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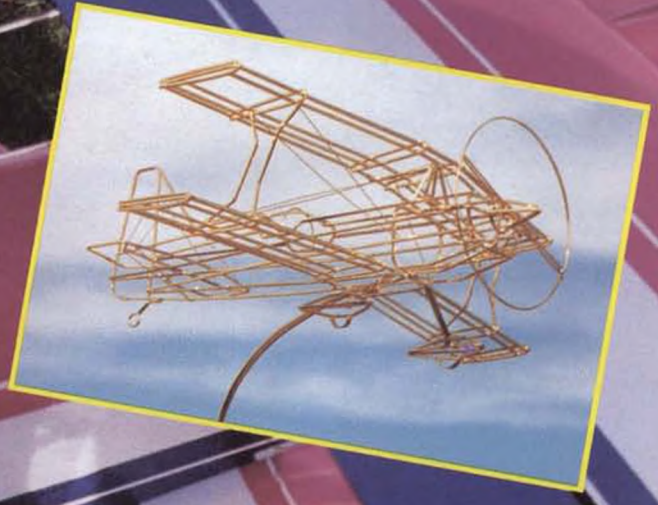

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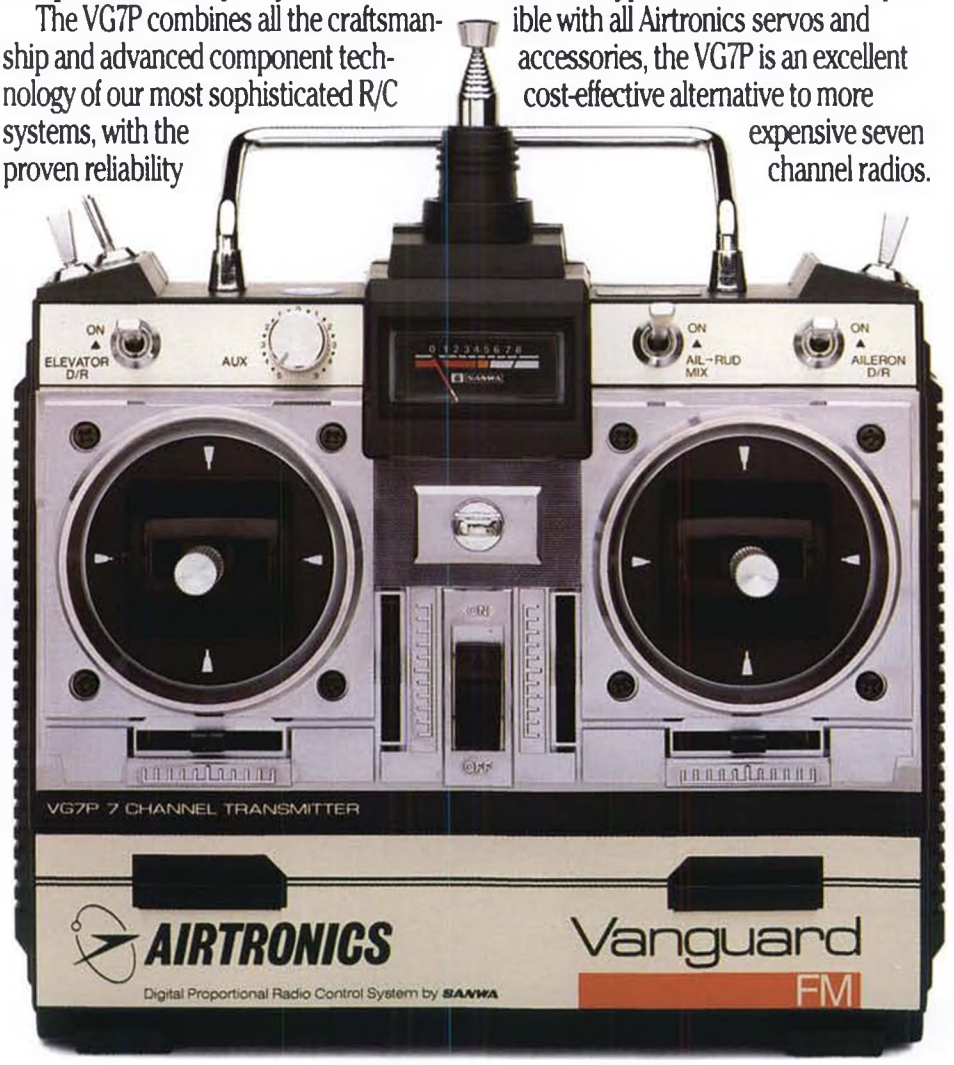

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DEPARTMENTS

FEATURES

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CONSTRUCTION

ON THE COVER

The top five competition aircraft at the 10th T.O.C. (from the foreground): Chip Hyde's 30% Ultimate, Steve Rojecki's Bucker Jungmann R131, Wolfgang Matt's 30% Ultimate, Steve Stricker's 30% Ultimate, and Bill Cunningham's 30% Ultimate. Photo by Bill Northrop. Top insert is David Ramsey's Robbe "Whopper" Autogyro, reviewed in this issue by James Wang. Bottom insert is one of the beautiful 28K gold-plated wire sculptures adorning the tops of the first five-place trophies awarded at the 1990 Tournament of Champions. They were created by Michael W. Thompson of Walnut Creek, CA. Photo by Buck Boynton, our photographer of the T.O.C.

MODEL BUILDER (ISSN 0194 7079) is published monthly by RCMB I NC., 898 W. 16th St., Newport Beach, California 92663. Phone (714) 645-8830. Subscriptions: $25.00 per year, $47.00 for two years. Subscriptions outside the US (except APO & FPO) $38.00 for one year, $68.00 for two years. All payments must be in US funds, drawn on a US bank. Change of address notices must be received six weeks before date of issue that new address takes effect. Send old address with new . . . old label preferred. Duplicate issues cannot be sent. Postmaster send address changes to Model Builder, 898 W. 16th St., Newport Beach, California 92663. Second class postage paid at Newport Beach, California, and additional offices.

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BILL NORTHROP'S WORKBENCH

Of course, by the time you read this, it will be early February, and the Christmas/New Year holidays will only be a diminishing memory for most of us. In this writer's case, the memories of the holidays will last longer. As this is being written, December 16, 1990, our daughter, Juliet Lehn, along with husband Carsten, and two sons; Nicolai, 11, and Samuel, 8, just arrived two days ago from Bangkok, Thailand, to spend Christmas. We last saw Juliet and Carsten in September, 1979, in Gamby, on the Danish island of Fyn, on our way back from Johannesburg, where we were Chief Judge for the FAI World RC Aerobatic Championships. At that time, Nicolai was just five months old and Samuel's arrival in May of 1982 had not as yet even been scheduled. Juliet and Carsten are in the exporting business, under the company name of Tropic Dane.

Both Nicolai and Samuel run RC cars (sent to them for Christmas last year by their grandfather), and drive them at a local track in Bangkok. There are several RC clubs in the area, and we have requested more detail about them for a possible activity report in a future issue. There will be a small delay on this, however, as the family will visit our oldest daughter, DiDi, in Pennsylvania, and Carsten's parents in Denmark, before completing their around-the-globe trip back to Thailand.

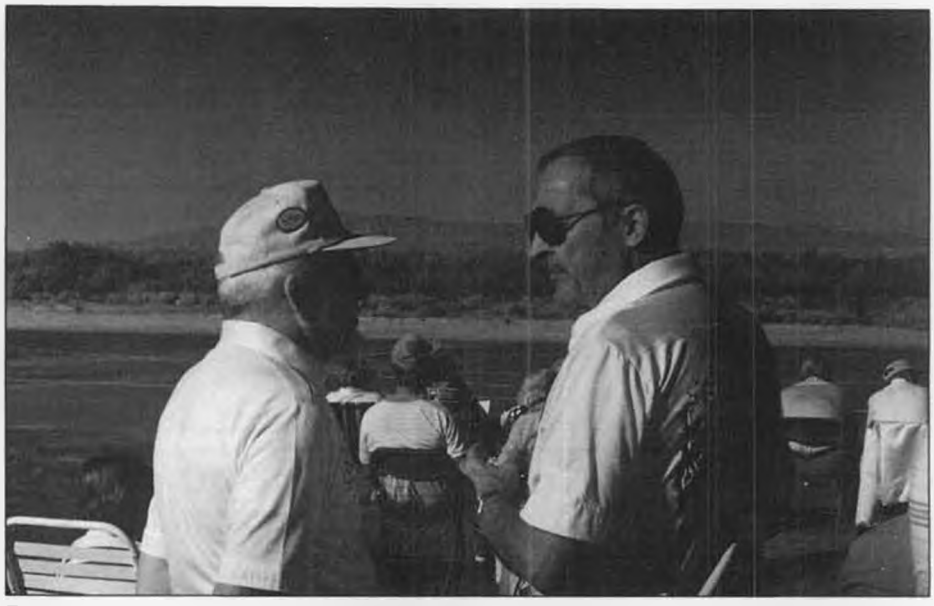
Naturally, it's kinda hard to tend to business under these circumstances, along with preparing for the fourteenth annual IMS Pasadena show coming up in just four weeks (January 11, 12, and 13), as this is being written, so our column this month will deal with a mixed bag of a few items found in our "Workbench" file.

Walt Schoonard, known primarily over the past two decades as a designer, developer, flier, importer and manufacturer of radio controlled helicopters, died on Saturday, November 17, 1990, after a lengthy battle with diabetes. His company, Miniature Aircraft USA, in Orlando, Florida, is a primary source of RC helicopter kits, parts and accessories and continues to operate under the management of his two sons, Ted and Tim.

RC UNLIMITED RACING

Here's one that sort of grabs the imagination . . . RC Unlimited Racing, flying large scale models of the glamorous unlimited aircraft raced at the annual Reno National Air Races, such as reported in this issue! These model aircraft would have to represent the scale outline of an actual Reno Unlimited racer, within 95% of scale, with a 100-inch minimum wingspan (before clipping). Any piston engine(s) may be used. Maximum aircraft weight not to exceed 55 pounds *(Perhaps a minimum would be of more concern wcn)*. Three classes of racing; Gold, Silver, and Bronze, with placement dependent on qualifying speed. All racers must qualify during time trials. Separate static contest. And get this . . . OVER $25,000 HAS BEEN COMMITTED FOR PRIZE MONEY for the first annual race to be held in early October of 1991! Just think of large scale P-51's, clipped-wing Corsairs and Bearcats, Lefty Gardner's white P-38, the sleek "Tsunami," and the thundering Sea Furies, storming around a closed race course. If this doesn't excite your imagination and get you to thinking about possible aircraft to design and build for such an event, you check your pulse . . . you may not have any!

This whole idea has been put together, and a California corporation formed, RC Unlimited Racing, Inc., 565 Mercury Lane, Brea, California 92621, to administer the promotion and execution of this event. The contact name is Tom Easterday, and the phone number to call for more information is (714) 255-0747.



Technical Editor Dick Kidd (left) of *RCM*, and Editor/Publisher Bill Northrop of *Model Builder*, discuss the pros, cons and oddities of the model hobby publishing business. Photo by Buck Boynton taken in the pit area just behind the flight judges at the 1990 T.O.C. in Las Vegas, Nevada.

In our humble opinion, this is the best thing to come along for RC aviation since the establishment of the Circus Circus Tournament of Champions.

NORTHWEST RC MODEL EXPO

Just a reminder that following only three weeks after the IMS Pasadena show, which opens the 1991 model hobby show season, the Tenth Anniversary Northwest Radio Control Model Exposition will take place on Saturday and Sunday, February 2 and 3, at the new Pavilion and Expo Hall of the Western Washington Fairgrounds, Puyallup, Washington. This show covers aircraft, cars, boats, helicopters, and railroads, with manufacturer's displays and demonstrations,

raffle drawings, and swap meet. It's sponsored by the Mt. Rainier RC Society.

DID YOU KNOW?

The following was pressed into our hands during the 1990 T.O.C. by Gus Ohlsson, son of Irwin Ohlsson, and manufacturer of glow plugs for various model companies. Gus just figured it needed to be told.

"Forty years ago, during 1948, Ray Arden introduced the first successful glow plugs for model airplane engines, which literally revolutionized the operation and performance of the then ignition-type two-cycle engines. At that time in history, the platinum wire, which must be used in glow plugs, cost between $90.00 and $100.00 per troy ounce. Since 1948, the price of platinum and the other precious metal alloys that are needed to be included in the glow plug element, has reached a high of $1787.00 per troy ounce! The main culprit of this drastic increase is a precious metal known as rhodium, which helps retain the heat in that little coil, and allows our miniature model engines to idle at low rpm's, while also increasing durability so we can reach those over-20,000 rpm's at which many engines run.

"Nearly 90% of platinum and rhodium is extracted from the earth near Africa, and is subject to uniform worldwide pricing. There are no deals when purchasing precious metals, so we, the modelers, must bite the bullet on the higher costs of glow plugs. Don't blame the glow plug manufacturers, they have to bite the bullet too, as they have no choice but to pay the price in order to keep on manufacturing glow plugs for modelers."

In passing, we note that in the British SAM 35 Yearbook No. 6, there is a copy of a patent drawing and a description, which indicates that in 1937, a Kenneth Howie, of Norristown, PA, applied for a patent which was granted in November, 1938, for a hot coil ignition to be used in the production of the H & H .45 engine, definitely establishing the principle of the glow-plug engine.

BUILDING BOARD MATERIAL

Pete Kerezman, Kingsville, Texas, has written in regard to our comments about a great building board surface in the November '90 "Workbench." First, we were concerned about the origin of the name, Homosote, which Pete neatly solved. We simply spelled it wrong . . . it's Homasote. Second, he suggests that interested modelers contact a local model railroader, as "the same qualities that make it desirable as a building board surface are most useful in a model railroad tabletop." So, model railroaders and model airplaners, if you haven't tried Homasote, do it now. You'll be glad you did.

TAILLESS NEWS

We have just received a copy of a 20-page newsletter from England that will fascinate anyone interested in tailless model aircraft. Primarily for free flight, the newsletter, the majority of which is (very legibly) handprinted (!) is listed as . . . "an occasional publication. There is no subscription, and

continued on page 48

ADVICE FOR THE PROPWORN—
BY JAKE

OF ELECTRICS & STEEL-TOED SHOES

Dear Jake:

My safety-conscious girl friend nags me to wear safety glasses and ear plugs and heavy gloves whenever I start my model airplane's engine. I think that's rather extreme, but she's probably right, so I comply with her wishes. But she also tells me I should wear steel-toed shoes. I think she's overboard on this one, and it has caused many arguments. Do you think she's right? Should I wear the steel-toed shoes?

Soft Shod in Shreveport

Dear Soft Shod:

It depends. How much does she weigh and how often does she step on your toes?

Jake

• • •

Dear Jake:

What's the story with electric powered models? First we had cars and boats. I guess they were first because they could afford to carry the weight of heavy batteries. For several years now we've had electric airplanes. I guess this became possible as battery technology progressed in the area of ampere hours per ounce. Now, I hear electric helicopters are a reality. What's next for electrics?

"Current" Events Follower

Dear Follower:

The next fad will be electric powered remote control dolls.

I understand that Duracel has built an electric hunter doll, complete with working subscale shotgun. It will be programmed to blow the Energizer rabbit's head off the next time it appears in somebody else's commercial.

Jake

• • •

Dear Jake:

Radio control technology has triumphed again!

As you may recall, I wrote to you once before when I used a radio controlled miniature submersible to acquire photographic proof of the existence of the Loch Ness monster. (Sadly, the academic pinheads who have viewed those photographs refuse to accept their authenticity. They still cling to their ludicrous belief that I photographed a sunken submarine, and they refuse to accept my assertion that the "U24g" markings are a naturally occurring birthmark on the animal's hide.)

Nevertheless, having proven the reality of one legendary animal, I set out to validate the existence of another often sighted, but never verified creature—the Himalayan Yeti, or Abominable Snowman, as he is known.

To capture the photographic proof of this legendary man-ape, I set out from Katmandu with a party of Sherpa guides and three radio controlled helicopters, each equipped with a Leica 35mm camera with telephoto lens and servo-operated shutter. The helicopters were difficult to operate at that altitude, but by adding nitro to the fuel and by following the performance enhancing advice of Mr. James Wang, the payload capability we needed was attained.

As luck would have it, on the third day out we came upon a nomadic village that had just moments ago been trashed by a rampaging Yeti. Even as we approached, the beast could be seen lumbering toward the nearest reach of the forest. At wood's edge, the creature was joined by several others of its kind. The group (gaggle?) of Yeti remained just outside the cover of the trees and appeared to communicate in a primitive grunting and gesturing fashion.

As the Yeti were in plain view, we launched two of the RC helicopters. Hovering out of reach of the startled creatures, the helicopters were able to expose a roll of film each. But on the return flight to our location, a sudden snow squall blew up. One machine crashed into a bottomless crevasse and was never recovered, but the other made it back safely and provided remarkable photographs, one of which I have enclosed.

There can be no further doubt about the existence of the Yeti. Don't you agree that the creature pictured here is undeniably the legendary Abominable Snowman?

Adventurer in Tibet

Dear Adventurer:

No doubt about it. He's the one on Jimmy Hoffa's left, correct?

Jake

• • •

Dear Jake:

That "Adventurer" guy is several bricks shy, isn't he?

Drake in Danbury, CT

Dear Drake:

At least half a hod.

Jake

continued on page 48

OVER THE COUNTER

The F-16C Falcon from Bob Violett Models, which has been seen in previous "Jet Trails" columns in *Model Builder*, is now available in high quality kit form from BVM, 1373 Citrus Road, Winter Springs, Florida 32708, phone (407) 365-5869, Fax (407) 365-4727.

The F-16C kit features wings and tails prebuilt with balsa, foam, and carbon fiber construction. The stabs have pivot tube and counterweight installed. All scale panel lines and details are molded into the grey-finished epoxyglass components of the fuselage, hatches, ducts, etc. There is extensive use of carbon fiber components in the BVM Falcon to make it more durable. The specially made scale landing gear has proven to be reliable and extremely strong in over 100 test flights and hard landings. Laminate molded gear doors are operated by custom-built, scale-like cylinders. BVM claims that this is the most complete and easiest to assemble jet kit available. Power is supplied by the Viojett/KBV fan engine system and provides flight performance from 20 to 180+ mph. Scale decals and a complete hardware package are included in the kit. Length is 70 inches, span 46 inches. Instruction package is complete, including radio installation, finishing tips, and flight operations.

For information on the complete BVM line, including the F-16, send $4.00 for the BVM Jet Pack and/or $15.00 for a subscription to the "INLET" newsletter. To charge by phone, call (800) 899-1144.

• • •

The Single Stick version of the Ace Radio Control Micropro8000 transmitter is pictured this month. A complete description of this new Ace transmitter in two-stick form was covered in this column for January 1991. It is a microprocessor-driven, eight-channel transmitter that in addition to the usual features of the competition, has auto trim, eight-aircraft memory, totally universal mixing, and extremely easy, logical layout and setup. It's suitable for all applications, including pattern, helicopters, hi-tech soaring, scale, racing, and as we mentioned in the January column, sport flying!

The transmitter is available as part of a

The Bob Violett Models F-16C.

"Explorer" floats by U.S. Air Core.

Single Stick Ace RC Micropro8000 transmitter.

"Ultra Sport 60" by Great Planes Model Mfg. Co.

The "Spectra" by Great Planes Model Mfg. Co.

The Hobbico Curtiss P-40E "Warhawk" ARF.

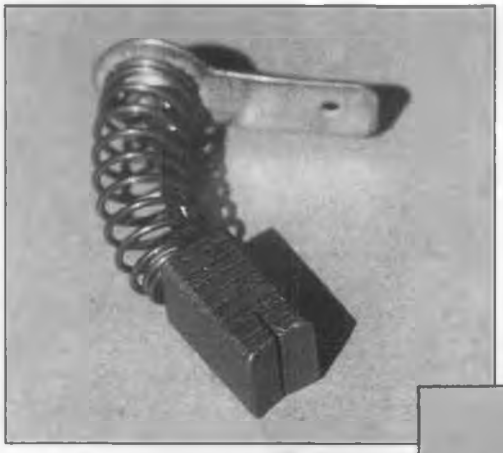
complete system, or by itself, or in the form of a retrofit package for existing Silver Seven transmitters. Available on all legal frequencies (even 75 mHz if you fancy driving a deep sea fishing trawler with single-stick!).

Contact Ace for more info at 116 West 19th St., P.O. Box 511, Zip 64037, phone (816) 584-7121. And be sure to tell them we sent you!

• • •

The U.S. Air Core goes to sea! At least the U.S. Air Core located at 4576 Claire Chennault, Hangar 7, Dallas, TX 75248, is going to sea, with its new "Explorer" floats for .40 to .60-size RC aircraft.

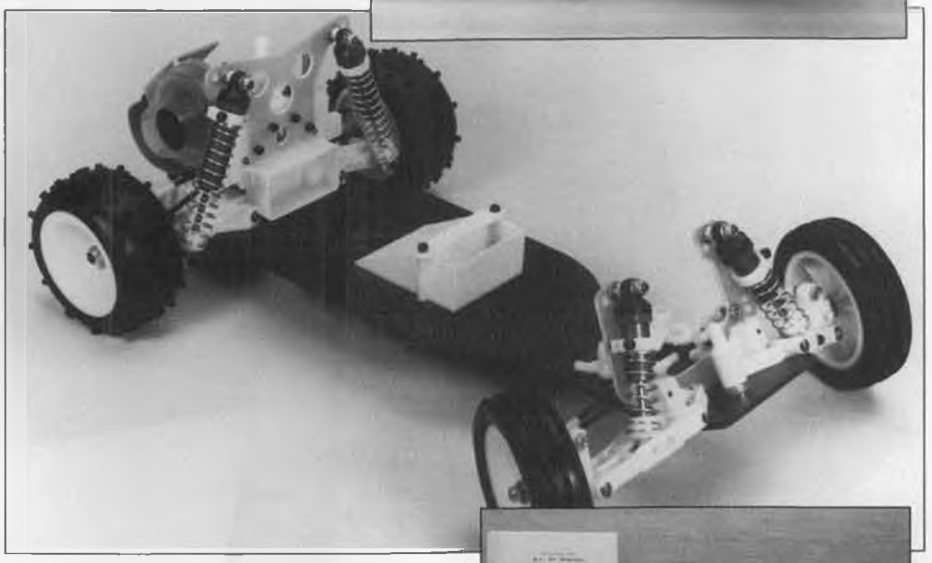
These floats are made from the same material used for the company's aircraft; the CoroStar 40 "Warbird Extraordinair" and the AirCore 40 Family Trainer. They are said to be extremely rugged, and can be assembled in as little as two hours. Hardware and unique four-point attachment gear for most aircraft, including ARFs, come with the set. They list for $39.95, and will be available in hobby shops before this appears at your newsstand. For more information, call (214) 250-1914, or Fax (214) 250-6532.



Astro Flight slotted racing brushes.

Astro Flight folding prop for electrics.

The "Maverick 40" by Carden Corp.



RC10 Team Car from Associated Electrics, Inc.

(Right) Airplanes from cans, by B.C. Air Originals. (Below) A 30% Ultimate by Matney's Models.

• • •

Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61820, phone (217) 398-6300, has three great new RC aircraft to offer the modeler and the sport flier.

First there is the .60-size version of the Ultra Sport, produced by Great Planes Model Manufacturing in nearby Urbana, Illinois. This model spans 61-1/2 inches, has 707 sq. in. wing area, weighs seven pounds, and can be flown with a .60 to .65 two-cycle engine or a .70 to .91 four-cycle engine. The retail price is a very reasonable $119.95. This should be a very easy-to-fly precision aerobatic trainer, with the high profile fuselage providing endless knife-edge flight. Construction is basic balsa and ply, and all hardware is included. It's a model builder's kit.

Another new model from Great Planes Model Manufacturing is the "Spectra," an entry-level electric sailplane. Span is 78-1/2 inches, area is 676 sq. in., and the flying weight is 48 ounces. List price is $79.95. Powered by the Great Planes Goldfire 550 motor, the Spectra will reach 500 feet in 60 seconds. The triple-taper wing features a modified Selig 3010 airfoil. Canopy and hardware are included, along with photo-illustrated instruction manual, and full-size plans.

In the ARF department, Great Planes Model Distributors offers the Hobbico Curtiss P-40E "Warhawk." This fine looking sport scale RC aircraft spans 61 inches, weighs 6-1/4 to 7 pounds, calls for a .46 to .61 two-cycle engine, and retails for $299.95. This ASAP (As Soon As Possible) kit is 80% prebuilt, requiring only 16-20 hours to complete. Retracts are available from Hobbico.

• • •

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292, phone (213) 821-6242, has two new items for the electric-minded modeler.

Astro is offering new motor brushes with a unique slotted face. This brush design is said to run much cooler and with less sparking. The lower temperature increases brush life, and the reduced sparking reduces commutator erosion. A heavier brush spring and larger shunt wire provide lower voltage drop and more power output. Airplane fliers can expect as many as 500 runs on a single set of brushes. Model 5044 brushes are for the Astro 035 through 15 motors, and Model 5045 brushes fit the Astro 25, 40, and 60-size motors.

Astro is also offering a new 7-inch diameter, 3.5-inch pitch, scimitar-shaped folding prop especially designed for the Astro Co-

continued on page 48

BIG BIRDS

BY AL ALMAN

GEARING THE ZENOAH G-62

Crash" Evanson loves to experiment with engines and aeroplanes. He's also power-hungry. So when there's a possibility of getting more out of an engine, this Norseman is gonna tinker . . . seriously.

His latest effort is directed at gearing the Zenoah G-62.

He writes:

"My new project is well under way. We (my machinist pal and I) are building a geared setup for my G-62 engine. This will be a bolt-on unit with a 2:1 reduction, allowing this high-winding mill to swing a monster 28x14 prop (great scale size).

"The most popular engine in these parts is the G-62 and we feel that there is a ready market for this. More details forthcoming as we forge ahead.

"Please note that the G-62 is the perfect powerplant for this venture as it has a nice healthy rear shaft on which to hang a hypoid gear. In practice the engine will be mounted backwards, allowing for the correct rotation of the oversized prop."

I've heard others talk about gearing the G-62 but Crash is the only guy I know who's doing more than just giving it lip service. Being (among other things) tenacious, he'll probably have come up with a viable bolt-on unit by the time you read this.

If you're interested, drop him a line or give him a call; he's never too busy to talk airplanes: Crash Evanson, 881 East Hyacinth, St. Paul, MN 55106; (612) 776-8845.

NEW IGNITION TIMING UNIT

Many of us are using some form of CD ignition on our big engines. Being able to control ignition timing has enhanced the overall performance of these engines such that we enjoy a lower and more reliable idle, smoother running through mid-range and more power at the top end. And with four-strokers we're talking about a tremendous increase in longevity because ignition timing virtually eliminates detonation, which is bad news for *any* engine.

Now you can optimize ignition timing with the GKD Products Inc. (3705 Innsbrook Drive, Garland, TX 75044) High Resolution Microprocessor Controlled Electronic Advance/Retard Unit.

That's quite a mouthful, but according to George Paris, what it all boils down to is that GKD's new MCU/ETC makes changing your timing for best engine performance as easy as changing your garage door opener code.

(Top) Wendell Hostetler with his Lindbergh Lockheed Sirius scratch-built from his own plans. She weighs 25 pounds and is powered by a 3 cu. in. Kioritz. (Middle) Another Wendell Hostetler bird, the Turner Special, is also scratch-built. All of Hostetler's plans are available. (Bottom) Balsa USA Fly Baby built by Kenneth Russell. He made the tail section removable. A Quadra 35 hauls this 19 pounder around.

I haven't gotten my hands on one of these brand new units yet, but I do know that George doesn't market anything unless its been tested extensively . . . in the air, where it counts.

Some of the MCU/ETC's feature are:

1. 36 mode selection with a seven-position DIP switch.
2. Uses one magnet and one Hall switch.
3. Will interface with CH, Tran-Sil, A&R, RC and GKD CD ignitions.
4. Uses ignition battery pack.
5. Plugs in series with Hall switch and CD unit.
6. Nothing is coupled to your throttle.
7. Measures engine rpm and calculates timing.
8. It's small (2.8xl.35x.75 inch) and weighs 2 ounces.

More on this new unit as soon as I've had a chance to wring one out.

(Top) Bill Forsyth and his 84-3/4", 15-pound Pietenpol. An O.S. FS-90 is a great match with this airframe. (Middle) This well-flown 18-pound Pogo belongs to Bob Redinger and flies with a Q-35 up front. (Bottom) A Q-35 powers John Vogel's Christian Eagle, which weighs 19 pounds.

PFM

Did you ever get the feeling that, somehow, the rest of the world has passed you by? Well, that's how I felt by the third time I was asked about PFM (at least when the second guy asked I knew it was a glue or at least some kind of adhesive).

Then to my rescue came The Big Elf From The Olympic Rain Forest with a sort of PFM product review. In real life the Big Elf is actually mild-mannered Fritz Bruning, who spends much of his time browsing in places no one else knows about.

Let me share his findings:

"When last I wrote, and later we spoke, I told you that our club had acquired quantities of PFM adhesive marketed by Greg Namey of Innovative Model Products and, more recently, Hobby Lobby.

"In the week that I have been using this stuff, I've put it to about every modeling application I could think of with very satisfactory results. It's a good product!

"It thins with Xylene (commercially: Xylol) and Toulene (commercially: Toluol) to about any consistency you would want for about any application you can think of . . . except for foam, which it eats. And it is fuelproof."

Fritz didn't mention it, but this stuff dries in 30 minutes and is waterproof. It's also touted as being great for permanently patching fuel tanks, gluing in servo rails, forming waterproof and fuelproof seals, gluing canopies in place, etc.

SCALE DOCUMENTATION

Bob Banka's Scale Model Research keeps growing. This time he's added over 225 new scale goodies to his inventory . . . which means that they now have over 3,000 different Foto-Paaks with more than 90,000 photos. All are 3-1/2x5 full color photos showing the details of landing gear, instruments, hinges, flaps, paint schemes and markings.

According to Bob this is the world's largest collection of full color aircraft documentation photos and Koku-Fan three-views. So if you're into scale and need any kind of documentation for that new (or old) pet project, including Schneider Cup Racers, SMR can probably help.

And did you know that the pictures are sold on a satisfaction guaranteed basis?

You can get a catalog by sending $4.00 (foreign orders add $3.00 for A/O postage) to: Bob Banka, Scale Model Research, 2334 Ticonderoga, Costa Mesa, CA 92626; (714) 979-8058.

THOUGHT OF THE MONTH

You're old when you sleep in twin beds and like it!

Al Alman, 1910 154th Street Court South, Spanaway, WA 98387; (206) 535-1549. This is still "building" weather for most of us, so be careful when using those power tools and sharp blades. I don't know about you guys but old age seems to have made me more accident prone. Even though I try to be very careful my poor fingers are bearing the brunt of all this. ***MB***

FREE FLIGHT

BY BOB STALICK

HIDE THAT BLUSH!

Blushing! No, not that kind! This has nothing to do with your first kiss with the cute neighbor girl. Nor does it have anything to do with the noises in your digestive tract. This is the real thing: that white, milky looking hue embedded in your newly doped silk covered wing. It may not affect you if you live in an area of the country where the humidity is always low or the temperature is usually warm to hot. However, for most of us who live in the wet zone or near large bodies of water—such as the Pacific Ocean—It is a continuous problem.

Mel Marcum, who is the editor of the Eugene Prop Spinners newsletter, noted in a recent issue:

"With the coming winter weather come painting problems when finishing your favorite model. The Sig catalog has some good ideas on what the various paints (dopes) do and how to handle high humidity conditions such as we have here in the Northwest.

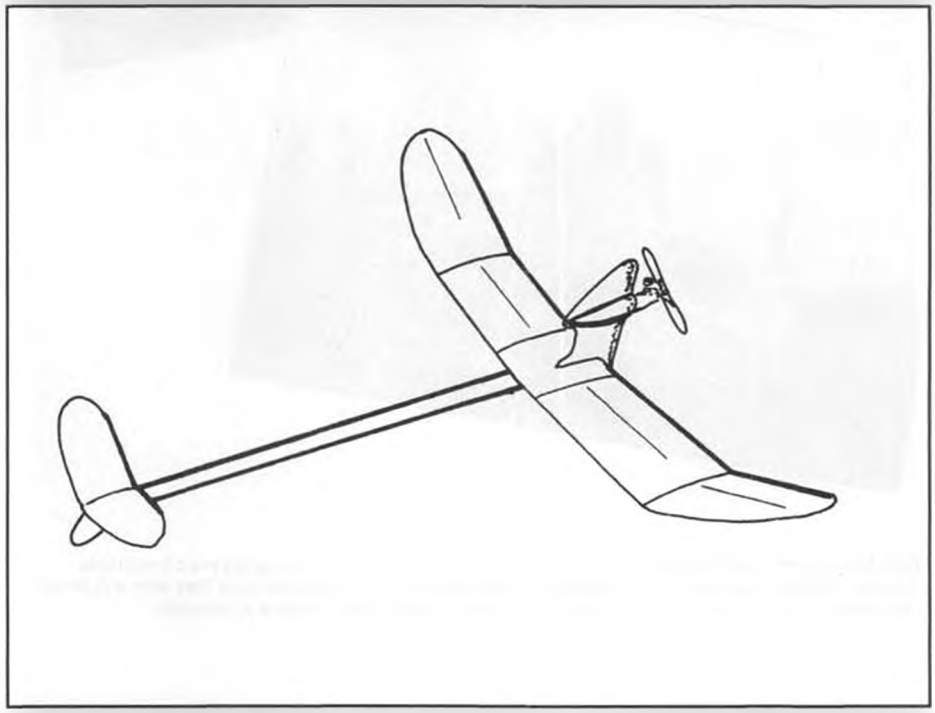
"I spray paint all my models and find that the thinning of the dope really sets you up for blushing. I am told the thinner is the culprit. The Sig article says to try harder instead of thinner. I have tried this, and it does work.

"Also I watch the weather channel on TV to keep track of the humidity for the day I am painting. I never spray unless the humidity is below 50%. This means being patient and waiting until the right time. Also, I have found that retarder does work, and you can use up to 10% retarder in your dope. Use the retarder before putting any thinner in the dope and check to see if you have the right consistency for spraying. If not, add thinner until it is."

Another trick is to use a slower drying thinner in your dope. I use Acme Pro-Quil #302 Acrylic and regular lacquer thinner. Acme, and other brands, are available from

(Left) Greg Davis from the Vancouver, B.C. area, built the Stardust, a featured three-view in Model Builder last year. Design is by Don Wensel. Ship flies in the Nostalgia event. Greg tunes the K&B Greenhead .15 for an official flight. (Right) Nigel Tarvin, Vancouver, B.C., came to the Williamette Modelers Meet with this beautifully tissue-covered version of the V-Tailed Swallow, a British Free Flight design that Nigel has converted to RC assist. Power is a Cox reed-valve engine. Won Concours d'Elegance at NW Old Timers Champs.

MARCH MYSTERY MODEL



your local auto paint store at a price much lower than that charged by the hobby industry for similar products. I pay around $6.50 per gallon. At any rate, these thinners are available in both faster and slower drying rates. Under normal conditions, the regular drying rate, such as #302 Acme, is just right. But during the wet season, a slower rate would reduce blushing, just the same as adding retarder to the dope.

Finally, I just purchased an Indoor Thermometer/Hygrometer from Radio Shack. This unit, which sells nationally at $29.95, measures from 0 degrees to 150 degrees and relative humidity from 25% to 95%. According to the hygrometer, dry conditions exist when the meter reads under 45%, and wet when it reads 65% or more. I have had the unit for nearly a month, and it has yet to read below 60% in my shop. So, as you can guess, I have done absolutely no doping recently.

For those of you who do have one of the Sig catalogs, it would be a good review for you to read the page on using Sig dope on your model, even if you don't have blushing problems in your area.

FEBRUARY THREE-VIEW: STAMOV'S F1A WITH BUNT SYSTEM

It has been quite a few months since I have featured a Nordic glider as a three-view. This particular one was included in a recent issue of the Phoenix Model Airplane Club newsletter, Sal Fruciano, editor. Here's what Sal has to say about this glider:

"Victor Stamov's recent visit to the USA (Livotto and Sierra Cup) gave us an opportunity to witness yet another Soviet innovation and development in F.A.I. model competition.

"The idea of a bunt on F1A models is now a reality. Witnessing the performance of this stunt, done properly, always brings applause from the gallery. Best description: *Spectacular!*

"Stamov's model deserves careful consideration for its innovative construction. It flies very well even without the bunt maneuver. The newest Soviet move is toward the use of more plastics. Carbon fiber, Kevlar, and fiberglass abound in their latest F1A and F1B ships. Adrukov stated they have abandoned the aluminum skins except for F1C because they are too sensitive to damage. The newest skin technique is 1/2 mil Mylar, with tissue added by use of contact cement. This covering is applied to structures that include a Kevlar D-box, thin C.F. outlines, and 1/32 balsa ribs capped with .003x1/16 C.F. This makes for a tough, durable, waterproof airframe, with a greater degree of conformity to airfoil shape.

"The bunt maneuver is timer actuated. On application of the full 4kg (10 lb.!) hook release pull, the stab assumes an additional 1/16 inch negative incidence, providing a tremendous nose-up attitude while still on the hook. Upon release, the timer is actuated 1.2 seconds after release to provide about 1/4 inch positive stab position for a split second. The result is a vertical climb off launch of 50 to 75 feet, then a bunt into level flight. Make no mistake, this is not recommended for beginners or the faint of heart. When properly executed, this is spectacular. A goof-up is disaster.

"Also noted in general use are compartmentalized timers and other mechanisms, with cover, for efficiency and cleanliness. Timers on F1A all now utilize the 'Archimedes Spiral.' Wing wires are tapered 3/16-inch steel. Stab mounts are elevated."

A couple of notes about the three-view. As you look over the drawing, one item pops into view quickly, and that is the wing construction. The leading edge is truly a D-box with two layers of pre-preg carbon fiber covered with 15-micron (1/2-mil) aluminized Mylar. The ribs are 1.5mm (1/16-inch) balsa with C.F. caps on top and bottom. The T.E. is carbon fiber strip. The spar is hard balsa vertical grain between the C.F. D-box.

The stabilizer is standard model practice construction. Note that the stab overhangs the rear of the model. The manner by which the VIT arm fits the stabilizer is not clear in the drawing, but it fits into a slot cut into the centerline of the stab. Covering of the stab is 1/2-mil aluminized Mylar with white tissue on the top only from the leading edge to the

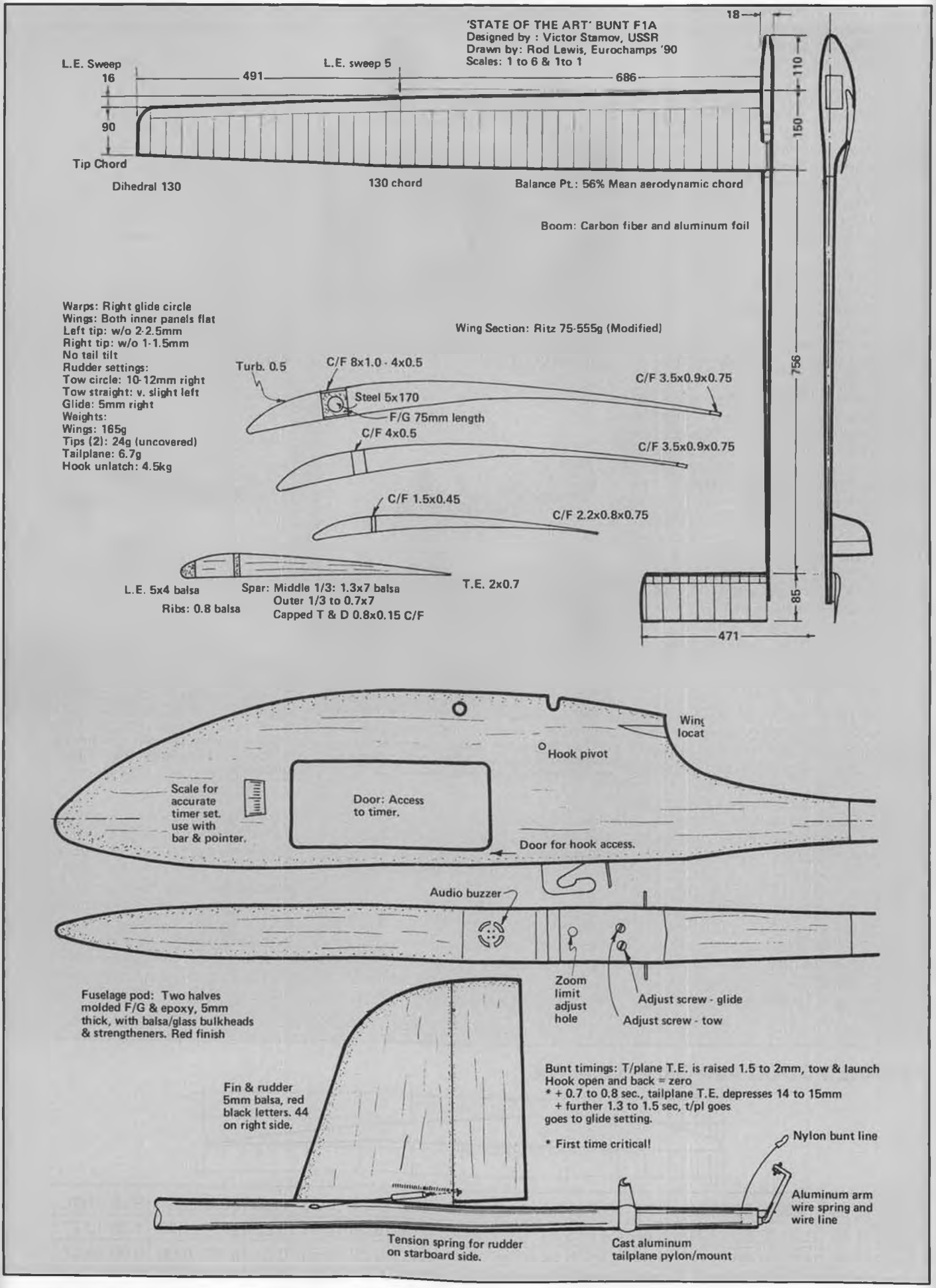
Mark Sexton poses with his P-30, the Dandy Diamond. Ship was designed by Phil Hainer and is a good flier, as Mark placed second in a field of 12 P-30 contestants.

B-C Nostalgia winner Ron McBurnett poses with his Top Banana 800. Ship is powered by a Johnson .32. This is a terrific combination, and the Banana has a marvelous glide.

Wes Funk made the trip to the NWFF Champs to fly this 1/2A Zeek. Wes had a few troubles with the Reed Valve Cox engine, but the Zeek is a good performer.

