award from EOLE. The Argo even has a landing wheel for landing on asphalt. Dynaflite has the Sensor (118 inches). The list could go on and on. These are all rudder/elevator control models, but you might want to try your hands on an aileron model too.

Years ago there was a club out in Antelope Valley called the AVSA (Antelope Valley Soaring Association). If it still exists, I haven't heard from them in a long time. Are you guys still an organization? We'd like to hear from you. They used to fly from a field at 110th West and Avenue T, Ed. Check it out if you like.

One sure way to hear about contests which are major ones is to join the AMA. Every month they publish a calendar of contests in their magazine *Model Aviation*. Another way is to write to the nearest clubs around you (SFVSF, TOSS, SCVSA, PSS) and ask to be put on their mailing list (be willing to pay, though, unless you have a club newsletter to exchange).

Thanks for writing, Ed. Sorry I don't have room for an Airfoil of the Month this time!

The next letter is for the competitive flier who is looking for a little variety in his club's contest formats.

'I had promised you some original stuff as candidate material for your column. Here it is:

"Landing points and their effect on contest standings has long been a controversial issue in our club. Most of us feel that sailplane contests should be won in the air, not on the ground. Others feel that landing for high points is a learned skill to be acquired by practice and hard work; once that skill is in hand, it is one more thing that will separate winners from the rest of the pack.

"We have developed a landing system that seems to satisfy both camps and has stood the test of time in over two years of use. The system does not reward excessive points except in short duration events where the obvious objective is a landing contest. PPSS does not fly this system exclusively, but it is considered the standard. Our club rules do not permit landing points to be awarded worth more than 20 percent of the total flight points for the contest.

"Attached is a rough drawing describing the system. It is structured as a possible addendum to the AMA rule book.

"Bill, as you may remember, we had once talked about variety in sailplane contests. Here are some contest concepts that have been used in our area. I would like to hear of others. . . perhaps you would consider running this as a regular feature in your column; 'Contest Idea of the Month'?

"1. The Landing Contest. We named this 'The Ken Simmonds Memorial Landing Contest' after a member who hated landings. The objective is to accumulate as many landing points as possible. There are no flight points, and it is practical to run 8 to 10 rounds. Great for LSF achievement. Much more popular than we thought it would be, but we don't count it for club points!

"2. Team X/C. CD makes up three- to five-man teams arbitrarily with attention paid to frequencies and chase vehicles. Each team member has to fly in turn and no relaunching on the course. Each team is responsible for making sure the winch line is retrieved before they can start on the course. If you launch and don't find thermal, then the next team mate in order tries his luck. The different feature of this contest is that the objectives are for LSF goal and return distances (1, 2, and 10k) and the highest accumulated distance over a three-hour period wins. Great fun since the team concept involves everyone even if it isn't your turn to fly. The CD can make up colored task completion markers that equate to proportional distance attained. In this manner the teams can readily see where they stand.

"3. All Souls Day. Not liturgically correct, as the contest is typically flown around here in summer and involves sailplane types. Basically this is a fun-fly with competitive aspects. We attempt to provide a forum for every sailplane type. We have flown HLG, Two-Meter, Scale, Electric, Flying Wings, demo X/C, Aero-Towing, and F3B all in one day. Granted the competition is low-key with one big open round to complete your flights, but it is fun! This event gives a club a good opportunity to host other clubs, have a family cookout and promote the sport.

"4. AMA Distance. I have never read of this event being flown in other areas. Our RMSA cousins in Denver fly this several times each season, and it continues to be popular. The addition they make to the event is to fly it Man-on-Man with four winches. We recently flew two rounds in two hours with eighteen entrants in a PPSS contest. This is a good warm-up to building some F3B experience.

"5. F3B. RMSA and PPSS have not flown very many F3B contests, but I would like to mention one CD'd by John Wyss of RMSA. John used straight F3B rules including working time with two exceptions. One which was key was to assign entrants to teams. This immediately promoted good organization and helping hands for the less experienced entrants. Second, John assigned the teams to two of their own winches and these winches were left in place for the entirety of the contest. The effect was positive for F3B in this area and we will have more this year. Many fliers were heard to extoll the virtues of this contest in that they were entertained even when they weren't flying.

"6. Pro-Am. Pick any thermal event you want and assign one experienced flier to a novice and you have your Pro-Am team. Winners can be for team and individual. The good this contest does is proportional to making sure that the novices participate. Phone calling and advertising helps. One Pro can be assigned more than one 'Am' if need be. Many former novices in our club will speak fondly of their introduction to contest flying with the Pro-Am.

"7. Progressive. This is a contest I heard about from you. . . sorry about the name! PPSS flew this twice this past season and here is how we modified it: The thermal duration tasks can be 3-5-7 or 4-6-8 min., etc. The flier may fly the tasks in any sequence he desires but must select the task within one minute after release from the line. If the flier doesn't commit within the allotted time, the timer assigns the maximum task to his flight. We fly it so that a fourth 'gamble' or replacement round can be flown if the pilot wishes. He must state which round he will replace before launching, and he is committed to take the results of that flight no matter what the result. PPSS does not use fixed winch orders preferring the open winch with announced round closing times to maintain pace. With this contest we have made the entire contest one open round; you may complete the tasks at your own pace. Result? The contest moves quickly, your chances of getting 'dumped on' by Lady Luck are greatly reduced, and strategy and skill are rewarded.

"8. Colorado Challenge Cup. This is an annual challenge contest between the two Rocky mountain area clubs, PPSS and RMSA. The challenging club is the visiting side and has to fly on the home club's turf (literally, since both clubs fly from sod farms!) The defenders get to select the tasks. The reason for bringing this up is that the contests are great fun and certainly help to unify club spirit. RMSA has selected AMA distance in at least some of the rounds in every contest so far and has managed to defeat the challenger narrowly for the last three years. This year, PPSS was ahead going into the last round, but RMSA managed to pull it off. Rats!