DARNED GOOD AIRFOIL — I.S.A. 666

STA	0.00	1.25	2.50	5.00	7.50	10.0	15.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100.
UPR	1.05	2.08	2.60	3.30	3.99	4.47	5.30	6.00	6.40	6.05	5.30	4.47	3.62	2.67	1.70	1.35	0.77
LWR	1.05	0.12	0.00	0.00	0.00	0.10	0.25	0.40	0.65	0.72	0.62	0.50	0.32	0.12	0.00	0.00	0.17


'STATE OF THE ART' BUNT F1A
Designed by : Victor Stamov, USSR
Drawn by: Rod Lewis, Eurochamps '90
Scales: 1 to 6 & 1to 1
L.E. Sweep
16
491
L.E. sweep 5
686
18
110
150
90
Tip Chord
Dihedral 130
130 chord
Balance Pt.: 56% Mean aerodynamic chord
Boom: Carbon fiber and aluminum foil
756
85
471
Warps: Right glide circle
Wings: Both inner panels flat
Left tip: w/o 2-2.5mm
Right tip: w/o 1-1.5mm
No tail tilt
Rudder settings:
Tow circle: 10-12mm right
Tow straight: v. slight left
Glide: 5mm right
Weights:
Wings: 165g
Tips (2): 24g (uncovered)
Tailplane: 6.7g
Hook unlatch: 4.5kg
Wing Section: Ritz 75-555g (Modified)
Turb. 0.5
C/F 8x1.0 - 4x0.5
C/F 3.5x0.9x0.75
Steel 5x170
F/G 75mm length
C/F 4x0.5
C/F 3.5x0.9x0.75
C/F 1.5x0.45
C/F 2.2x0.8x0.75
L.E. 5x4 balsa
Ribs: 0.8 balsa
Spar: Middle 1/3: 1.3x7 balsa
Outer 1/3 to 0.7x7
Capped T & D 0.8x0.15 C/F
T.E. 2x0.7
Wing locat
Hook pivot
Scale for accurate timer set. use with bar & pointer.
Door: Access to timer.
Door for hook access.
Audio buzzer
Zoom limit adjust hole
Adjust screw - glide
Adjust screw - tow
Fuselage pod: Two halves molded F/G & epoxy, 5mm thick, with balsa/glass bulkheads & strengtheners. Red finish
Fin & rudder 5mm balsa, red black letters. 44 on right side.
Bunt timings: T/plane T.E. is raised 1.5 to 2mm, tow & launch Hook open and back = zero
* + 0.7 to 0.8 sec., tailplane T.E. depresses 14 to 15mm
+ further 1.3 to 1.5 sec, t/pl goes goes to glide setting.
* First time critical!
Nylon bunt line
Aluminum arm wire spring and wire line
Tension spring for rudder on starboard side.
Cast aluminum tailplane pylon/mount

spar.

This is indeed a new development in Nordic gliders. It is worth studying for anyone who is interested in the current developments of this model type.

MARCH MYSTERY MODEL

This is one design that can be easily spotted by the newer old timers in the readership. It wasn't too long ago that a number of us were experimenting with oddball thrust lines and other design innovations. One of the more successful of these designers was Keith Hoover. This month's ship is one of Keith's creations from the early '60s. It features Jedelsky all-balsa wing and stabilizer construction. A dihedralled stabilizer is featured. The original was powered by a Holland Hornet. And, for some additional clues, I have even enclosed a picture of the ship direct from Keith himself. So, you think you know the name of this ship, do you? Well, if you do, all you need to do is to write it down on a sheet of paper, enclose your name and address and fire it off to Bill Northrop, c/o *Model Builder* magazine. If you are the first one in line with the correct title, you have just won yourself a subscription to my favorite magazine.

MARCH DARNED GOOD AIRFOIL: I.S.A. 666

This is an airfoil that is perfectly suited to current F1C applications. The section is only 6.4% thick and has a very slight undercamber. The nose entry is slightly lifted. So, what you have here is a very fast climbing airfoil that should give a reasonable glide. Construction will be a challenge, but with modern techniques and materials, I am sure that it can be made quite stiff to withstand the stress of high speed climb.

Give it a try on your next power model. You should be pleasantly surprised.

FREE FLIGHT RULES CHANGES PROPOSED—READ 'EM CAREFULLY

Front view of Keith Hoover's VHTL model, this month's Mystery Model. (Photo by Hoover)

Last month, I noted that the proposed rules changes as carried in the November 1990 issue of *Model Aviation/Competition News* had very little for any of us to get

excited about. However, since then, I received the December issue of the magazine and noted several rules change proposals that most gas fliers should oppose vehemently. I refer you to pages 135 and 137 of the December issue of *Model Aviation*.

Specifically, look at proposals FF-92-22 to FF-92-27. All of these proposals, submitted at least in part by contestants who typically fly Cat. III, call for reducing engine runs for AMA FF power events. The first three proposals call for reducing Cat. III engine runs from 7 to 5 seconds, Cat. II from 9 to 7 seconds, and Cat. I from 15 to 12 seconds VTO/ROG and from 12 to 10 seconds hand-launch. All flyoff flights would require an eight-second hand-launch with 5 minute maximums throughout. The latter three proposals would change Cat. III engine runs from 7 to 4 seconds, Cat. II from 9 seconds to 5 seconds, and Cat. I from 12 seconds to 8 seconds-no VTO even included. Maximums in Cat. I would remain at 5 minutes with no decreasing engine runs.

Why should we seriously oppose these changes? The reasons are simple. In reducing the engine runs to this level, the emphasis for all contestants will be upon the most powerful engines, thereby giving newcomers and others who do not have or care to invest in screaming Schnuerle VIT equipped models even less of a chance to compete with those who do. Consequently, it will decrease even more the number of contestants who will be willing to enter FF power events. For Juniors and Seniors, it will serve to eliminate their participation. Finally, in the case of Cat. I events, pegging the max at 5 minutes with 8 seconds of engine run means that some flyoffs could continue until dark. My suggestion is to either continue to decrease the engine runs or allow the max to increase as at present.

I strongly urge anyone who cares to write to his District FF Contest Board Member (listed on page 136 of the same issue of *Model Aviation*) to let him know how you think he should vote on these proposals. Tell him to vote "no." Leave well enough alone.

If some individuals want to fiddle with the engine runs due to peculiar conditions in their flying areas, propose a Cat. IV and a Cat. V with the engine runs desired. But don't ruin the current events for the rest of us.

As you look through the other rules changes, you will not that most of them are simple and straightforward. Proposal FF-92-19, affecting Mulvihill flyoffs, will serve to limit the number of flights necessary to obtain a winner, as it increases the flyoff maxes by two-minute intervals rather than the current one minute. Probably a good idea.

One final note on proposed rules changes. Look at proposed scale rule, SC-92-16. This would establish an indoor RC event—Indoor Electric RC Scale. Might be fun, but I wonder whether any of the indoor types will notice it, as it is submerged in the better part of three pages of scale rules proposals.

SCATTER RETURNS

Just a month ago, I noted that *Scatter*, the newsletter of the Southern California Aero Team, had published its last issue. Craig Cusick, editor, had put in his time at the helm and was calling it quits. Now, a new issue of *Scatter* has arrived on my doorstep. This time, longtime free flighter Bill Bogart has picked up the charge. It seems as though the new issue picks up right where the last one left off—without skipping a beat. It sure is nice to see *Scatter* back. It is the best newsletter source of F.A.I. doings published in the US. If you would like to receive *Scatter*, send a check for $15 to Bill Bogart,

14837 Los Robles Ave., Hacienda Heights, CA 91745. I am sure that Bill wouldn't mind it if you were to send him news of F.A.I. doings in your area while you are subscribing.

INDOOR FILM CUTTER AVAILABLE

Just received a letter from Plenny Bates, noting that he now has available a surgical cautery unit that is equipped with a temperature control and cuts film covering material without burning the balsa. He notes that you can receive a five-page info pack for $1.00 plus 25 cents postage, or a complete unit with info pack for $15.00 postpaid and an SASE.

Plenny encourages folks to order the info pack first so that you know what you are getting. If you are having difficulty or would like to improve your ability to trim indoor film coverings, you should drop him a note at 2505 White Eagle Trail S.E., Cedar Rapids, IA 52403.

CAMPBELL'S CUSTOM KITS

I recently received three new sample kits from Lee Campbell, and they are beauties. The newest design of the whole bunch is Dave Platt's Slow Worm 432, designed for .09 to .15 engines.

Other new issues are the Rambunctious 260 and Rambunctious 480. Both of these ships are high thrust-line models designed by Richard Mathis and have a long history of contest wins dating back to the 1970s. The 260 is perfect for Cox .049 and .051 engines. The 480 is intended for anything from a .15 to a .25.

As usual, the kits are professionally cut and include all the balsa, plywood, and metal parts needed to build the model. The Rambunctious 280 also includes Japanese tissue covering material. Lee's kits are among the very best in the industry, and if you've never tried one of them, these new issues would be an excellent place to begin. Price for the Slow Worm Kit is $49.98, the Rambunctious 260 goes for $29.98, and the 480 sells for $53.98.

Lee also has some thin-wall surgical tubing that is especially well suited for the Cox .020 or for anyone using a low powered timer, such as the Tomy. This tubing goes for 60 cents per foot, or 10 feet or more for 50 cents per foot. Nice stuff. Lee packages 3-48 hardened hex screws perfect for the Cox .020; three of them with a wrench will set you back a mere $1.75. Similar setup for the Cox .049-.051—four 5-40 screws with wrench for $1.75. All of this, plus a new up-to-date catalog, can be yours from Campbell's Custom Kits, 401 Executive Center Drive, H-108, West Palm Beach, FL 33401; (407) 686-7824.

1990 *NFFS SYMPOSIUM*

I just received my copy of the 1990 *NFFS Symposium*. This is the 23rd year of this publication, and it is super! Contained therein are 129 pages of both technical and popular information all about free flight. Some insights: High Thrust Designs, Winglets, Rubber Energy Storage, P-30U, Nordic Wing Designs, and Stiffness Testing Balsa are but some of the titles of the articles. Also included are the NFFS Hall of Fame, Ten Models of the Year, and a list of International and Nationals winners from a long time ago, and finally a list of all of the Top Models of the Year. It's all there. You want a copy? Contact Fred Terzian, 4858 Moorpark Ave., San Jose, CA 95129. For the 1990 Symposium, the cost is $16.00 plus postage costs of $2.00 for fourth class or $3.50 first class in the US. Fred also has a complete listing of other NFFS publications, including past issues of the *Symposium* all the way back to 1972. If you are interested, contact Fred with an SASE.

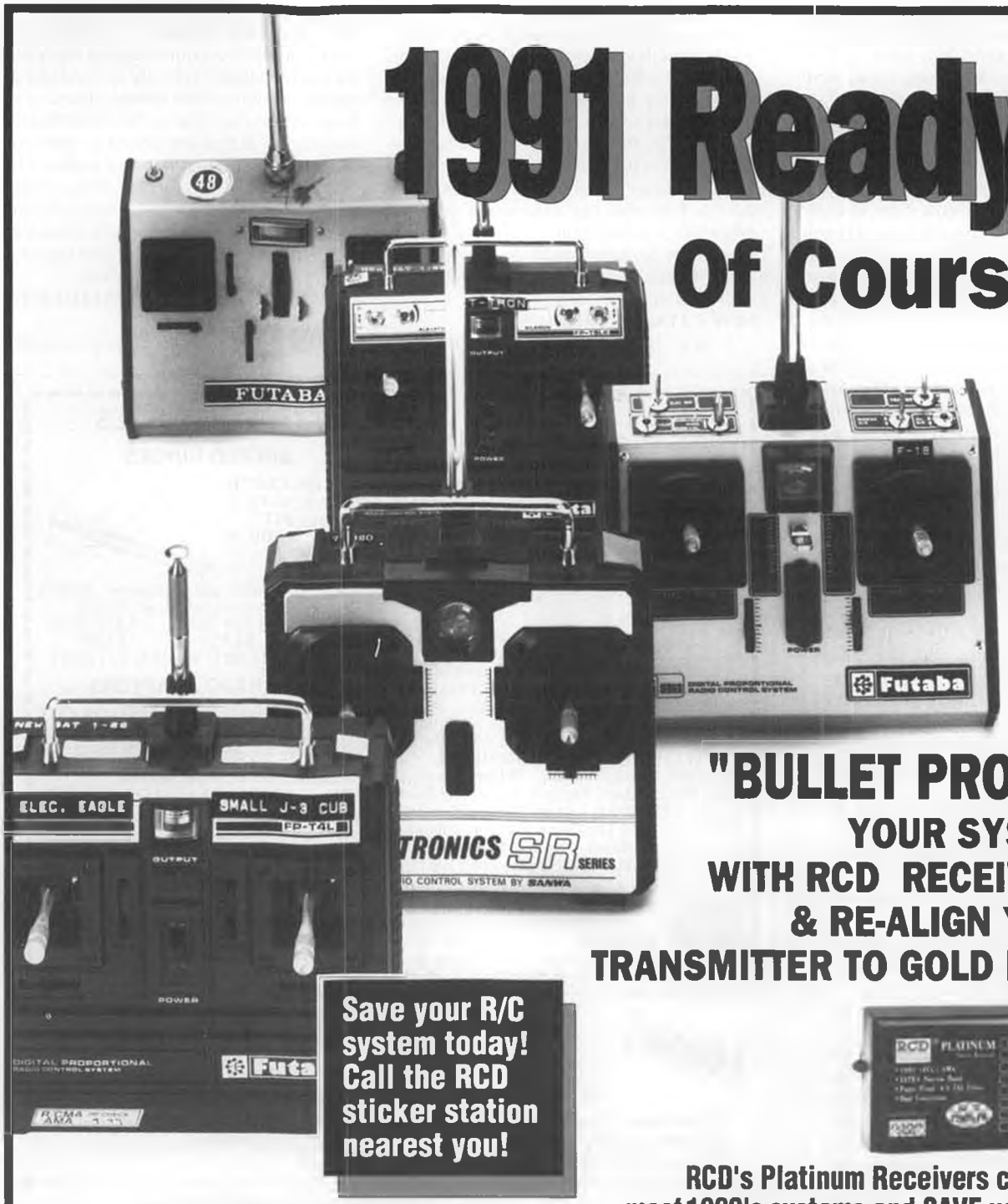
NEW CATALOG FROM CST

A new catalog is now available from Composite Structures Technology (CST). Matt and Gail Gawain, proprietors, now have complete vacuum bagging equipment for model builders who are in need of it and haven't known where to look. These, and a neat five-function Circle Towhook that only weighs 9.5 grams, are added to their complete supply of fiberglass and carbon fiberglass products. I suggest that you call Matt or Gail at (805) 723-3783 for more information. Or drop them a letter with a buck and order their new catalog. The address is P.O. Box 4615, Lancaster, CA 93539.

HOW I GOT STARTED IN FREE FLIGHT, By Granville Andrews Jr.

continued on page 49

1991 Ready?
Of Course!



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BY RICK ALLISON

PERFORMANCE ANXIETY

How important is mental preparation to the contest flier? I'm often asked this question in several forms, such as "How do you handle nerves?," "How do you get ready for an important flight?," and even, "How do you remember to breathe?"

The answer I often give is that they are asking the wrong guy, because I get just as nervous as anybody else! The old joke about remembering to call your maneuvers loud enough so that the judges can hear over the sound of your knees knocking is funny to all of us simply because the experience is pretty much universal.

Basically, what we are talking about here is what the psych boys call *performance anxiety*. Anxiety is a funny thing. A little bit has the effect of tuning you up, sharpening your reflexes, getting your mind fixed on the job at hand—getting you ready for a maximum effort, in other words. Your mouth dries out, your heart rate speeds up, blood is diverted from the internal organs to the skeletal muscles, your eyes dilate to admit more light and enable you to see better, and you are ready to either face or flee from whatever steps out of the jungle. Good enough. You are reading this today because your distant ancestors took their job of not being processed into lion manure very seriously.

(Above) Les Bollinghagen's Checkmate. See text. (Left) EQ60 Bolly pipe on Les Bollinghagen's Checkmate.

Your body doesn't always know when to quit, however. Anxiety can easily get out of hand. Your heart pounds, your muscles tighten until fine motor control (like your thumbs) is impaired. Your vision gets a little fuzzy from all that light, and the brain that was so focused and working so well just a little bit ago is paralyzed with indecision. You can't seem to make little things work, like your lungs or your vocal cords. Mild, beneficial performance anxiety has progressed through the panic stage to terror. It is now your turn to fly.

Sound familiar? Most of us, at one time or another, have had to deal with being a little too anxious for our own good on the flight line. The ideal is obviously to be able to consistently achieve in front of the judges 100% of what we are capable of doing in practice. Nice theory, you say, but walking out front to fly with the contest on the line has a tendency to shrink your underwear. What do you do about it?

The answers are pretty individual. Some guys find relief in ritual. Stuff I have seen includes always wearing the same shirt, lucky hats, lucky pins, socks on inside out (honest!), never talking right before a flight, constantly talking right before a flight, arranging the starting equipment and airplane in a particular pattern in the ready box, and about a hundred other little odd rituals. This can help, especially if the pilot believes it helps. The soothing effect likely comes from just repeating familiar actions.

Other guys take the Zen approach. They

Mike McConville and "Desire."

meditate, recite little mantras to themselves, listen to soft music on the Walkman, listen to heavy metal on the Walkman, practice self-hypnosis, regulate their breathing, do yoga exercises, commune with their navels, and otherwise attempt spiritual union with the gods of RC flight. This works too, especially for those who believe in it. I sort of lean in this direction myself. The idea is to balance your anxiety with relaxation, and not let your emotions take control. Great stuff if you have the skills and self-discipline to make it work for you.

The psychological approach is big right now in pro sports. Positive imaging, casting out the negative thoughts (like crashing, pushing wrong rudder, forgetting how to do a maneuver, having a midair, etc. Need I go on?), and seeing yourself put in a great flight. Good stuff here too. Even if you can't see yourself winning the Nats in a glorious walkover, it can help to just spend a little quiet time before a flight thinking good thoughts about the pretty maneuvers you have flown in the past.

All this stuff is just window dressing, however. There is no real substitute for the confidence that comes from adequate preparation. All those repetitions in practice have the effect of drilling the task deep into your innards. Come contest day, your mind may be confused and scattered out there, but your fingers and thumbs will seem to know what to do. After they pull you through a couple of times, you learn to trust them a little. Your confidence level goes up, and your anxiety level goes down. Contest experience is the other side of this coin. The more times you walk out there, the more comfortable you will be. It really is as simple as that.

Two things to remember. One, if you can't do it in front of the judges, you really don't know how to do it yet. And two, if none of this stuff works for you, you can always buy larger underwear.

• • •

To completely change the subject, have you ever done something incredibly dumb and embarrassing in public? No, not that! Everybody does that at one time or another, but most people just move upwind quickly and politely ignore it. I'm talking nuclear doomsday dumb here.

Not so very long ago, I very nearly lost a brand new airplane due to terminal velocity brain fade, and because my pure and idealistic nature inclines me to believe that exposing my horrible example may possibly save an innocent airplane or two out there, I'm going to tell you about it.

I am in the habit of using extra capacity aftermarket battery packs in most of my aircraft. I have been doing this for about six years, because some time back around then I lost several aircraft simply by having too much fun and overflying the Rx batteries. A quick calculation convinced me that I could nearly double my flight time on the airborne system if I didn't mind a little extra weight. I bought some packs, plugged them in, and went flying. Over the years since, I've purchased several more. Of course, aircraft in the stable come and go, and radio components get switched around, stuff gets shoved to the back of the drawer, etc. You know, normal stuff. Normal for me, at least.

My big packs worked great, and as the battery cycles kept coming up roses, a terrible thing gradually happened to me. I strayed from the paths of electronic righteousness and became a shameless and vicious battery abuser. Battery cycles became few and far between. Aircraft were left on charge at the standard C/10 rate for weeks at a time. Packs were allowed to completely discharge under full load (switch left on, right?). Brutal fast charges were performed. I decided all the so-called experts must be behind the times, and that modern, good quality NiCds were completely idiot proof.

I kept no charge/cycle records. The

(Above left) Dennis Breene holds his modified Bridi Escape. (Above right) Gordy Jack, a Canadian FAI flyer, shows off his "Legacy" design. Good turnaround machine popular in western Canada. (Left) Canadian Pete Thannhauser and his Eclipse.

dreaded "memory" never formed, and the planes kept flying merrily along. Every so often, I would come home from a 12-flight day, and out of curiosity, throw the ship on the cycler to see how much time was left on the pack. The cycler would tell me at least another six flights, and I would smile and nod, serene in my wisdom and complacency.

Time passed, and a brand new pattern airplane with a brand new computer radio accompanied me to the field. Buried in its innards was one of my trusty old big packs, freshly fished out of the back of the drawer, cycled, and fully charged (for about a week, I think. It was raining, you see, and . . .) for the occasion.

The sun shone, the breeze was light, the day was mild, and *the range check was good.* I put it up, and man, it flew solid! Good straight airplane; very little trimming to do. Only trouble was, the darn throttle servo was behaving strangely. It kept coming back to low throttle. I landed and took a look at the thing, but everything seemed fine on the ground. I took off again, and things were OK for a bit, and then it happened again. Very annoying. I'd pull the throttle down, push it back up and everything would be fine for about 30 seconds . . . *30 seconds!* The section out of the radio manual on low airborne battery warning that I had read the previous evening flashed up on the idiot screen in the back of my mind, and I set a new Northwest fun-fly record for Fastest Time to Land on the way down.

Safely back at the flight box, the bird immediately failed the range check at 10 feet. I plugged in the ESV, which indicated completely off the scale to the low side. We tried another ESV of different make; same story. Later, at home, a check with a digital voltmeter gave a reading of 3.7 volts (!) for the airborne pack. It is truly amazing what a modern radio is capable of, even when almost totally deprived of electrons. There was no doubt about the fact that one of my trusted and previously bulletproof battery packs had finally let me down.

Being the curious type, I wondered why the thing had let go with no warning. After all, hadn't I always fed it well? The cycle I'd done before installation had come up about the same as always. I called NiCd battery expert Larry Sribnick of SR Batteries for some answers.

Good guy, Larry Sribnick. He even talks to idiots. I learned:

1. Continual overcharging is bad for batteries. It makes them hot, and they don't like to be hot. Hot is a major NiCd no-no. Actually, I knew this; I just ignored it. I was a victim of battery denial.

2. NiCds grow old and die, and sudden death by internal shorts resulting from crystalline build-up on the plates is not uncommon. So many charge/discharge cycles, and that's it, Fred. As a NiCd cell is used and ages, it consumes negative plate area while dishing out those delicious electrons your radio is so fond of. The average NiCd Rx pack is good for about three or four years of normal service if well cared for. The pack that quit on me had been in constant, heavy use for *over six years* while being viciously abused in every possible manner, including at least two crashes. It was so old that the insulation on the connector wire was stiff and cracked. Larry tactfully expressed the opinion that the pack didn't owe me much, especially since I had taken such wonderfully good care of it.

3. If you really want to know how good your older battery might be, fully charge it and let it set for about three days before you run the discharge cycle. If the pack is more than 20% down from its rated capacity, you've likely got some internal shorts, and it may be time to shop for batteries. Or a new plane.

4. Modern, good quality NiCd packs are *not* idiot proof. They are, however, pretty tolerant of a wide range of conditions, temperatures, and installation/storage procedures. As in my case, this sometimes includes ignoring frequent and prolonged attacks of silliness on the part of their owners.

What did I do? Well, I took a firm pledge to never again be so silly about batteries. And I bought a new batch of packs to replace the old batch, on the theory that batteries are cheaper than airplanes. That Larry is some salesman. Good thing he doesn't run an aluminum siding business. I haven't painted the house in years.

More important news on the pattern home front. Tom Dixon, the Bolly prop guy for the USA, is turning the Bolly line of props and pipes over to Randy Smith of Aero Products, effective immediately. That is, by the time you read this, the move will have been history for several months already. Tom says he made the move to simplify a life that had gotten a little too crowded. I can certainly sympathize with that. Like Dave Brown is fond of pointing out, it's a great life if you don't weaken! Tom is using the time freed up to get his new line of control line kits well launched.

Tom tells me that Randy is a very savvy fellow, and the same range of custom services (repitching, reworking, etc.) will be available. Among other chores, Randy did the custom prop work for the last USA CL Stunt Team, so he should know what he's doing. The new address for the good stuff is Aero Products, 1880 Scenic Highway, Snellville, GA 30278; (404) 979-2035. Visa and MC are accepted.

Speaking of the Bolly stuff, there are a couple of photos of Bolly owner Les Bollinghagen's Checkmate around here, direct from Australia. The pipe shown is the Bolly EQ 60, of which I have made mention in past columns. I thought you might like to see what it looks like.

Just in from Ohio are photos of well-known FAI flier Mike McConville new "Desire" design. Vital stats are 840 squares, 64 inch span, 66 inches long, 8 lbs. This airplane is a bit unusual in that the pipe is located above the low mounted one-piece

continued on page 61

PLUG SPARKS

BY JOHN POND

SAM SPARK PLUG AWARD


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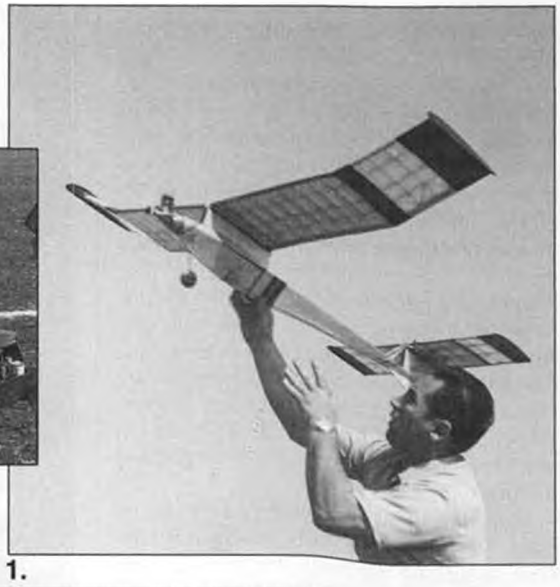
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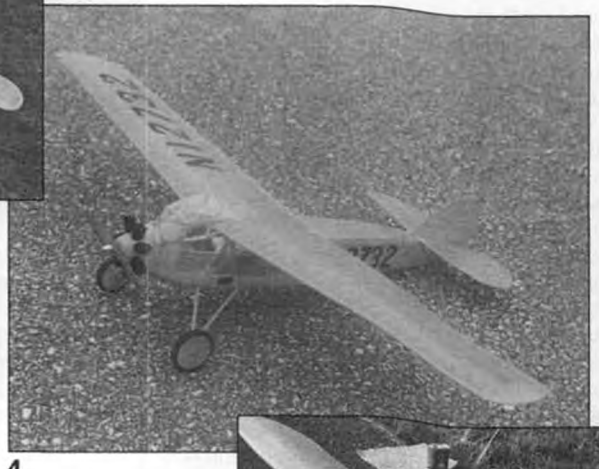
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This month's column will feature a new item, one that has been lacking all these years. This columnist would like to start a "SAM Spark Plug" award for those fellows who will probably never receive the proper recognition due them. The writer is referring to those hard working, unselfish members who have contributed mightily to the development and growth of SAM proper. This recognition will in no way detract from the present SAM Hall of Fame awards. This columnist feels that the "Plug Sparks" column is an excellent spot to acquaint the readers with the various people who have so unselfishly contributed all these years.

What else would be more appropriate than to nominate my longtime friend, William Bowen, for the initial recognition of a "SAM Spark Plug." For those unaware of Bill Bowen's help, let it be said he has been Pond's traveling companion to most all the major SAM meets, in many cases helping to organize and participate in those meets.

As part of Bowen's background, it should be noted that there are three Bowen boys: Bill, Bob, and Jack, in the order of their age. When the idea of an Old Timer meet was first proposed back in 1960, these brothers formed the backbone of the Stockton Gas Model Association that heavily backed the original Stockton Old Timer Contest.

In the last five years, Bill has taken it upon himself to run no less than seven O.T. RC contests a year in conjunction with the Northern California Free Flight Council (NCFFC) meets. Because of his efforts, the NCFFC treasury has expanded from a meager $100 or so to over $1500. Bill does everything: brings all the equipment, organizes, and runs at least six O.T. events each time.

One final endorsement for Bill Bowen is the little-known fact that he has been involved in model aviation since 1936. He and his brothers were the original founders of the Oakland Cloud Dusters, with meetings being held in the basement of their father's home.

All three brothers have been connected with modeling up to the present, with Bob and Jack belonging to and attending MECA Collectos. No question about it, we have picked the right man for the initial "SAM Spark Plug" award.

AMA FREE FLIGHT CHAMPS

Held at Lawrenceville All-American Air-

port in conjunction with regular SAM F/F events and the SAM 57 Variety Club O.T. RC Contest, this well attended meet suffered the same fate as the SAM Champs at Westover AFB earlier in the year. With a strong, cold wind dominating the action, many elected not to fly. By the third day, with reports of an impending rain storm, a considerable number of contestants (including this reporter) left Thursday morning.

RC Flying on the first few days was limited to the hotshots and trophy hounds. However, there were some interesting aircraft to be found, such as the unusual Gee Bee "Ascender," the handiwork of Hale Wallace, well known RC scale modeler. Quite a crowd gathered when Hale decided to fly his odd 1/2A Scale Texaco entry. For those interested, the model appears to want to fly; however, Wallace was unable to get the model off the ground, The general opinion (and this writer's also) was that the forward elevator was not set at a sufficient amount of positive incidence. Anyone who has flown twin pushers or single stick pushers has found the forward elevator must be set at an angle of four degrees or better. Hale says he will try it again.

This latest craze, RC 1/2A Scale Texaco, is taking off like mad. Walt Geary is so enthused by this new event that he built four models and showed up with three (the first, a Waco biplane, was lost previously). In reports on flying, the scale models are sometimes registering better times than the standard O.T. 1/2A Texaco models. Great stuff from a flying scale enthusiast's viewpoint!

Also seen at the SAM 57 Variety Club portion of the Lawrenceville Champs was a Miss Delaware built by George Brenchly, brother of Bill Brenchly, who is generally RC CD at the SAM Champs. This RC version is powered by a Saito four-cycle engine. George reports it flies well.

Compare this version with the Miss Delaware II built and flown by Charlie Thuet.

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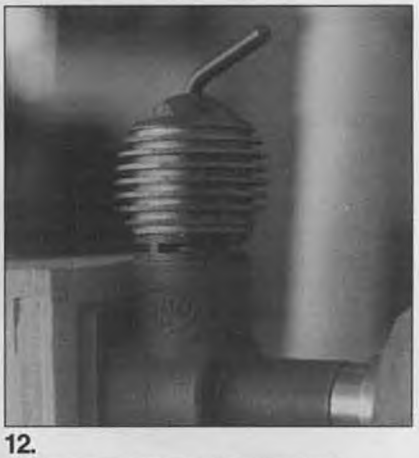

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(1) Our initial nomination for "SAM Spark Plug" is Bill Bowen, a modeler and active O/T flyer since 1936. (Gene Pond photo) (2) Whatta pal! Always willing to help, Bill Bowen restrains Pond's hot Playboy Senior while holding the watch. (3) What? Yes, it's a 1/2A Texaco scale Granville Bros. (Gee Bee) Ascender, by Hale Wallace. (4) Walt Geary built this excellent Cessna CW for O/T RC Flying Scale. These things fly! (5) Stephen Kowalik design, a Miss Delaware, by Robert Brenchley of San Jose, CA. *MB* has plans. (photo by George Brenchley) (6) Charlie Thuet has been flying this Miss Delaware II successfully for a long time and has won plenty of trophies. (Brenchley photo) (7) George Aldrich (left) checks out his Comet Mercury before launching. (Abell photo) (8) Great flying O.S. 90 four-cycle powered Custom Cavalier by Art Hillis. (Groscheider photo) (9) Beautiful shot of a Melvin Yates "Herky" seen with Ed Rangus, Orwick 64 power. (10) A Curtiss Wright Aero Inst. "California Chief" MK A-2 by Brad Allen, seen at Madera Circle Meet. (11) An early Don Burnham Twin Pusher flown by Art Watkins, SAM 21. Good performer. (12) Prototype of the Elfin 2.49 diesels as being produced by Argo USA, for 1991 delivery. (13) Finally, a solution to the twisting fuselage problems of the Snuffy VI by Tom Smith.

Charlie has been very successful with this follow-on design by Stephen Kowalik. The Mk II Miss Delaware employs the same wing and tail configuration of the original with a cleaned-up fuselage. The model is well stringered aft of the cabin section. It also appears the thrust line has been lowered, resulting in a good cowl effect in the nose. One of these days we'll get the plans to this version.

ENGINE OF THE MONTH

For this month's subject we are indebted to Karl Spielmaker and the *Model Plane Annual, 1941-42* for information and outline drawings of the Marvin Jr."A" that was produced after World War II. Some discrepancy is noted as most collectors regard the finned head type engine as postwar, while the book was published in 1941 showing a photo of the finned head model.

This engine was a direct outgrowth of the Dallaire Pee Wee engine. To back up a bit, when Frank Dallaire first produced his successful Pee Wee engine, he was hardly prepared for the demand for his product.

To help production, a Mr. Marvin, an engineer with the Plymouth Division of the Chrysler Corporation, was enlisted to speed things up. Of course, inasmuch as Marvin was a full-time employee of Plymouth, all work had to be done on Marvin's lathe and equipment in his basement.

Naturally, from an engineer's viewpoint, the engine could stand some improvements to facilitate and simplify production. Frank Dallaire gave Marvin a free hand on changes such as the die cast intake and sand cast crankcase, along with several other items such as timer frame, backplate, and exhaust pipe.

As Karl notes in his article on the Pee Wee, Marvin continued to make changes designed to speed production, most notably the three-piece crankshaft where before the crankshaft was hogged from solid bar stock. In addition, the metal castings were changed to 1/3 aluminum and 2/3 zinc for better metal flow.

By the time 1939 came to a close, the Pee Wee as made by Marvin was a considerably different looking engine. In addition, the practice that Frank Dallaire had adopted of running every engine was dropped in favor of spot checking the assembled products.

By 1940, Frank Dallaire had turned over all manufacturing rights to Marvin. In 1940, advertisements for the new Marvin appeared, still looking like the Pee Wee but with spoked cooling fins on the head, a practice of many early engines such as the Loutrel, Tlush, Power Airplane and Boat, etc. The excessive amount of zinc in the casting resulted in many crankcase leaks. Of course, the performance of the engines suffered accordingly.

The drawing we are presenting is a 1946 Marvin Junior A. Photos appearing in the advertising illustrated an Ohlsson type enclosed timer. Other changes consisted of an Ohlsson type needle valve, one-piece cylinder and new style tank. As near as can be determined by Spielmaker, this particular model was never produced in quantity as the features of the 1941 version were retained. Unfortunately, there is no real way to clarify when and if such a model came out as all records were destroyed in a fire in 1949.

This Class A engine (with a bore and stroke of 9/16 in., giving a 14 cu. in. displacement) was a three-port type rated a 1/10 hp and weighing 4-1/2 ounces. Maximum rpm rating using a 9x3 prop was in the 10,000 neighborhood. Priced first at $7.95, the price rose to $9.95 as materials and engines started to get scarce. This still was a considerable reduction from the original Pee Wee price of $14.50 with coil and condenser.

In closing, it is interesting to note that Spielmaker's reproduction of the Pee Wee turned 9,000 rpm with no problem. Still a pretty good figure for those days.

LET GEORGE DO IT

In the latest letter received from George Aldrich, 12822 Tarrytown, San Antonio, Texas 78233, "Gawge" announces he is going back into the engine rebuilding and restoring business. This might be tough on

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(14) A Ted Evans "Rocket" by Swedish modeler Karl-Johan Eiroff looks good and flies good. (15) Tom Charlsworth flies his Lanzo "Stick" and "Bomber" electric models in New Zealand. Great time battling magpies. (16) An electric powered Bill Winter "Vagabond" built by Bill Vanderbeek, SAM 21 V.P. (17) A rare combination: a GHQ engine and a little seen "Ad Astra." Neil Kaminar, SAM 21, showed the boys how!

Aldrich for awhile, but as a modeler who admires good running engines, this is truly a bonanza for those fellows who have trouble starting and running engines. George will be offering custom fitting and rework of control line, free flight and RC engines, with special emphasis on antique ignition engines. Ohlsson .60 engine restoration is something George is tooled up for, especially the intake tube replacement.

George has rebuilt and restored over 27 Ohlsson engines in the last two months. All types and sizes of Ohlsson engines from .19 to .60, both sideport and front rotor models are his specialty. George writes:

"I had a beam type Ohlsson .23 sideport that was brand new, having been in my collection for ten years. I decided to run it, selecting a 10x4 Top Flite Super Maple prop and a fuel mix of castor oil, U-con, and Mobil II turbine oil together with any hi-test unleaded gasoline (Texaco and Exxon work well). On the first run, the engine turned 10,200 rpm! Here was a real bear from the start.

"Old buddy, Jim Reynolds, heard about this Ohlsson .23, so I sold it to him. It wasn't long after that I again heard from Jim saying the engine had tightened up and would only run thirty seconds before slowing down. This performance (or lack of it) was obtained using his standard fuel. I suggested he use 25% castor oil but the engine still overheated after 45 seconds.

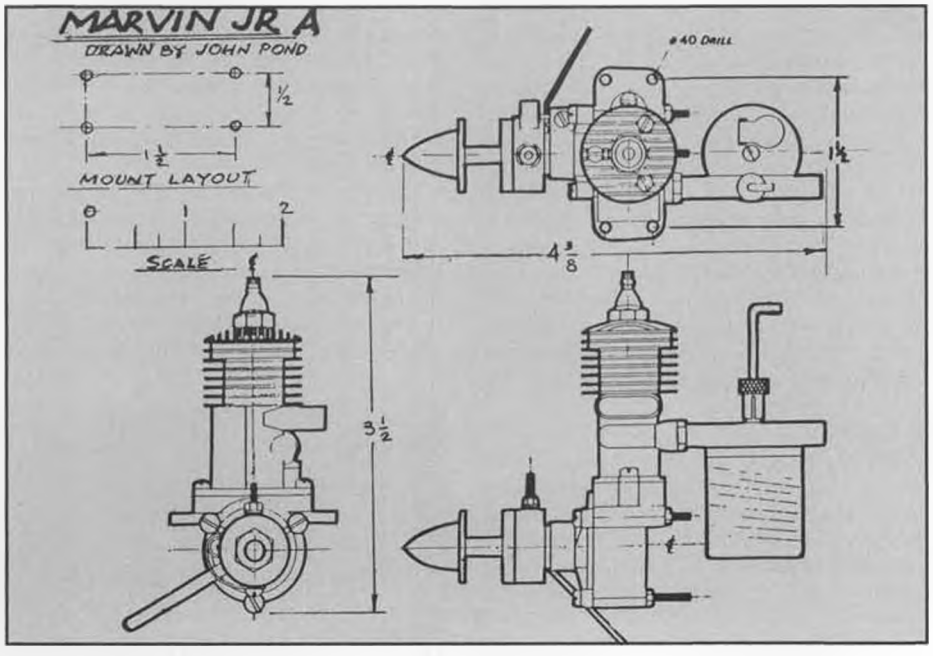
"Finally, Jim made up a 3:1 mix using 70 wt. oil. The Ohlsson ran out the whole tank at 9,600 rpm! If there was ever any doubt in my mind as to why we have found thousands of old engines to use and collect (and in good condition), I don't have any now. The 70 wt. SAE oil is the best lubricant for certain!"

George is now trying to get more power from gasoline fuels. The aforementioned fuels when mixed with 70 wt. oil have given him 25 to 35% more punch. Of course, George will get a lot of flak on this from the castor oil boys (this writer included) but this is what makes this Old Timer game interesting.

Aldrich also reports he has two Burford (Australian) diesel engines, an Elfin 2.49 and a G.B. Sabre 250. Both are fabulous engines according to George. He uses an APC C-2 9.5x4.5 prop—a perfect match!

RC 1/2A TEXACO POSTAL CONTEST

Conceived by SAM 41 and with a perpetual trophy donated by this writer, the 1/2A Texaco Postal meet has been drawing more SAM Chapters and contestants every year. Previously won by SAM Chapters 41, 56, 30, and 51 (if we skipped anyone, blame it on this columnist's memory), SAM 51 was able to launch a publicity campaign that attracted competition from all over the world.



Despite the fact that SAM 51 won again, competition was very good. Take a look at these results:

1. SAM 51	"Nifty Ones"	(CA)	8433
2. SAM 21	"Blackjack Club"	(CA)	8066
3. SAM 84	"Vintagents" (Australia)		7884
4. SAM 39		(OH)	7623
5. SAM 82	"SAM Houston 82"	(TX)	7378
6. SAM 29	"Plainsmen"	(TX)	7250
7. SAM 26	"Central Coast"	(CA)	7188
8. SAM 66	"Golden Era Flyers"	(DE)	7172
9. SAM 56	"WHAM"	(KS)	7121
10. SAM 41	"S.D. Aeroneers"	(CA)	6903
11. SAM 77	"Sun Coast"	(FL)	6816
12. SAM 40		(MI)	6682
13. SAM 1386	"The Alamo"	(TX)	6623
14. SAM 65	"SAM Alaska"	(AK)	6585
15. SAM 1	"Model Museum"	(CO)	5948
16. SAM 27		(CA)	5831
17. SAM 59		(LA)	5538
18. SAM 57	"Variety Group"	(IN)	5352
19. SAM 100	"2nd Chance Sqdn."	(PA)	4594
20. SAM 00	"2nd Time Around"	(CA)	4105
21. SAM 55	(New Zealand)		3967

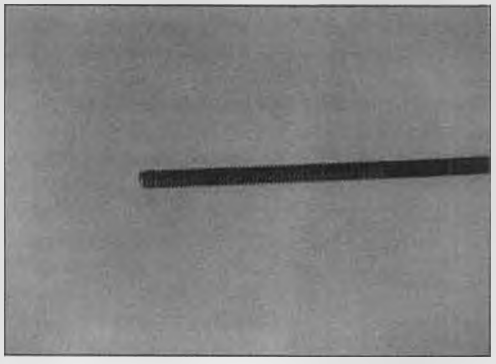
What a tremendous turnout! Too bad we didn't get the English and Italian boys in the

continued on page 61

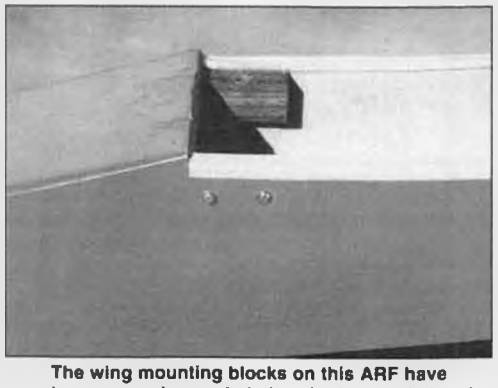
ALL ABOUT ARFS

BY ART STEINBERG

WATCH THAT CLEVIS!



Check the shallow threads on this pushrod. If the metal is soft, a vibrating metal clevis will come loose. Only a nylon clevis will hold dependably in this case.



The wing mounting blocks on this ARF have been securely epoxied, then further beefed up by the addition of wood screws.

A few months ago we went into a dissertation on metal clevises and threaded control rods, examining the possible causes of failure in these components. One of the chief problems encountered was the poor quality threads found on some cheap imports, and when combined with a metal clevis, a sloppy fit is usually the result. This play between the threads and the clevis can easily cause the threads to wear quickly due to vibration, and the clevis eventually slips off the threads, resulting in a totalled airplane.

Apparently many of our readers have encountered similar problems in their installations, and a number of letters were received on that subject. One interesting account was as follows:

Hello Art,

It's me again, Ron Parker, in soggy Houston. I read your article in Model Builder *yesterday concerning the metal clevis on an ARF control rod with a shallow cut thread. It was deja vu to me as I had the same sort of problem with my Avistar 40 ARF earlier this year.*

I had been concerned as to the strength of the nylon clevises that were installed on the aileron control rods that lead from the servo, so I changed them out with a couple of Du-Bro metal snap clevises and went about my pilot training. It wasn't long after this modification that I got into some major problems trying to make gentle turns with the ARF. I had to call for the help of an instructor friend just to get the ARF back on the ground.

The plane came in slowly but managed a single cartwheel as it touched down. One of the clevises had pulled clean off the original threaded steel rod and fallen at an angle into the fuselage battery compartment, jamming it in place. There was no great damage to the airplane and it went on to fly many more training flights.

I learned a lesson just like the one you wrote of in your column; if you change an ARF's clevis you had better change the entire control rod with it.

Regards, Ron Parker, Houston, TX

Ron certainly managed to luck out on that near disaster, but the writer of our next letter

In addition to the fully painted ready-to-fly version, Thorpe Engineering now offers the Starhawk biplane in a ready-to-cover rendition. By covering it with heat shrink film the model weighs two pounds less. Modeled by Rhonda Gabel.

ARF quarter-scale Bearcat pro-totype shown by Mike Beauchamp of the Beauchamp Aircraft Company. Presently undergoing flight tests, watch this column for further news on this slick warbird.

wasn't nearly as fortunate:

Dear Art,

If only I had read your column a few weeks sooner I would not have wrecked my beautiful EZ Mustang P-51! Yes, I committed the stupid mistake of switching the nylon clevises which came in the kit for metal clevises, while retaining the original threaded pushrods. Now this plane was a beautiful performer, as it flew straight and true, just like on rails. But on the fifth or sixth flight something felt drastically wrong. The nose gradually dropped and the model kept losing altitude. I tried to correct by feeding in more and more up trim, but after a couple of

minutes all elevator control was lost and my beautiful Mustang went in nose first from about 200 feet. The really annoying thing was that there was really enough time to get it back on the ground before the elevator clevis let go completely, but I thought it was just a bad trim problem and I could correct it in flight. Believe me Art, I'll know better next time! Keep up the good work.

Sincerely, Arnold Clemson, Detroit, MI

So it looks like we've learned two important things. First, never use a metal clevis on a threaded rod which was intended for use with a nylon clevis. A nylon clevis will hold securely even on a poor quality threaded rod (nylon clevises use an undersize, unthreaded hole, which self-threads when you screw it on), and should always be used with a safety keeper cut from a piece of silicone fuel tubing. Secondly, if there is a drastic trim change of any kind while flying, cut power and land immediately! Ron Parker's instructor showed enough sense to land, and by so doing he averted a crash.

None of this is meant to be a reflection on the Avistar 40, because it is a fine ARF, admirably suited as an intermediate trainer, nor is it a criticism of the outstanding EZ Mustang, one of my favorite ARFs of all time. However, when it was decided not to use the nylon clevises supplied in the kit, the builder set the stage for a potential component failure. Nor is there any deficiency inherent in good quality metal clevises such as those made by Du-Bro Products. However, when using these clevises, one should mate them with the corresponding threaded rods from the same manufacturer if at all possible, so as to assure a perfect fit.

Not all component failures are caused by mistakes in assembly. Regrettably, some models come with badly engineered features which will often contribute to a crash. The most sensitive area on an airplane, be it model or full scale, is the junction between the two wing halves. During flight, this is the place where spontaneous breakage is first to occur, especially if the airplane is subjected to violent maneuvers. I have recently become quite concerned about the lack of strength built into some ARFs I have seen lately, and would like to direct this situation to the attention of our readers.

First of all, when I assemble an ARF for the purpose of evaluation, I always follow the manufacturer's instructions to the letter, even though I may feel that there is need for an improvement. When I fly RC models I tend to fly them in what you might call a "vigorous" style, doing one stunt after another. Even the comparatively flimsy old timers I often fly are subjected to loops, rolls, and inverted flight, so if anyone is going to fold a wing, I am a prime candidate. However, in my decades of RC flying I have never folded a wing, either on an ARF or a conventionally constructed model. Yes, I've had a few wing hold-down systems give way, allowing the wing to part from the fuselage, but never have I broken a wing in flight. But lately I've begun to notice a disturbing trend in the way ARF wings are joined to each other. Many manufacturers are furnishing wing joiners which are much too flimsy for the purpose, often consisting of only a couple of 1/8-inch thick pieces of light plywood. This wood can be so weak that I once had a piece break in my hand as I tried to insert it into the channel located on a wing root! This type of wood should *never* be used in an important structural joint, and the builder should make a substitute from a piece of strong, dense plywood.

A few weeks ago I flight tested an ARF whose wings were joined with skimpy light ply joiners. All during strenuous aerobatics there was no sign of failure, but a balky engine led to a dead-stick approach, and the plane met the ground in a rather forceful wheel landing. The model appeared to survive the hard touchdown with no damage, until close examination disclosed that the center joint had fractured. The repair was

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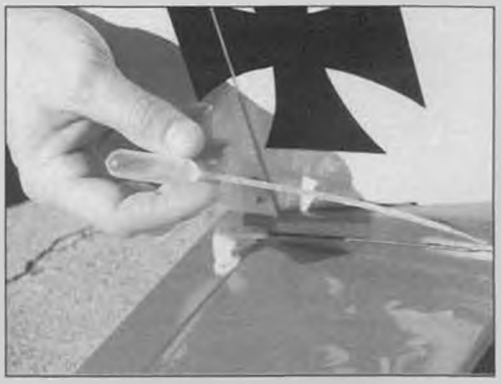
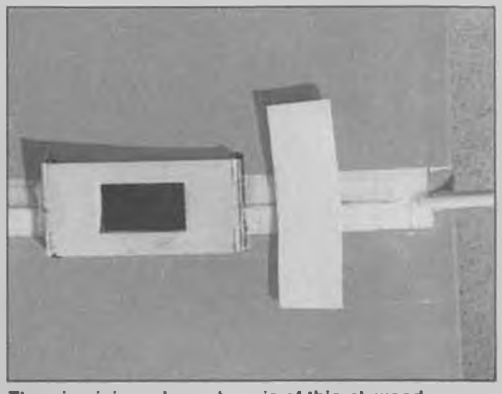
Jim McCarter uses his ARF Indy Clipped Wing Cub for exhibition flying with the Arizona Flying Eagles Show Team.



The amazing CA applicator from Art Gross Enterprises. This little squeeze bulb puts the glue exactly where you want it with absolutely no waste.



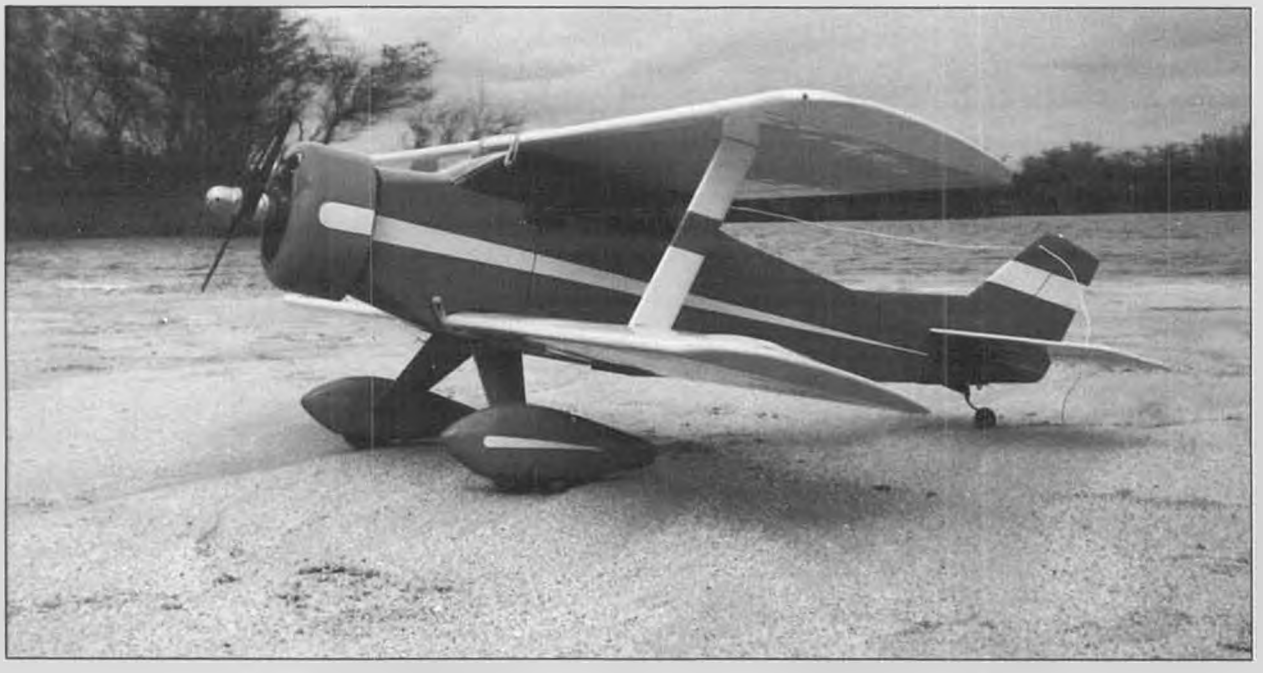
The wing joiner shown here is of thin plywood and much too short. The answer was to remove a strip of covering and fiberglass the wing joint.

These ARF wing joiners are alarmingly short, and may give way during violent maneuvers.

This is a tapered wing joiner which looks strong enough to do the job. But can you be sure?

CONSTRUCTION

BY AL WHEELER



EEE-Z-FLI 'BI'

Several years ago I sat in the back of my hangar at Schellville Airport, Northern California's mecca for homebuilt and antique aircraft in the beautiful Sonoma Valley. The object of my attention was a neat little 90 hp Lambert radial, recently removed from a Monocoupe to make room for a flat Lycoming. What an ideal engine to power a little two-place tandem bipe, the one sketched out on the hangar floor . . . Time passes and dreams slip away, people move to Hawaii and dusty hangars complete with their dreams sketched on doors and cement floors become a thing of the past. The dream of the little bipe remained and somehow the Lambert got traded for a Magnum .25 FSR and the welding equipment for a tube of model cement. So, throw in a little balsa wood, a roll or two of MonoKote and herein we present EEE-Z-FLI "BI," a somewhat dehydrated version of an old dream.

"BI" follows the basic EEE-Z-FLI construction techniques throughout. The fuselage, wings and tail group are of simple construction, providing an airframe of moderate weight and good abuse tolerance factor. Also, no need for aircraft Medicare; repairs, if required, can be accomplished at home.

Flight characteristics are pleasing, ground handling and tracking are without problems, and with a flight weight of 3.2 lbs. and a wing area of 532 squares, the Magnum .25 swinging a 9x6 Master Airscrew provides excellent performance. Ailerons, rudder and elevators may be adjusted to provide aerobatic capability to the builder's taste.

So, clear the workbench, spread out the plans and let's scratch-build an exciting little biplane!

FUSELAGE

Edge join FS-1 and FS-2 to make two fuselage sides. Now install FD-1, 1/8 of an inch behind the front of the side piece. Using a piece of 1/8 balsa as a spacer, install FD-2 behind FD-1. The space provides a slot to support B-1. Complete both sides, being sure to make a left and a right.

With one side flat on the work surface, install B-1 in the slot provided. Install B-2 flush against the rear face of FD-2. Join the

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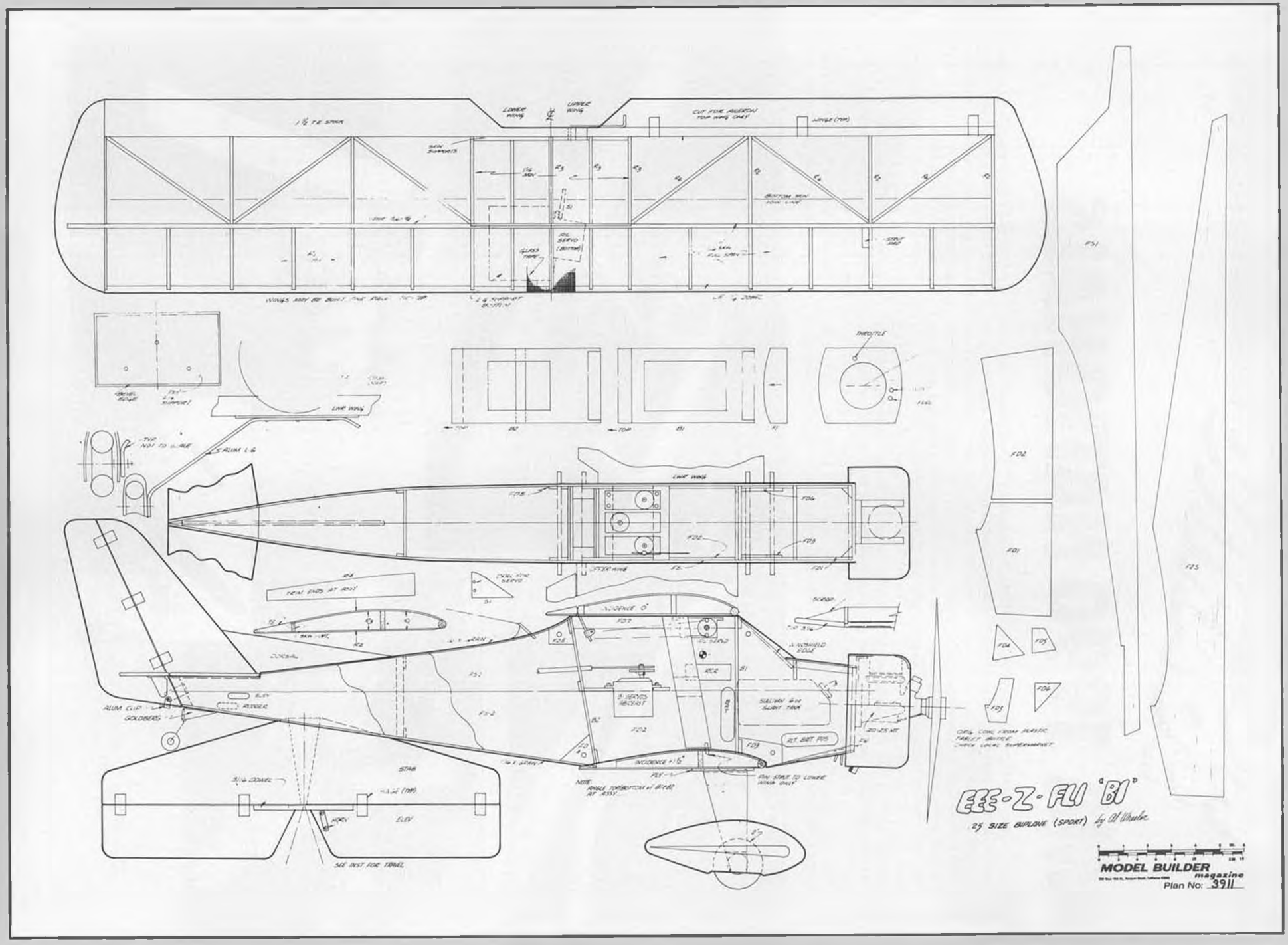
EEE-Z-FLI "BI"
25 SIZE BIPLANE (SPORT) by Al Wheeler
MODEL BUILDER magazine
Plan No: 391

R/C SOARING

BY BILL FORREY

AMA 1990 NATIONALS

Tom Gressman, of Oconomowoc, Wisconsin, sallied forth this past summer to participate in and photograph the AMA Nationals in Lawrenceville, Illinois. He has generously submitted these photos for the benefit of those sailplane fliers who were unable to attend.

As a technical side note, Tom shot Kodak Gold 100 color print film from a pocket-size camera with a Zeiss lens. The quality of the color negatives was such that I was able to make very good black and white prints from them. It required a high contrast filter and polycontrast paper to obtain usable prints, however, as you can see, the results were quite impressive. Facial detail in the shadow of hats was better than I expected, as was the detail in highlight areas.

From now on, anyone in the model sailplane world wishing to submit photos of favorite models or projects but having only color print film available may submit the negatives, and I will take care of the rest. Write-ups are a must, even if they are only a few sentences or paragraphs. Any prints you would like to see (possibly) printed in color may also be submitted! I will return the negatives to you, but any prints must remain the property of *Model Builder*.

Getting back to the Nats, Tom writes to say that there were 110 competitors in Class B (2-meter) and 122 in Class C (100-inch, or Standard Class). The Unlimiteds (Class D) were not mentioned in Tom's letter.

Because some of Tom's photos have only one-line cations, not all of them will have

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RG14A-1.4/7.0

N	X	Y
0	100.000	0.0
1	99.642	0.038
2	98.705	0.164
3	97.189	0.375
4	95.162	0.638
5	92.636	0.934
6	89.634	1.240
7	86.207	1.625
8	82.392	2.008
9	78.241	2.465
10	73.800	2.805
11	69.123	3.198
12	64.262	3.572
13	59.285	3.918
14	54.231	4.225
15	49.158	4.488
16	44.118	4.686
17	39.163	4.825
18	34.343	4.885
19	29.698	4.874
20	25.277	4.798
21	21.117	4.613
22	17.258	4.363
23	13.729	4.038
24	10.553	3.644
25	7.772	3.187
26	5.392	2.678
27	3.431	2.128
28	1.905	1.554
29	0.801	0.974
30	0.163	0.433
31	0.0	0.0
32	0.310	-0.332
33	0.930	-0.612
34	2.157	-0.966
35	3.699	-1.263
36	5.674	-1.489
37	8.048	-1.692
38	10.815	-1.837
39	13.955	-1.917
40	17.468	-2.003
41	21.358	-2.113
42	25.623	-2.133
43	29.735	-2.128
44	33.555	-2.088
45	37.160	-2.030
46	44.064	-1.932
47	47.079	-1.888
48	54.135	-1.743
49	59.181	-1.634
50	64.163	-1.448
51	69.026	-1.303
52	73.726	-1.101
53	78.181	-0.844
54	82.357	-0.631
55	86.134	-0.426
56	89.589	-0.274
57	92.596	-0.138
58	95.129	-0.036
59	97.166	0.027
60	98.685	0.013
61	99.665	0.008
62	100.000	0.0

AIRFOIL OF THE MONTH: RG14a-1.4/7.0—Here is a section that all red-blooded F3B, F3F, and F3E fliers should know and respect! It's a fast one!

elaborate commentaries. Those which do are as follows:

Photo #1: Paul Carlson's two-meter Spirit design which he flew in the Nats. Paul took 1st place in the Two Meter Class with this basically box-stock Spirit. The model is now a Great Planes Model Manufacturing Company kit and available through your favorite supplier.

Paul used the optional bolt-on wing design rather than the normal rubber band-on wing to save a few drag points, and besides, it does look nicer. He also took the extra time to sand the trailing edges to a knife-edge to further reduce drag. This Spirit has a wing loading of only 6.3 ounces per square foot, but according to Tom, who flew the model after the contest, it flew as if it had a heavier wing loading. I assume Tom means it had a faster forward speed than you would expect for its weight, not that it sank faster. Tom says it has a "very good speed range

(1) Paul Carlson's "Spirit" helped him win 1st place in Two Meter Class at the Illinois Nats for 1990. (2) It's a Duck . . . or . . . that's what you yell when it flies by! Troy Lawicki of Michigan likes to build hardbody sailplanes that'll withstand severe treatment. (3) Rusty Shaw took home a 1st place trophy in RC Hand Launch Glider with this Culpepper/NSP Chuperosa with SD7032 airfoil. (4) Julian Tamez was one of the many who flew a Competition Products Mariah in the Two Meter Class at the Nats. He placed 5th. (5) Jim Thomas was the undisputed No. 1 flier at the 1990 Nats. He took home the Lee Renaud and HI Johnson trophies flying this Falcon 800 (100" model) and a two-meter Duck. (6) Mr. Low Speed Airfoil himself! Meet Michael Selig, the guy who has more RC sailplanes flying the world over with airfoils bearing his name than any other. Woody Blanchard, retired NASA aerodynamicist looks on, smiling his approval. (7) Terry Edmonds flew his trusty lo two-meter ship with Eppler 193 airfoil. Sure is a clean machine. (8) Brian Agnew and his personal Mariah. Brian is always a top contender, witness that he took first in Two Meter, Standard, and Unlimited Classes in the 1988 Nats! (9) Dave Thornburg flew this interesting two-meter design at the 1990 Nats. Sure is nice to have the Old Buzzard flyin' with us again! (10) Woody Blanchard's two-meter ride with crescent moon wings. Wing tip panel shape cuts induced drag (i.e., wing tip losses).

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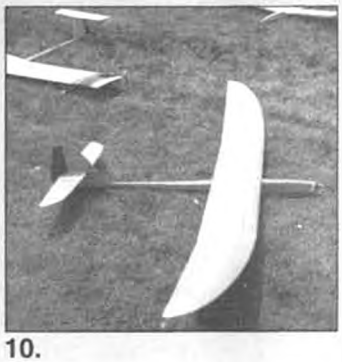

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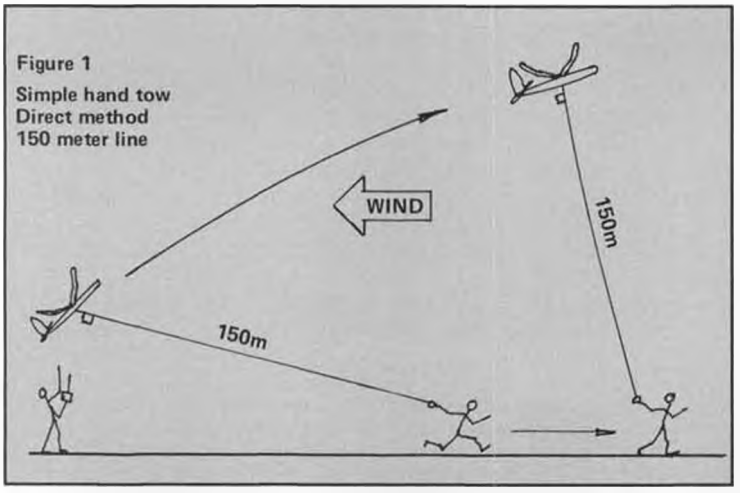

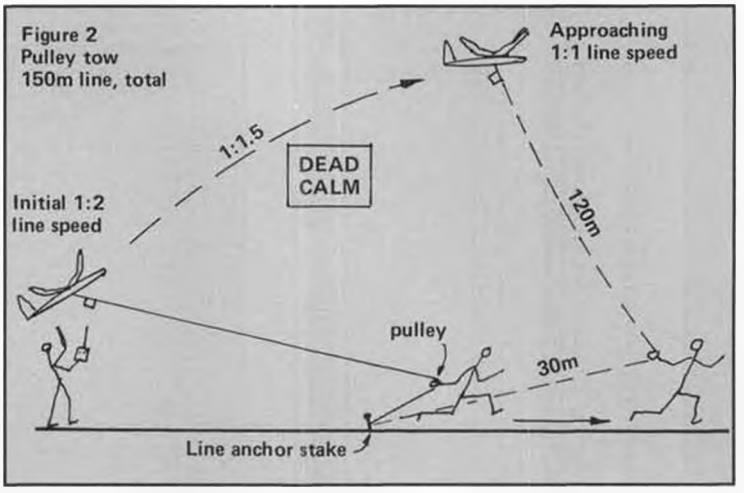

Figure I. If there is any breeze blowing (2 mph or better), this is the preferred towing method. Maximum tow height is achieved in 10-35 seconds. In high winds, merely a walk forward will launch most sailplanes. Figure 2. In NO wind situations, some models have extreme difficulty getting airborne due to lack of initial and medial line speed. Pulleys can double line speed at first, but as model climbs to zenith, the speed gets closer to tower's running speed. Line is shortened at zenith by amount runner has moved forward.

and is exceptionally smooth in all axes." The Spirit uses a modified (again, I would assume this means flat-bottomed) Selig 3010.

Photo #2: Called the Duck, this model was designed and flown by Troy Lawicki. (Seen behind Troy's aircraft is another Duck owned by Pat Sullivan.) Troy finished 7th in the Two Meter Class with this S3021 airfoiled model and Jim Thomas finished 4th with an SD-7037 version.

According to Troy, a super-deluxe kit of this model will be available about the time you read this issue. The kit will feature an epoxy fiberglass fuselage with Kevlar reinforcement that has all wing and stab alignment holes and slots pre-drilled for perfect alignment. All formers and wing root ribs will be totally pre-shaped and fitted for immediate gluing. All flying surfaces will be foam core.

Two versions of this kit will feature either the Selig 3021 or Selig-Donovan 7032 airfoil. The S3021 is the preferred choice, while the SD7032 is more suited for thermal flying or training. The foam core wing panels measure 10.5 inches at the root with constant chord main panels and tapered tips totalling 740 square inches (5.15 sq. ft.) of area. Pre-cut, pre-cured carbon fiber strips will be supplied as reinforcement to the wing spars. Hardened 5/16 inch wing rods will join the wing halves. Balsa sheeting is supplied.

The all-up flying weight of a Duck with six servos should be 51 to 52 ounces for a 10-ounce wing loading. Functions are aileron,

flap, rudder, and elevator. Standard four-channel radios may be used, but an Airtronics Vision or similar radio with mixing ability will be preferred by most fliers.

The Duck is without a doubt (in this writer's mind) stronger than any other two-meter on the market today. Prototypes have been intentionally (and accidentally) crash tested without damage to the airframe or fuselage (servos were another story). However, a Duck kit won't be cheap. Ducks will carry a $200 price tag plus shipping! Interested parties may contact Troy at 5954 Karlin Rd., Interlochen, MI 49643. Bear in mind that Troy is just getting started in this kit business as a side line, and as with most "cottage industry" manufacturers who supply "custom" kits, patience should be a virtue of the buyer.

Photo #3: Rusty Shaw holds his Culpepper Models Chuperosa with which he took First Place in Hand Launch Glider at the Nats. Chuperosas come in a variety of airfoils (Eppler 214, or Selig 4061) and now the Selig-Donovan 7037 which Rusty is flying and which is only available through Northeast Sailplane Products. Rusty lightened his model, using cap strips rather than full width sheeting. Looks like it worked quite well. (By the way, that wind sock which appears to be coming out of Rusty's hat is really in the background!)

Photo #4: Julian Tamez, of Channel 1 Productions video tape fame (Humble, Texas) holds his Mariah two-meter sailplane. Julian took a respectable fifth place in the Two Meter Class (B). Tom says, "The Mariahs were very impressive at the Nats. They took 5th, 11th, and 13th places, and Julian also took 8th place with this model in Standard Class."

Mariah is a foam core wing model with fiberglass pod and graphite boom. The Selig 4061 airfoil is used, and the wing features flaps and ailerons. Wing area is 590 squares with an 8.75-ounce wing loading (34-37 ounces total weight).

Mariah was designed by Ed Burton and is kitted by Competition Products. They are available by mail order from Northeast Sailplane Products (802) 658-9482 for about $159.95. For your information, NSP also handles just about every other glider kit mentioned this month. Sailplanes are their specialty.

Photo #5: Jim Thomas, of Michigan, was the flier to beat this year at the Nats! Jim used this Flite Lite Composites Falcon 800 Standard Class ship to take 1st in Standard and 4th in Unlimited. This earned him both the Hi Johnson Award for highest points scored in any class, and the Lee Renaud Trophy for the highest combined total score for three classes: Two Meter, Standard, and Unlimited. Remember, Jim took 4th in Two-Meter with his Duck SD7037.

Tom tells me that Jim believes the Falcon 800 has an aerodynamic advantage over the Falcon 880 in that the wing tip panel is smaller and a better proportion and shape for reducing induced drag. Bob McGowan, of California, took 1st at the Masters of Soaring contest and 3rd at the Visalia Fall Soaring Festival with the Falcon 800. He would probably agree with Jim, as he too favors the 100-incher.

The remainder of Tom's Nats photos are presented with captions as that should be sufficient to tell the story.

SULA FAI/F3J STYLE CONTEST

Thermal duration is taking new directions these days as modelers are finding new ways to make competition more interesting. Lately, the English style F3J format is being looked at with curious attention.

For those who are not familiar with F3J, let me first tell you that whatever model you are currently flying in AMA TD meets is probably competitive in F3J. Don't be turned off by that almost-F3B-sounding name! The two events are totally different.

In a very small nutshell, F3J is a 10-minute time slot event where the longest duration time in a given slot is the 1,000-point winner, and the remaining places are scored man-on-man by percentage to the winner time. The thing that makes F3J really different, however, is the method of launch . . . hand towing!

Before you turn-off to that last note, however, let me tell you that launching is not as hard as it sounds . . . in true F3J competition. The Brits have been doing F3J

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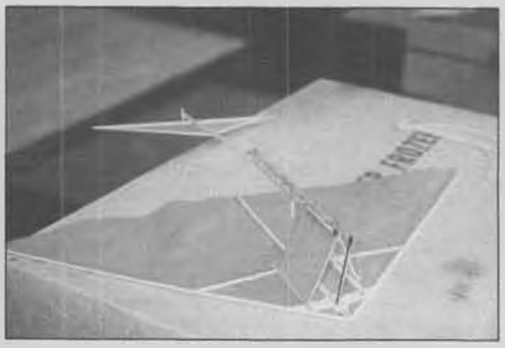
INDOOR

BY KEN JOHNSON

TO REED OR NOT TO REED



(Above) Underside of the Walt Mooney/Dick Baxter ornithopter model. (Left) Beautifully built Easy B model by Bob DeBolt. Notice the V-shaped wing posts, which prevent downthrust due to motor stick bowing under heavy rubber winds.

Some time ago, I wrote about building certain types of indoor models with a material called reed. This 1/32-inch round fiber is generally used for making baskets and such. It is very light and bends quite well around a curve. It is also very inexpensive.

I recently decided to try reed for the wing tips and tail outlines on my current model. The subject is Walt Mooney's 18-inch Piper Super Cruiser. This model was built before and found to be a great flier.

After the structure was built and sanded, I noticed that the outlines changed slightly on the wings. The stab and rudder seemed to hold their shape better (they were sanded to a smaller size). After several days of pondering, it was decided it would be best to remove the reed tips from the wings and replace them with laminated balsa (my regular method for tips).

The uncovered weight of the parts on the model seems slightly more with reed. I, for one, am very concerned with a plane's weight. If the parts are heavy, I lose interest in finishing the airplane. This is why I still prefer using condenser paper (dyed to the desired color) for indoor scale models. The resulting flights are slow and long. If you build a heavier type model the reed tips may be just the ticket for you. But not for me. I feel this type of structure may be ideal for outdoor Peanut and small scale craft, but not for indoor.

Bob Randolph and his winning F.A.I. Microfilm model, a result of much testing and refinement. It consistently logs flights of over 40 minutes.

Florida's Doc Martin holding his No-Cal indoor profile Dayton Wright Racer. Model consistently logs flights of 3-1/2 minutes. Note Blue MAX-FAC.

Dave Aronstein and his Seagull rubber model. It flew better after dihedral was changed to gull type.

Bob DeBolt watches his Easy B model cruise under the ceiling at Los Angeles Navy Marine Corp. Armory. Note the gun used for training reservists.

Micro-X's new 1924 Farman kit. This airplane is a favorite of Bill Hannan of "Hannan's Hangar" fame.

Now here's a unique way to wind your Embryo craft. Wonder if it sits up under the ceiling longer if wound while sitting down?

COLORING CONDENSER PAPER

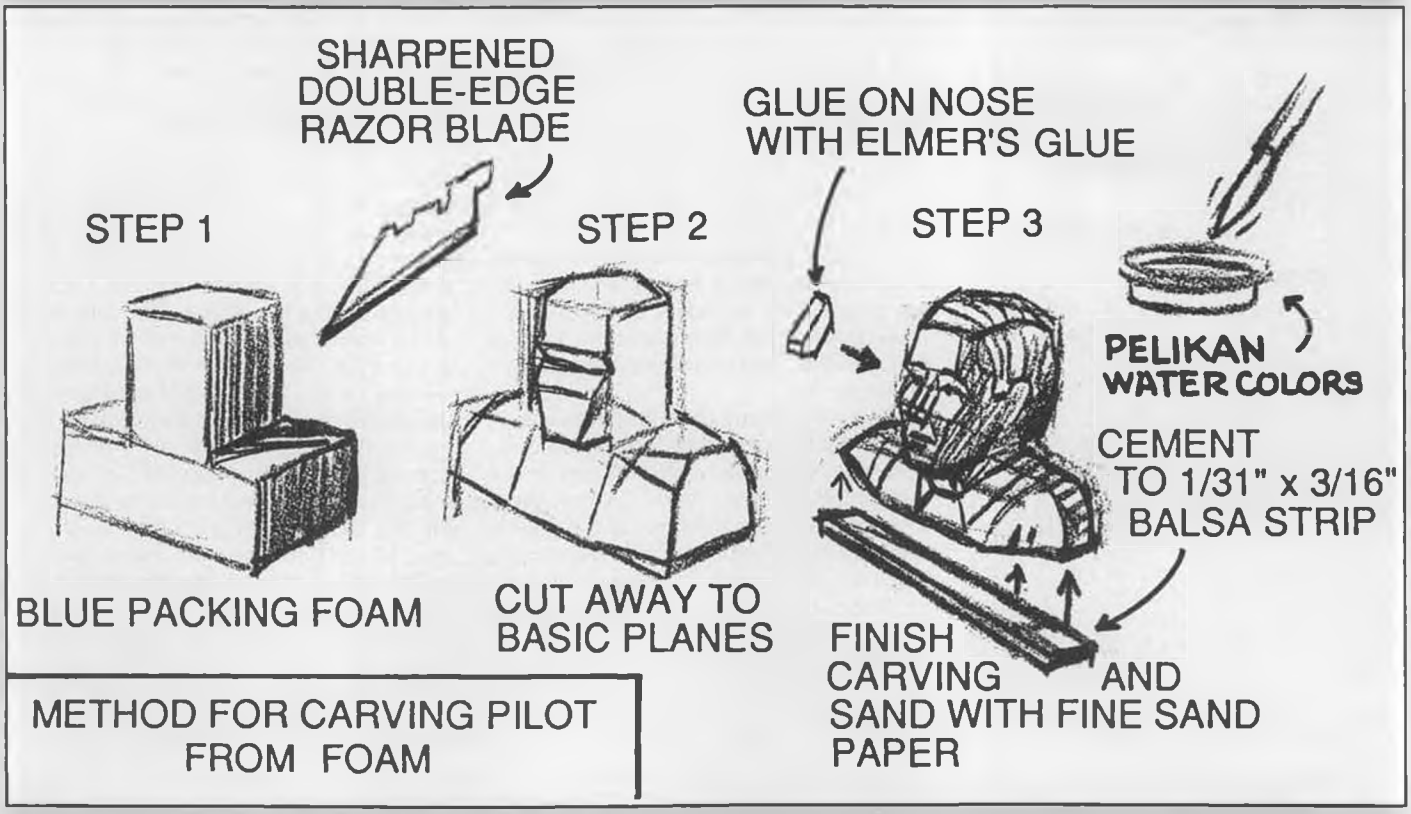
The general method I use for dyeing this paper is to tape the corners to a sheet of artist's illustration board and spray from about 10 inches with a solution of 60% Dr. Martin's watercolor dye and 40% water. This colors the paper and also pre-shrinks it at the same time.

It seems that condenser has no grain. It appears to have an oily quality about it. When the dye is sprayed onto the surface, the color does not penetrate into the paper; it just sits on top. If you try to spray the paper after it is on the model's frame (to snug it up) and use too heavy a spray, the color will wash away and leave tiny clear dots with no color.

If the nose of the fuselage is handled frequently while attaching the prop, the color will eventually be rubbed off. I recommend a thin coat of clear dope over the area to remedy this condition.

(As a side note, while covering the stabilizer of the above mentioned Piper Super Cruiser I ran into a problem. After covering the top and bottom surfaces of the stab I decided to spray both with water. The paper was rather loose. The mistake was to spray both top and bottom at the same time. Because the surfaces were so close—about 1/32 inch—they immediately stuck together. In the process the color or the condenser paper ran off and the stab was ruined. The only thing left to do was to carefully remove the paper, sand the wood and re-cover. The lesson: spray one surface at a time, let it dry, then spray the other.)

It may seem like a great deal of trouble to use condenser paper instead of other coverings, but a lighter, slower flying model will make it worth the extra effort. *continued*



TOP FOAM PILOTS

Have you noticed how nice the other guy's scale model looks when it has a pilot in it? It also rates extra points at scale judging time. If you want to go the pilot route, you must keep him light. Super light balsa will work, but foam is even lighter. I tried carving pilots from white beadboard foam, but it's very hard to work with. The little beads keep pulling out when you try to cut or sand it.

The light blue foam found in packing for small appliances, toys, etc., is much better. It is harder and has no beads. When you cut into it, it seems to glisten with little white sparkles of light. This foam can be easily cut with part of a double-edge razor blade cut to a sharp pointed angle with large scissors. Start by cutting out the basic block shape of the head and shoulders of the pilot. Usually this part of the pilot is all you need. Gently cut away thin slivers of foam till it begins to take shape. Do not attempt to carve the nose into the head; once the head and shoulders are carved and sanded with very fine sandpaper, a basic nose shape can be glued onto the face. The pilot can be colored with Pelican or Marabou brand opaque watercolors from your local art supply store. Once dry, the pilot can be tack glued onto a small length of 1/32x3/16 balsa, which is then fitted into the fuselage as a cross member at the bottom of the side window line.

NEW INDOOR RECORD

Seems that every time I think the indoor Ornithopter record couldn't go any higher, it does.

This time it's Frank Keiser's turn. How well I remember when four minutes was a good time in this event. Frank has now recorded a high time of 17 minutes, 1 second. WOW! Also recorded at the Labor Day meet at Lakehurst was a 9:46 in F.R.O.G. (Federation R.O.G.) by Jim Clem. Walt Van Gorder also beat the Manhattan Cabin record. These times come via the *Domeduster* newsletter.

TOP CAT 90

Bob Randolph, of Loma Linda, California, is one of the winningest indoor modelers around. He has been on many FAI US World Indoor teams in recent years. At the Nagoya, Japan and Cardington, England World Indoor Championships Bob was among the top four indoor modelers in the world. I asked Bob to relate the history of his Top Cat 90 FAI model in his own words. Here's what he wrote:

"TopCat 90 is my newest and most successful FAI Indoor design. I started its development as soon as Johnson City was finally selected as the 1990 World Champs site. I had flown there in 1988 and was painfully aware of its catchy beams and unique rope, bag, and vent hazards. Therefore, I set about to design a ship that could stay under the 106-foot high beams and still exceed 40 minutes. I retained some of the features of my Boron Bomber (Nagoya '84) and TopCat (Cardington '86). After much quarter motor testing in my 25-foot gym, the final design features a very reliable, adjustable 22-1/4x40 VP (variable pitch) prop, boron prop ribs and fin, short tail moment, small stab, and nonuniform wing rib camber. Three ships were built and flight tests in my little gym indicated that the design goal would be met.

"At Johnson City, TopCat 90 was the star of the World Champs even though it only won the Bronze FAI Medal. Its record of exceeding 40 minutes on all six official flights is one World Champs record that can never be broken. Its long, slow climbs are difficult to describe and hard to believe when observed. It starts out very shallow and after four or five minutes appears that it will only get halfway up, however, after 16-18 minutes, there it is, two or three feet under the beams.

"The key to this performance is my VP prop and the way I adjust it. First of all, you must determine by flight tests the rubber size that will almost use all the turns when descending from top altitude. Next you set the VP spring tension and dwell so that it goes to low (cruise pitch) at about cruise torque. Lastly, adjust the nylon screw that limits high pitch so that the ship levels out at the correct altitude. As Hunter on TV likes 'to say, `It works for me!' It should be noted that all of my VP action is limited to only the climb portion of the flight. I am able to greatly reduce backing off turns and to launch with high torque and turns without outclimbing the site."

TopCat Contest Record

- 1990 World Champs: 1st Team, 3rd Individual.
- 1990 Nats & NFFS Champs: 1st FAI, 2nd Stick.
- 1990 Moscow, Idaho Regional: 1st FAI, 1st Stick.

All flights exceeded 40 minutes. Best time was 42:07.

As you can see from the above, this model must surely qualify for consideration as the NFFS Indoor Model of the Year. Model selection committee please take note!

MOONEY/BAXTER FLAPPER

One of the last projects the great Walt Mooney worked on was a simplified Ornithopter design. He and Dick Baxter (well known in this column for his outstanding flapper concepts) discussed this idea many times. After Walt's untimely death, Dick set about building the model. The delta wing shape resembles the AMA Racer/Delta Dart airplanes somewhat, but that's where the similarity ends. The side and front views of the model reveal the simplest linkage and mount I've ever seen on an ornithopter, consisting of an unsupported "V" shaped wing mount with one connecting rod pushing the flapping wings up and down. Of special note is that the wing mount flexes in and out when viewed from the front. I can only imagine that it took many experiments to design such a simple mechanism. If asked, I would name this model the Walt Mooney/Dick Baxter SIM-FLAP. What do you think?

Send your comments, questions and pictures to Ken Johnson, 16728 Bermuda Street, Granada Hills, CA 91344.