"Thanks for continuing to put out a quality soaring column, I know it must be diffi-

cult to maintain that interest. Keep it up! Best Regards, Randy Reynolds." Thanks again for the input, Randy. I am equally impressed by the volume of quality stuff you produce in the modelling press. Give one or more of these formats a try in your club contest season. If you have an interesting club-favorite contest write in and tell us about it.

SIGN OFF TIME

That is going to have to be it for this time. Until next time, THERMALS! Please note the new address for those important newsletters and correspondence: Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, California 92330; (714)245-1702. •

Dear Jake. . . . *Continued from page 7*

they affect maneuvers and how they can be altered by propeller selection and rpm. What do you know about P-forces?

Pattern Flier in Point Mugu

Dear Pattern Flier:

The only forces I know of associated with that particular function are gravity and bladder control.

Jake

* * *

Dear Jake:

At a recent free flight contest at Taft it was much warmer than I had anticipated, and I had brought only heavy clothing. (Murphy's Law strikes again!) I had one lightweight shirt and wound up having to wear it for all three days at the event. The days were very hot, and the Right Guard eventually broke down. Funny thing though, as the shirt got stronger, I won more events. Best explanation I have is that the shirt overpowered the negative aerions and allowed me more lift than my better-scrubbed competitors. Could I be onto something big?

Curious in Corona del Mar

Dear Curious:

Sounds like you encountered a Berkstrom oblate air mass. Discovered in 1964 by Karl Berkstrom, the Berkstrom oblate air mass is a localized body of rising air. They sometimes contain severe updraughts and are usually oblong in cross section, with the longer axis generally aligned with the local winds. When centered over an unwashed shirt, the Berkstrom oblate air mass is frequently referred to by its shorter name, the B.O. thermal.

Aerions have nothing to do with B.O. thermals. The subatomic particles involved are the olfactoron and the beode. Beodes are anti-magnetic and are repelled upward by the earth's crust. Olfactorons are prograviational, and the resultant strong bond with the beodes carries them aloft in tow. Since air is a viscous mass, a large body of it always accompanies the rising olfactorons and beodes. Hence, the B.O. thermal, and the explanation for your good fortunes at Taft.

Jake

* * *

Dear Jake:

I know discussions of what's pretty and what's not can lead to really heated arguments, but in your opinion, what's the best-looking thing in the air today?

Esthetician in El Segundo

Dear Esthetician:

A Cadillac Seville that just drove off a cliff.

Jake

* * *

Dear Jake:

Hot air balloons were first used in battle as aerial observation posts in the Civil War; right? Before that, what did artillery officers use to pinpoint enemy positions?

War Gamer in Wapakoneta

Dear War Gamer:

Before balloons, helicopters, spy planes, and satellites came along, artillery batteries used information sent in from scouts by carrier pigeon. Before that, they relied on a distant relative of the carrier pigeon for their information on the enemy's whereabouts . . .the stool pigeon.

Jake

* * *

Dear Jake:

Many home-builts and commercially produced light aircraft are constructed of chrome moly tubing. So are bicycles, apparently. This tubing is actually made of steel; isn't it? Why is it called chrome moly?

Jasper in Macon, Georgia

Dear Jasper:

Chrome Mollie was a B-girl working the bars of San Francisco during the Gay Nineties. She got her name from the chrome shoes she wore. Her underwear was reflected in the shiny chrome, thereby allowing the bar's patrons to look up her dress without having to pretend to pass out and lie on the floor and wait for her to step over them.

How Mollie's name got attached to aviation tubing was not clear. She predated the Wright brothers by ten years, and she was long gone by the time wood was no longer the primary structural material for airplanes. My extensive research into the matter has provided the answer, however.

At the age of 52, Mollie married in 1923. Her beloved was a Bessemer heir named Charles Steubing. She passed away within the year, and her bereaved husband went to work in the family steel business in Alabama. Is it any wonder then, that when the product came out several years later, it was named in honor of his dearly departed wife, Chrome Mollie Steubing.

Jake

•

Workbench. . . *Continued from page 7*

be seen will be the U.S. Army's Golden Knights, the Eagles Aerobatic Flight Team, wingwalkers, Bob Hoover, Lefty Gardner, Joann Osterud, Brigitte de Saint-Phalle, the Stardusters, and Team America. For reserved or general admission tickets, contact Ticketron (415-392-7469, 702-348-7403, our your nearest outlet. For general admission only, contact any Bass ticket center, or outside California call toll free 800-275-BASS.

* * *

Here's one we'll have more on in the future, but if you want to plan ahead, and you're a C/L stunt grunt in any shape or form, set aside February 18 and 19, 1989, and plan to be at Whittier Narrows Recreation Area, South El Monte, California. This will be the time and place for the inaugural Vintage Stunt Championships, being organized by Mike and JoAnn Keville, 6618 Dashwood St., Lakewood, CA 90713, phone (213) 804-4056, 5:00 - 9:00 p.m. weekdays, or 10 a.m. - 10 p.m. weekends, all Pacific Time.

It is hoped that many of the old-time C/L stunt greats will take this opportunity to have a reunion (and also duck the winter weather if they're from "snowbird" country), so Mike is hoping that some of you out there will be able to find and notify Palmer, Gialdini, Still, McFarland, Silhavy, Kostecky, Lickliter, Werwage, Giesecke, O'Toole, Tucker, Saftig, Sieverling, Parrot, et al. More details later. . .we still have a little time. . . •

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