See ya next time! ***MB***

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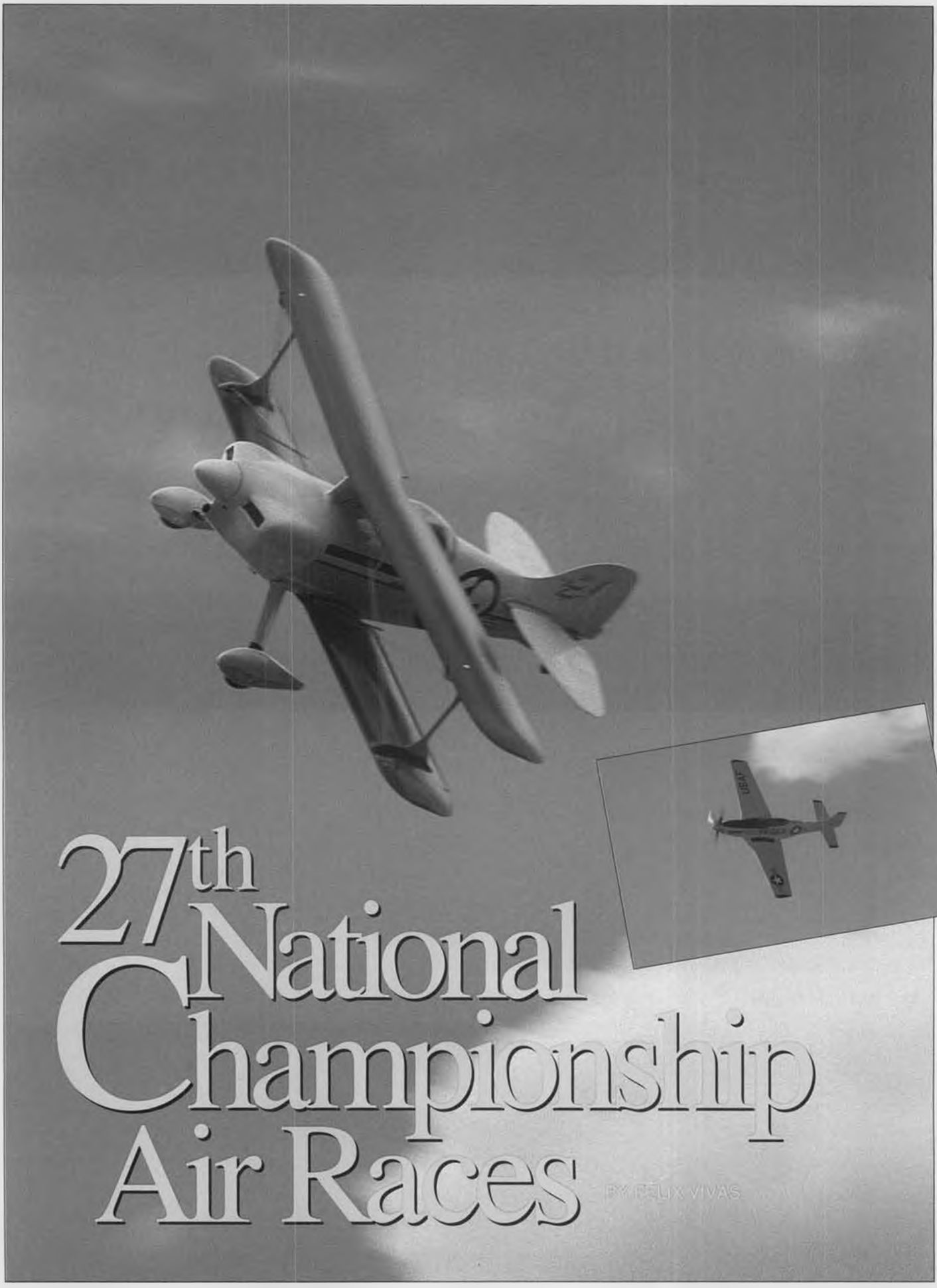


27th National Championship Air Races

BY FÉLIX VIVAS

In near perfect cool weather, 45,000 plus fans saw the fastest and safest air races in the 27-year history of Reno's National Championship Air Races, as well as some glamorous aviation history in the making.

The glamour and charm were provided by Erin Rheinschild and her husband, Bill, a successful land developer in Southern California. Erin, the First Lady of Unlimited Air Racing, is a first officer with United Airlines, in her late twenties, slender and pretty. She became part of aviation history when, on Sunday, in her P-51D "Miss Fit," she won the Bronze race, becoming the first woman to race and win in unlimited close course air racing. Erin attributes much of her new racing skills to help from her mentors, Skip Holm, David Price, and Allen Preston, all very skilled, well-known unlimited race pilots.

Bill Rheinschild flew an excellent race too, piloting his P-51D "Risky Business" to win the Silver unlimited class, which marked the first time a husband and wife won in the finals (Silver and Bronze) at the Reno Air Races.

Another historic first was achieved by Lyle Shelton, a 57-year-old airline pilot from Granada Hills, California, who set a new speed record of 468.620, to break his own record of 456.821 set in 1988. He was a strong favorite to win this year, and did, in his highly modified F8F Bearcat, "Rare Bear." At the beginning of the Gold $50,000 first prize race, Skip Holm, in the prototype special built "Tsunami," took the lead, with Lyle in his "Rare Bear" second, and Bill Destefani in his P-51 "Strega" third (Those were the three fastest unlimited aircraft at the four-day races as "Dago Red" and "Stiletto," both P-51s, didn't show up for this year's race). By the third lap, Lyle and "Rare Bear" passed Skip and "Tsunami," widening his lead with every lap to win and set a new speed record of 468.620.

Carl Friend, a cordial, articulate aeronautical engineer with many years of experience, and one of "Rare Bear's" crew members, along with Jack De Boer, a major sponsor, explained the major improvement to #77 since last year. They had taken an old four-bladed propeller from a Lockheed Orion P3, cut down three of the blades, mounted them on a hub, and installed the new three-blader in place of last year's four-bladed "paddle" on the 3800 HP Wright R-3350-77, giving Lyle a three-year consecutive championship and fifth since 1973.

The Formula One category produced a new first time Gold winner, James W. Miller, flying his beautiful unique pusher #14 "Pushy Cat" made of composite fiber materials. This is one design the NMPRA racers should check out!

From the standpoint of very colorful and dashing, the Biplanes, along with the Formula One aircraft really are eye-catching. On Sunday, Danny Mortensen, from Placerville, California, flew his Mong biplane very smoothly to win the Gold Biplane race, with Sam Maxwell in his "Legal Eagle" coming in second.

Watching the AT-6s is about the most nostalgic fun for this photographer/observer at the Reno Air Races. Mainly because I had a lot of flying time in the aircraft in the late 1940s. But at Reno, they have the most picturesque flying start, all abreast with the mountains in the background. They fly unusually tight, sometimes three abreast, going into the pylon, and always down low, "on the deck," and extremely close to the pylon, with their deep radial engine roar almost strong enough to knock you over.

Tom Dwelle repeated his 1989 win in the AT-6 Gold Championship by smoothly flying his T-6 "Tinkertoy" to victory.

As my publisher Bill Northrop says, "Everyone, once in his or her lifetime, has to attend the Reno Air Races," so if you can make it next September 12 through 15, 1991, do so, but make your reservations now! ***MB***

Tom Dwelle repeated his 1989 win in the AT-6 Gold Championship with his "Tinkertoy."

Jim Miller's "Pushy Cat," with which he won the Gold in Formula 1. Nose gear retracts, mains are fixed. Tough to model, but it would be different!

Lyle Shelton, Maryland Heights, GA, set a new record average speed of 468.62 mph to win the Gold Unlimited final at Reno. That's three in a row!

(Opposite) Sam Maxwell, Shelby, Alabama, flew his gray and white Pitts "Legal Eagle" to second in the biplane Gold final. (Insert) Erin Rheinschild, a First Officer with United Airlines, based in Los Angeles, won the Bronze in her "Miss Fit" P-51D, thus becoming the first woman to win an unlimited, close-course air race.

Products I·N U·S·E

Teardown shows the glitter/glamour of modern CNC machining. Upgrades include a split collet for a truer running prop drive washer, larger bypasses for more power, new high tech rear ball-bearing, and other subtle improvements. (Insert) The K&B .61 RC engine has been in continuous production in the USA for over 20 years. It is fully guaranteed against defective materials and/or workmanship for 90 days.

K&B .61 RC ENGINE

BY STU RICHMOND

An engineer once defined man this way . . . "Man is a complete, self-contained, totally enclosed power plant, available in a variety of sizes, and reproducible in quantity. He is relatively long-lived, has major components in duplicate, and science is rapidly making strides toward solving the spare parts problem. He is waterproof, amphibious, operates on a wide variety of fuels; enjoys thermostatically-controlled temperature, circulating fluid heat, evaporative cooling; has sealed lubricated bearings, audio and visual communication, and is equipped with an automatic control called a brain."

Man's brain has further developed an engineering axiom that says . . . "If it ain't broke, don't fix!" K&B Manufacturing Company has well applied the "ain't broke" axiom to their ringed .40 for RC (Engine No. 4011) and to this month's ringed .61 for RC. These two power plants are America's best RC success record in model engine manufacturing . . . through their production years there have been successive minor changes in castings, assembly bolts, ball bearings, and bypass areas. The smaller 40 RC engine was an outgrowth of a very successful .29 U-control engine. The .61 design came to K&B as they bought the prior manufacturer's design.

The .61 engine for this month was designed by Clarence Lee for Veco, a company that was deep into model engine and model kit manufacturing some years back. Veco sold the kit business to Dumas, and the engine business to K&B. Veco went into other manufacturing allied with full scale aviation. I sent a short note direct to Clarence and he responded with an interesting history on the K&B .61 that we'll get to shortly.

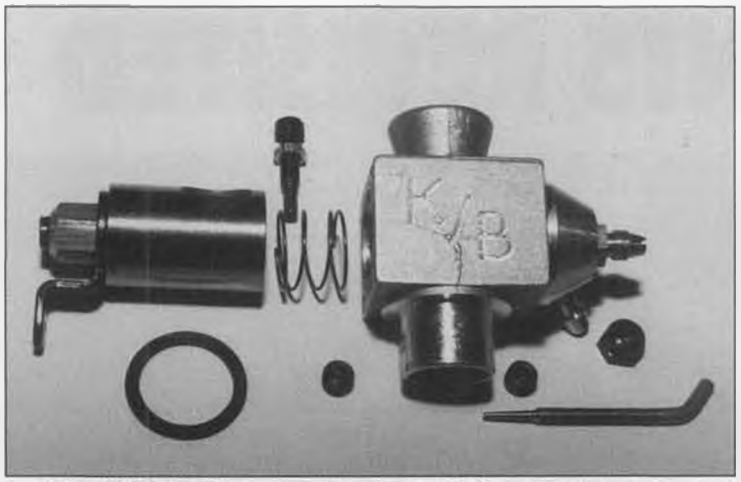
I'm continually surprised to see ten-year-old K&B .61s showing up in shiny new models in the Florida area. When I inquire about the engine's life span, the answer is generally . . . "yeah, I put a new ring in it every once-in-awhile . . . it comes up running like new."

The K&B .40 went through some difficult years when it was equipped with a black English-built carburetor . . . that was solved by Perry carbs and K&B's new proprietary carb. The .61 missed these problems, although some modelers did add Perry carbs to their .61s.

I was privileged to recently be a guest

speaker at the Orange County (California) RC Club, where I spoke about basic RC engines, setting needle valves, NiCds, today's radio features, model designs . . . and ended up boldly stating my opinion about today's best dollar values in the hobby. In the sixty-sized two-stroke engine I recommended the K&B .61 and the Super Tigre S-61K ringed sion ring/wrist pin order costs you only $13.50. The K&B .61's cylinder seems to outlast two or three such rebuilds. The heart of this engine's performance is really the fit of the ring into its aluminum piston and into the steel cylinder. When the ring is properly seated after engine break-in, you'll feel good compression as you flip the engine over backwards *against* its normal direction of rotation. If this engine is run on fuel containing castor oil, its life is extended. The piston ring costs $2.00 . . . only *two bucks each!* If the old piston ring is worn out (normally you'll feel very little compression as you flip the engine backwards if the ring is worn

continued on page 81

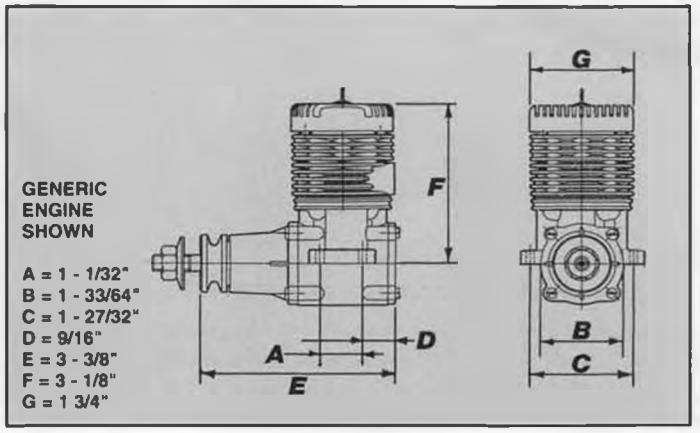


The K&B designed carb is easy to disassemble for cleanout. The end of the low speed idle needle is at extreme left. High speed needle is at bottom right. Bolt with locking nut (above spring) sets incoming idle air volume. Setting instructions are simple to understand.

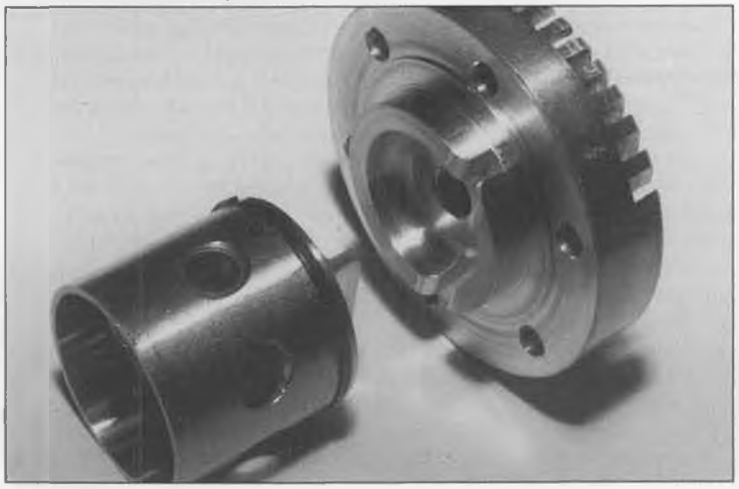
Text explains how to avoid getting a cylinder in backwards, and other helpful tips. Teflon pads on the wrist pin (left). Inner bore of the cylinder (right) is chrome plated.

engines for their *dollar* values. The Tigre is Schnuerle ported and has more power . . . the K&B is loop scavenged (has a deflector baffle on the top of its piston) and has a bit less power. Both have good speed ratios of high rpms to idle rpms . . . both have more useable power than the serious Sunday flyer can use. But when it comes to buying repair/replacement parts, the contest is over. K&B is the outright best buy by far. With every K&B .61 RC engine comes a prepaid business reply envelope for your use in ordering parts.

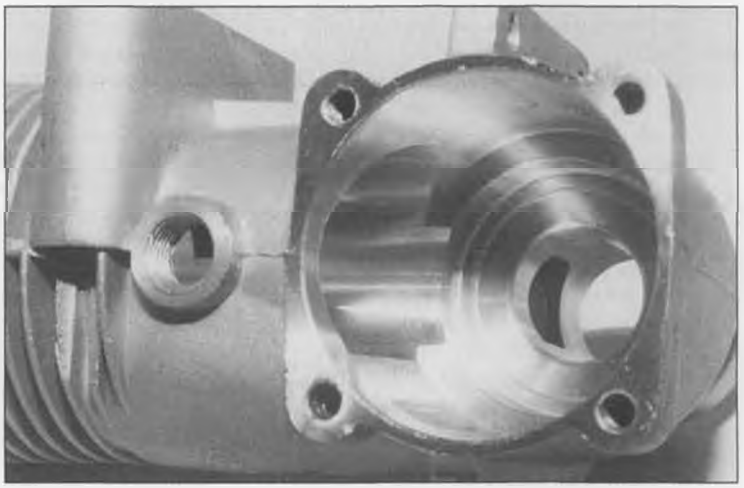
If you strip a cylinder head, a replacement is only $6.00. If the engine feels totally worn out, a new piston/connecting rod/compres-



Baffle on top of the piston is typical of loop-scavenged engines . . . Fox .35 uses similar porting. This K&B .61 is very much in demand by East European U-Control precision stunt fliers because of the porting. Note the baffle fits into the cylinder head recess.

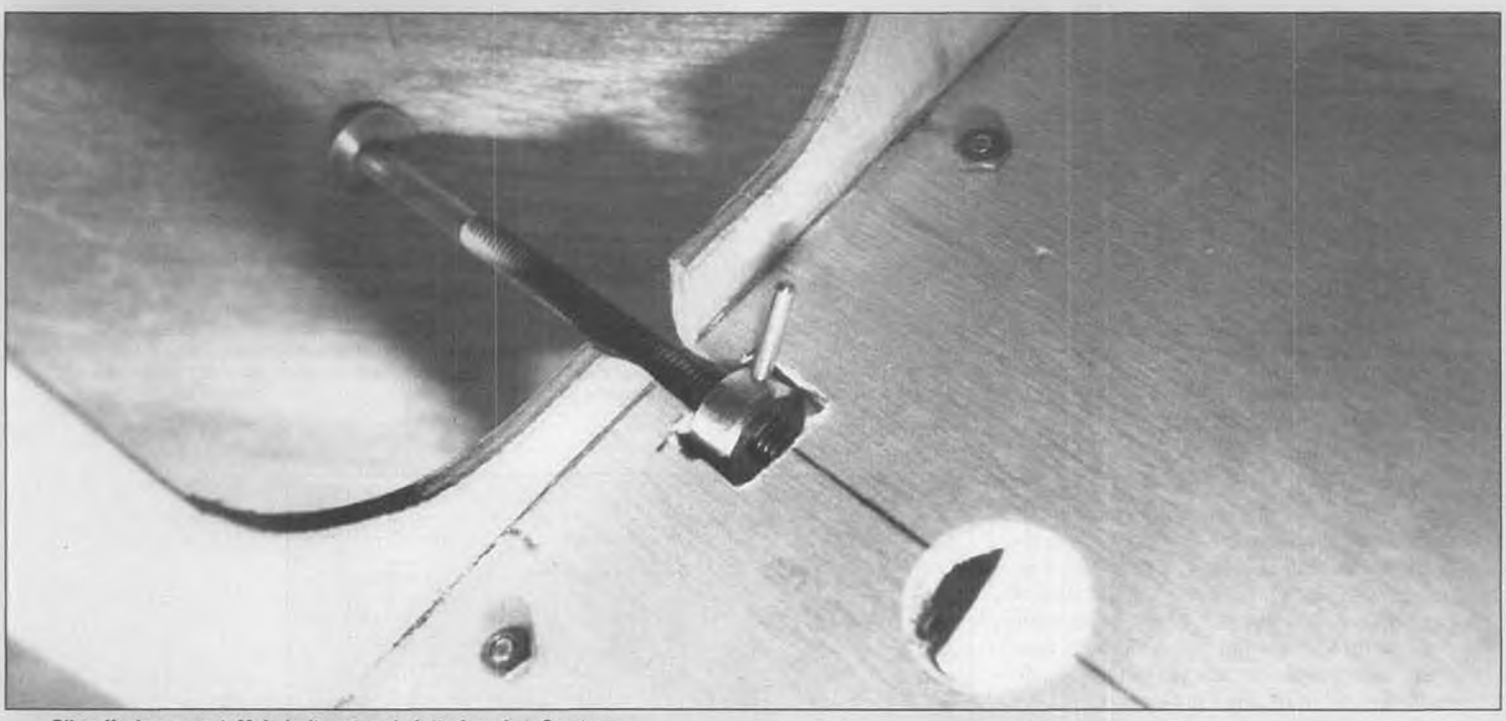


Here we see the inner intricasies of machining accomplished on Computor Numeric Control machinery. The quarter-inch hole in rear of case allows access for fitting the wrist pin through the piston and through the top end of the connecting rod during assembly.



BY FRANCIS REYNOLDS

SLIP-OFF MOUNTS REVISITED



Slip-off wing mount. Main bolt, nut and slotted socket. See text.

This author offered, in MD&TS for June 1990, a new type of wing mount for model airplanes which is simple, reliable, light, AND which guarantees the model major reduction in crash damage. If you missed it, and would like to do less repairing, I suggest you read the June column. We also brought up the subject in the October issue. The photo shows how the main wing-attachment bolt can slip out of its socket, but see the previous issues for details.

KEITH PETERSON ON THE WING MOUNT

In the June issue, I invited reader suggestions to further develop the slip-off wing mount hardware. Keith R. Peterson, of Orem, Utah, responded with flying colors. On locking the single not-too-tight main wing mount bolt, Keith wrote, "It seems to me that the need is not so much to prevent the bolt from rotating relative to the wing as it is to prevent rotation relative to the nut. With this in mind, it seems reasonable to me that a drop of Loctite or other thread-locking compound would serve our needs well. Another option that would not take any time at all for curing would be to use a nylon inserted locknut. This would, of course, make `finger tight' insufficient, but it is, after all, tension rather than torque that we care about."

Keith, you are entirely correct in observing that a bolt-to-nut lock is what we are really interested in. I just ran some tests to see how long it took Devcon Super Lock (an anaerobic thread-locking compound similar to Loctite) to cure in the threads on a slip-off wing mount. It took two minutes to get a very slight locking. In a 15-minute test, the cure was partial but with adequate locking. In a thirty-minute test, the excess compound around the edges was still liquid, but the compound in between the nut and screw threads was thoroughly cured and the torque required to break the bond (to replace the wing) was too great. I bent the anti-rotation pin on the nut in freeing the bond.

So the Loctite type of compound would do the job, but we would need at least 15 minutes between wing installation and engine starting, and there would be considerable danger of excessive locking.

I then tried thick CA at the nut. (Thin would not do because it would cure before we could get the wing on and the screw adjusted "finger tight.") I just put a bead of thick CA on the top of the nut against the threads, and did not work it into the threads, because it will stay fluid longer that way, and I also didn't want to overdo the locking as I did with the Loctite type of product. In four or five minutes this joint was adequately locked. In an hour of curing time the breakaway torque was not excessive as it was with the Locktite type.

Be careful to avoid getting any CA between the nut and its socket; gluing the wing on would defeat the purpose of our slip-off wing mount! The old CA must be cleaned out of the nut and off the threads each time the wing is removed and replaced.

Because of these problems, if we choose to do the locking down at the nut, I prefer a lightly self-locking nut. Here, however, as you observe, Keith, we introduce the problem of the locknut torque masking the somewhat critical wing-bolt installation torque.

After thinking it over, I am personally continuing to lock the head of the bolt, and not the nut. The head is always visible so I know what is going on. If I'm not going to fly the plane right away, I use a touch of Wilhold R/C-56 glue or Silicone sealer around

the head. At the field, to fly immediately, I use a very little application of CA at the bolt head.

Keith continues: "In order to work properly, the bearing face of the nut must be parallel to the bearing face of the socket. This implies that the bolt must be perpendicular. If this condition is not met, the system may bind up in one direction or the other. In order to ensure perpendicularity, the hole through the support structure in the wing should be a snug fit around the bolt to prevent its angle from varying. The unsupported portion of the bolt between the wing and the nut should also be kept as short as possible, as long, small-diameter bolts are prone to bending, which affects perpendicularity.

"The shearable bolt should also have little or no length unsupported between the wing and the fuselage to facilitate consistent and easy shearing. Incidentally, I have occasionally removed broken nylon bolts by heating the tip of a knife or screwdriver and melting a `screwdriver slot' into the bolt."

Right on, Keith. These are important points and I should have covered them last June. I also like your idea for removing broken nylon screws.

Keith writes further: "I wonder about the effects of objects like servos and strip-aileron horns that protrude from the surface of the wing into the fuselage. Do they do damage on the way out? Might it be worth the weight penalty to fair around them so that they ramp out of the fuselage rather than striking and ripping their way out?"

This guy Keith has a good feel for the problems of the real hardware world. Yes, protruding servos and horns can scar things up when the wing separates. Built-in ramps of hard material do help, and I have used them. For new models designed or adapted to use the slip-off wing mount, a better solution to the problem is to avoid it by not permitting any protrusions in the joint between the wing and the fuselage. In my sport models the strip aileron horns and the servo arm protrude on the outside of the wing, not on the inside. Not quite as clean looking, and it adds a small bit of drag, but well worth it to reduce crash damage.

Then Keith says, "On a plane with the main gear mounted on the wing, such as your `Knockabout,' are we likely to have a problem with unwanted separation when landing on grass fields? Such an occurrence would be somewhat disconcerting, but I suppose increasing the size of the shearable bolt could cure this if it were a problem."

Again, yes, Keith. If the aft shear member is too small we could get separation on a rough landing, especially on a field with gopher holes or bumps. On the other hand, we want to let the wing come off if the landing is too rough, to prevent bending the gear or damaging the plane. Use your judgement on shear-pin size. We will all learn by experience.

(Editor's Note: These last two paragraphs kicked off a long-forgotten moment in our past. We were flying our McCoy .09-powered, rudder-only by escapement, Great Lakes Trainer at a fun-fly gathering in New Jersey, probably right around 1960. Both wings were held on with rubber bands; the bottom wing strapped to dowels, the top wing strapped to the cabane strut cage, and outer struts plugged in under compression. After one long flight on this hot, sunny, summer afternoon, the rubber bands, which were probably not new, must have dried out in the heat. As the plane touched down right in front of everyone, on a perfect dead-stick landing [pretty good for rudder-only, no throttle, no elevator], the bumpy surface provided just enough strain to break the top wing bands first, then the bottom wing bands. Obviously, the top wing departed, then the struts, and finally the bottom wing, just before the fuselage rolled to a stop. Several fellow modelers complained of stomach pains from laughing so hard at the spectacle of this dignified scale biplane shedding parts along the runway as it rolled to a stop . . . still upright! wcn)

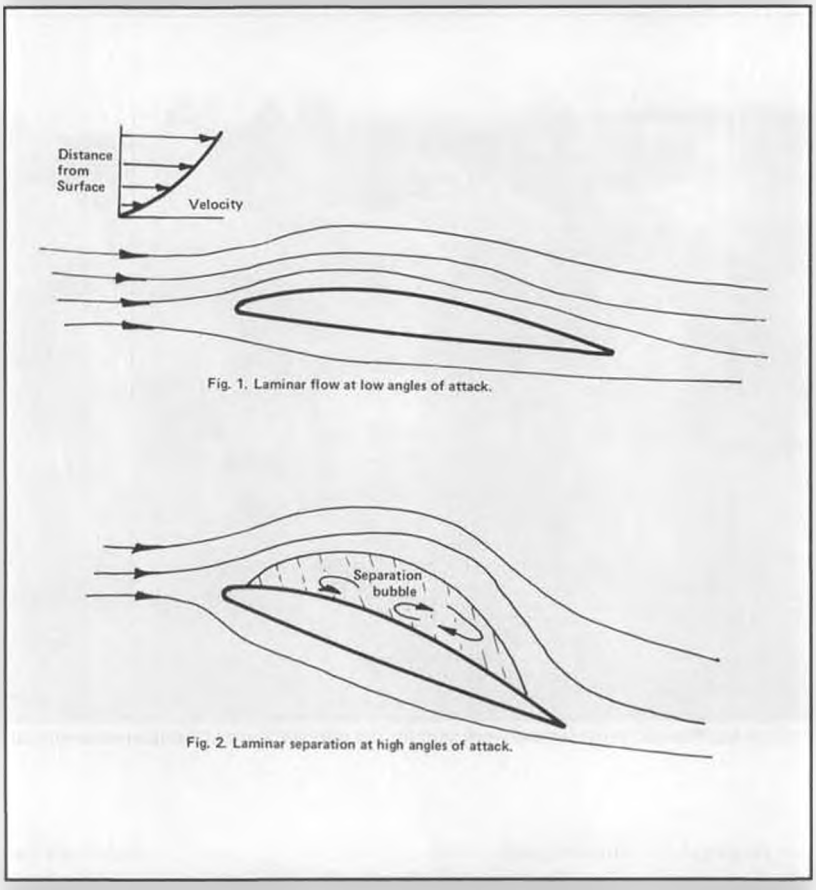


Fig. 1. Laminar flow at low angles of attack.

Fig. 2. Laminar separation at high angles of attack.

I have found I prefer a piece of small birch dowel for the aft shear pin, rather than a small nylon screw. The tests on "Knockabout" that I reported were (and my present flying is being) done very satisfactorily with wood peg shear members. I'm now going to try using balsa shear pegs. I think they will be best of all. One eighth square balsa for a two-pound airplane, 3/16 square for up to four pounds, 1/4 square for five to eight pounds, and 3/8 square from nine to 15 pounds? Drill the trailing-edge holes of such size that the corners of the balsa peg are knocked off when it is pushed in under pressure.

Keith finishes up his very good letter with, "It would probably be a good idea to provide some form of strain relief to reduce damage to servo wires that are forcefully unplugged when wings separate from the fuselage."

Yes, this is another area of concern that we should consider. I'm using the old-style Futaba connectors where the plug leads come off at right angles to the connector pins. This had me worried, because the separating pull is not in a straight line and the servo leads are bent sharply at the plug during separation. In the crash separations I have had so far, however, the servo plugs separated cleanly from the extension cables without damaging the connectors or breaking the wires. There has also never been any other significant damage to the models in crashes using the slip-off wing mount. Believe me, it really reduces crash breakage!

One word of warning with regard to the aileron cable, though. Even if you have lead length enough to plug the aileron or flap servo leads directly into the receiver, *don't*. That could damage not only the servo leads but the receiver. Always use extension cables to the wing, so the separation will occur between the servo leads and the extensions. Another word of warning: *Don't* use anything (such as rubber bands, tape or commercial devices) to lock these connectors together. They must be able to pull apart in the event of a crash.

Thanks for all the valuable suggestions, Keith Peterson. Sorry I interrupted your letter so much, but it is my column and I get to interrupt. *(Don't we all! wcn)*

BALANCE THE AIRPLANE, NOT THE WING

I've been trimming out a new sport aerobatic RC model of my own design lately. As a good builder should, I had carefully balanced the wing, gluing nails inside the light

continued on page 84

PYLON

BY WAYNE YEAGER

THE NEXT NATIONALS

The "Remote Control Association of Central Florida" provided the work staff for the NMPRA Form I Championship with all of them wearing these neat aqua-colored "Ts."

The FAI F3D (Pylon) team received a slight jolt recently when it was announced the World Championship scheduled for August in Italy was cancelled. It seems the Italians planned a very lavish party, one that would have created a heavy financial load on the participants, with a boat cruise and lodging at a resort hotel. The powers that be felt that much of this wasn't necessary as we were going there to compete, not party, and the Italians were asked to find a cheaper hotel and drop the cruise, but they said, "Uh-Uh, our way or the highway," and it ended up the highway.

However, the Australians immediately announced they could handle the championship as they had already planned to bid for the '93 championship. They upped their bid by two years, which was approved, and the F3D Team will be traveling down-under instead of up-over. The scheduled events, Pylon, Pattern and Helicopter, will take place in October of 1991, probably in the third week, at Wangaratta, about two hours north of Melbourne. (Mel-bun to the folks down-under.)

As Momma and I attended the 1987 World Championship in Melbourne, we can say we're happy with the change in venue, because the Aussie's are very conscientious, seem to have tons of qualified workers, and will host a good race, plus, we'll get a chance to renew some old friendships. It is tough on the toes though, hanging on to momma earth. (We are upside-down, don't ya know?)

If you were planning on traveling to Italy as a spectator, I hope you haven't purchased your airline ticket, and if so, hope it's not the non-refundable type cause we ain't going to It-tall-eeee.

In other news, the NMPRA held its annual Championship race in Florida and although I didn't get a report, we did receive some pictures from photog, Stu Richmond, which are included within. Perennial Dave was SECOND! Now that's news! Gary Hover finished 1st, Shadel 2nd as mentioned, Brian Richmond 3rd, Norm Johnson 4th, and Pete Bergstrom was 5th.

The National Aeromodeling Championship (does the name throw ya?) . . . to digress, it seems the helicopter people think calling it the National Model *Airplane* Championships (Nats) excludes them in name, and have petitioned AMA for a change, which was accepted. Why didn't they just change the word 'Airplane' to 'Aircraft' then everybody would be included. Oh well, shut up, Yeager, and quit complaining! Sheeese . . . Anyway, the Nats will be back in Lawrenceville, Illinois with the dates being July 13 through July 21.

Pylon will start flying on Saturday the 13th, which means processing for the first event (Q-500), will be on Friday afternoon. The early start is an attempt to find some extra time for Quickie, which had 96 entries in 1990 and probably will exceed 100 in 1991.

The flying hours will remain about the same, although there are some major changes in the other events because the new odd-numbered frequencies will be utilized, and all frequencies will be allocated to specific groups, resulting in pylon, pattern and helicopter flying at the very same time, at the

Contest Director Dave Tyson awarding a plaque to "Perennial Dave" while Dave tells Dave a good story, or is it Dave listening to Dave while . . . .

The top five at the Form I Championships are in the front row, all holding airplanes, (l-r) Gary Hover 1st, Dave Shadel 2nd, Brian Richmond 3rd, Norm Johnson 4th, and Pete Bergstrom 5th. Front left is Jimmy Shinohara, Shadel's and Hover's caller, and in the rear is (l-r) Paul Benezra, Lyle Larson, Henry Bartle, Don McStay, J.P.Hanway, unknown, and Marie Bergstrom. Unfortunately, we weren't provided with the finish position of the entire back row.

very same site!!!

Pattern will fly all day, which is a big change in its usual hours, and should give them enough time to complete several rounds. Pylon also was offered all-day flying, however, we have a couple of other logistic problems that couldn't be solved with that kind of schedule.

First, it's too much of a work load on management because, picture if you can, we fly from 8 a.m. to 5 p.m. When the event is finished, we tear down our equipment, pack up our vehicles, finalize the scoring tabulation, pass out trophies, and take magazine pictures.

This all takes a couple of hours, then rush off for a quick greaseburger and soda-pop, which is all you have time for because the fliers in the next event are waiting to process their paperwork and airplanes. This would run us to about 10 p.m., which makes for a very long day and some very grumpy people.

The second problem encountered is the site itself. As pattern is flying all day, they need the entire strip, including the area at which we flew last year. After some quick looks at other suitable sites, the only solution available was for the airport management to shut down the active runway from 6 a.m. until 2 p.m. each day and let us use it.

Therefore, pylon will fly at a slightly different location on the active runway, which this writer has inspected and can state "is a very nice surface" and I'm sure the fliers will be content with it. We will schedule flying from 7 a.m. until 1 p.m., with an hour of cushion in case we need to go a little longer. We will NOT be having pilots meetings at 6 a.m., however, will schedule for 6:30 so we can get started by 7.

Quickie goes first and flies Saturday, Sunday and Monday. Quarter Midget unfortunately, has only one day on the schedule, which is Tuesday the 16th. On Wednesday the 17th, F3D will fly for a short few hours and we will vacate the site because it will be taken over by, can you believe?, ELECTRIC PYLON!!!

How about that, sports fans? No Noise Pylon!! It's the first Nats for them and should be interesting from a spectator standpoint. They will run their own event, so we won't be needed for staff purposes. I understand they run the regular Quarter Midget course with low 20s times, which means these dudes are mooooo-vuuun!

Form I will wrap up the week by flying on Thursday and Friday. We wanted to showcase Form I by having them scheduled for the last weekend, however, we ran into a problem with scheduling Scale. They will be using the same frequencies as Pylon, meaning they cannot fly at the same time and as we will be using seven of the total nine flying days, the only way we could fly Form I on the end, was to put Scale at the beginning. This, of course, is impossible, because they need a couple of days for static judging, so needless to say, no showcase for Form I.

The frequency allocation for Pylon is channels: 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, and 55, along with ham frequencies; 50.8, 50.86, 50.92, 53.2, 53.4, and 53.7. These will be the only allowed frequencies for all of Pylon, period!

Next month we will have some pylon equipment designs by request. G'Day. ***MB***

WORKBENCH *Continued from page 7*

we only promise the next issue. It is financed by the time, effort, and money of those above (a list of contributors), and the generous donations acknowledged separately. Donations are welcome but not essential. Just an S.A.S.E. will bring you the next issue."

Obviously, our mentioning it here can only add to the printing and distribution costs, so we'd suggest that if you want to get on the mailing list, you should send some kind of monetary donation along with your request to: John Pool, 8 Sycamore Road, Barlby, SELBY, North Yorkshire, YO8 7XB, England, phone Selby (0757-703060).

The newsletter contains drawings of various flying wing designs, airfoils, technical discussions on the elements of tailless aircraft design, and a long list of tailless designs and where they were published. It's a must for anyone who doesn't like to build tail surfaces! ***MB***

DEAR JAKE *Continued from page 7*

Dear Jake:

A friend of mine told me that the bungee cord we use to high-start our sailplanes was originally developed in the 1930s for aircraft landing gear systems. Can this be true? What's the real background on bungee?

Stretch McGwyn in St. Louis

Dear Stretch:

Bungee cord is nothing more than strands of rubber encased in a braided cotton sheath. I think it was originally developed to hold school books to bicycles, but it was used as shock absorber cord in early aircraft landing gears in much the same way as cars use coil springs.

Nowadays, it is used by morons who like to dive off bridges with bungee cord tied around their ankles to arrest their fall just before their teeth become fossils in the rocks below.

Bungee got its name from the area where rubber, its main ingredient, grows in lush jungle climates. This area includes India, Thailand, and Burma, and is characterized by large numbers of elephants running around loose everywhere. "Bungee" is a Burmese word which, roughly translated, means "Bring me the scraper, I stepped in another one."

• • •

Dear Jake:

Airplanes that have the C.G. too far forward are always referred to as "nose heavy." Couldn't they be called "tail light"?

Amos in Arkansas

Dear Amos:

No. Tail lights are what there are about fourteen of on the back of an Edsel.

• • •

Dear Jake:

Well then, how about "empennage light"?

Amos Again

Dear Amos:

No, that's a reduced-calorie French beer.

Jake ***MB***

COUNTER *Continued from page 9*

balt 035 motor and the Astro Mini-Challenger electric powered sailplane. The prop hub is machined from solid aluminum bar for maximum strength and reliability. A precision molded nylon spinner is included. The prop can also be used with most ferrite 05 motors and most 05-size gliders.

Want more info? Call Astro and ask for Bob Boucher. Tell him you read about these items in *Model Builder*. Thanks.

• • •

The "Maverick 40" is the latest RC model from Carden Corporation, 1731 N.W. Madrid Way, Boca Raton, Florida 33432, phone (407) 367-7744. It' a sport/aerobatic design for .40 to .50 two or four-cycle engines, and said to have positive control and stability, even in heavy wind. Landings are slow and predictable. Span is 56 inches, area is 630 sq. in. and flying weight is 5-1/4 to 5-1/2 pounds.

The kit goes together very quickly and accurately, featuring hand-selected and matched finest quality balsa, precision-cut parts, foam core wing with balsa skins, custom ailerons, and top quality hardware. Rolled plans and a detailed instruction manual round out the supplied material. List price is $114.95, but there is an introductory special at $79.95, plus $5.00 shipping and handling. How long that offer lasts is your guess! Call Dennis and find out for yourself.

• • •

Anyone who is even remotely aware of the RC car hobby, has heard of the RC 10. This car by Associated Electrics, Inc., 3585 Cadillac Ave., Costa Mesa, California 92626, phone (714) 850-9342, has been on the top of the popularity and competition heap for as long as it has been in existence, and nearly every after-market manufacturer in the RC car hobby has made some accessory or add-on part for the RC 10. Now Associated is introducing the RC10 Team Car, which incorporates all the latest speed secrets of the Team. It has: Stealth transmission; new, improved, hard anodized, Teflon-coated racing shocks; Wide track front suspension; Turnbuckle tie rods and links; Zero-offset front end; Lightweight one-piece wheels; New Viper buggy body; Ball bearings throughout; and Universal dogbone/stub axles. The RC10 Team Car with Graphite Chassis, less battery, motor, radio, and speed control lists for $345.00

• • •

There's an alternative to turning in your beer and soda cans for recycling . . . you can turn them into airplanes! B.C. Air Originals, 725 S. 12th St. #114, Bismark, ND 58504, has plan sets to show you how to make over twenty-five different single or multi-engined mono-, bi-, or triplanes out of the cans from which you drink or pour your favorite beverage. In fact, B.C. has now gone one step further by offering a two-hour and 45-minute video tape which takes the builder through every step in the process of turning beverage cans into works of art. The VHS tape sells for $20, including First Class

mailing. Call (701) 258-7423 for further information.

Try it . . . you really CAN do it!

• • •

Matney's Models, 11325 Harold Dr., Luna Pier, Michigan 48157, phone (313) 848-8195, is offering a 30% Ultimate 10 Dash 300S kit with epoxyglass fuselage; engine cowl molded on for easy construction. Balsa, ply and foam construction. Other aircraft also include Q/M pylon racers and a sport/pattern ship. Contact Kevin Matney for further information. ***MB***

FREE FLIGHT *Continued from page 17*

tell me how they got started in free flight, and I received a number of very interesting responses. This month, I would like to share with you the poetic response from Granville Andrews Jr. from Jasper, Alabama. In months to come I will feature others. I hope you enjoy these stories as much as I do.

"My first free flight was an Aeronca C-3. How can I ever forget! It had a twenty-four-inch wingspan, and it was powered by a Pee Wee .020 engine.

"I worked on it from early dawn till late at night. And even when I went to sleep, I would dream of launching it for the first time.

"And my dream came true . . .

"The day of miracles finally arrived. The engine hum sounded better than any bird I ever heard sing.

"With a full tank of gas, the yellow Aeronca C-3 lifted from my loose hold. In one large sweeping circle, it passed over my head and gracefully ascended into the autumn sky.

"It climbed higher and higher into the afternoon sunlight, and for a moment, I lost sight of it. But then, I caught a glimpse of the sun reflecting off the gas tank. Up until then, it had climbed slowly upwards in circles. Suddenly, it stopped circling, and set a straight course to the great beyond.

"All I could hear was a faint hum, and all I could see was a tiny outline of yellow, singing on wings.

"The Aeronca C-3 flew on into the autumn sunset. I never saw it again.

"But it wouldn't surprise me if it is still flying on its journey. After all, free flights . . . are magic in the wind."

THAT'S IT DEPARTMENT

Thanks for reading along this month. I know of no way to improve on Granville's story. It describes free flight for me. And, I hope, for you. Thermals to you until we meet again next month. ***MB***

ELECTRONICS CORNER

BY ELOY MAREZ

LISTEN UP AND LIVE

THIS IS EC NUMBER 123! Doing this sort of thing is quite like many other tasks we take on for ourselves . . . some I have enjoyed writing and have been pleased with the results more than others. However, I can tell you that I have never enjoyed or will probably ever enjoy writing a column as much as I am enjoying this one. To bring you the whole story, I have to stray off our favorite subjects and even get a little personal, and I ask your indulgence because I do so with good reason.

To start with, there is a super young lady in my life. Her name is Erin Hayes; she is in her first year of high school, and as I write this in late November, just after the year's first report cards, she has started off with a 4.0 grade average. On top of that, she is a star soccer player, a star softball pitcher and top hitter on the team, MVP and, in some way, still found time to be a cheerleader.

A granddaughter to be proud of, right? And while I will not admit that she is my favorite, she is the oldest, which has given us more opportunity to do things together, having roamed as far as Costa Rica, just the two of us, a couple of years ago. Erin plans to be a pediatrician, and has her life all charted in that direction. I, with a lot of flying time on the old airframe, have at times wondered if I would be allowed to be at that all important future graduation.

I am glad to tell you that as of last week, my chances of doing so were increased many times over. One week ago today, Thanksgiving Day actually, I was the recipient of a triple heart bypass. Read that again . . . one week, and tonight I am in my home, ate three meals today, walked in the warm California November sunshine (Ha), and here I am working. We are truly lucky that there exist people with skills necessary to help people like me. *(Always thought he was a turkey. Now we know for sure, as he was being carved on Thanksgiving! wcn)*

Now comes the soapbox, but I promise to spend only limited time on it. The whole story is that I never knew that I had a heart problem, and never experienced chest pains, shortness of breath or any of the other classic symptoms. As a leftover from my Air Force flying career, I am accustomed to having what I still think of as my "annual flight physical," and it was during the last one that a discrepancy was discovered. The other side of the story, had I not had the exam, would have been completely different, and quite possibly the first warning would have been the last thing I ever felt, as unfortunately happens to so many people. At best, had I survived a heart attack, I would probably have experienced some irreparable damage to the heart. Found at this point, the cure is complete, and it'll have to be something else that grounds me for good.

Why am I boring you with all this? Because in the nine years of EC, I have had so much mail and have met so many of you in person that when I sit down once a month, I don't do so to write a column, but once again to chat with my friends. And with friendship go privileges; I can offer unasked-for advice. True, you may not have a granddaughter quite like mine, but hey, in that league, even second place is great! And I know you don't love her any less! For the sake of whoever you do love, or loves you, or even if you are only finally going to start that long-term scale project, if you have not had a physical exam for a long time, get one my friend! And don't ever just wait for things to "go away" . . . the Chief Pilot up there has decided to extend my Airworthiness Certificate, and no doubt he will do the same for you, but you've got to help him first!

NORCAL AVIONICS' TACH/VOLTMETER is the subject of our first letter this month. It comes from Harold Layser, Myerstown, Pennsylvania, and says:

"Some time ago I purchased a Norcal Avionics tach/voltmeter combination at Sunnyvale, California. Now it needs help to make it work again. I sent the unit to that address and it has been returned `Not Deliverable.' Do you know where they are or if they are, or who would, could, might repair the unit?"

This brings up a related subject I mention every couple of years and have been wanting to do so for some time. First though, let's see about getting Harold's tach back to counting. I do have a current address for who is apparently the current owner/maker of this instrument: Norcal, Div. A.B. Tech, Inc., 5689 Glasgow, Troy, MI 48098; (313) 828-8210.

I don't know the history or the logistics involved, but probably, as often happens with model equipment manufacturers, many of whom are small, even one-man operations, the original Norcal was merged with or bought out by A.B. Tech, whoever they may be! Harold, you might let us know who how it all turns out.

LACK OF NAMES AND ADDRESSES enclosed with equipment being sent in for repair is the related subject I wanted to touch on . . . again! Every manufacturer and importer I have ever visited has a shelf of boxes of equipment that arrived with illegible sender's addresses, or in many cases, no addresses at all. You may find that latter statement hard to believe, but I have seen it dozens of times. Your complete address should actually appear in two different places; the normal place on the outside of the box, and again, complete, clearly legible and without abbreviations, on the letter enclosed describing the malfunction you have experienced.

That letter, which is a subject in itself, is a must if you expect a thorough repair and test at reasonable cost. Otherwise, the service technician, no matter how capable he or she may otherwise be, who cannot read your mind, will have to spend extra time testing and evaluating your equipment. If the fault you discovered is intermittent, it may be missed all together!

The inclusion of your complete name and address inside the package is even more important if you use "Mail Boxes USA" or one of the many shipping services available to us all over the country. They generally add a rubber stamp or label as the shipper, and when it arrives at the destination, it's often logged in with Mail Boxes as the shipper/owner. Without your name inside, that item might never be traced to you, and actually most companies have a maximum time for which they keep such things, eventually disposing of them.

Unfortunately, the number of company representatives who we see actually entered in flying events or at trade shows around the country gets less and less every year . . . what we get to talk to more and more are salesmen. Whatever the reasons for this, should you discuss a piece of malfunctioning equipment with one of these gentlemen, and later send it in for repair, don't do so with a note saying "Joe, here is the servile (I've actually

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seen that in a letter!) I told you about, please see what you can do with it."

In the first place, the chances are almost certain that Joe is not the person who will repair your "servile," he's not the one who really needs to know what difficulties you have encountered. Secondly, the chances are that Joe is not going to remember you . . . or your "servile" and its symptoms. He probably talked to dozens of people that weekend, and now, two or three weeks later, in his mind, you are just one of the great unwashed multitude. It helps to remember that your malfunctioning RC unit might be of great importance to you, but its importance to one who deals in them by the bushel dims rather rapidly.

PRINTED CIRCUIT BOARDS are one part of the RC system that we are all at least vaguely familiar with. Don't just take them for granted. The type used can tell you a lot about the company that made your system, its level of expertise, and its interest in providing you with state-of-the-art equipment.

Such PC boards come in three general categories:

1. Single-sided, with the conductor (metal land) pattern bonded on one side of an insulating material and the components mounted on the opposite side. Component leads pass through properly dimensioned holes and are soldered to the conductors.

2. Double-sided, used for more complex circuitry, containing bonded conductors on both sides of the insulator. Connections between conductors on opposite sides can be made by component leads, though in the better class of board, the holes through the insulators is plated through, so that each wire lead is actually soldered into a metal tube instead of simply on top of the metal land.

3. Multi-layer, a technique not yet seen in RC equipment to my knowledge. Expensive and requiring great precision, this technique uses several layers of wiring patterns, each mounted on a thin insulator, carefully aligned and molded together. Effectively, you wind up with printed circuit connections on top and bottom, and one or more layers internally. Additionally, as in RF circuits, the internal lands can be left largely intact to provide shielding between components. Multi-layer boards are all made with plated-through holes, making internal connections as planned by the designer.

The materials for PC boards also vary widely, also attesting to the overall quality of the equipment built on them:

1. Phenolic, usually of a brown or white color, and suitable only for applications where temperature stability, reliability and resistance to stress and/or shock are not important.

2. Glass epoxy laminate, cloth reinforced, the most widely used material comes in blue and green and in many thicknesses. It has excellent temperature stability and resistance to shock.

3. Ceramic, not often seen outside highly specialized high temperature equipment and in small light assemblies as it tends to be very brittle.

Additionally, any of these boards of any materials may be treated in one or more ways. The most common is the plating of the copper with a tin/lead mixture to retard corrosion and to improve solderability. Lacquers, plastic coatings, or at times epoxies may be "painted" over the boards, which greatly improves their appearance, but is really there to provide further insulation between components.

What can one expect upon looking inside a favorite piece of RC equipment? I have talked before about cheap radios . . . the quality of the PC board is definitely reflected in the cost of the system and even some of the "biggies" use boards that are more suitable for automatic coffee pots than flying *my* airplanes. On the other hand, however, a lot of the better equipment does include double-sided, plated-through epoxy boards of excellent quality.

And I am happy to report, there is one RC manufacturer on the brink of releasing equipment using the latest PC technology, the multi-layer board described. Care to guess who? Actually it is considered one of our minor manufacturers, a view definitely affected by the fact that its major market is in RC cars. This year, Novak Electronics will introduce a three-channel 75 MHz receiver designed and built on a four-conducting-layer board, to be followed by a double-conversion, small, three-four channel 72 MHz unit. The use of the inner board shielding material greatly increases the receivers' immunity to the problems that have begun to plague us with the use of more closely spaced operating channels.

And it's American . . . and will come with an understandable instruction manual! Actually, though Novak Electronics makes little of the fact, it is now probably the largest US maker of RC equipment, uses proprietary ICs of its own design and development, and as far as I know, is the only US RC manufacturer that owns and operates its own robotic surface mount device assembly equipment, not to mention the equipment and expertise to design highly complex multi-layer PC boards. Most other US SMD equipment you see will have been built by a "job shop," who might be long on expertise but there is still no substitute for having complete control when you are producing high quality equipment.

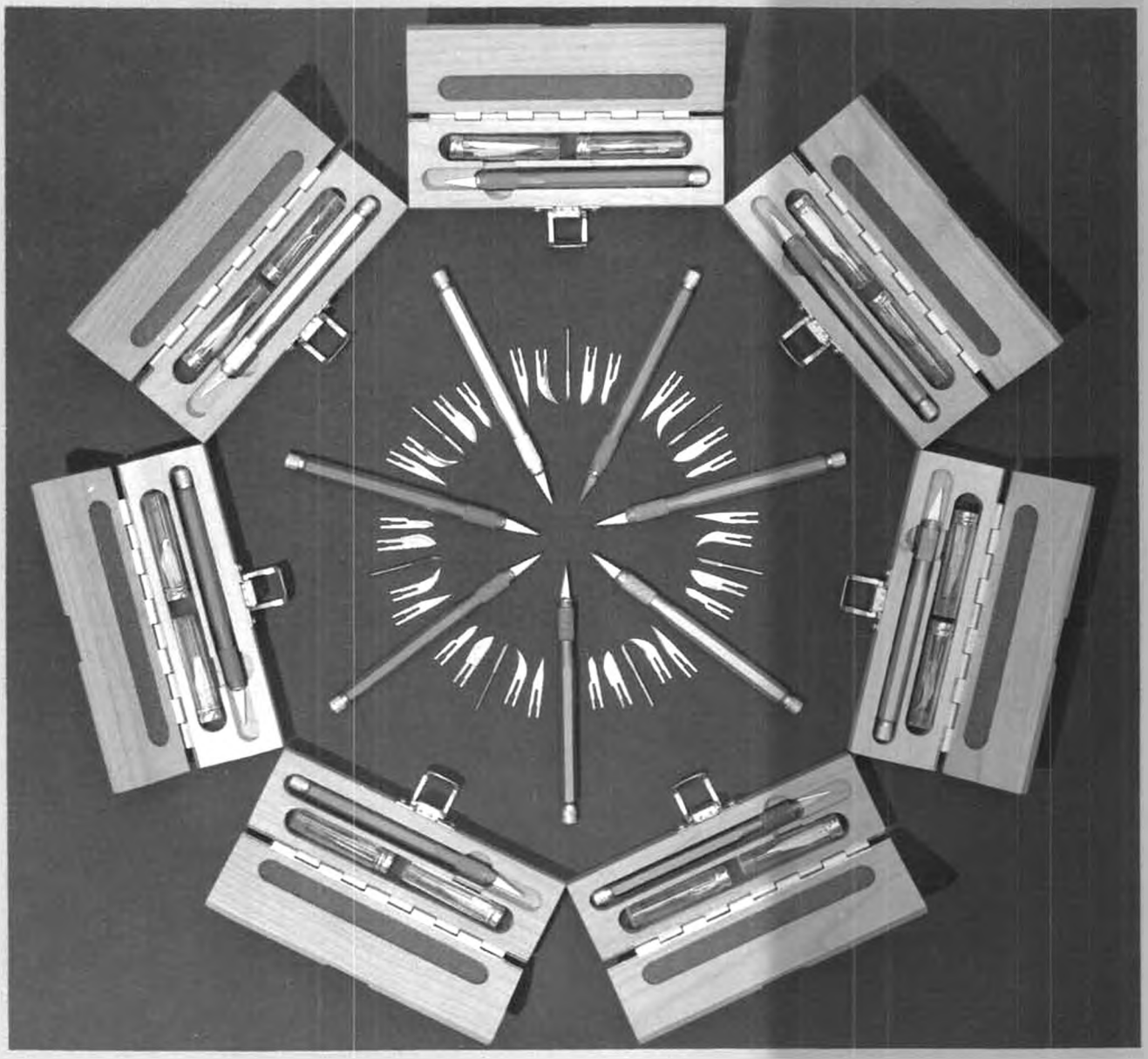
No, I haven't lost my allegiance to things that fly . . . I go back to "Memphis Belle" . . . but you have to give credit where credit is due and in this case you have to appreciate the efforts being put out for RCers by the small group that comprises this huge company!

Eloy Marez, 2626 W. Northwood, Santa Ana, CA 92704. ***MB***

TOURNAMENT OF CHAMPIONS NUMBER TEN

BY RICK ALLISON/PHOTOS BY BILL BOYNTON

IN THE BEST CIRCLES, IT'S **über skiver**



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For the tenth time since its inauguration in 1974, the world's richest model airplane meet has taken place in the neon nirvana of the American southwest, Las Vegas, Nevada. Starting November 8, 1990, and running through the 11th, thousands of spectators watched as twenty one of RC's finest from around the world kicked the tires and lit the fires for $126,500 in fresh American bucks. Minus whatever minor amounts those worthy stick twiddlers saw fit to leave in the casinos, of course!

What I'm talking about is the Tournament of Champions, aerobatic aeromodeling's World Cup, World Series, and Super Bowl. The story of the tenth edition of this classic event was a story of marvelous flying, beautiful machines, and meticulous preparation. Elements of drama, emotion, dogged persistence, and great theater were evident. And throughout all of this, we enjoyed near perfect weather. In other words, except for the weather, most were agreed that it was just about your dead solid average normal TOC. It was wonderful!

The scene this year was the recently completed and dedicated Circus Circus RC Field, which was personally funded by TOC sponsor Bill Bennett in cooperation with the Clark County, Nevada Dept. of Parks and Recreation. This is a beautiful 192,000 sq. ft. facility a mere 7 miles east of the famous Las Vegas Strip, and is complete with a baby

Gracing the tops of each of the first five place trophies was is a beautiful gold plated wire sculpture of, appropriately enough, an Ultimate Aerobatic Biplane, like those which dominated the 1990 T.O.C. They were created by Michael W. Thompson, of Walnut creek, California.

layan mountain peak for the last 16 years, a little history and a peek into the nuts and bolts of this one-of-a-kind contest is perhaps in order.

The International Tournament of Champions was started in 1974 by the late Walt Schroder, modeling great and former editor of Model Airplane News, and William G. "Bill" Bennett, Chairman of the Board of Circus Circus Enterprises, Inc. The intent, then as now, was to present the ultimate challenge to the best radio control aerobatic pilots in the world, and provide them with sufficient incentive (prize money) to meet that challenge. I suspect that the idea of thereby creating a grand destination event spectacle for vacationers from the ranks of the world's RC hobbyists also occurred to someone fairly early on in the formative stages of the contest as well.

In any case, from that modest beginning ($11,000 in total prizes; $500 1st place award) has grown an event that dwarfs most of its counterparts in the full scale arena. Changes along the way have been many, most made in the interest of keeping the challenge fresh, achieving an ever more realistic simulation of full scale aerobatic flight, and providing more spectator appeal.

Accordingly, scoring is as per full scale criteria established by the I.A.C., or International Aerobatic Club. Maneuver schedules flown are created from the F.A.I. "ARESTI" catalog of full scale aerobatic maneuvers.

The 22 competitors at the 1990 TOC were invited by the contest management, half from the U.S., and half from the rest of the planet. For five pilots from each of these groups of eleven, the invitation was based solely on their order of finish at the FAI Team Selection finals (U.S. pilots), the AMA Nationals (US pilots), and the FAI F3A World Championships (foreign pilots). The remaining six from each group were invited at the discretion of the contest management. The usual TOC contestant lineup is a "Who's Who" of distinguished RC aerobatic pilots, and as can be seen from the listing, this year's group was no exception.

As in full scale aerobatics, the programs flown at the TOC consist of both "Known" Compulsory (published in advance; practice allowed) and "Unknown" Compulsory (published the day before flight; practice strictly forbidden). In a change from previous years, the usual "Free" program, normally made up by the contestant from the Aresti catalog to a specified "K" factor (degree of difficulty) was dropped in favor of an additional "Known" program. This was done to enhance the ability of spectators to follow the progress of the competition.

In another significant change from past years, a different type of three-minute "Free" program was flown as a separate contest with separate ($5000 1st, $2500 2nd, $1000 3rd) prizes. This event was open to all invitees, but compulsory for none. No schedules needed to be submitted, maneuvers did NOT have to come from the catalog, and no holds were barred. Contestants were allowed music, announcers, smoke, or anything else they wanted to enhance their performance. The idea was to create an

smooth 100x700 ft. east-west runway, shade structures, bleachers, soft green grass, and the clearest air I've ever seen. For the contest, a huge Circus Circus concession tent was erected to dispense bitable burgers and state of the art Chili Dogs along with the usual lineup of beverages and souvenirs. Clean chemical toilets abounded, and the new place has enough parking for an Oklahoma-Nebraska football game. The lucky members of the Las Vegas Radio Control Club get to use this as their home field. These guys definitely deserve our envy!

For the benefit of any newcomers to the RC airplane hobby out there, as well as any recently repatriated old timers who may possibly have been squatting on a Hima-

(Opposite) Close-up aerial view of the Tournament of Champions as taken by Bill Northrop from the Long Ranger helicopter piloted by Mel Larson, who along with wife Marilyn, owns and operates the Action Helicopter Servicenter in Las Vegas. Fly-by was made during an intermission between rounds of competition. Camera-wise, it looks like we're outnumbered about 300 to 1! (Inserts from left) John Britt prepares to fly his Skybolt, which won the Best Aircraft trophy, plus $3,500 cash. He also won this award in 1988. • Dave von Linsowe and his recently completed "Courtesan. See text. • Steve Rojecki's two Dick Hanson Bucker Jungmanns. • Wolfgang "The Banker" Matt, Liechtenstein, one of the world's best. • Jeff Tracy (Hang one!) from Australia, and his Sukhoi 26M. • Ivan Kristensen, Canada, powered his Ultimate with a Tartan Twin.

anything goes, "Hot Dog" type of airshow, scored solely on the basis of originality, versatility, harmony and rhythm, and execution. This turned out to be about the second biggest aeronautical crowd pleaser of the event. Curtis Youngblood's helicopter demos were the first biggest, but more on both of these later. I digress.

The TOC contest is structured so that both "known" programs and the first two "unknown" programs are flown by all contestants during the first three "qualifying" days of the meet. The top individual flight scores from each completed qualifying program are then added together for each contestant, and the top five finishers then show up as finalists on Sunday. In the finals, the two "known" programs are flown again, along with different "unknown" programs announced on Saturday evening. The best individual flight scores are again totaled to determine the winners.

As the "K-factor" degree of difficulty multipliers are determined by adding maneuver elements together under the Aresti system, the math and methods involved in scoring the event, along with the multiplicity of programs flown, make the scoring difficult to understand and fairly hard to follow. The rounds are flown, the numbers appear on the board, the flyers are ranked, and that is pretty much that. This seems to matter to very few, however, as most folks seem much more intent on watching the flying than they do on watching the scoreboard. The Sunday finals, with only five pilots involved, were much easier to follow.

Chip Hyde's Ultimate hangs motionless as he balances aircraft weight with engine thrust during three-minute Free Style demonstration.

So what happened? How did all our favorites do?

To begin, we had a pretty large surprise right out of the blocks. Hanno Prettner, the reigning World Champion in F3A and winner of eight of the previous nine TOCs, was unable to show for the event. Contest management was informed that Hanno was in the hospital with some fairly severe and sudden internal problems, and would not be attending. To say that this news caused something of a stir would definitely be an understatement.

Hanno wasn't the only competitor to run into a bit of misfortune "on the way" to the TOC. Well known pattern competitor and first time invitee Dave von Linsowe planted his primary airplane because of an inflight failure barely a week before the contest. Due to the grace of good friend Tony Frackowiak, Dave was able to snag a loaner . . . the Godfrey Ultimate bipe that had been Tony's back up bird at the '88 TOC. An unexplained radio "hold" two days before the contest plugged the loaner so deep into the thick underbrush surrounding the brand new Circus Circus RC field that it stayed lost until the contest was nearly over on Sunday. Dave was left with only his unfinished "Courtesan" bipe, which, fittingly enough, was modeled after Henry Haigh equally unfinished and yet-to-fly full scale aerobat.

Remember the "dogged persistence" I mentioned? Team von Linsowe completed the unfinished airframe that night in the hotel room, borrowed a used 3W engine from Chip Hyde, and installed a radio. The next morning, they drove out into the desert for five trim flights. Bright and early Thursday morning, Dave was on the line and ready to compete with an airplane that literally had not existed except as unfinished components as late as Tuesday evening!

So how was the flying? Fantastic, of course. Over the years, we have come to expect no less from this event. The TOC is the place you go on years when the World Champs are not being held to see the best in the world . . . Period. The level of skill was such that it truly was very difficult to pick differences among flyers unless you followed the flights as closely as the judges did; noting a tiny bobble here, a slight over rotation there. Even then, the nits you were picking were just that: nits. This was especially true during the "known" sequences. The "unknowns" were a little different story. Here, the differences between the pilots began to show a little bit more obviously, and experience began to tell.

Heading into the third day of qualifying on Saturday morning, the order had pretty well shaken down into a contest between the "heavyweights." Chip Hyde was the leader, followed closely in order by Wolfgang Matt, Steve Rojecki, Bill Cunningham, and Steve Stricker. No surprises here; the one thing common to this group was previous TOC experience. In fact, four of the five had finished in the top five at previous TOCs, with Bill Cunningham being the only newcomer to the inner circle. And you could hardly label Bill a dark horse, after a strong 8th place finish at the '88 TOC.

Making a strong showing were tournament rookies Quique Somenzini of Argentina, and Dave von Linsowe, in 6th and 12th place respectively. In particular, Quique's bid to break into the final five at his TOC debut provided the crowd with a fair dose of drama as the flying started. By mid-morning, however, the scores being posted made it obvious that the leaders had taken the game to a new level. When the feathers and fur had settled to earth on Saturday evening, Quique had dropped back to 7th, a scant 168 points out of the 5th and last finals position (out of nearly 50,000!). Veteran Japanese competitor Giichi Naruke had closed fast to take 6th, and while the morning's leaders had swapped a few positions among themselves, no one had been unseated. The final standings for the day, in order, were Hyde, Matt, Stricker, Rojecki, and Cunningham.

The finals on Sunday started in an atmosphere fairly appropriate to the day, with the first flights being run off in a reverential hush. Rather like Center Court at Wimbledon during the finals of Men's Singles, actually . . . with the English accent of TOC announcer Maurice Franklin only adding to the effect. It was awe inspiring; such a multitude of folks watching a single model airplane fly, and not a sound to be heard but the engine exhaust and the prop tips!. Early on, it became obvious that the finals would be an eyeball to eyeball game. With the differences between pilots so slight at this level and major miscues so rare, the game

Steve Stricker, with wife Pat and 34% Ultimate builder Ron Stahl. Note 7% wing airfoil, lowered stab placement.

Dean Koger and his Extra 230. Twin Tartan with belt drive.

George Manning with his Godfry 30% Ultimate. Probably uses Powermaster fuel.

Quique Somenzini of Argentina, holding his trophy for First Place in the voluntary Free Style event.

Chip collects the Second Place trophy in the Free Style event as T.O.C. sponsor Bill Bennett checks his brand of hair spray and Mel Larson croons "The Party's Over" on the microphone.

Bill Cunningham collects his Fifth Place Trophy, $5,500, and a little bonus, as a smiling(!) Bill Bennett and Mel Larson witness the action.

boiled rapidly down to flying as smoothly as possible and attending to minor details of positioning and presentation.

With so much at stake on every flight, the concentration level was intense. I believe that the traditional breaks between rounds for the helicopter and ducted fan demos probably did the pilots and judges more good than the spectators!

The top story of the finals had to be Chip Hyde. While Chip led the contest all the way, the actual margin wasn't much until Sunday. Chip really hit the afterburners in the finals, winning every round in convincing style. For the last dozen years or so, the pattern community has watched Chip grow from "child prodigy" to become the poised and confidant winner of four Nationals, one Masters, and now a Tournament of Champions. The natural question, of course, is would there have been a difference in the outcome had Hanno been able to attend? I don't know, and I don't think either Chip or Hanno knows. All of us were disappointed at Hanno's inability to attend, and wish him a speedy recovery, but I don't think anybody was any more disappointed than Chip. Unless it was Hanno! The next TOC should be very interesting. Make your reservations early. . . .

As in any good circus (circus!) there were other interesting shows aside from the main ring. This year's innovation, the three-minute "Free" airshow event, was a great, if limited, success. The fellow that came up with the idea should go to the head of the class. Only eight pilots entered, but the quality made up for the quantity. Choosing to fly were Chip Hyde, Quique Somenzini, Dave von Linsowe, Steve Rojecki, George Manning, John Beasley, John Lockwood, and Hajame Hatta. The top five qualifying would fly a two round "finals" after the main finals on Sunday, with the winner to be determined by the single best round. Saturday's flying closed with Somenzini, Hyde, von Linsowe, Rojecki, and Manning to fly on Sunday.

Quique Somenzini and Chip Hyde pretty much ran away with the show on Sunday, as they had on Thursday, Friday, and Saturday. Dave von Linsowe, with brother Steve doing the "air show" announcing, flew to a very credible 3rd place. As for Quique and Chip, well, you really should see the videotape. As a matter of fact, I want to see the videotape, just to make sure I saw what I think I saw!. Smoke, music, multiple torque rolls, lomcevaks, knife edge and rolling avalanches, hovering tailslides . . . and that just covers the simple stuff. Quique won, and I think deservedly so. I have seen many pilots fly to music, but Quique flew with his music. If you saw Katerina Witt skate at the Olympics, you know what I mean. Look for this young Argentine to accomplish great things in the future. He owns a marvelous touch on the sticks.

The Heli demos by Curtis Youngblood have to rate a line or two of raves. This guy (it was properly pointed out by announcer Maurice Franklin that Curtis may not be from this planet originally) does stuff you can't imagine and I can't begin to describe. I know (I think) I saw a rotary winged model aircraft go apparently divergent in at least two of three possible axes simultaneously, and yet remain under perfect control. Inverted autos, backwards and sideways loops, you name it. He did it. All of the stuff you can think of that can't be done by a helicopter, he did.

The Ducted Fan demos by John Nogy and Ron Gilman were super as well. Nothing should move that fast that low, or get that high that quick. The crowd loved it, and (I must admit) so did I.

T.O.C.'s 1984 winner, Steve Rojecki flies as judges grade maneuvers.

As father Merle stands by, Chip Hyde keeps his thumbs limber by "flying" Steve Rojecki's Jungmann as he waits in the Ready Box.

Bill Cunningham and his Godfry Ultimate. Even without the 2% bonus, biplanes would have maintained a hold on the top places . . . not without their pilots, of course.

As far as really new stuff to report on the technical front, there wasn't a great deal. The 10% biplane bonus, introduced in 1984 to counter the trend towards a one design "Laser" contest, was reduced to 6% for the '88 TOC and further to 2% for this year. Still, 16 out of 21 contestants flew biplanes, with 10 out of the 16 picking the "Ultimate" as steed of choice. Monoplanes finished 9th, 15th, 18th, 19th, and 20th. Maybe it's time for a monoplane bonus?

Kidding aside, do monoplanes really fly better than biplanes, or vice versa? Well, if you had pulled the biplane bonus, bipes still would have won and dominated the top of the standings at this TOC. I suspect this may have less to do with the intrinsic qualities of the different airframe types than it has to do

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Void where prohibited

with the intrinsic qualities of the pilots who flew them at this TOC. This is especially true with the ability of today's radios to "dial out" unwanted cross-couple tendencies. The nut that holds the stick is still the most important component in any airplane, and especially in an aerobatic airplane.

Bucker R131 Jungmanns were flown by Gunter Hoppe of Germany, Steve Rojecki, and George Manning (in the 3 minute "Free" only). The Jungmanns of Rojecki and Manning were designed by Dick Hanson, my predecessor at this job, and proprietor of Dick Hanson Models. The Hanson Jungmann took Rojecki to 2nd overall . . . a fine airplane.

Steve Stricker showed up with a pair of beautiful 34% Ultimates he had whipped up with builder Ron Stahl. These glass, carbon fiber, and foam beauties had lowered stab placements, 7% airfoils, carbon graphite landing gears, and titanium fittings on the flying wires! These were easily the largest birds at the meet, making the standard 30% Godfrey Ultimate seem small by comparison, and they flew beautifully. Steve is presently negotiating, and a kit should be available from a major manufacturer next year.

Dave von Linsowe's model of Henry Haigh's Courtesan flew fantastically, considering the stage of trim and development it was in when called on. A very attractive bird with those exotic retracts, and more than capable. No kit is planned that I know of, but who can tell?

The self-designed and scratch-built Ultimate of Quique Somenzini had a lowered top wing, slimmed fuselage, bigger stab, and a 10% foil. Quique used a Sachs 4.2 on gas, with the intake tuned as well as the exhaust. Good flier with buckets of horsepower.

The top placing monoplane (9th) was Dean Koger's Ulery Extra 230. This machine had maybe the best horsepower going, using a Tartan Twin on belt drive with CF tuned pipes. Dean spun the biggest prop, a repitched Zinger 24x17. Some club!

England's Ken Binks had a beautiful glass and foam Extra 300. This machine featured a glass and foam laminated fuselage and honeycombed plug in wings with CF spars. A Model Effects kit will be available in England. Ken claims the naked fuselage weighs a mere 39 ounces right out of the mold. Unfortunately, due to a camera malfunction, we have no pictures.

Australian Jeff Tracy brought another edition of his big and beautiful Sukoi 26M. Noteworthy on this craft is the thick 15% airfoil and a 6% tail moment stretch. This is a sweet looking airplane that is very graceful and realistic in the air.

IMAC Nats winner John Lockwood had a slimmed down and stretched scratch-built CAP 21 with a Zenoah G-62 for power.

Peter Wessels of Germany had a scratch-built Extra 300 which showed nice flight manners.

John Britt again brought his beautiful Scully Skybolt with Tartan Twin power, and again walked off with the $3500 Best Aircraft award. In a gathering of beautifully built airplanes, this machine was still obviously in a class by itself. Most of the competitors using Tartan Twins were also using John's innovative pyramid reed valve block modification. The Skybolt is now available from RC City in kit form.

The balance of the aircraft flown were more or less "stock" Godfrey 30% Ultimates from Precision Built Models. (This is like a "stock" Ferrari . . .) All in all, eight different aircraft types were modeled.

On the power front, this appeared to be the year of the Sachs Dolmar 4.2, with nine competitors committed to this engine. Most of the Sachs were run pretty much stock, on methanol fuel. Methanol was the predominant fuel, by a 13 to 8 ratio. Six of the eight competitors using gas were foreign pilots, most using German engines, although two of the Sachs 4.2s were also run on gas. Twin Tartans were still much in evidence, with four flyers using this engine. There appeared to be no runaway winner in the cowl stuffing department. The situation seems to be that there are a lot of powerful, reliable, good quality mills now available for "TOC type" airplanes, and you can pay your money and take your choice. Most people had some sort of vibration isolation motor mount scheme.

The single most popular prop was the Seyer 20x11.75 Carbon Fiber three-blade used by five or six flyers. I could find out very little about this prop other than that it is German, expensive, and hard to get. Is it worth it? Well, the winner and the 2nd place guy flew inexpensive wooden props. Most props of all makes were in the 20x10 to 22x11 range, and most people were propping to turn 8-9000 r.p.m. on the ground.

Most mufflers were "shelf" items with familiar names: V-Tech, Slimline, A&M Aircraft, Tatone. I counted only four aircraft using some sort of tuned pipe arrangement. Most of the planes were fairly quiet, but not nearly as quiet as the average pattern airplane. The exception here was Wolfgang Matt's Ultimate with its German 3W engine and Carbon Fiber tuned pipe. Very powerful and very quiet.

Futaba was the dominant choice in radios, with 9VAPs outnumbering JR PCM-10s 16 to 4. Peter Wessels flew the lone Graupner. One servo per flight surface seemed to be the rule, with most servos mounted as near as possible to the surface that they operated. John Britt's Skybolt was a notable exception here, with all servos except ailerons mounted amidships.

If there is a conclusion to be drawn from all of the above, it is that equipment availability for the "TOC type" of giant scale aerobatic airplane has improved dramatically. Exotic homemade engineering at the TOC is much less in evidence than it used to be, because the need has largely disap-

continued on page 86

READER SURVEY: We want your help in making *Model Builder* a better magazine. By answering the questions on this survey, we'll have a better idea of what you like or dislike about the magazine and how we can improve it. In appreciation of your efforts, we will award 25 one-year subscriptions, by drawing names from the survey responses received by March 31, 1991. *If you don't want to cut this survey from your magazine, it's OK to make machine copies.*

1. Age: Under 10 [ ] 10-14 [ ] 15-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] 51-65 [ ] Over 65 [ ]

2. Sex: Male [ ] Female [ ]

3. Married [ ] Single [ ]

4. Education: In school [ ] High School Diploma [ ] In college [ ] College degree [ ] Some college [ ] Graduate Degree [ ] Trade School [ ]

5. Occupation: Student [ ] Professional [ ] Sales [ ] Service [ ] Laborer [ ] Other [ ]_____

6. Occupation of head of household: Student [ ] Professional [ ] Sales [ ] Service [ ] Laborer [ ] Other [ ]_____

7. Head of household income: Under $15,000 [ ] $15,000-$24,000 [ ] $25,000-$34,000 [ ] $35,000-$49,000 [ ] $50,000-$74,000 [ ] $75,000-$99,000 [ ] Over $100,000 [ ]

8. In which model aircraft category are you interested? If more than one, indicate preferences in numerical order (1 thru 4): RC_____ FF_____ CL_____ Static_____

9. In which categories are you currently active? RC [ ] FF [ ] CL [ ] Static [ ]

10. How long have you been active in your categories?

	RC	FF	CL	Static
Less than a year	[ ]	[ ]	[ ]	[ ]
1-2 years	[ ]	[ ]	[ ]	[ ]
2-5 years	[ ]	[ ]	[ ]	[ ]
5-10 years	[ ]	[ ]	[ ]	[ ]
Over 10 years	[ ]	[ ]	[ ]	[ ]

11. Do you build your own models (not including ARFs)? All [ ] Most [ ] A few [ ] None [ ]

12. Do you design and build from scratch? All [ ] Most [ ] A few [ ] None [ ]

13. Do you scratch-build from plans? All [ ] Most [ ] A few [ ] None [ ]

14. Do you build from kits? All [ ] Most [ ] A few [ ] None [ ]

15. Do you assemble and fly ARFs? All [ ] Most [ ] A few [ ] None [ ]

16. How many model aircraft have you built since you began the hobby (Rough estimate)? RC_____ FF_____ CL_____ Static_____

17. If you build and fly RC, what types? Sport [ ] Scale [ ] Pattern [ ] Helicopter [ ] Glider [ ] Pylon [ ] Old Timer [ ] Other_____

18. If you build and fly FF, what types? Sport [ ] Scale [ ] Peanuts [ ] Gas [ ] Rubber [ ] Nordic [ ] HLG [ ] Indoor [ ] Other_____

19. If you build and fly CL, what types? Sport [ ] Scale [ ] Stunt [ ] Combat [ ] Speed [ ] Racing [ ] Carrier [ ] Other_____

20. How many model aircraft do you have that are entirely or nearly flyable? RC_____ FF_____ CL_____

21. How many 1991 RC transmitters do you own? _____

22. How many 1991 receiver packs (with servos, battery, switch harness) do you own?__

23. How many pre-1991 radio systems do you own? _____

24. How many of your pre-'91 sets do you plan to upgrade? _____

25. How often do you fly? _____ days per week _____ days per month

26. How many hours a week do you spend on your model aircraft hobby? _____

27. To what model aircraft organizations do you belong? Include National, regional, local (club), special interest. (Initials, i.e., AMA, are OK)_____

_____

28. Do you plan on joining any organizations this year? Yes [ ] No [ ]

29. If so, what organizations? _____

30. In what organized model flying activities do you participate? Competition [ ] Fun-Flys [ ] Both [ ] Club [ ] None [ ]

31. If competition, at what levels? Club [ ] Local [ ] Regional [ ] National [ ] International [ ]

32. Are you a subscriber to Model Builder Yes [ ] No [ ]

33. How long have you been a subscriber? _____ years.

34. If not a subscriber, how many copies of Model Builder do you buy a year? _____

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36. How many hours do you spend reading an issue of Model Builder? _____

37. How many friends also read your copy of Model Builder? _____

38. Do you save back issues of Model Builder? Yes [ ] No [ ]

39. If so, how far back? _____ years.

40. How often do you refer to a back issue? Weekly [ ] Monthly [ ] Yearly [ ]

41. What other hobby magazines do you read? Flying Models [ ] Model Airplane News [ ] Model Aviation [ ] Radio Control Modeler [ ] RC Report [ ] Other [ ]_____

42. How does Model Builder compare with:

	Better	Same	Worse
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Model Airplane News	[ ]	[ ]	[ ]
Model Aviation	[ ]	[ ]	[ ]
Radio Control Modeler	[ ]	[ ]	[ ]
RC Report	[ ]	[ ]	[ ]

43. What percentage of the advertising in an issue do you read in its entirety? _____

44. What influences your decision on what to buy for your model aircraft hobby? Advertising [ ] Articles [ ] Fellow modelers [ ]

45. Does the information in Model Builder help your decision on what products to buy? Yes [ ] No [ ]

46. How much do you spend on your model aircraft hobby each year? _____

47. What major RC related products do you plan on purchasing this year?

48. Where do you purchase most of your model aircraft supplies?

	Most	Some	Very little
Hobby shop	[ ]	[ ]	[ ]
Mail Order	[ ]	[ ]	[ ]
Mail Order Discount	[ ]	[ ]	[ ]

49. Do you own a personal computer Yes [ ] No [ ]

50. Model Builder wants to know which of its regular columns and special features you like or dislike. Put an 'X' in one box for each item listed.

	Like a lot	OK	Don't like
All About ARFs	[ ]	[ ]	[ ]
Big Birds	[ ]	[ ]	[ ]
Chopper Chatter	[ ]	[ ]	[ ]
Control Line	[ ]	[ ]	[ ]
Dear Jake	[ ]	[ ]	[ ]
Electronics Corner	[ ]	[ ]	[ ]
Electric Power	[ ]	[ ]	[ ]
Free Flight	[ ]	[ ]	[ ]
Hannan's Hangar	[ ]	[ ]	[ ]
Indoor	[ ]	[ ]	[ ]
Jet Trails	[ ]	[ ]	[ ]
Model Design & Technical Stuff	[ ]	[ ]	[ ]
Over the Counter	[ ]	[ ]	[ ]
Plug Sparks	[ ]	[ ]	[ ]
Precision Aerobatics	[ ]	[ ]	[ ]
RC Pylon	[ ]	[ ]	[ ]
RC Soaring	[ ]	[ ]	[ ]
Strictly Scale	[ ]	[ ]	[ ]
Workbench	[ ]	[ ]	[ ]
Products in Use	[ ]	[ ]	[ ]
RC Construction	[ ]	[ ]	[ ]
FF Construction	[ ]	[ ]	[ ]
CL Construction	[ ]	[ ]	[ ]
Peanut Construction Plans	[ ]	[ ]	[ ]
Full-size aircraft 3-views	[ ]	[ ]	[ ]
Other_____	[ ]	[ ]	[ ]
Other_____	[ ]	[ ]	[ ]

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PRECISION *Continued from page 23*

wing. The elevator and rudder servos are accessed through a hatch on the bottom of the aircraft aft of the wing, and the Rx battery, fuel tank, and throttle servo are on top of the fuselage, accessed through a removable panel above the pipe. Jim Graham of RC City tells me that a kit of the Desire is in the works, and maybe even a larger version for 1.20 four-strokes.

Intrigued by an earlier column on the past of RC pattern, reader Denies Breene of Exeter, CA shipped me a couple of snaps of yesteryear. Dennis has just returned to the pattern wars after a 15 year layoff engineered by marriage and the US Navy. Back in the early '70s, he worked for Joe Bridi. The pics of Dennis' Super Cuda and Super Kaos date from '73 and '74, respectively. The third photo is Dennis today, with his modified Bridi Escape. Evidently, you can take the boy away from Bridi, but you can't take the Bridi away from the boy . . .

That's all for this trip around the pea patch. Remember to keep those photos and letters rolling in. See ya at the field. Rick Allison, 15618 N.E. 56th Way, Redmond, WA 98052; (206) 883-3047. ***MB***

PLUG SPARKS *Continued from page 27*

act. For whatever reason, the 1/2A Texaco event has not taken hold in these countries. Eventually, they will discover the fun! Group entries where everyone pulls together is so much better than head-to-head competition.

It remained for Bob Grice, Postal Match C.D., to summarize the 1990 Postal Challenge: "We (SAM 51) will keep the trophy for another year. We attribute our win to the excellent club participation (12). The SAM 21 boys were close behind in the same maritime air mass prevailing throughout Northern California on that day.

"We were delighted to see the Australian Vintagents under the direction of Colin Borthwick place well. Also representing the international aspect was Pat Clarke's New Zealand team."

SAM 1

SAM 1 newsletter editor, Art Grosheider, 2045 So. St. Paul, Denver, CO 80210, sends in such good photos that we cannot resist using them. The latest is a photo depicting a very good takeoff by a Berkeley Cavalier built by Art Hillis.

Many years ago, this writer ran a shot of Art Hillis and his Cavalier in an issue of the Engine Collectors Journal. At that time, the model was powered by a Forster .99. Now with an O.S. .90 four-cycle engine, the model demonstrates a snappy takeoff even at Denver five thousand foot altitude.

The reader will note this is the "bull-nose" version of the Cavalier, called the Super Cavalier. The original more streamlined fuselage was changed by Bill Effinger of Berkeley Models (the kit manufacturer) to accommodate larger engines and early radio control equipment.

SALT LAKE CHAMPS REVISITED

While visiting with Ed Rangus, a photo in Ed's album caught this writer eye. It's a great shot of Ed with his "Herky" as designed by Melvin Yates.

This nine-foot elliptical wing design was featured in a 1937/38 Forster Brothers sales brochure complete with a letter written by Yates extolling the virtues of the Forster .99 (which powered the Herky) and the good flying characteristics.

This photo was taken at the so-called "Salt-Air Airport" used by the Salt Lake Airplane Modelers (SLAM Club) to stage the 13th Annual SAM Championships. The field was great for size but the salt encrustation coming from the earth was dynamite on the engines and other materials liable to rust. Then, too, one day the contest was "favored" by an east wind that found more than one F/F model dropping into the Great Salt Lake.

SAM 21 "MIRACLE MEET"

So called because it was a "miracle" it didn't rain for a change at a SAM 21 Annual. With rainstorms few and far between in California, this has been a source of frustration to the SAM 21 membership.

This year (1990) was a great day with only about a 10-mph wind, allowing this writer to circulate around and seek out unusual subjects. He struck gold with Brad Allen and his California Chief Model A-2 as kitted by Curtiss-Wright Technical Institute, manufacturers of the Baby Cyclone. This model is a faithful re-creation of the original design even to the point of using a Baby Cyclone engine and the special motor mount and tank designed for use with this model.

This follow-on design of the Model A-1 Chief is a considerable improvement over the old sheet balsa slab-sided version. Both models were designed for speed of construction and simplicity of flying. These models, sold as a package deal by Curtiss-Wright, were quite popular with the newcomers to F/F gas.

Another interesting free flight model is a Burnham Twin Pusher as built and flown by Art Watkins of Mt. View, California. This particular model won the Twin Pusher event with a rather good flight of three minutes.

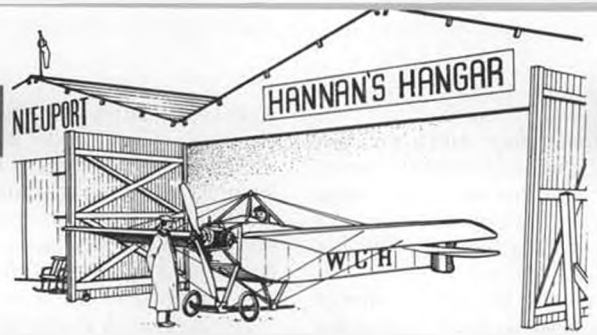
These special events, such as the Twin Pusher Mass Flyoff event, is what makes Old Timer contests interesting and attracts spectators. It is always a source of amazement to this writer just how many modern modelers do not know how a twin pusher is wound, or for that matter, how it is flown. In short, if we are gong to fly Old Timer models, it is our considered opinion that all O.T. fliers should be conversant with all types.

FREE PLUG DEPARTMENT

For those who have patiently been waiting for John Targos to start producing replica Elfin 2.49 diesels, we have a status report. John Targos (company name: ARGO USA) can be reached at 3229 Dianora Drive, Palos Verdes, CA 90274 or better yet, call him direct at (213) 377-6186. John says progress on the engine is slow but if you want one, get your name on the list.

The biggest problem in production is the machining end of things. Inasmuch as John has contracted with a machine shop in Long Beach, and despite his heavy pushing for production, he finds that the shop is heavily booked in other governmental projects. Poor John, caught in the middle, has attempted to interest other machine shops. Their lack of enthusiasm is not very encouraging; hence, John is still looking for a retired machinist

continued on page 76



BY BILL HANNAN

"A HUMBLE CONCESSION TO NATURE'S SEASONS, A MINIATURE MONUMENT TO SHORT-LIVED THINGS."

Doesn't our quotation, from a Spanish publication, sound like a perfect description of a model airplane? Certainly they are always at the mercy of the climate, and considering their basic delicacy, isn't it remarkable how many of them survive as long as they do?

THE PASSING PARADE

Model builders themselves, of course, are as delicate as their models—just as subject to Nature's whims and just as short-lived. Shouldn't we appreciate each other while there is still time to do so?

KEN GROVES

One of Canada's most popular modelers, and one who frequently participated in US contests, has departed from our ranks. We would like to quote a few inspiring lines from his friend John F. Marett, who wrote:

"Some time ago I wrote an article for *MAAC* magazine that reminisced a bit about the influence one person could have on our lives. This is particularly true for Free Flight modelers because this pastime brings together people who draw on one another constantly for knowledge and experience, and who can share in our triumphs and ease our failures, as we float along on a kind of thermal of happiness, oblivious much of the time to the outside world.

"But we are jolted back to reality and the fragility of life, with the passing of a special friend—Ken Groves, one of the most influential and respected modelers in his field that Canada has seen in a long time.

"Ken's working relationship with the town of Markham, and his many good friends, led to his getting the Markham School Gym for indoor flying, which brought back together the few remaining modelers left in this area, and they slowly rejuvenated the sport by traveling to the US to compete and make friends. Ken enjoyed both very much. But even more important was his desire to pass on his knowledge to others, teaching youngsters in Markham how to build and fly, and helping some of us oldsters over the hard spots as we returned to model building.

"But Ken Groves was even better known internationally as a dedicated craftsman. His rubber powered scale models were masterpieces, not only for finish but for details as well. His Bristol Scout received the highest scale score ever given by the Flying Aces. And just two months ago, Ken received the ultimate tribute from his peers, when he was awarded the prestigious Walt Mooney Trophy at the Flying Aces Nationals at Geneseo, New York. In quiet conversation with a fellow modeler just last Friday evening, he stated that at the presentation he was overwhelmed and speechless and couldn't think of a thing to say. Ken Groves' name is the first on the Walt Mooney Trophy and sets a very high standard for those who follow.

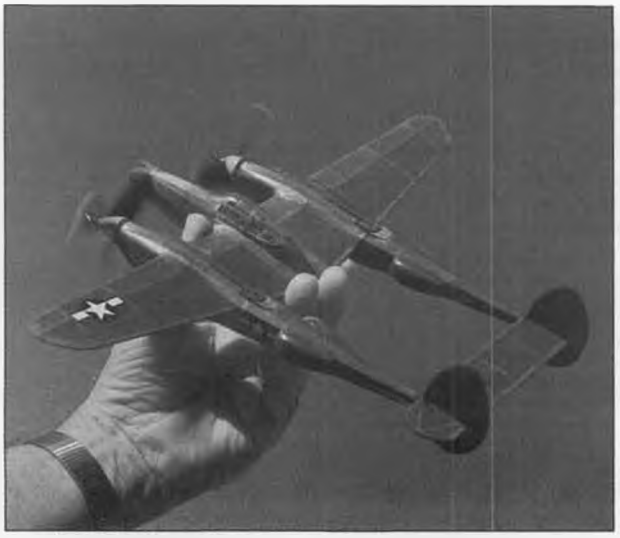
"Wherever Ken is now, we'd like to feel he is still building and flying the model planes that were so dear to his heart. He loved to fly—so much so, that at many of the outdoor competitions, he flew some of his best indoor models which, more often that not, flew away in the rising air currents we call thermals. To a modeler, it seems such a beautiful and appropriate way for a favorite model to leave us, gracefully soaring ever higher till out of sight.

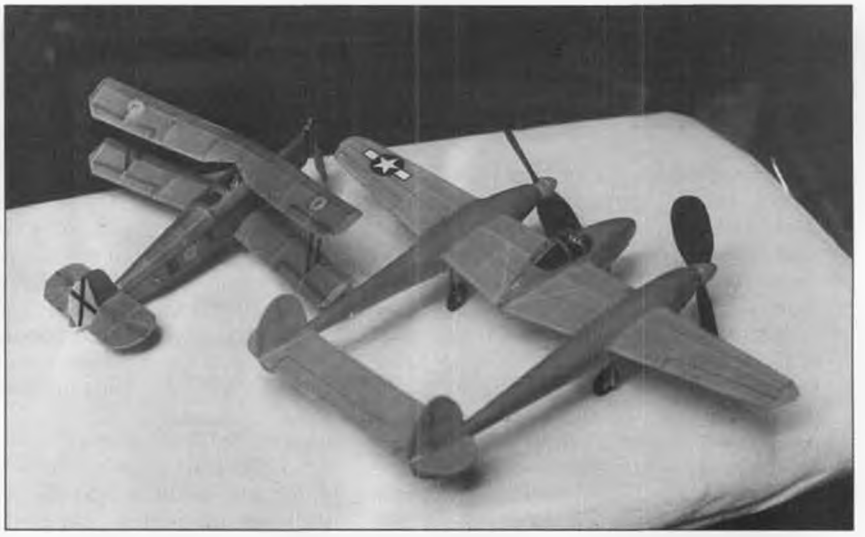
"This is the way we wish to remember Ken Groves, a good friend, a tough competitor, a true champion and an inspiration to all of us, gracefully and majestically soaring off into the heavens—out of sight perhaps, but never forgotten.

JOHN R. BOND

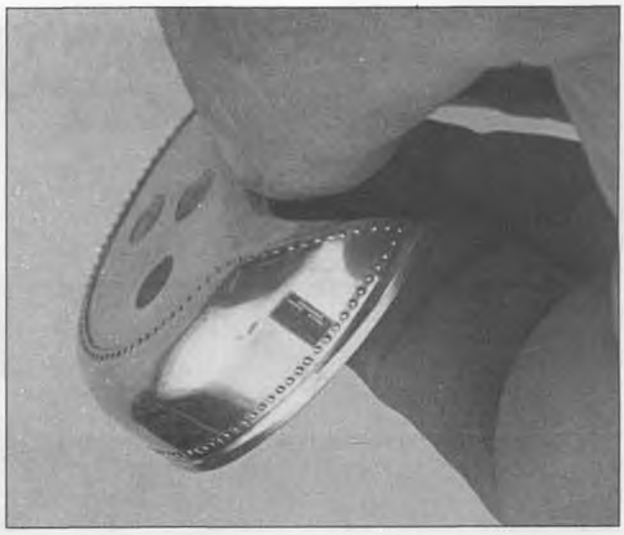
The longtime publisher of *Road & Track* passed away in July of 1990. John Bond's influence reached far beyond his magazine, and indeed his philosophy and style may have altered the thinking of generations of readers, including at least a few writers of model airplane articles. . . .

John's "Miscellaneous Ramblings," which former *R&T* editor Dean Batchelor described as "the longest permanent floating word game," was must-reading for this budding columnist. John somehow managed to infuse *Road & Track* with an undefinable





(Left) Dick Howard's Peanut scale Lockheed P-38 is a reproduction of an actual aircraft that Dick piloted during WWII photo missions. (Right) Another P-38, this Pistachio version is by Roger Aime of France, who also built the tiny Bucker Jungmann, which has over a 40-second duration.



(Left) This 1912 Clement Bayard Peanut by Wijand De Joode of Holland was constructed from plans by Benno Sabel of Germany. (Tondra Alfery photo) (Right) Peanut Fokker triplane cowling by engraver Sam Welch features 142 hand-made .010 diameter rivets and tiny nameplate.

"essence" that rival publications could never approach, and set editorial standards that have never been exceeded to this day. Thank you, Mr. Bond, we miss your wisdom. . . .

finding and keeping flying sites (both indoor and outdoor), and in our own way to encourage each other to press on, through fun-flys, local contests (if we can drum up enough

ington, Oregon, Nevada, California and Canada. It wasn't always that way, as Jim explained: "Eric Dittman and Larry Olson, along with others, created this annual event

(Left) This AVRO 560 constructed by Reg Boor of England was proxy-flown in Belgian Peanut contest, and photographed by Czechoslovakian Tondra Alfery. Is our hobby international or what! (Right) Vivacious Svetlana Filoppova of the Soviet Union upstages two Giersky model engines which may soon be imported.

HELP!

George Koller, of the San Francisco bay area, would like to "semi-organize" other modelers in his vicinity for mutual benefit, and says:

"Individually we are doomed to the backwaters of the modeling pecking order; collectively, we may be able to help each other . . . I need help: in finding a place to fly, in prop carving, soldering, trimming (both with tissue and airbrush as well as the airborne kind). I'm sure there are others out there who need help as I do, as well as some marvelous craftsmen who are willing to share their time and talents with the rest of us."

George especially wants to avoid the narrow compartmented thinking of elected officers, bylaws, etc., which takes the joy out of some organizations:

"Our purpose of banding together would be for mutual support of our addiction, builders), and just plain fun. . . ."

George is willing to act as a communications liaison person, so anyone interested may contact him at: 7186 Wooded Lake Drive, San Jose, CA 95120.

AND ELSEWHERE

Other groups are also "semi-organizing" to increase model flying satisfaction. John Koptinak and Jerry Bokius have initiated a Norwich, Connecticut branch of the Flying Aces Club, with specific intentions of indoor flying. They are off to a good start, having secured use of a site, published a five-page newsletter, and are proposing to start in the simplest manner possible with R.O.G. models.

IN WASHINGTON STATE

Free Flight Scale has grown by leaps and bounds, according to *Scalewatch*, edited by Jim Woods, who points out that their recent contest attracted 103 models from Wash-

from thin air three years ago, and have progressively turned it into a premier Scale Free Flight happening."

MEANWHILE IN IOWA

Paul McIlrath reminds us that the indoor model flying sessions at Kikwood Community College have continued for nine or ten years, and is surprised that more groups have not followed a similar arrangement. It seems that the flying meets are scheduled as *classes*, with regular registration and tuition, by semesters.

AND IN CALIFORNIA

Herb Weiss sent us the Los Angeles Harbor College Extension Course Catalog, and among the listings were "Electric Plane and Glider Pilot School," described as a build-it-and-fly-it class for kids over 16, teaching such things as safety, pre and post-flight plane care, and crash-less landings.

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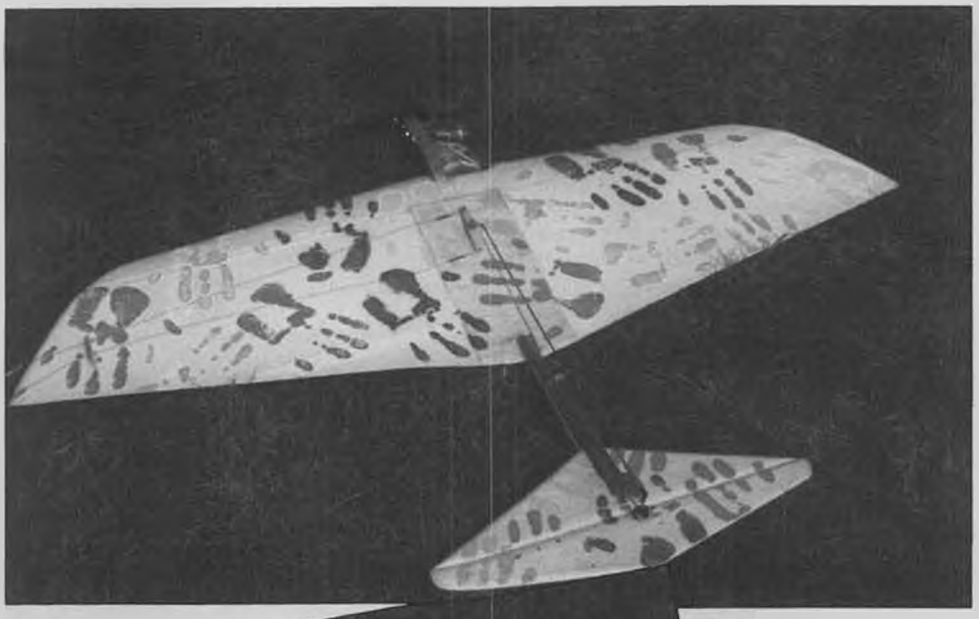
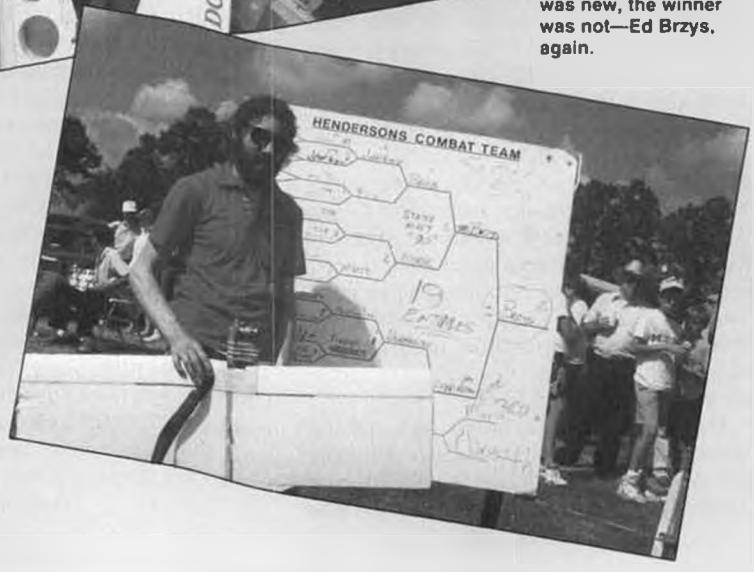
CONTROL LINE

BY JOHN THOMPSON

GETTING A RUNNING START





(Above) Bob Whitely's SLOW is decorated with day-glo hot neon handprints of his kids. Outdoor Controls.(Left) SLOW winners at 1990 Exchange Club State Meet: Ron Colombo, 1st; Ben Henderson, 2nd; Bill Trumble, 3rd; Steve Kott, 4th. There were 22 entrants in the State Meet. (Below) Super Slow had 19 entries, not bad for a local "non rule book" event. While the event was new, the winner was not—Ed Brzys, again.

Let's begin with a little poem: *If the engine won't run, the flying's no fun.*

OK, it's not Robert Frost, but if he were a relatively inexperienced control line flier trying with some difficulty to get his first Fox .35 stunt engine started, he might have said it. What the experts know and do automatically when it comes to starting engines may have entirely escaped the beginning flier's notice. So, this month we'll discuss some elementary aspects of engine starting and, we hope, save some fliers from becoming discouraged and turning to poetry.

Something commonly heard around flying circles, particularly from the newer fliers, goes like this: "Boy, those Foxes (Enyas, K&B's, O.S. Maxes, etc., etc.) sure are hard to start. I'm gonna get me a *good* engine!"

Let's puncture a myth: No modern-day model airplane engine is hard to start. Some have different characteristics than others. All are a little more balky on a cold day than on a warm sunny day. When they're taken out of the box and started the first time, some may be a little more cranky than they will be after a few runs. But, handled properly, virtually any modern engine can be started with a few flips of the prop.

Furthermore, most modern engines are just as easy to start cold or hot from a high-speed run. You just have to learn how to treat them in the various circumstances. Case in point: Ten years ago, when Pacific Northwest fliers decided their favorite racing event, Northwest Sport Race, had speeded up a little too much to be an entry-level event, they decided to split it into two classes, one of which would be limited to the Fox .35 stunt engine. That's now called Northwest Sport Race, and another less restrictive event was created called Northwest Super Sport Race.

When it was announced that the Fox .35 would become the required racing engine, it was heard from many quarters: "It won't work. You can't restart a hot Fox .35." But almost immediately, the more canny fliers were starting the Foxes both cold and hot with one or two flips. Nowadays on the Northwest Sport Race circle, nobody says you can't start a hot Fox! In fact, the Fox .35 stunt has become the popular "sport" racing and combat event engine nationwide.

So what is it about starting engines that causes some fliers to make it look so easy, while others seem to be trapped in one of

those nightmares: "It's my first combat match, Doctor. The starter says `Go.' But I flip and I flip and I flip and I prime and I flip and I prime and I flip and I flip and finally the horn blows for the end of the match and—I wake up in a cold sweat. Can you help me, Doctor? What does it mean?"

Now if the doctor were some kind of psychologist or marriage counselor, he would say, "Have you communicated with your engine? Have you listened to what it was telling you?"

"Well, gosh, Doc. I didn't hear it say anything. I was just flipping the prop."

"Go home, young man, get your plane out, fill the fuel tank, connect the battery and *listen* to what your engine is saying to you."

The message here, then, is that the key to starting any engine is finding out what it's telling you that it wants. *You* may want to prime the engine but *it* may not want the prime!

It would be hard to cover all engines and all circumstances, but we'll look at a few common situations as examples in the hope that they will help improve new fliers' overall communications with their engines and lead to long and happy flying relationships.

(Because it is common control line practice to learn to handle engines without the use of electric starters, we are going to assume that starters will not be necessary here. Most control line competition events do not allow the use of starters.)

COLD STARTS

The first start of the day for any engine will go smoothest if some careful preparations are made.

We need a full fuel tank, and we need fuel in the fuel line, in the crankcase and in the cylinder.

As we fill the tank, we want to make sure fuel will go through the lines. We can do this by forcing a little fuel through after the tank is full. Can we see it going through the line? If not, we may have to flush a filter or take other measures to make sure the lines are clear.

We don't want to fill the crankcase with fuel; we just want to make sure there's some in there. We can do this by choking (put a finger over the venturi and turn over the prop a few times).

We get fuel into the piston by priming and, alas, here is where many starts go wrong. How much is enough, and how much is too much?

With a cold engine, it's pretty hard to over-prime an engine, because, as a rule, cold engines don't mind a bit of a flood. (Yes, you *can* overdo it!)

The best way to prime a cold engine is to *measure* the prime. Understand that we are talking right now about an engine with an open exhaust—muffled engines provide some additional problems.

In the "old days" the common method of priming was simply to stick the fuel bulb's tubing into the exhaust and squeeze until fuel dripped out. How much fuel were we actually getting into the exhaust? Answer: We had no idea!

Here's a much better way: Turn the airplane so that the exhaust points up. Close the exhaust port and fill the corner with fuel. Turn the prop so that the fuel runs in. Right the airplane and prepare to flip. In this way we have given the plane a measured amount of prime. As we become familiar with the engine, we can vary the amount of prime for best results.

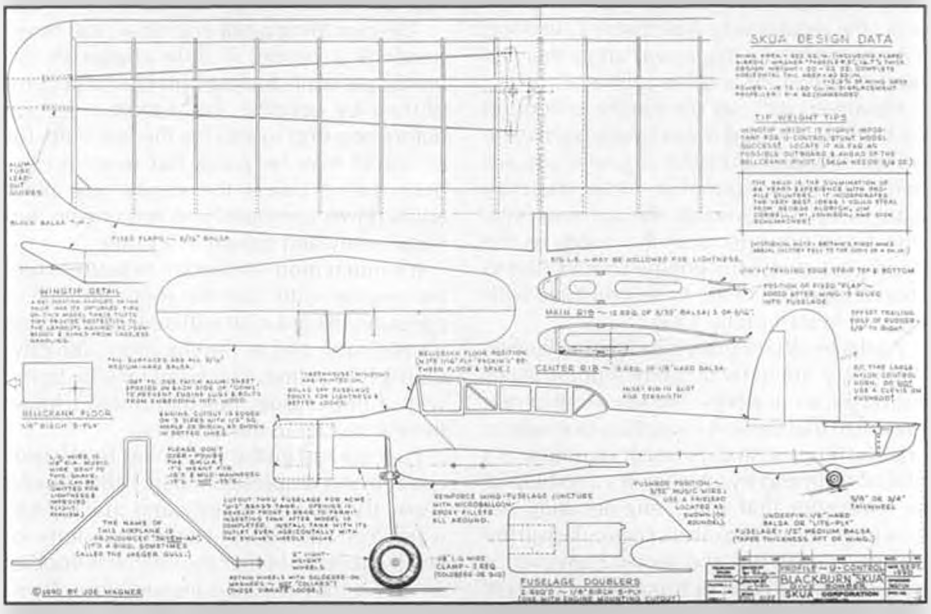
If we're using a muffler that can't be primed (some styles of mufflers do allow a prime, but many don't), then we have to get fuel into the cylinder by choking. With the battery disconnected, choke and flip the prop several times. Then connect the battery and feel for a bump. We'll keep choking until we get a good solid bump.

The bump, in fact, is the key to starting any kind of engine.

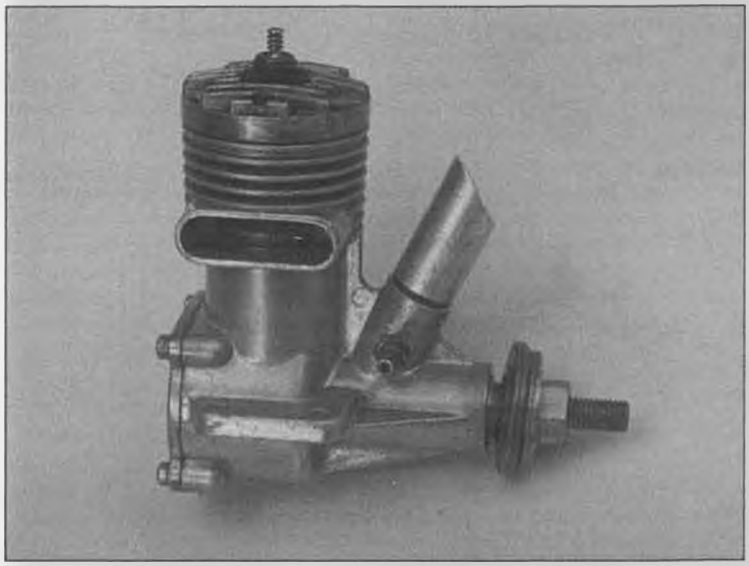
The very beginning flier may not be familiar with "the bump." It's the kick you feel when you have the battery connected and turn over the engine slowly, holding the prop securely. The engine will kick back against the rotation of the prop, indicating that there is fuel in the cylinder trying to ignite when the piston pressurizes it.

Only some experience with the engine will tell you exactly how to "read" the bump. Generally speaking, however, a good solid bump means that the engine is ready to fire. If it is completely overloaded with fuel it may give a tremendous kick, or even not bump at all. When it doesn't have enough fuel it will not bump, or will bump weakly.

Now that we have our cold engine fueled, primed and bumping like it's ready to fire, how do we actually accomplish starting?



First of all, we need to get one thing straight—who is boss here? Are we going to start the engine, or are we going to let it do what it wants? If *we* are going to start the engine, we are going to show it who is boss. We are going to flip the prop *smartly*. Little, tentative pecks at the prop, or slow, graceful rotations are just not going to be successful; we need to get the prop spinning at something resembling running speed.



Joe Wagner says most CL engines need longer intake for reliable suction feed. This is his modified Veco .35.

So how do we flip the prop? Just spin it counterclockwise, right? Well, maybe. I find that with a great many engines, it's the type of bump we are experiencing that tells us how to flip the prop.

With a cold engine, if I feel a good, very strong bump, I will not flip the prop the normal way. I will rotate the prop gently counterclockwise until it is stopped by compression, then wind up and slap it backwards, *away* from compression. This is a reliable way of starting well-primed engines, and you'll see it used by many racing and combat pit crews.

Now, if the bump is a little weaker, flipping through compression (counterclockwise) the regular way is probably called for. If the bump begins to go away altogether, it's probably time for another prime or choke.

However, let's say the engine is flooded and neither method is working (you may be getting snapped at by the engine if you are trying to flip it normally). Now you may want to flip it backwards *through* compression a few times to clear the flood. As the flood goes away, the engine should start to snort a little and begin to demonstrate willingness to start pretty soon.

As the feedback from the engine changes, you may want to try different flipping styles to find out what works. The key point here is to realize that there is more than one way to crank an engine, and if one isn't working, it's probably time to try another. It's also helpful to remember that some engines may not give much of a bump at all, particularly if the engine is a bit old and worn. However, it may respond to one or more of the types of flips described here anyway. Experiment.

Use a glove or a leather finger protector so that you can hit the prop as hard as you want. No sticks or other hard objects—they break props and create a safety hazard.

HOT STARTS

Here's another nightmare that seems to recur to your columnist. It's a racing contest. A relatively new flier asks me to pilot his entry. Glad to help, I hang on for the first tank, grease the plane into the pits and watch the pit stop. The pitman fuels the plane, flips the prop, and after a couple of flips, the engine still hasn't started. Then the nightmare begins. Like the dream in which a person is falling, falling and can't do anything about it, I see the pitman reach for the prime bottle. "No, no!" I try to shout, but nothing comes out over the noise of the engines. He sticks the prime bottle in the exhaust and *("No!")* squeezes! Arrrghhhhhh. The race is lost. It may be another 30 seconds of prop flipping before I awake and take off for the rest of the heat.

The one thing a hot engine almost never needs is a prime! A little charge in the crankcase while fueling (this can be accomplished by opening the shutoff a second before you stop squeezing the fuel bulb, for example) may be good, but never an exhaust prime unless the engine just plain cools down completely. A hot engine will flood easily and drown in a prime.

It's much more important to learn to fuel the engine with just the right amount of pressure, to cool it off with fuel on the head if necessary, and to flip the prop correctly, than it is to prime. You wont feel the bump with a hot engine, but that doesn't mean there's no fuel in the cylinder.

Fuel up and give it that smart backwards (away from compression) slap. If that doesn't work, try flipping smartly and quickly forward. You should feel something soon—or be able to tell whether the engine is flooded or dry. It may not start instantly but if you prime it you can practically guarantee it won't start. If the engine is in fact dry, a couple of rotations of choking probably will be enough of a prime. If it takes a long time—20 or 30 seconds—then a prime may in fact be called for as a last resort. Remember, hit the prop smartly.

It's important to practice with your equipment and begin to develop a sequence of functions that starts the engine reliably. Virtually all competitive fliers work out a predictable sequence for handling each engine.

Here's a sample hot start sequence that would not necessarily work for all engines and situations, but it gives a sense of the kind of sequence that can be developed with practice. The point is not to copy this to start your engine, but to develop your own sequence that works and practice it. This is the pit stop sequence used by my racing team for its Northwest Sport Race plane. This is a simple setup with no shutoff, fastfill or hot glove. The task is simple—just fill the tank and start—but the way we go about it is very deliberate and has been practiced literally hundreds of times:

The pilot brings the plane in to the pit at a good clip, wasting as little time as possible in the glide. Because shutoffs are not allowed in this event, the glide can vary from about a quarter lap to about 1-1/4 lap. The pitman catches the plane and follows this sequence exactly: 1. Pour fuel on the head of the engine for cooling. 2. Put filler bulb on tank and push button that opens uniflow vent. 3. Squeeze until fuel overflows. 4. Release uniflow button a split second before stopping the fuel squeeze, to allow some fuel through the line. 5. Remove bulb. 6. Connect battery. 7. Lift nose of plane, push prop up against compression and hit the prop a tremendous smash backwards. 8. Release plane.

If the engine doesn't fire in the first couple of flips, we'll switch to fast forward flipping and it will go in a few seconds. Normal ground time for this pit stop, assuming the engine starts on the first flip, is 6-10 seconds. It would be in the range of 4-6 seconds if fastfills were allowed.

To illustrate that not every engine is the same, here's another sequence for hot re-

continued on page 86

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SCHLUTER 'WHOPPER' AUTOGYRO

BY JAMES WANG

This month, let's take a look at a very unique RC model; an autogyro kit manufactured by Robbe/Schluter of Germany. An autogyro is unlike a helicopter because its main rotor is not powered by the engine, and it depends on the engine and propeller at the front to pull the aircraft forward. An autogyro is not an airplane either, because it does not depend on wings to provide lift, instead it has a free, windmilling rotor for lift. In our review, we will go over the theoretical differences between autogyros and helicopters, then the history of autogyro development, then look at the Whopper kit engineering, and finally, talk about what it's like to fly the Schluter Whopper.

First, what is an autogyro? A helicopter can hover because the engine turns the main rotor at about 400 rpm (for full-size helicopters) to produce thrust to lift the helicopter's own weight off the ground. For forward flight, the helicopter has to fly in a slightly nose down attitude so the rotor thrust is tilted forward to pull the helicopter forward. An autogyro is unlike a helicopter in that the main rotor is not powered by the engine. Autogyros have an engine with an aircraft propeller mounted on the nose to pull the autogyro forward. The main rotor is like a windmill, and is allowed to spin completely free by itself. In order to get the windmill effect and to obtain lift at the same time, the

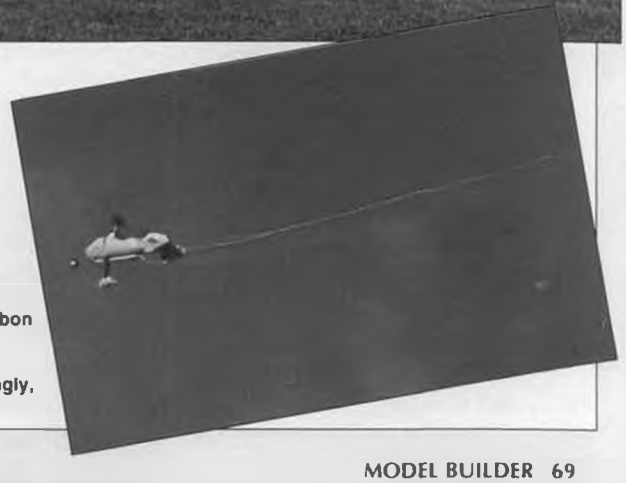
The author's Whopper before the first flight. The rotor span is five feet and it weighs 10 pounds. It is powered by an O.S. 61 with Robbe special tuned pipe and header designed for the Whopper. Radio is the Airtronics Vanguard 6 FM with five servos used. The main rotor is driven by the engine for takeoff, but windmills freely while in flight. Aircraft's pitching and rolling motions are controlled by helicopter-style swashplate cyclically varying the blade pitch angle to tilt the rotor disk. A slow but stable flying model. Requires diligence on takeoff.Note that even though the rotor blade is three inches above the vertical fin, on a bad takeoff or landing, the blade can come down to strike the fins. The author has rebuilt the balsa tail a couple of times already!

autogyro's main rotor must be mounted with the main rotor shaft tilted back at about five degrees. This way, as the autogyro moves forward, the airstream will rush into the rotor disk from below and spin it up to speed. As it spins, it produces thrust to lift the autogyro. It is very much like a big kite. If the autogyro loses its forward speed, or if there is no wind, then the autogyro will fall out of the sky just like a kite! On a windy day, 15 to 20 mph, an autogyro can hover in the sky only if it is faced into the wind. Unlike airplanes, autogyros need only a short takeoff run for liftoff. They also need less runway for landing because the tilted rotor disk has a lot of drag and does not allow the autogyro to charge down the runway. On a windy day, a full size autogyro can take off in as little as 50 feet.

A Spaniard named Juan de la Cierva was the inventor of the autogyro. His first successful flight in an autogyro took place in 1923 at Getaffe Airport, near Madrid, Spain. It was through a long engineering and also trial and error process that Cierva designed a successful autogyro. The major cause of his early failures was that every time he tried to take off, and the autogyro gained speed going down the runway, the autogyro would want to tilt to the left.

A pair of Whoppers ready for bonzai action! When they fly, everyone at the field stops to watch. Definitely an attention getter! The tuned pipe makes them look even sleeker. A Harry Higley propeller nut is used instead of a spinner to enchance scale appearance. Yellow one with Ace 1/4-scale pilot is Dave Ramsey's. The other is James' test model. Both built according to instructions, without alterations.

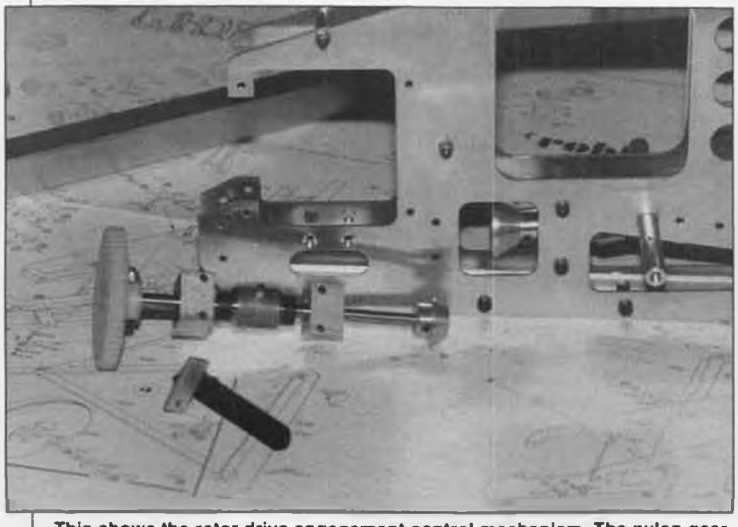
The Ace 1/4-scale "Captain Eddie" pilot in Dave's Whopper. The wire sticking out behind the pilot is a Deans base-loaded antenna, highly recommended to replace the long, dangling receiver antenna. Cut out on the fuselage side reveals fuel tank. The swashplate and main rotor is the same as on Schluter model helicopters. Cyclic controls are used to control the tilt of the main rotor. Only very sophisticated full-size autogyros have cyclic controls!



(Above) Gary Frank came up with the ingenious idea of using a ribbon to hold on to the tail wheel so the Whopper will not ground-loop. He runs with the Whopper, then releases the ribbon just before lift-off. The method works! We actually think it's a great idea for any first-time Whopper flyer. (Right) Whoops! Gary was supposed to release only one end of the doubled ribbon and hold the other, so the ribbon would slip off and not go with the Whopper. Amazingly, the Whopper flew better with the ribbon! The text explains why.

The components are packed in plastic bags with a number on the outside. The instructions tell the builder when to open the next bag. Note the clear fuselage shells on the right.

Start the assembly by bolting together the excellent die-cut aluminum frames. The black plastic frames on the back are for the cyclic, throttle and rotor engagement control servos. Futaba 148 servos fit perfectly. JR, Futaba 130 and Airtronics 102 servos need to have the mounting screws canted slightly to fit because they are slightly smaller than the Futaba 148 servos. We fitted four Airtronics 102 servos without problems.



This shows the rotor drive engagement control mechanism. The nylon gear is constantly turned by the engine, but the black lever can slide the rotating shaft forward or back. When it slides back, the aluminum cone slides into the metal cup on the right to spin the main rotor.

The completely assembled main structure includes the metal side frames, metal tail boom, aluminum dural struts, main rotor, rotor drive mechanism, engine mount, fuel tank and servo tray. The thing on the tail boom is for supporting the plastic fueselage shell.

Eventually, as the main rotor reached full takeoff rpm, the autogyro would roll over to the left. Finally, Cierva discovered that the reason for the persistent rollover was because of his autogyro's main rotor head being "rigidly" attached to the rotor shaft. Therefore, as the autogyro gained forward speed on the runway, the advancing blade side of the main rotor disk produced more lift than the retreating blade side of the main rotor disk. Hence, the unbalanced lift distribution would roll the autogyro toward the retreating side. (Cierva's main rotor had a counterclockwise rotation when looking down from the top. Therefore, the advancing blade was on the right side, and the retreating blade was on the left side. Note the model Whopper main rotor has a clockwise rotation, therefore the advancing blade would be on the left side.)

Cierva solved this uneven lift, rolling problem very elegantly. Instead of mounting the blades solidly to the rigid hub, he mounted the blades on a hinge. This allowed each blade to "articulate," or flap up and down freely. This design is now called an articulated rotor head. The Kyosho Concept 30 and Hirobo DDF rotor head have this articulated rotor head design. The beauty of it is that it allows the advancing blade, which generates more lift, to simply flap upward by itself, instead of tilting the entire rotor disk and rolling the autogyro over. Because of this improvement, Cierva's autogyro became successful.

But please note that Cierva's first autogyro did not have cyclic control. That's why he had no control to prevent the rotor disk from tilting due to uneven lift distribution. He simply allowed the rotor disk to articulate and tilt with respect to the main rotor shaft. All full-size or model helicopters have cyclic control. Therefore, helicopter pilots can use the swashplate to reduce the blade pitch angle on the advancing side, and increase the blade pitch angle on the retreating

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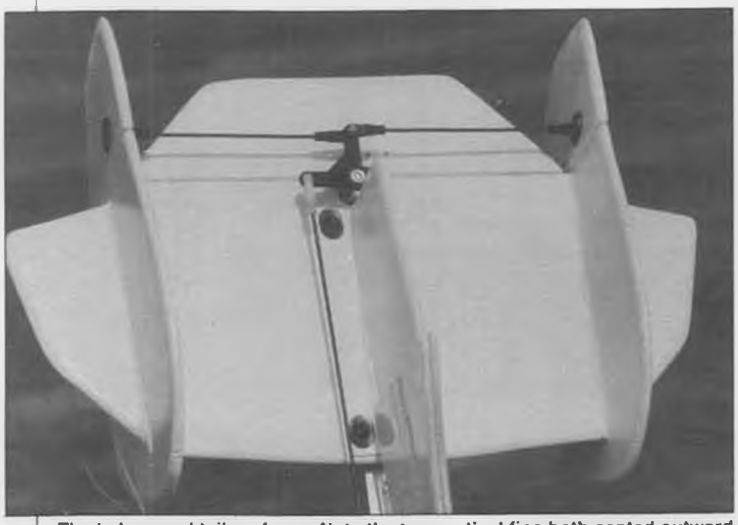
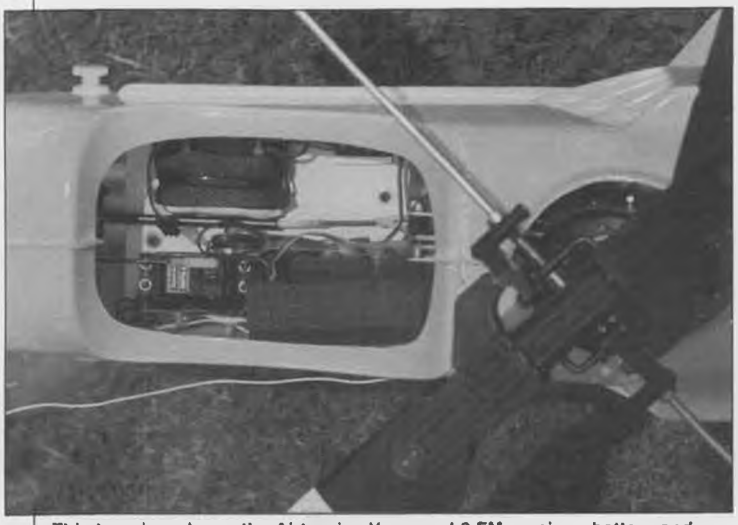


The balsawood tail surfaces. Note the two vertical fins both canted outward slightly. Each rudder is also trimmed to the left to counteract the main rotor torque transferred to the fuselage. The text explains this detail. The tail wheel is steerable.

The completely assembled Whopper before the clear fuselage is painted. This one is Robbe's display model. Robbe sells a special tuned pipe and header designed for the Whopper. This header is highly recommended because conventional pattern plane style headers will not clear the fuselage. A muffler also will not clear the fuselage. But you can use Robbe, MAC or Hatori pipes with Robbe's header.



This top view shows the Airtronics Vanguard 6 FM receiver, battery and rudder servo inside the pilot cockpit location. Mount the switch here for easy access. David has a dummy Ace pilot mounted here, too.

Closeup of the engine and rotor drive gear. Even though the nylon gear is constantly being driven, it can slide forward or back. When it slides back, the main rotor is driven by the engine. A fifth servo is needed to control this. James used an O.S. 61 SFH engine with Robbe header and tuned pipe. A very strong .60 and 12-6 prop is recommended.

Peter Cooke, the ace helicopter and airplane pilot at James' field, decided to give the Whopper a shot. He had three successful flights, but on the fourth, the engine lost power and the Whopper sank slowly to the ground. Wang had to built another balsa tail! The moral: use a healthy 60 engine. Autogyros will not tip stall like airplanes, they just sink gradually to the ground.

side, to produce an "even" lift distribution across the rotor disk. Hence, helicopters do not have to have articulated rotors to fly. However, almost all the full-size helicopters produced in the US have articulated rotors because it helps to reduce vibration, not because of the rolling problem experienced by Cierva. This month's "Chopper Chatter" column has more discussion on this rolling phenomenon.

The autogyro reached its all time popularity high in the 1920s and early '30s because Cierva in Europe and Harold F. Pitcairn in the US were having great success with autogyros. On May 13, 1929, Pitcairn flew a Cierva C-8 autogyro for 165 miles from Pitcairn Field in Bryn Athyn, Pennsyvania to Langley Field, Virginia. At that time, no one had successfully designed and flown a helicopter. Pitcairn

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CHOPPER CHATTER

BY JAMES WANG

This month and next "Chopper Chatter" will focus on programming the Futaba 9-channel 1024 and the JR PCM-10 radios for forward flight aerobatics. We will let you in on some tips that I learned from the 1990 US National Champ, Cliff Hiatt, and from US FAI team member Tom Dooley.

We will not be talking very much on hover maneuvers because these require less tricks. The way to improve your hover maneuvers is to build your model precisely, and practice, practice, and practice; no pain, no gain.

Next time we will publish our interview with Kenneth Wayne Mann, who has only been flying RC helis for five and a half years, but recently became one of the top FAI contenders. Wayne won second place at the 1990 Nats, and was first at the 1990 Schluter Cup. He shares his flying and setup techniques with us.

At the end we will feature a letter from a reader in New York regarding diesel engines and why they may not be the best thing for RC helicopters. Most of our articles have been very technical recently. For readers who have just started in RC helicopters, and the ones who could not find help locally, we will soon have an article on how to set up your first helicopter.

Meanwhile, order a video of the 1989 F3C World Championships from RC Video in Colorado. It's a forty-minute video with lots of helicopter aerobatics. It also has good interviews with the world's best pilots. RC Video's phone number is (800) 873-3347. I believe the price is around $25.

If you have a model helicopter with a belt-drive tail rotor system, such as GMP Legend, Stork, or Kalt Cyclone, or Hirobo Shuttle, make sure the belt tension is very tight. If the belt is loose, then the yaw control will be very slow, the gyro will not be effective, and the model will be unstable in yaw. " Very tight" means you should be able to squeeze the belt together and see the belt depress no more than 1/8-inch on each side. Another test is to hold on to the tail rotor with one hand and turn the main rotor with the other hand. If the belt can jump a tooth, then it's too loose.

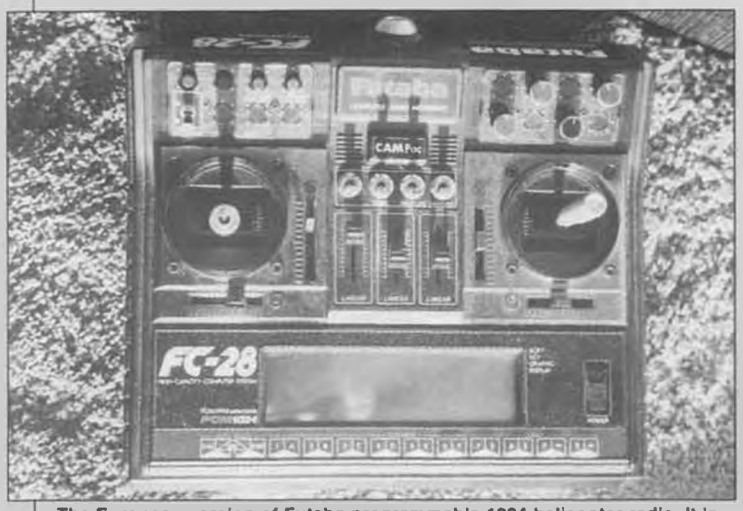
Most airplane pattern fliers will agree that it is most important to be able to fly perfectly straight and level. Nearly all the FAI pattern maneuvers require the airplane to enter from a straight and level attitude. If the entry is set up well, then the maneuver will most likely be performed decently. The same is true for RC helicopter aerobatics. All five FAI forward flight helicopter maneuvers are entered from level flight. The loop, roll, 540 stall turn, rolling stall turn, and 180 autorotation will look better if the helicopter started in nice, fast, and level flight.

To fly a model helicopter perfectly straight and level is not as easy as you might think. Just watch your own helicopter or other fliers', and most likely you will not find the models actually flying straight like an arrow for more than 100 feet. Helicopters are not like airplanes that you can trim for straight and level flight and then take your fingers off the sticks.

The European version of the JR programmable helicopter radio. The Euro radios are shaped like a tray. Note two brackets at the bottom of the transmitter for neckstrap. (Insert) The metal transmitter case is a very good investment to protect those modern programmable transmitters with toggle switches sticking out everywhere. James bumped off one of those switches, and including shipping, it cost $40 to replace the switch.

Most chopper pilots trim the model for hands-off hover. Then as soon as the model goes into forward flight, the helicopter will slowly drift to the right and try to make a right turn by itself. This is because in forward flight, the oncoming air flowing by the fuselage and vertical fin helps weathervane the model to prevent the model from yawing. This reduces the need for tail rotor thrust to balance the main rotor torque.

If the tail rotor is trimmed for hover, then in forward flight the tail rotor is overcompensating the main rotor torque, and the excess tail rotor thrust yaws the model nose to the right. Furthermore, in hover, both the left and right side of the main rotor disk are providing almost equal amounts of lift. But in forward flight, the advancing side (for clockwise rotation main that's the left side) produces more lift than



The European version of Futaba programmable 1024 helicopter radio. It is much more bulky than the American version.

At the 1990 Rave's Funfly, a fellow showed this homemade pitch guage with liquid crystal display down to 1/10th of one degree. The Smart Level is sold at hardware and specialty stores.

the retreating side (the right side for our models). The advancing side is the side on which the rotor blade swings forward.

The velocity of the air flowing over the blade's airfoil is higher on the advancing side than on the retreating side because the helicopters forward flight velocity is added to the blade rotational velocity. More air flowing over the blade means more lift. The extra lift from the advancing side (left side) causes the model to roll to the right as the model goes into forward flight.

Note, this is only true for model helicopters because our main rotor head is attached "semi-rigidly" to the main rotor shaft. As we explained in last month's GMP Jet Ranger review, full-size helicopters like the Jet Ranger have a totally free teetering main rotor head. Thus, as the full-size Jet Ranger goes into forward flight, the rotor disk may tilt, but the fuselage does not tilt along with it.

The first autogyro ever built (back in 1920) had a totally rigid main rotor, therefore, as that autogyro ran down the runway, the autogyro's main rotor would spin faster and faster. Finally, the extra lift from the advancing blade would roll the autogyro to its side and it would crash. The autogyro inventor, Juan de la Cierva, solved the problem by not mounting the autogyro rotor head rigidly to the shaft. This is also one of the reasons that all helicopters DO NOT have the rotor head attached rigidly to the shaft . . . to prevent excessive rolling action. We have more discussion on this topic in our Schluter "Whopper" autogyro review. The other more important reason that helicopters use articulated rotors is to reduce control sensitivity, and vibrations transferred through the shaft to the cabin.

A second effect of the extra lift produced on the advancing blade side is that it will cause the rotor disk to flap back and pitch the helicopter nose upward as forward flight speed increases. The reason for this is that the rotor is a spinning system, therefore there

PROGRAM MIX

	CLEAR	PAGE	ENTER
MIX 1	PIT— AILE		
	SW	OFFSET	+0%
	1,2	0	+10%

Figure 2. Screen display for programmable mix on the JR PCM-10 radio. This shoes how to automatically mix in 10% rightward cyclic when collective pitch is negative. This gives straight, hands-off, switchless inverted flight.

PROGRAMMABLE MIX • PCM 1 X-CELL

	mas	slv	inh	R/u	L/d	sw	trm	ofs	
MIX 1	AU2 —	AIL	ON	-3%	+3%	4	OFF	+	0%
MIX 2	AU2 —	ELV	ON	-2%	+2%	4	OFF	+	0%
MIX 3	THR —	AIL	ON	+10%	-0%	4	OFF	+	0%
MIX 4	THR —	ELV	ON	+2%	-0%	4	OFF	+	0%

Figure 1. Screen display of the programmable mix for Futuba 1024 9VHP radio to help model helicopters fly straight and level "hands-off". Lines 1 and 2 are for right-side-up. Lines 3 and 4 are for switchless inverted flight. The numbers are for the X-Cell 60 that we reviewed in November 1990 *Model Builder*. These numbers work well for the Excaliber and Legend, too. Next month we will show how to mix rudder with throttle.

is a physical phenomenon called "precession." Precession causes the resulting action to happen 90 degrees later than where and when the input force is applied. Thus, extra lift force at the left side (advancing side) causes the main rotor to have a maximum flapping deflection 90 degrees later, which is at the front of the rotor disk.

This effect will happen whether the rotor is free teetering or semirigid. The precession delay is exactly 90-degrees when the main rotor is totally free. And it's less than 90 degrees when the rotor is semirigid. This is why, in order to prevent cross-coupling effects (like when you give forward cyclic, the rotor disk tilts slightly to the left side also), we need to rotate the bottom swashplate on our models by about 10 degrees. This is called "phase correction." This way, a flybar tilt will give an input to the main blades about 80 degrees later, instead of 90 degrees later. Phase correction can be easily implemented on the X-Cell by shortening the radius arm pitch link that's holding the swashplate. On the Cobra, the radius arm pitch link needs to be lengthened. The idea is to rotate the bottom of the swashplate forward by about 5 to 10 degrees. The more you tighten the rotor damper rubber, the more the phase shift is needed. Instead of correcting the phase by rotating the bottom swashplate, it can also be done by electronic program mixing of the forward/aft cyclic and roll cyclic. Most modelers do not even realize that there is pitch/roll control cross coupling because model pilots do not sit inside the cockpit. On full-size helicopters with a stiff rotor head, the cross coupling would be more readily recognized by the pilot.

Please note, the above phase delay reduction from 90 to 80 degrees happens only when cyclic commands are input slowly, such as in hover or steering in forward flight. When you pull up hard in forward flight for a loop, the phase delay changes from 80 to about 100 degrees. Thus, in hover, back cyclic causes the rotor disk to tilt back and slightly to the right, but in forward flight, a quick back stick input causes the rotor disk to tilt back and to the left slightly. The reason is that a quick cyclic command changes the "induced velocity" flowing into the front and back side of the rotor disk, thus changing the "effective angle-of-attack" the blade sees at the front and back half of the rotor disk. Therefore, a quick cyclic command causes a reversal in phase delay behavior. This is why in a loop, the model helicopter tends to roll to the left slightly.

From experience, and after reading the above paragraphs, we know that to maintain forward flight, the model helicopter pilot needs to do three things; First, hold some forward cyclic stick to cancel out any backward flapping tendency of the main rotor and to keep the rotor tilted forward to pull the model forward. Secondly, some right cyclic stick is needed to cancel the rightward tilt of the rotor disk due to the extra lift of the advancing side. And third, some left rudder is needed to reduce the tail rotor thrust, so the model will not yaw to the right.

Traditionally, before the invention of programmable radios, most chopper pilots just learned to hold the sticks slightly off center to keep the model flying straight and level. Alternatively, some pilots immediately move the tail rotor trim and cyclic trim full left as the model moves into forward flight.

The modern way is what you can do with the modern JR PCM-10. The stunt trim on the PCM-10 automatically kicks in some tail rotor, fore/aft cyclic and roll cyclic when "idle-up 1" or "idle-up 2" is switched on. Therefore, I do all my hovering on the normal pitch curve and normal throttle mode. I switch on the "idle-up 1" for general forward flight, loops and rolls, and just enough negative pitch (about -4 degrees) and hi-idle throttle opening (about 80%) to sustain inverted forward flight. The "idle-up 2" is reserved for heavy duty forward flight aerobatics and switchless inverted flight, inverted hover, and inverted climb.

For most model helicopters, I suggest you set up the PCM-10 stunt trim with 3 to 5% left cyclic, 1 to 2% forward cyclic, and 3 to 5% left tail rotor. For example, my machines are trimmed for hands-off hover, but once in forward flight I would switch on "idle-up 1," and the PCM-10 would kick in the above three trim corrections and make my models fly straight and level hands-off. Now you can relax and watch the model fly across the entire field straight and level with your hands off the transmitter. Helicopters are dynamically unstable in hover, but in forward flight, due to the horizontal tail surface, most helicopters become dynamically stable systems. Theoretically, if there is no wind, and the model is trimmed for forward flight, it should fly straight by itself. This is also a reminder that you should never remove the horizontal stabilizer . . . in fact a slightly larger one would be even better. The size on the Legend is about the best for

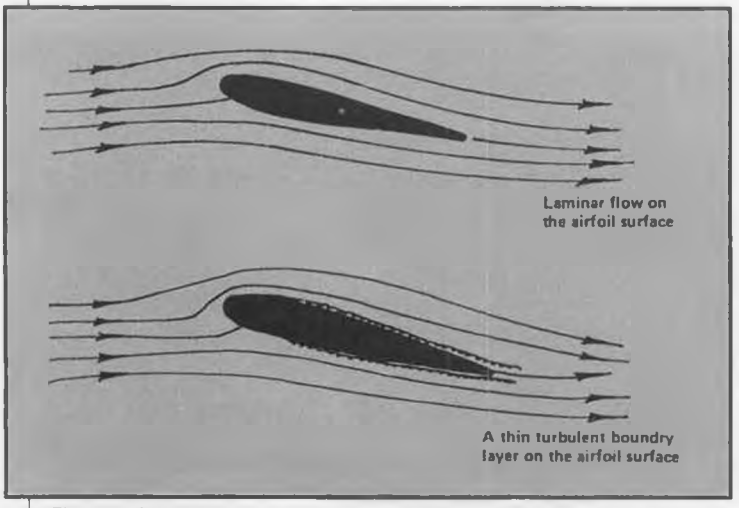


Figure 3. A glass-smooth blade surface can reduce skin friction drag, thus reduce the engine power needed to spin the blade, but it stalls at a lower angle. Rough blade surface (like 600 grit sandpaper) has a 1/100 inch thin turbulent boundary layer than can increase the blade stall angle from 10 or 11 degrees to 13 or 14 degrees.

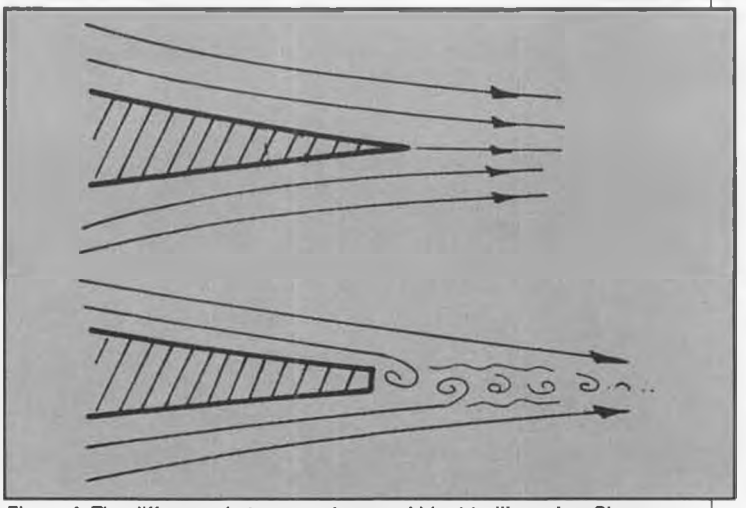


Figure 4. The difference between a sharp and blunt trailing edge. Sharp trailing edge improves the blade or wing efficiency tremendously.

Helicopter WORLD

a 60-size model.

The Futaba 9VH 1024 radio does not have the stunt trim feature. To achieve the same result, we will have to use the programming mix circuits. The 1024 does have rudder offset for forward flight. It is under the rudder mixing category.

Different models need different rudder and cyclic offset. X-Cell, Excalibur, Legend, Concept and Shuttle need very little rudder and cyclic offset (try 6% as a start). The Magic needs more, try 15%. To have stunt trim for fore/aft and roll cyclic, first go into the MIX. Then into PROG-MIX. Once you are in PROG-MIX, you must set SW to 4. SW 4 means the mixing circuit will be turned on only when "idle-up 1" or "idle-up 2" is turned on. Set trim to off. Leave ofs at +, and at 0%. You need to set mas to AU2, and slv to AIL for MX1. On my R/U, it's set to -3% and L/D equal +3%. This all means when idle-up 1 or 2 is flipped on, 3 percent left aileron (in helicopter terminology this should be roll cyclic) trim will be implemented automatically. 3% is perfect for my X-Cell. Similarly set up MX2 in the same manner, except set mas to AU2 and slv to ELV, and R/U equal -2% and L/D equal +2%. This means when idle-up is switched on, 2 percent down elevator (forward cyclic) will be implemented automatically. The above programming is shown in line one and two of Figure 1.

In order to use the idle-up switches as the trigger for automatic forward flight trim, you must set the dual rate switch direction (D/R sw DIR) under parameter to 1. This is because the Futaba 9VH has a programming bug, thus you must use 1. Setting D/R sw DIR to 1 simply means you will get full rate when the toggle switch is pulled downward, and low rate when the toggle switch is flipped upward. The Futaba 9VH instruction forgot to mention the above computer bug.

People who are doing switchless inverted flying, have probably noticed that most helicopters want to bank to the left when flying inverted. Again the problem is just the mirror image that we had when the model is right side up: it is due to the tail rotor thrust and extra lift from the advancing side. You need two more program mix circuits to make the model fly "hands-off" straight and level while inverted. The key is to mix the elevator and aileron with the throttle stick. When the throttle stick is pulled all the way back for switchless inverted flight, about 2% aft cyclic command is added to help keep the model's nose down and the model flying forward. When the throttle stick is pulled all the way back, about 5 to 15% right cyclic stick is added. These two programs are shown in line three and four of Figure 1. The exact percentage for your model needs to be determined by trial and error.

To achieve the above inverted mix on the Futaba 9VH, I mix the THR with AIL, and THR with ELV. To achieve the same inverted mixing for the JR PCM-10, I mix the PITCH with AILE and PITCH with ELEV. For example, Figure 2 shows the program mix for pitch with aileron. Notice here I use pitch instead of throttle. Why? It just seems this works great with the PCM-10, and mixing the throttle works for the 9VH. On the PCM-10 program mix, setting the SW to 1,2 means

continued on page 101

PLUG SPARKS *Continued from page 61*

who wants to keep busy and make a few bucks.

By the end of this year, John Targos states, he should be ready to ship complete engines. So gettum while they're hot!

SNUFFY VI REVISITED

This snappy design by Bob Toft has been popular with O.T. modelers for the last twenty or so years. The beautiful lines of the Snuffy reveal an extremely small cross section after the pylon. When flown on low power, the model flies great. With added power, however, the fuselage has the most disconcerting habit of twisting to an alarming degree.

For years, modelers (this writer included) have tried every conceivable way of strengthening the fuselage. Models have been double silked, double tissued with cross grained application, balsa sheeted, diagonal braced every which way, but none have worked as well as hoped.

It finally took Tom Smith to come up with a solution. Tom reasoned that Wakefield rubber model fuselages take terrific strains without appreciable twist. Building a basic square type Wakefield fuselage, formers and stringers were added to the square to get the Snuffy shape. Voila! The solution was personally double-checked by this writer, the fuselage showing only small deflection in twist.

SWEDEN

This columnist is again indebted to Sten Persson, Palslyckegatan 26, S-302 30 Halmstead, Sweden for a half dozen or so photos taken at the Swedish O.T. Nats.

We were particularly taken by Photo No. 14 depicting a model called the "Rocket" designed by Ted Evans in 1938. Evans will be remembered for his "Jaguar" which turned in an impressive score at the World Cup Wakefield contest in the USA. This enabled the Britishers to reclaim the trophy.

The Rocket, as built by Karl-Johan Eitoff, flew right off the board according to Sten Persson. Here is a classic case of good looks paired with good performance.

NEW ZEALAND

Received a photo from Tom Charlsworth of Hamilton, New Zealand, which shows two electric powered old time models. On the left is a converted Flying Aces Stick. The F.A. Stick originally had such poor performance in the glide that Tom built a 70-inch Lanzo wing and tail to replace the original flat-bottom surfaces. Tom says it flies almost as well as his Lanzo Bomber.

Tom is now retired and flies quite often during the week. He has found that electric power is the way to go at the local university grounds. None of the local people or students are bothered, but the magpies are! He writes:

"These large birds are very aggressive and they do not like models flying close to their nests in the trees. A Snoopy and Red Baron situation has evolved with the score of one model to two magpies down. I have battled as many as four at once. The Lanzo Stick and Bomber are quite maneuverable and can usually climb away and tire them out. No engine noise to keep the birds at bay!"

NCFFC DOINGS

These contests are the least publicized of all, yet offer plenty of events at least seven times a year. The contests are rather laid back but it does take good time to win.

This writer has taken plenty of photos but never seems to time it right with publication dates. This time is different as we present a photo showing Bill Vanderbeek, the NCFFC vice-president, holding an electric powered "Vagabond" as designed by Bill Winter.

This writer has always considered this design as the "poor man's Bombshell," as the Vagabond was featured in the Winter Yearbook with the Bombshell. An interesting comparison. Vanderbeek reports the Vagabond is an excellent flier and wins its share of trophies and merchandise.

SCHMIDT RANCH CONTESTS

With fields rapidly disappearing in the Northern California area, SAM 30 has held its Spring and Fall Annuals at the Loren Schmidt ranch, as has SAM 27 and their "Crash & Bash" Annual.

Seen at the latest SAM 30 meet was Neil Kaminar, SAM 21 member, with a rare model, the Ad Astra (Latin for "to the stars").

Neil really stood the boys on their ears when he used a reworked *GHQ* engine for power.

THE WRAP-UP

This obituary is a tough one to write, for a genial, longtime Old Timer advocate, Walt Parker of Salinas, California, passed away on November 16.

Walt will be remembered as the bosom buddy of Jack Jella, founder and former owner of Air Trails Aviation Co., which operated out of Salinas Airport. Walt and Jack were seen at so many contests that it was practically second nature to expect both to attend. At the early Stockton Old Timer contests, Parker astonished the boys with excellent flights with his F/F Flying Quaker.

Walt Parker was, by trade, an excellent cabinetmaker. This writer employed Walt on more than one occasion to build wood bases for perpetual trophies. An example of his handiwork can be seen on the old Roberts Trophy donated by Chester Lanzo as a perpetual trophy for the modern SAM RC Texaco event. Knockout of a trophy!

LATE OBIT

Just received a postcard from Kenneth Wilson of Evansville, Indiana, who relays the information that Joe Fitzgibbons passed away on Saturday, September 22, 1990. Joe will be remembered for his "Golden Age Reproductions" business. This has now been sold to Jim Fiorello, P.O. Box 1685, Andover, MA 01810.

REMEMBER FRANK!

Frank Ehling has suffered a serious stroke, according to Tom Ogden of Norwich, New York. At present, Frank is unable to walk or use his left arm. Frank is a great friend to many and it is only fitting that you, the reader, drop him a letter of appreciation for all his famous designs. Write Frank Ehling, c/o Joe Harris, Box 282C, Harding Road, Laurel, MD 20810. ***MB***

ARFS *Continued from page 29*

simple enough, and consisted of removing a strip of plastic film covering about an inch on either side of the wing center joint, and glassing the joint as should have been done in the first place. The glassed joint was then neatly covered with a strip of MonoKote (the tacky adhesive-backed variety), and looks as good as ever. You can be certain that joint will hold from now on.

Henceforth, it will be my practice to reinforce any wing joint in which I have no confidence. For example, an ARF on which I am now working is very well constructed, and the factory covered wings require only the gluing together with two wing joiners. The joiners are made of 1/8 inch light ply, with one being a single thickness of wood, and the other a double thickness to make up a 1/4-inch spar. The wingspan is 62 inches, the engine will be a powerful .60 two-cycle, and the plane is intended for unlimited aerobatics, yet the joiners are of soft wood and only 3-1/2 inches long! And after joining the wing halves, the instructions only require that the joint be covered with a narrow strip of colored tape to dress things up. It is inconceivable to me that a joint such as this can stand up to heavy strains, and so I will substitute a harder grade of plywood, and then glass the center joint.

Other places which may also need extra strength are the landing gear attachment points, the motor mounts, and/or the firewall, but a rule of thumb to follow is that the higher the performance intended, the beefier these components should be. And these design flaws are not limited to ARFs by a long shot. Even if you are building a conventional kit, beware of any wing center joints which do not require a fiberglass treatment. Sometimes the designer and the builder of the kit have entirely different goals in mind where a particular model is concerned. For example, I often see fliers with airplanes which were intended to be intermediate trainers. Though the manufacturer recommends a moderate amount of power, the builders often go overboard and use engines which are much too powerful for the airframe without beefing up essential areas of stress. This usually leads to structural failure, and the wing is the first thing that folds in a high-G pull out. Keep in mind the kind of flying you do, and treat the center joint of the wing accordingly.

CA GLUE DISPENSER

If you get as annoyed as I do when the nozzle clogs on my bottle of CA glue, then your worries are now over! Art Gross gave me a package of his CA glue dispensers to try, and I think he has come up with an ingenious solution to a vexing problem. You see, the glue is never applied with the nozzle of the glue bottle. As a matter of fact, the bottle is used only as storage for the glue inside. All applications are made with Art Gross's amazing dispenser, which looks like a transparent bulb with a long tail. To use it, first uncap your CA bottle, then roll up the bulb to evacuate the air. Stick the tail in the bottle of CA and let go of the bulb. As the bulb expands back to its normal shape it sucks up CA and becomes a ready-to-use dispenser. Next, you insert an inch or so of thin teflon tubing into the end of the dispenser, and by gently squeezing the bulb you can now apply CA accurately anywhere you wish, from a tiny drop to a continuous flow. There is no possibility of leakage, and wasted CA is now a thing of the past. Meanwhile, your original bottle of CA remains clean and uncontaminated. Furthermore, you now have the handiest emergency supply of CA for your flight box that I've ever seen. The dispensers are supplied in six-packs, with an ample supply of teflon tubing included, and Art is offering the readers of *Model Builder* a special reduced price of $3.98 per package, postpaid, which is a buck less than the list price. The CA dispenser pack is available directly from Art Gross Enterprises, 12516 Maplewood Ave., Edmonds, WA 98026, telephone (206) 743-9332.

ARFS AND THE AMA

Over the past year I have been in commu-

nication with the Academy of Model Aeronautics concerning various matters. One of the topics I discussed with some of their officials pertained to the part ARFs play in today's scheme of model aviation. It was accepted that up until now the AMA has been primarily oriented towards its members who prefer to build their models rather than purchase them in ready-to-fly configurations. However, statistics indicate that at least half of the models sold today are ARFs, and a high proportion of modelers are not involved with the building of conventional kits. Even those who disagree with this premise will readily concede that a significantly high proportion of AMA members are ARF enthusiasts. In view of this belief, I am of the opinion that future issues of *Model Aviation* will have articles of interest to those of us who are devoted to ARFs, and will therefore appeal to a broader spectrum of readers.

Another suggestion I made to the AMA was to initiate an incentive gift award system for those of us who are instrumental in procuring new members. For example, the National Rifle Association is one organization which often uses this method to increase its membership.

Hardly a year goes by without my personally signing up at least a half dozen new AMA members, and to motivate others to do the same, a small award such as an appropriately designed cap, T-shirt, patch, pin, or belt buckle would probably do wonders in building up our membership. In any event, Geoffrey Styles, AMA Director of Marketing, assures me that this idea will be given some consideration in the near future.

Another topic we discussed concerned the various membership classifications employed by the AMA. I am sure my readers will be as amazed as I was to learn the following, and I quote Geoff as saying, "The subject of membership classifications is a touchy one. In actual fact, AMA loses money on all but the open member category. *It costs more to maintain a member and provide services for him/her than the dues provide.*"

Astounding! Those of us who are not full dues paying open members are being subsidized by those who are, so the next time we grumble about dues, we'll have to keep that fact in mind!

Anyway, that's enough time on the soapbox for now. You can pass your ideas on by contacting me as usual at 2257 Alta Vista Drive, Vista, CA 92084 (SASE for reply, please), or by phone at (619) 726-6636. My FAX number is (619) 726-6907. ***MB***

EEE-Z-FLI *Continued from page 30*

two sides by cementing B-1 and B-2 to the remaining side—use a square to assure alignment at the tail. Install the rear vertical members, FD-7, and FD-3,4,5, and 6. Drill holes for wing attachment dowels and cut slots for the rudder and elevator pushrods.

The firewall (FW) may now be glued in place with epoxy. Add vertical supports between rear face of FW and fuselage sides, also with epoxy. Now pull the rear end of the fuselage together, *align carefully* and cement, holding with clothespins. Add rear fuselage cross supports at the vertical members and install the triangular block at the tailpost. The bottom of the fuselage from B-2 aft is covered with 1/16 balsa. Cover the bottom from the wingcut out to the firewall with 1/16 balsa with the grain running fore and aft.

F-1 may now be fitted in place and the top skin, also 1/16 balsa, fitted with the grain fore and aft. Cover the top of the fuselage from B-2 back to the stab cutout with 1/16 balsa. Fit and install the stabilizer support pad.

The servo supports may be installed at this time. They mount to the top of FD-2, the rear one as shown and the front as required to accommodate the servos used.

The windshield may be fitted using any type of flat plastic sheet. Where the edges meet the fuselage sides, leave about 3/16 inch of extra material and bend it over the edge of a flat surface so that the edges lay flat against the outside faces of the fuselage.

The engine mount may now be positioned as required for muffler clearance. Center the mount as marked on the FW drawing. The FW angle provides for the required down thrust (approximately 3 degrees). Drill mount holes and install blind nuts. The required holes for fuel and vent lines are shown, but the throttle control position will have to be determined by your engine positioning.

The cowling on the prototype was made from a plastic dog tablet bottle, "Filaribits." Cowl mounts may be made from aluminum angle as shown or, if preferred, wood supports. Cut openings for cylinder head and muffler clearance, mixture adjustment and carb throat if required.

TAIL SURFACES

All tail surfaces are 3/16 medium hard balsa. Elevators are joined with 3/16 dowel as shown; join on a flat surface and be sure the leading edge is flat and straight. Cut hinge slots and cement hinges into stabilizer only. Join the fin and dorsal and install hinges in the fin and aft fuselage only. Trial fit stabilizer and fin to the fuselage. Sand all edges round and put surfaces aside for covering.

WINGS

Two things are unique about the "BI" wings. First, the upper and lower panels are identical with the exception of the ailerons in the upper. Second, there being no dihedral, the wings may be built flat with the bottom skins, spars, leading edge and trailing edge in one piece, tip to tip. This is quite a savings in time and makes for a super strong wing.

Start by selecting four matched sheets of 1/16x4 balsa. Cut and edge join the bottom skin sheets. Leaving the bottom sheets on the plan, mark the spar and rib locations with a ballpoint pen. Cement the spars to the bottom sheets, assuring that the sides are vertical. Cut the trailing edge material to length, mark its location and cement it to the

bottom sheets.

Now install the five R-3 ribs, noting that the center R-3 is 3/16 balsa. Assure that they are flush with the top of the spar and 1/16 inch below the front edge of the trailing edge. Now install the six R-2 ribs assuring that they are 1/16 inch above the spar top and flush with the top of the trailing edge. Bevel the ends of the R-4 ribs for a good fit and install, also 1/16 inch above the top of the spar and flush with the top of the trailing edge.

On the 17 R-1 ribs, be sure that the round cutouts for the leading edge allow it to seat firmly on the bottom sheet, flush with the front edge of the sheet. The rear edges must be level with the top of the spar. Install the R-1 ribs and cut the leading edge dowel to the correct length. Cement it in place, being sure of a good bond with the bottom sheet and all ribs.

From 1/8 scrap balsa make skin supports for the area between the R-3 ribs. Cut to fit 1/16 inch below the top of the trailing edge. These provide a support for the rear edge of the center section planking. The area between the outboard R-3 ribs may now be planked with 1/16 balsa. End the planking at the center of the spar. Cut a length of 1/16 sheet for the leading edge, notched to clear the center section planking at the spar top. Wet the top side and install flush with the rear face of the spar. Assure adequate cement on the spar top, all rib tops and the top of the leading edge dowel. Tape around the leading edge to assure a tight joint.

The ailerons can now be cut from the trailing edges of the upper wings. Trim the inboard ends as shown and round the trailing edges. Cut hinge slots in ailerons and trailing edges and glue hinges in trailing edges only. Install actuating hardware as shown; DuBro strip aileron hardware may be used. Bend the actuating arm forward from vertical to provide clearance at B-2. Trim and sand the bottom sheets and top planking to form a round contour with the leading edge dowel. Make wing tips and install as shown. Finish sand the wing for covering. Epoxy the landing gear support plate to the bottom of the lower wing as shown. Epoxy servo supports to bottom of upper wing as shown.

LANDING GEAR

If your landing gear is not already drilled, lay out and drill according to the hole pattern in the support plate; if it is pre-drilled, drill the support plate to match. Shown is a typical wheel and pant installation; modify to suit your type of wheel pant as required. At the aft bottom fuselage area install a Goldberg or similar tail wheel support, bend the wire as shown and make an aluminum clip to tie it into the bottom of the rudder.

COVERING

Sand all surfaces a final timed round the fuselage edges to suit, remove all dust, and cover. The prototype was covered and trimmed in Super MonoKote. Mark and cut the covering from all assembly joints to assure a wood-to-wood cement joint.

ASSEMBLY

Cement stabilizer to fuselage, checking for alignment. Position fin on top of stabilizer with rudder temporarily attached and check alignment with aft fuselage, then mark and install fin. The elevators may now be permanently installed, followed by the rudder. Install the servos and control pushrods. Complete servo-to-aileron hookup on upper wing.

Install engine mount, engine, throttle control, landing gear, and fuel tank. Prior to muffler and propeller installation the cowl may be installed; additional trimming may be required. With the stabilizer level, the upper wing support should provide 0 degrees incidence and the lower wing saddle 1.5 degrees positive.

Do I hear questions? Remember, the lower wing is the leading wing, and as with most real-life bipes, we want the leading wing to stall first. The same principle applies to models. Adjust control travel as follows: elevators, up and down 1/2 inch; rudder, 3/4 inch right and left; ailerons, 1/4 inch up and down. Throttle travel as required to obtain full throttle and a satisfactory idle, including cutoff.

Roll the aircraft on the ground to assure straight tracking. Range check your radio and double check all controls for the correct

travel *in the right direction!* Too many brand new models are stacked because the ailerons were hooked up in reverse. It takes a pretty hot pilot to detect this problem in time to save the ship and get it back down in one piece! Balance the model to hang nose low at the point indicated. *Do not* attempt to fly tail heavy!

FLYING

The prototype has been flying on a Magnum .25 FSR turning a 9x6 Master Airscrew, burning 5% fuel. When satisfied that the "BI" taxis well, add throttle slowly for takeoff. Tracking on the prototype is good and the tail comes up by itself with neutral elevator trim. Liftoff is straightforward as is the climb out.

If you have a trim problem, throttle back a little and correct it. Once trimmed the "BI" tracks well, and even with the initial control settings is quite responsive. Approaches are normal at reduced throttle and flare and landing are normal.

The "BI" is fast at higher power settings and, with the control throws increased, it becomes pretty quick. The prototype has been flown under varied conditions of both weather and pilot ability and seems to live up to the EEE-Z-FLI tradition. ***MB***

RC SOARING *Continued from page 35*

for over 15 years, and it has become the accepted way of flying TD.

This past weekend, I was a participant in the above named "F3J-style" thermal duration competition. I put the name in quotes because it wasn't really flown to true F3J rules. Variations included: two fifteen-minute slot rounds in addition to the three (standard) ten-minute slot rounds; no spot landing bonus; and the elimination of towing pulleys. The former two exceptions were to place an even greater emphasis on FLYING ability, not just landing ability. The latter pulley ban was actually a misunderstanding of the F3J rules by the CD (who didn't have an official set) combined with his personal feeling that inexperienced towers with pulleys might impede the orderly progress of the meet. (A real possibility.)

Anyone who has done any hand towing in any kind of breeze or wind can tell you that hand towing is an easy task. An initial run to tension the line and get the model started on its way is usually all that is required, with just a trot or a walk to maintain the climb. In serious wind, the tower often just stands there holding onto the line while the model climbs merrily away.

However, when there is no wind, it does get tough with just a simple tow line (see Figure 1). A Paragon or other flat bottom wing floater or even a two-meter can be launched easily with a moderate sprint of 35-seconds or so. A heavier sailplane with less camber in its wings, like a Cumic Plus, Gemini, Sagitta, etc., will take a flat-out, chest pounding sprint! If you fly a Falcon 880, F3B ship, or the like, you might need a college-age athlete to get a decent launch! . . . But that is with a simple tow line.

With a pulley (see Figure 2) in the tow line, you can DOUBLE your running speed as a tower. Now any middle-age duffer can get better line speed than a Carl Lewis in a no-wind situation. However, there is a penalty to pay! Yes, at first you can run forward six feet and have the glider move forward 12 feet. BUT . . . when you are all though towing, and the model is overhead, you have taken in "X-feet" of line, all of which is resting on the ground, not flying through the air. When there is no wind, sometimes this is the only way a model can be launched!

The length of the tow line cannot exceed 150 meters when tested under a tension of 2kg (4.4 lbs.). Our CD tested under a 5-kilo tension which was another deviation. A 5dm-sq. pennant or parachute is also required by the F3J rules, but wasn't enforced. "Hand operated pulleys" (for tow persons) are allowed by the rules, but no other mechanical aids other than a hand operated reel (winch) for line retrieval once the launch is complete.

Launches were started with the pilots and models standing on a line facing the wind (approximately) and the towers upwind (generally). Most fliers opted to launch as soon as possible at the start of the slot time because of the real possibility of being skunked by a guy finding "ten-minute air" at the beginning. Relaunches are permitted, but this voids your previous time.

In actual practice, the SULA F3J-style meet was a disappointment. With no wind for the first three rounds, many towers were completely exhausted and ready to quit. Some, in fact, did quit. Others stuck it out for Round Four when a light breeze came up making towing a lot easier. By Round Five there was a 8-10 mph breeze and towing was a dash-trot-then-walk affair. By the time the wind came up, only 11 of the original 23 fliers remained. This probably would have been closer to 20 fliers had pulleys and tower experience been available.

In defense of the CD, however, his contest did feature more flying time per flier than any other meet I've been to in many a year! The eventual winner, Joe Wurts, flew for a total time of nearly one hour (over 11-1/2 minutes per round for five rounds)! Compare this with your typical 5 to 7-minute precision TD contest where you fly anywhere from 15 to 21 minutes.

The winning aircraft ranged from (1st place) Joe Wurts' F3B and modified Falcon 880 models, to (2nd) Bill Watson's prototype Unlimited Class Mirage (yes, it was the original Mirage 118" and it was flown unballasted), to a Nordic-style RC towline model (6th) flown by Matt Gerwain who towed his own plane, and even a Class A RCHLG original (10th) flown by Jim Skinner. Piloting ability still won the meet, as it usually does, but launching handicaps were a factor for

some who dropped out.

In a phone conversation with Tom Gressman, I learned that his club held a similar "F3J-style" contest. Theirs was modified by the use of identically constructed heavy duty hi-starts. All hi-starts were new, and all were tested to give equal power. Due to a limit-line beyond which you couldn't launch, maximum potential energy was the same for all fliers. There was always a breeze present during this meet, so launches were always excellent, and always fair.

The hi-start idea eliminates the need for hand towing and its perceived "inequities," AND it eliminates any arguments over supposedly "identical" winches performing in apparently "un-identical" ways. Plus, the advantage of having the "tower" serve only as a line retriever means he is closer to the pilot for ease of communication, and the tower can always WALK the line back to you while you land IF you need a relaunch. Sounds like a plan to me. How about it?

Looking at what the English tend to fly in their F3J meets leads one to select a large (110-inch or bigger span), moderate-to-lightly loaded sailplane with a 2.5 to 4% mean cambered wing that can be ballasted if necessary as demanded by weather conditions. Many English ships are in the 12 to 14-foot span range, and most are balsa built-ups, many have flaps, and most have (get this!) carbon fiber reinforced spruce spars! Yes, it is altogether too easy to break wings while hand towing in the wind, so be prepared!

If you are looking for a source for a good hand tow winch, turn to Hobby Lobby mail order. They sell Graupner's molded nylon reel which is very nice (I've seen one). Personally, I have a vintage 1979 English winch which was modified from a hand-powered grinder. I purchased it from a friend who imported it directly from his source in the UK. Unfortunately, I have no idea who sells these anymore! If any readers "over there" can help, it would be appreciated.

Give hand towing a try the next time you go flying. Try it outside the confines of an organized contest. Try it where you can experiment with a pulley system in dead calm, or without a pulley on a breezy day. I think you'll find it adds a physical dimension to your hobby that is really enjoyable. Put some meaning into the term "sport flying!" *(Hand towing without a pulley on a calm day is more effective than Ultra Slim-Fast! wcn)*

AIRFOIL OF THE MONTH: ROLF GIRSBERGER RG14a-1.4/7

Here is an airfoil that is one of the thinnest I've ever seen for high performance RC sailplanes. Because it is thin and because it is low cambered, it is not an airfoil for the thick of thumb or faint of heart. Serious F3Bers and F3Eers take note: here it is, your "vundersection!"

The RG nomenclature indicates this section is 7% thick with a 1.4% mean camber line. Airfoil courtesy of Randy Reynolds and the F3B/USA newsletter, "The newsletter for persons interested in F3B/MTS soaring." Subscription rate is $12 per year for six issues on odd numbered months. Write to: F3B/USA, 122 East Uintah, Colorado Springs, CO 80903.

SUPPORT YOUR NATIONAL TEAM

And speaking of F3B . . . It's time to show your support for the official United States F3B Soaring Team! That team consists of Joe Wurts, Larry Jolly, and Daryl Perkins. Randy Spencer is Team Manager. We've put together great teams in the past (and some infamous ones too), but this team shows the greatest potential, AS A TEAM, of any previous team. All members are from Southern California, they are very good friends, they fly together and practice REGULARLY, and they are expert modelers in every way. If you have ever considered giving to a team, now's your chance to give to the best.

Send money (pure unadulterated lucre) to: USA F3B Team Fund, P.O. Box 3242, Lakewood, CA 90711-3242. The Team appreciates your help . . . it's a long way to Holland in 1991!

SIGN IT OFF, BUSTER!

My, how the pages fly by when you're having fun! If you have sent material in for this column and haven't yet seen it appear, don't loose heart! Next month we'll try to get caught up! Bill Forrey, 3610 Amberwood Ct., Lake Elsinore, CA 92330. Between 7-9 p.m. PST call (714) 245-1702. I enjoy hearing from you, don't hesitate to call. ***MB***

K&B .61 *Continued from page 43*

out), the skillful replacement of the ring gives like-new performance. It pays to buy two or three rings . . . when you install a new ring it *must* freely rotate in its groove. If not, you've bent the ring (permanent deformation) and you must try again with more care/skill. The installation of a new ring will then require a bit of careful break-in to get optimum performance again. The outer roundness of the ring needs to have lots of lubrication as it wears into the roundness of the cylinder. A sure sign of needing a new ring is the failure of the engine to idle as well as it used to as long as you are on the same fuel and you've installed a new shiny K&B #4520 idle-bar glow plug. The ring forms the seal between the piston and cylinder. If the seal leaks (due to wear) the pumping action of the piston/cylinder diminishes as does the ability to draw fuel and air and as does the ability to compress the mixture for reliable idle performance.

The single best feature of K&B's .61 contributing to my best dollar value rating is that if you plant the model and destroy the engine, a complete factory rebuild will cost you about $50.00. I received a price quote for parts to repair a worn Japanese engine recently . . . the piston, cylinder, connecting rod and bearings cost $104.30 by contrast . . . the piston and cylinder alone was $57.40! Case closed.

The following quotes from Clarence Lee's letter are most interesting . . . "I was commissioned in early 1965 to design and develop the Veco .61 for Veco. Six prototypes were to be built, but to speed things along we decided to go straight to the die-cast case rather than make a prototype sand-cast case . . . a bit of a gamble, but I knew pretty well what I wanted in the way of a crankcase. Initially, the engine was going to be a .65 with a bore of .970" and stroke of .880". I had just finished the cranks and was starting the sleeves when the FAI put a 10cc limit on engine size for pattern competition. We decided to change the displacement size to .61. Work progressed and the first engine was assembled the 9th of July, 1965. The first engine was bench run the 10th of July. I got hold of my good friend Cliff Weirick

(Cliff is part of Airtronics today) and we flew the engine in Cliff's `Candy' on the 11th of July. Cliff got engine #001. Cliff went on to win the Nationals that year with the engine, which certainly kicked off the sales of the engine. K&B, in 1969, took over the engine portion of Veco . . . in 1972 I was asked by Johnny Brodbeck, Jr. to update the .61 for K&B, which I did. The engine has remained pretty much the same ever since, with only minor cosmetic changes. After 23 years of production, the engine is still one of K&B's best selling engines. Many thanks, Clarence."

Let's look inside the K&B .61 RC engine. The K&B factory has a dozen CNC machines in operation and the bulk of this engine is now machined to tighter, closer tolerances than Clarence ever dreamed of 23 years ago. If there's a problem in the engine, you can bet it originated in assembly.

All model engines, regardless of brand name, that use one or more paper gaskets, share a common problem; the paper gasket material compresses while the engine waits for you to buy it. All new engines should have their bolts lightly tightened . . . invariably the rear crankcase bolts *will* noticeably tighten on the K&B .61, as well as other brands. If any engine leaks air in that area, it can't perform properly. I'd guess the paper gaskets start out at .025" and compress with time and tightening pressures to half that thickness. If you ever destroy a gasket with a cleanout a regular playing card can be a suitable replacement material until you can order a factory replacement.

The cylinder head is held in place with six 6-32 x 1/2 inch Allen bolts and once they're snugged they seldom need attention again. The backplate bolts are 6-32 x 3/8 inch and any time you have this engine out of the model you should check these four bolts for snugness. The rear crankcase cover is not symmetrical . . . if you ever remove it for engine clean-out, as after a crash, be sure to first scratch a tiny "X" on the "up" side for proper reassembly.

The muffler mounting bolts are 5-40 size . . . if replacements are needed, you're not apt to find them locally in a hardware store!

As on all model engines, if you remove the cylinder and forget which way it goes back in, the highest up porting is ALWAYS the exhaust port. Engines will idle fine if the sleeve is in backwards, but they usually die as you advance the throttle. The K&B .61's piston has a deflector baffle on the top of the piston . . . the piston goes back in the cylinder with the deflector baffle furthest away from the exhaust port.

If you remove the head and remove the piston too, you'll have trouble getting the piston ring to close to allow the piston to go back down into the cylinder. The trick here is to wrap a piece of monofilament fishing line once around the piston ring, pull the line tight to compress the ring and while doing . . . push the piston down into the cylinder *(What, you don't have three hands!? wcn).* I mention these techniques as some modelers like to take an engine apart before running it to clean and flush out any metal chips. I mention these techniques also because this is an extremely easy engine to rebuild after much use.

If the engine loses compression, a $2.00 ring change will often rejuvenate the .61. The ring change procedure is simple:

1. Scribe the "X" we've already described.
2. Remove the rear cover, taking care to not damage the rear gasket (spare gasket/screw set #6733 is only $2).
3. Mentally number the front top cylinder head bolt #1 . . . and proceed clockwise to number the others #2, #3, #4, #5 and #6.
4. Pay careful attention to the tightness of these six head bolts as you loosen them in the sequence of #1, #4, #2, #5, #3 and #6. Later you'll want to incrementally (in tiny successive steps) re-tighten the cylinder head in the same exact sequence to at least the same relative tightness. The head must never leak.
5. Remove the head and its six bolts.
6. Remove the single large aluminum short bolt in the rear of the crankcase to reveal a 1/4 inch hole.
7. Rotate the crankshaft until the wrist pin assembly (you'll see a white Teflon anti-scuff pad through the 1/4 inch hole) centers in the hole.
8. With a tapered pin, reach through the 1/4 inch hole and gently put the pin in the center hole in the scuff pad, and pull out the wrist pin to disconnect the piston from the top of the connecting rod.
9. If you're replacing the ring, remove the old one, clean the groove and replace with K&B ring #6516 for $2.00 . . . use *great* care to not deform the ring . . . check to be sure the new ring freely rotates in its groove.
10. With the "pull the fishing line tight" trick, put the piston back down inside the cylinder . . . but first lightly wipe the inside of the chromed cylinder with 400 wet-or-dry sandpaper to remove any glaze . . . wipe *around,* not up and down, and flush well.
11. Simply backtrack the steps to complete assembly.

With fuel containing castor oil, proceed to break the engine in with a series of short, fast, rich runs, with complete cooling between the runs.

If you'll keep the needle valve setting on the engine 500 or so rpms *below* maximum, use a quality fuel, and avoid ingesting filth (the Bru-Line air cleaner is great), this engine will give you fantastically long service. If you follow the disassembly steps but completely screw up . . . don't despair . . . send all parts to K&B's Customer Service Department along with your charge card number and a note that says "please fix!"

On this review engine, the carb's intake diameter is .312". The muffler's outlet ID is .375". More power can be had from this engine by modifying the muffler outlet to 1/2" ID (ream out and press in a piece of K&S brass tubing for a bigger outlet), but sound levels rise and the idle may suffer. I don't feel this engine will respond well to a tuned pipe . . . it is rather lightly built for pipe performance and the exhaust timing measures a

modest 137 degrees . . . this is a beautiful and economical performing sport engine by today's standards.

The stated compression ratio is 7.25:1 but the test engine measured almost 9:1. If you live in a high humidity climate (like Louisiana or Florida), you might buy a head shim at your local hobby shop to fit under the cylinder head which will slightly lower the compression ratio for still better performance. I've added .035" to another brand of .60 for Florida's 95-degree and 95% humidity with startling results.

The K&B's bore measured 935" and stroke measured .880 for .604 cubic inch displacement. Weight is 15.4 ounces and the muffler adds 3.3 ounces . . . a light combination for its displacement.

The top and bottom of the connecting rod are both bushed and the lower tiny lubrication hole faces forward. The piston's holes that accept the wrist pin (gudgeon pin to our British/Australian readers) are also bronze bushed for wear improvement . . . simple and ingenious engineering not often seen on pistons. The crankshaft's OD is .580" and the hollow passageway for fuel/air flow through the journal is .430". The crankshaft's intake window is a generous .625" long by .390" wide. The replaceable 1/4 x 28 front prop stud takes crash 'n bending loads and costs only 50 cents! Most of the K&B engines use this protective feature for their crankshafts.

The front ball bearing is shielded or closed on its front side and the rear bearing is one of the new plastic caged units that K&B has pioneered in its higher speed performance engines. A very tiny .025" hole is drilled front-to-back starting behind the front bearing's seat and extending straight back into the engine's carburetor mounting area . . . clever and functional. Unless you were to know the lubrication hole was there, you could easily overlook it. It prevents the front end from running "wet."

Our K&B .61 was very carefully broken in with a series of short fast runs on an undersize 10-6 prop, with liberally lubricated fuel. When it was judged ready for performance testing, it easily turned the undersize 10-6 at 15,200 rpms with the muffler off . . . about 25% faster than the stated 12,000

rpm figure in the K&B literature! As expected, the glow plug element in the K&B 1L plug was slightly distorted. For testing, the plug was replaced with a new K&B 4520 idle bar type and one ounce of castor oil was added to a gallon of Powermaster 15% fuel for new engine protection. While other engine writers quote heat and humidity at testing, we find the ratio of high speed to reliable idle speed (the Richmond Speed Ratios) to be a practical and useful guide to measuring engine performance on a given propeller . . . temperature, pressure, and humidity have practically no effect on these ratios. While some engines show great variance with different prop sizes, it's most interesting to see the near uniform ratios of performance of the K&B .61 in these test figures below. It means the engine is ideally suited for a variety of sport models and their prop needs.

Please remember, this engine was a pattern winner over twenty years ago. At the September 1989 Florida Pattern Association Championship meet there were 42 entrants and the dominant engine was from Japan. But among the novice entrants was Bill Pierce, flying a Sig Astro Hog powered by a K&B .61. He had logged almost 350 flights on the plane and engine at contest time. The engine had *never* had an internal part replaced. K&B advertises their products as "The Choice of Champions Since 1946." I bought my first K&B in 1946 . . . an ignition .29 . . . and proceeded to set an AMA U-Control speed record for Class III with it.

PROP SIZE	HIGH RPM's	IDLE RPM's	SPEED RATIO
11-6	13,400	2500*	5.36:1
11-6	14,200**		
11-7	12,750	2400*	5.31:1
11-7 1/2	12,400	2400*	5.29:1
12-6	11,900	2250*	5.29:1
13-6	9,350	2150*	4.35:1

*Indicates the idle rpms fluctuated above and below this figure by 100 rpms average. By leaving the glow plug heat applied the idles greatly smoothed out and could be dropped 200 to 300 rpms readily.

**Indicated muffler-off performance. All other figures are measured with the supplied muffler installed.

A speed ratio below 4:1 is unsatisfactory.

A speed ratio of 4:1 is barely satisfactory.

A speed ratio of 5:1 is average performance.

A speed ratio of 6:1 is superb performance.

The K&B .61 RC engine (#6550) carried a retail price of $135.00 at test time . . . it is often available for less than $100 in many hobby shops. It is a "best buy" made in the USA by K&B Manufacturing Company, 2100 College Dr., Lake Havasu City, AZ 86403. ***MB***

MD&TS *Continued from page 45*

tip, until the wing balanced perfectly at the center. But, I found the plane didn't track well in loops, inside or out. A careful examination of the entire airplane didn't disclose any warps anywhere. Mystery.

Sure the wing was balanced, but suddenly I realized that the airplane as a whole hadn't been. Why would it need to be? Airplanes are very symmetrical, and even if one side of the stabilizer was a little heavier than the other, it couldn't be much out of balance. Ah . . . but I hadn't built the airplane entirely symmetrical! The majority of us (who use side-exhaust engines) hang a heavy muffler out on one side, unbalancing the fuselage. In this case I had tilted the engine about sixty degrees from vertical to get more clearance between muffler and fuselage. So I have the weight of the cylinder as well as the muffler off-center. At first I didn't think this could be the source of my tracking problem, because the unbalanced weight is so close to the fuselage center line.

But, these unbalanced weights are among the heaviest things in the model. Especially as the muffler on this model has an added steel "Snuffler." It was all very evident when I checked to see how much weight I had to add to the wing tip on the light side of the airplane to balance the offset sixty-size cylinder and muffler combo. One and a half ounces at the 32-inch semi-span! That was a lot of unbalance, and was the cause of my aerobatic trimming problem. She now tracks perfectly in both inside and outside maneuvers.

Observation: The wing alone doesn't even need to be balanced. It is the airplane as a whole that must balance if it is to track well. To check the balance of the airplane, put it on the floor and then lift it by one prop blade (not on the compression stroke) and by a finger tip under the center of the aft fuselage, or by the prop and the fin.

KEN SIMMONDS on REYNOLDS NUMBER

Ken Simmonds, Albuquerque, New Mexico, an ex-wind tunnel engineer, contributed another excellent essay on fluid flow. I had to shorten it a bit.

"Laminar flow does indeed result in lower wing profile drag. You may remember many experimental airplanes of the '50s and '60s which used laminar flow concepts, and of course, the P-51 fighter. If we were to test a conventional or a laminar flow wing section at low Reynolds Number in a smoke tunnel, where we had streams of smoke to visualize the flow, we would see something like Figure 1 at low angles of attack. The air progresses smoothly over the wing section with only minor turbulence.

"At high angles of attack, the stagnant, slow-moving air close to the surface causes an effect known as a separation bubble. The energized, high velocity air separates from the airfoil and forms a flow pattern similar to that shown in Figure 2. Like the flow of water around a rock in a stream, the flow inside the separation bubble is confused and may actually circulate toward the leading edge. This effect can actually be seen in a wind tunnel if the wing section is painted with a mixture of oil and pigment. At high angles of attack, the oil can be seen collecting within the separation bubble and flowing forward toward the leading edge. The flow separation occurs quite suddenly, with a disastrous effect on section lift.

"I once built a radio-controlled sailplane with a small-chord wing which exhibited laminar separation characteristics. It would suddenly stall; the ensuing dive would build up speed (and Reynolds Number) to where the flow would re-attach and the wing would lift strongly. The model would then zoom, lose speed at the top of the zoom, stall, and repeat the sequence.

"Laminar separation can be forestalled by `energizing' the boundary layer close to the wing surface. The laminar flow research aircraft achieved this by two methods. In the first, the wing surface was perforated with many small holes which were connected by ductwork to the intake of an auxiliary jet engine. The engine literally sucked away the stagnant air at the wing surface. Others used `blown' leading edges, where high-pressure air bled from the engine compressors was expelled from slots in the leading edge, thus energizing the boundary layer.

"Unfortunately, laminar flow demands

precise airfoil sections and absolutely smooth surfaces. Laminar flow aircraft could lose their laminar-flow characteristics simply from having bugs impacted on the leading edge.

"Back in the model aircraft world, we're more interested in having our wings behave in a predictable fashion. We'd rather have a nice progressive stall where the flow separation starts at the trailing edge and moves slowly forward with increasing angle of attack, in place of the `whoops, we're stalled' phenomena of the sudden formation of a separation bubble.

"Hence the development of turbulator spars. These project into the higher-energy part of the boundary layer and produce a turbulent flow which effectively mixes the higher-energy air with the near stagnant air at the surface. This has the effect of keeping the flow attached to much higher angles of attack and stops separation near the leading edge. The result is a much more predictable and docile wing with a small profile drag penalty at low lift coefficients. You'll see sailplane old-timers put a couple of strips of trim tape on the leading edge of troublesome solid surface wings, for the same reason.

"In the wind tunnel, we were always fighting the battle of Reynolds Number versus Mach Number. The limited size of affordable wind tunnels limits the size of the wind tunnel model. We could invariably test at the desired Mach Number, but not simultaneously at the correct Reynolds Number. We therefore had to trick the wind tunnel model wing into thinking and acting as though it were operating at the desired Reynolds Number, with turbulent flow characteristics. Typically, we sprayed about 1/4-inch of the leading edge with a mixture of epoxy resin and 240-400 grit. We called this a `trip' strip, since it tripped the boundary layer from laminar to turbulent flow, just as the turbulator spars do on slow-flying sailplanes. We accepted a small increase in minimum drag coefficient in return for achieving full-scale stall characteristics." Well said. Thanks, Ken.

STILL MORE ON RN

I have also received a letter from Ted Off, who enclosed copies of three articles by George Xenakis, all on Reynolds Number effects on free flight models. These articles were published in the National Free Flight Digest in the 1960s and '70s. I re-published another one of George's papers on the same subject in the October 1990 MD&TS column. I don't want to overdo Reynolds Number in the column (there is too much other good technical stuff to cover), so I won't quote these three additional articles here, but they are good. If you are interested I will send you copies.

The first article is three pages long and is entitled: *A Discussion of Speed Effects on Model Trim.* It is very similar to his article I published in October, but more detailed. The second article is two pages long and entitled *Reynolds Number Effects on Model Trim.* It is very technical and is complete with differential equations. The third article is nine pages and entitled, *A Comparison of Optimum and Helical-Pitch Wakefield Propellers.* It is also highly technical and would be of interest only to competition rubber-power free flighters. To break even, my postpaid price is a buck for a copy of articles one or two, and $2.00 for three.

CONTROL LINE TECHNICAL STUFF

My friend Howard Rush, who is a Boeing engineer and a competition control line combat flier, intends to do some analytical work in developing the equations of motion for control line flight. In particular he is interested in how a wind can add energy to the system. He would like to correspond with anyone who has similar technical curiosities. Howard pointed out that it is possible to continue to fly a control line model indefinitely in a wind after the engine quits, without "whipping," by doing consecutive horizontal eights downwind. Sounds like the same principle as a kite doing loops yet staying up. Howard's address is 14321 SE 63rd Street, Bellevue, WA 98006.

PARTING WORDS

It is well into 1991, the year of the new RC channels. This has been discussed in great detail in all the model magazines, but as I know there are tens of thousands who only buy *Model Builder,* I feel it my duty to pass the word on to those isolated technical souls.

continued

To briefly summarize, we now have 50 frequencies exclusively for model airplane use. These are so close together that adjacent frequencies cannot be used with our old equipment without serious interference problems and crashed airplanes. The answers are to use narrow-band (gold sticker) transmitters and dual-conversion receivers. These improved circuits reduce or solve some of our other interference troubles as well.

Most of the radio equipment manufacturers currently have offers to update or exchange their older equipment at very reasonable costs. Look for advertisements for your brand of radio or see your dealer.

It is, and will continue to be, legal to use the older equipment, except in AMA events and contests. However, many or most clubs are passing rules which prohibit the use of non-gold-sticker transmitters, as they are apt to shoot other fliers down. You would be foolish to use an old-style receiver in a group where some fliers might have new odd-numbered channels, as they could shoot you down in some cases.

It is also probable that the managers of most public model fields, such as those in parks, will pass rules requiring the use of narrow-band equipment in the interest of safety. Rampant RC crashes (make that Radio un-Controlled crashes) don't inspire public confidence in our hobby. Unless you fly alone, and forever will fly only miles from all other modelers, a word to the wise. Francis Reynolds, 3802 127th Ave. NE., Bellevue, WA 98005-1346. SASE please. (206) 885-2647. ***MB***

TOURNAMENT *Continued from page 59*

performance these guys had (I didn't say skill!), and what the heck, it only money, right?

Last, you have to mention the officiating. In one word, it was very professional. CD Phil Kraft had all the best folks. Mike and Vicky Lauman, Betty and Suzi Stream, Sue Nelson and Jackie Edwards in the scoring trailer. Dick Penrod on the line. Lou Proctor and Dick Rake processing aircraft. Doc Edwards as Chief Judge, with able assistant John Fuqua. The judges were as big a "who's who" as the pilots: Ron Chidgey, Don Lowe, Isao Matsui, Geoff Franklin, Steve Nelson, Fred Johnson, Steve Morris, Jim Parker, Tom Prosser, and Bill Thomas, with Nats Chief Judge Darlene Frederick as the alternate. There were no problems, no complaints, and no hitches. The contest ran like a German engineer's pipe dream.

All in all, it was great fun. Would I go back? Does a frog have a watertight . . . ah, yes, I would. Certainly. I have already marked my appointment book. See ya at the field . . . Rick.

WHAT THEY FLEW AND HOW THEY FINISHED

Name	Amount	Aircraft	Engine
1. C. Hyde	$25,000	Ultimate	Sachs 4.2
2. S. Rojecki	$15,000	Bucker R131	Twin Tartan
3. W. Matt	$10,000	Ultimate	3W/ZG 62
4. S. Stricker	$6,000	Ultimate	Sachs 4.2
5. B. Cunningham	$5,500	Ultimate	Sachs 4.2
6. G.Naruke	$5,000	Ultimate	Sachs 4.2
7. Q. Somenzini	$4,500	Ultimate	Sachs 4.2
8. I. Kristensen	$4,000	Ultimate	Twin Tartan
9. D. Koger	$3,500	Extra 230	T.Tartan BD*
10. G.Hoppe	$3,000	Bucker R131	Titan ZG 62
11. D. Weitz	$2,750	Ultimate	Sachs 4.2
12. J. Britt	$2,750	Skybolt	Twin Tartan
13. D. von Linsowe	$2,750	Courtesan	3W
14. S. Helms	$2,750	Ultimate	Sachs 4.2
15. P. Wessels	$2,750	Extra 300	Titan ZG 62
16. G. Manning	$2,750	Ultimate	Sachs 4.2
17. H.Hatta	$2,750	Ultimate	Sachs 4.2
18. J. Lockwood	$2,750	Cap 21	Zenoah G-62
19. J.Tracy	$2,750	Sukoi 26M	Stihl
20. K. Binks	$2,750	Extra 300	King 67cc
21. J. Beasley	$2,750	Ultimate	3W

*belt drive.

$3,500 Best Aircraft Award—John Britt/Scully Skybolt

3 MINUTE FREESTYLE PLACING

1. Quique Somenzini	$5,000
2. Chip Hyde	$2,500
3. Dave von Linsowe	$1,000
4. Steve Rojecki	
5. George Manning	
6. John Beasley	
7. John Lockwood	
8. Hajame Hatta	

MB

CONTROL LINE *Continued from page 66*

starting. This one is for our Northwest Super Sport Race plane. On this one we have a shutoff and fastfill and the plane is powered by a K&B .35 plain bearing engine. We don't use a hot glove but have a helper attach the battery clip. The pilot shuts down and brings the plane in quickly. The pitman catches the plane and proceeds to: 1. Put bulb in fastfill opening (note, with this engine we do *not* put fuel on the head . . . the K&B tends to run cooler than the Fox). 2. Squeeze bulb. 3. When fuel overflows, open shutoff and keep squeezing another instant. 4. Remove bulb (helper has attached battery clip during fueling). 5. Lift plane, move prop up to compression and smack prop clockwise smartly. If it doesn't go quickly, flip forward a few times, and it will. 6. Release plane. This pit stop takes 4-6 seconds on the ground if the engine goes right away.

NEEDLE VALVE SETTINGS

I've not discussed needle settings along with starting procedures because it is in a way a separate topic that doesn't relate to either hot or cold starting. Needle settings actually are only distantly related to engine starting—prime and style of flipping are much more important. Needle setting is important after the engine fires. The urge to twist the needle to and fro frequently works against a beginning flier when other measures would be more useful in starting the engine.

First of all, it's necessary to consider whether the engine has been run before at the current setting. If it is a new engine, or you have disassembled it and put the needle

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ELECTRIC POWER

BY MITCH POLING

THIS, THAT & NORWAY TOO!

Last month I emphasized safe charging. Since then two items came up. First, J.C. Whitney, 1917-19 Archer Ave., P.O. Box 8410, Chicago, IL 60680, phone (312) 431-6102, offers a set of safety jumper cables (part #71-2177y, $22.46), made exactly as I outlined in my column, with a connector in the middle. They even have LED indicators to show you the correct connection polarity. You can regard these as already made "Sightsaver" cables for power system charging, or use them as jumper cables. I am ordering a set for my car.

Bill and Mickey Bowne use the alternative method for connecting their charger to a car battery. They clip the positive lead of the charger to the positive post of the battery, then the negative lead to the car chassis. Note: The clip-on order is important! Positive first, then the negative. The point is to avoid having a spark near the battery, which risks an explosion. When disconnecting the charger, unclip the negative lead first. The spark, if it happens, will thus always be between the negative lead and the car chassis. This system has worked well for Bill and Mickey. Thanks for the idea, Bill!

Jon Svendson and several other readers sent in a suggestion for dispensing with the arming (safety) switch. Their suggestion is to use the fuse as the arming switch—Jon's sketch shows how this is done. The fuse is removed any time the plane is not flying. I like the idea and will use it on my planes from now on.

You can glue the fuse holder in the fuselage and plug in the fuse for flight. Use a fiber tape tag or a thread tag to pull the fuse out. Alternatively, leave the fuse holder loose and pull it out of the fuselage to remove the fuse or insert it. The latter procedure is the one I will try, especially on my small planes, since it means less pushing and pulling on the fuselage. You do want the female spade lugs to be fairly tight to keep contact losses low.

Speaking of contact losses, I get the impression that most people think gold plated connectors have the lowest contact loss. Not so! John Sermos has made the point many times that *silver* plating has the lowest contact loss. Gold is pretty, and does not oxidize, but the numbers for resistance from the Chemical Rubber Handbook are: gold, 2.44 microohms/cm, silver, 1.59; copper, 1.72; aluminum, 2.82; tin, 11.5.

I recently did more contact resistance measurements, to test a product that claimed to drop contact resistance. The values I got for that series of tests were: Sermos silver plated connectors, 0.27 milliohm; gold plated connectors, 0.39 milliohm; brass tubing connectors, 0.32 milliohm. So, as you can see, silver beats copper, copper beats gold. The product I tested? Despite some great claims, including testimonials by users of the product, the contact enhancer did not have any effect on the contact resistance. I have written the manufacturer for comments, but in the meantime I am not impressed by contact enhancers. Too bad, the idea sounds good. Maintain your connectors by cleaning them and checking that they have kept their contact pressure, and you will have the best performance available from current technology!

Bernard Cawley wrote a letter to me about various topics. First, he pointed out that in

Flying in Norway. Friendly Vikings get a big charge from their electric boosted sailplanes! Erik Bakken and Sigmund Svendsen get ready for another quiet flying session.

(Left) Happiness is . . . a classic Bug, a beautiful flying site and a couple of simple electrics! Jon Svendson and his new Eclipse and an old standby Electra. (Right) Sigmund Svendson and the Airtronics Eclipse.

the July/August issue I listed the power loss in a 10 amp fuse at 20 amps! Whoops! Nobody else pointed out the error, to my surprise. At 20 amps the fuse would be long gone, of course! When I goof, let me know! It keeps me alert!

Bernard went on to say that SR Batteries, Box 287, Bellport, NY 11713, has the pin removal tool for the Sermos connectors. It is $5 and well worth it, as anyone who has tried to remove the housings knows. Bernard polarizes his Sermos connectors by stacking them so that the flat blades are parallel for the battery to speed control connection, and collinear for the speed control to motor connection. The connections are about the same size as a Tamiya pair. If you want a smaller size connection, another reader suggested cutting off some of the housing at the shank end. I have done this, and it does cut down the size by about 25%. Thanks, Bernard, for the info!

Ed Woo sent in an automatic cutoff charger circuit for six or seven cell packs that uses very simple components. It is a constant voltage charger. This method is not in common use nowadays, but it is a very reliable and easygoing way to charge batteries. It puts no stress on the packs, and they will last a long time. I described this method in detail on page 43 of my book, *Building and Flying Electric Model Airplanes.*

Constant voltage charging results in an automatic current taper as the charge goes on. Ed says this charger starts at 3.5 amperes. My own experience with constant voltage is that this will taper to somewhere between 1.0 and 0.5 amperes at the end of the charge. Ed says sub-C packs will take between 30 minutes to an hour with this charger. The voltage supply is a 12-volt, 6 to 10-ampere car battery charger. I think a 12-volt battery would also work for charging six cells, but it probably will not provide enough voltage for seven (the auto battery charger provides about 15 volts).

The circuit works as follows: The LM338K is a variable voltage regulator capable of supplying 5 amperes. When switch 1A (S-1A) is in the seven cell position, it will be at approximately 11 volts. When this switch is at the six cell position it will be about 9.4 volts. The voltage output of the charger will be .70 volt less than the value at this switch. This will give 1.45 to 1.47 volts per cell to charge the pack.

Against golden grain fields and green meadows, Erik Bakken checks out his well built Mini Challenger.

Bob Taylor's homemade electric flight box. Note the room for two transmitters and a car battery. Astro 112 charger on the left, 115 on the right, and digital voltmeter in the middle.

George Reich's "Albatross" Air Trails April 1941. Bob Taylor, builder and flyer. Now an electric, 89 ounces, 80" span, 5.75 area, 40 geared Astro, 13x7 prop, Jomar SM4 throttle, eighteen 900 SCR cells, Sermos connectors, 4" smooth contour Williams wheels; good flier, lots of fun.

The CA3130 (IC1), 2N2222 transistor and the relay (RS 275-206) are a chain circuit for sensing very small current or voltage changes. IC1 is used as a toggle switch (voltage comparator), and compares the voltage set at terminal 2 from switch S1-B to the voltage at terminal 3 provided by the 0.1 ohm resistor in the negative lead. The START button temporarily puts a higher voltage on terminal 3 as compared to terminal 2. This starts the charge current. The voltage at terminal 3, due to the charging current through the 0.1 ohm resistor, will then be larger than the preset .06 (six cell) or .07 (seven cell) volt at terminal 2. The relay will stay on until the current drops down to a value that gives .06 or .07 volt. Ohms Law says this is .7A for seven cells, .6A for six cells.

The charger is not set up for a trickle charge after the relay turns off, however, if you wish to have that feature, you could use contacts 9 and 5 on the relay. There are some clever features on this charger. The output marked "1 cell clock timer" will run a single-cell cordless clock. It will show you how long the charger was on. Set the clock (12 o'clock is handy), and it will run as long as the charger is on. Also, the output marked "current monitor" allows the use of a DVM 0-2 volt range to read current.

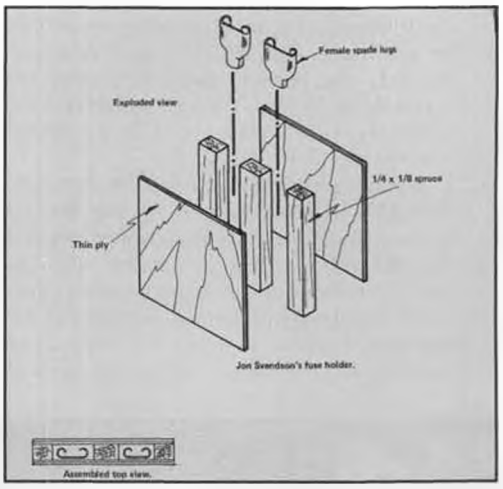
After assembly, you do have to set R1, R2,

R3, and R4 to provide reference voltages and current. Connect a #1156, 2-amp bulb to the plus and minus output (load), then measure at point X. Adjust R3 for .07 volts (seven cells), and R4 for .06 volts (six cells). Plug the voltmeter into the current monitor output and set R1 for an output current showing .20 volt. Repeat for R2. This will give the current output in amperes, expressed as volts (multiply by 10).

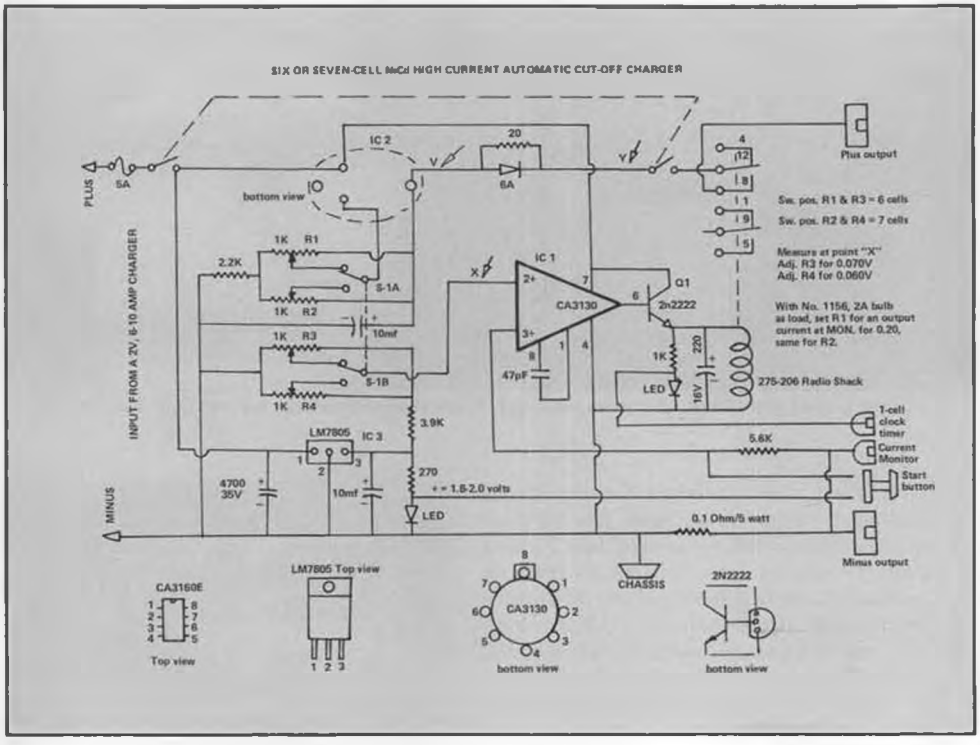
Ed says if you wish to use a smaller relay (higher impedance), a CA3160E can be substituted for the CA3130, and the 47 pf capacitor can be omitted. Ed also warned that if the pack has defective or shorted cells, the charger will not turn off, because the charge current will not taper. This is easy to spot—check the voltage of the pack before you charge. It should be at least 1.1 volts per cell. The charger is set up for 1200 mAH cells; Ed says it may have to be adjusted for lower currents for smaller cells. I would try it as is on smaller packs, and see. Usually the current will taper down faster with smaller capacity cells, so the process is self-adjusting, and the charge time will be shorter. Have fun! Thank you, Ed!

If any of you have circuits to share, I would be very interested in running them in the column. I am especially looking for circuits for peak detecting and for thermal point detecting chargers.

Bob Taylor, 1214 E. Fesler, Santa Maria, CA 93454, phone (805) 925-5366, would like to meet anyone in his area interested in electrics. He has some neat projects. He built a field box inspired by Bob Benjamin's flight box in *Model Builder* several issues back. It holds two transmitters, a car battery, and two Astro chargers (112 and 115). There is lots of room for extra equipment. It cost only $17 for the materials and hardware.



fine flier, but Bob had some problems with glitching of the throttle and servos. He followed the suggestion that Bob Kopski outlined in his December '89 column in *Model Aviation*, and installed three 10 microhenry chokes, one in each lead from the receiver to the servos and throttle. The chokes are available from Ace RCA part #LL 106, for 50 cents each plus shipping. This solved the glitching problem.



The only drawback is that it weighs 80 pounds! Bob must be a strong fellow; I find packing just a car battery is enough. Perhaps a field box and a separate box for a battery might be a good idea? The battery would then connect to all the stuff in the field box via a safety cable as described in last month's column.

Bob built the "Albatross" Old Timer from scratch using *Model Builder* plans 673-0T. The framework is a work of art. This is Bob's first big electric, with an Astro geared 40, eighteen 900 mAH SCR Sanyo cells, Jomar SM-4 throttle, and 13x7 prop. It is covered in red and yellow Solartex with a blue Solartex fuselage stripe. Flying weight is 90 ounces, wing area 828 square inches. The plane is a

Several other readers have also written to me to say that the "Kopski chokes" really work, and have saved them much grief. If you have some glitching, try them. Thanks, Bob, for the info, and if others around Santa Maria need some electric help or just some flying company, give him a call.

Jon Svendson sent photos of electroflight in Norway. The flying area is lovely, it reminds me of Alaska. Jon flies a Goldberg Electra, which is two years old and a veteran of many mishaps. Even after repairs it still

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CONTROL LINE *Continued from page 86*

valve back in since the last flight, your starting needle setting will be a guess.

If the needle is set the way you flew it last weekend, don't touch it. It may not be exactly right for today's flying conditions, but it will be close enough to get started. If the engine doesn't start when you flip the prop a few times, don't start cranking on the needle valve; that's not why it won't start. Get the engine primed and running, *then* adjust the needle.

If you have not run the engine at this setting, take a guess at the needle setting that is likely to be on the rich side. It's better to start out blubbery rich and sneak up on a good setting than it is to start out too lean.

Now you've got the engine primed and you flip the prop and it starts. Did it just run a short burst and quit? Try it one more time; maybe there wasn't enough fuel in the line. If it happens again, we're too lean. Open the needle and try again.

Did it start and go real blubbery, throwing out smoke before it quit? Try again, maybe it was flooded. If it happens again, we're too rich. Close the needle and try again.

Now it's running—how does it sound? Is it weak or surging strong and weak, etc., or just fading out and sounding uncomfortable? Too lean, open the needle (hang on tight to the plane, it may surge). Is it blubbery and blowing smoke? Good, too rich. Close the needle a little at a time until the desired setting appears.

What kind of setting do you want? For stunt or sport flying, a fast four-cycle or just breaking between four- and two-cycle is desirable. For racing and combat you want the engine in a two-cycle but on the rich side of the peak. A trick competitive fliers use is to pinch the fuel line ever so briefly. If the engine holds or picks up a tiny bit, it's probably set about right. If it sags, it may be too lean. Remember that the prop will "unload" in the air and the engine will speed up. Err on the rich side for engine longevity!

There's much more to be said about starting engines, and we'll attack some other problems in future columns, particularly if we get some questions on the subject. One topic coming up will be some sample procedures for engine break-in.

For now, let's go to the mailbag for a few final odds and ends:

Just as this column was being written, the mailman came up to the box with a big envelope from Joe Wagner. Joe is a longtime modeler and designer of the Skua pictured in this column last year. He enclosed plans for the Skua and also for an old-timer called the Di-Doe. Here's Joe's commentary:

"You may remember including a photo and data on my Skua profile ukie in one of your columns some months ago. As a result I received several requests for plans. Because my original model was constructed from rough sketches, I had to draw up the enclosed.

"As you can see, my drawing includes quite a lot of detail. I've got a bunch of sneaky model building tricks acquired through the years, which I use automatically (like epoxying aluminum sheet on each side of the nose to prevent engine mount embedment) but which up to now I haven't mentioned on my plans. Another nose-strengthening trick is that of using 1/2-inch thick maple all around the engine mounting area between the plywood doublers.

"I don't like the usual profile fuel tank setup, with the fuel feed line over an inch outboard of the spraybar orifice. For years I've been insetting my profile tanks, as on the Skua, to eliminate centrifugal force effects on fuel feed.

"Also enclosed is a copy of the original Di-Doe kit plan! This was probably the very first `full-stunt' control liner. It was designed and kitted in Warren, Ohio, by a couple of friends of mine, Howard Thombs and Fred Dunn. (Fred later designed the famous Astro-Hog RC model.)

"Howard and Fred would attend model contests all around this area in 1947-48 with their funny little bent-nose biplanes and steal the show with their amazing aerobatic antics. Up until now I looked in vain for authentic plans for the Di-Doe—but now I've got 'em at last!

"I can supply interested modelers with copies of the Skua and Di-Doe plans for $6 each postpaid—and I'll soon have plans available for another of my old Veco ukies, the 1/2-A Scout.

"I'll enclose another photo of my original Skua in case you can use it."

Joe can be contacted at P.O. Box 15, New Wilmington, PA 16142.

Further evidence that every modeling question has an answer, whether we can provide it immediately or not, comes in a letter from John Kelinske Jr. of Houston, Texas, who answers a puzzle asked some time earlier by Dean Whisler. Dean was searching for plans for the old P.D.Q. Flying Clown. Writes John Kelinske:

"Plans are available from several people, among them John Miske, John Pond and Tom Dixon. As far as kits go, Tony Drago over at Control Line Classics has a nice Super Clown kit out. If I remember correctly, the Super Clown was the same design, only with a slightly larger wing and flaps.

"Original P.D.Q. kits seem to be very scarce, even though they were still available into the late '60s. I haven't seen one since I was in high school back about 1970. I am still trying to find one for my own collection without success to date."

Here are addresses of the people mentioned by John Kelinske:

John Miske, 415 Clifton Blvd., Clifton, NJ 07013.

Tom Dixon, Suite 401, 1938 Peachtree Road, Atlanta, GA 30309.

John Pond O.T. Plans, 253 N. 4th St., Box 90310, San Jose, CA 95109-3310.

Control-Line Classics, 1788 Niobe Ave., Anaheim, CA 92804.

As always, club and contest news, technical tips and questions, photos and other control line related matters always are welcome. Write John Thompson, 326 No. K St., Cottage Grove, OR 97424. ***MB***

AUTOGYRO *Continued from page 71*

envisioned the autogyro as a mechanically simpler alternative to helicopters; able to take off or land on less runway than airplanes. Pitcairn was so impressed by Cierva's machine, that he started designing his own autogyros in the US in the '30s, the PCA-1 and PCA-2.

As an autogyro's main rotor is not pow-

ered by the engine, it needs a takeoff run to let the windmill effect bring the rotor up to speed to generate sufficient lift for takeoff. On the PCA-1, Pitcairn ingeniously incorporated a tiltable horizontal tailplane to shorten takeoff runs. For takeoff, the tailplane was set to almost vertical to deflect the propeller's airstream into the rotor system to help wind it up to speed quickly. The PCA-1 taxiing requirement was much shorter than Cierva's autogyro. The drawback was that the tailplane was bulky and heavy.

Pitcairn wanted something even better. The solution was the PCA-2, which has a twin disc clutch system that allow the engine to transfer 15 to 20 horsepower to drive the main rotor up to operating rpm before charging down the runway. With this system, he could rev up the rotor first, then disengage the rotor drive clutch, let go the wheel brakes, and the PCA-2 would lift off with a taxi run less than three times its own length! This was called a jump takeoff. There was also a demonstration of a jump takeoff from the top of a building!

In April 1931, President Herbert Hoover awarded Pitcairn the Collier Trophy for his development of rotary-wing aircraft. During the award ceremony, Pitcairn's friend, Jim Ray, landed a PCA-2 on the White House front lawn with less than 10 feet of ground roll. On September 23, 1931, a US Navy version of the PCA-2 made the world's first rotary-wing aircraft landing on the aircraft carrier USS Langley.

Up to this time, all the autogyros had fixed blade pitch angle, and there was no cyclic pitch control. The autogyros had wings. Pitch and roll control of the aircraft was through conventional aircraft style elevator and ailerons. The main rotor was there only to provide lift, not for control purpose. The wing also provided additional lift. Later on, Pitcairn and Cierva were in collaboration and developed many advancements for autogyros.

A major discovery by Cierva was the inclusion of swashplate cyclic pitch control to tilt the rotor disk. This was the birth of the cyclic control system which was eventually borrowed by helicopter pioneers such as Igor Sikorsky. Sikorsky once wrote to Pitcairn that, without Pitcairn's work, development and production of the helicopter would have been ten years behind where it was then. So, the helicopter guys should really thank the autogyro guys!

With cyclic controls, the autogyros no longer needed wings and elevator to control pitch and roll motion. The pilot simply controlled the tilt of the main rotor disk. Only rudder was retained to control the heading of the autogyro. This represented the peak of autogyro development. And since the 1930s autogyro technology has not changed very much.

The Schluter Whopper is almost a replica of the Pitcairn autogyro. It has no wings. The Whopper uses helicopter-style swashplate cyclic controls to tilt the rotor disk for pitch and roll control. It has rudders for heading control. Engine throttle controls the flight speed. A fifth channel is needed to engage or disengage the rotor spin-up system.

The Whopper is a well-engineered model aircraft. I am quite impressed, however, it is not for the sloppy builder or flier. It is a wonderful mechanical kit. The modeler really should appreciate the beauty of the autogyro to enjoy it the most. It is not like a simple two-channel balsawood airplane that you can just slap together and fly. The kit's instruction is excellent. You must read the instruction line-by-line and set it up properly, then it will fly.

The first time that I saw my Whopper in the air, I was really dazed and amazed that this contraption could really fly. I am the adventurous type, and even though the Whopper can't do much aerobatics except loops, I have no regret about building it. It's fascinating to watch it fly across the sky. I recommend the Whopper autogyro to the enthusiastic and adventurous modelers.

Well, let's finish the historical story of what eventually happened to the full-size autogyro industry. Pitcairn incorporated Cierva's tilting rotor into his five place PA-19 and PA-22 designs. The PA-22 had no wings or elevator. By 1934, because of the Great Depression, Pitcairn had to close down his Autogyro Company of America. To stimulate civil interest in autogyros, the Department of Commerce sponsored a competition for an autogyro that could fly at 100 mph, take off or land in 30 feet, and be able to convert into a road vehicle, too. Of course, Pitcairn's design, PA-35, won the contest.

Pitcairn's friend and research partner in Europe, Cierva, died in a DC-2 crash in 1936, but by this time Igor Sikorsky and Arthur Young in the US, Breguet in France, and Focke in Germany, were heavily into helicopter research. Day by day, the helicopter became more and more feasible. By 1941, Sikorsky's VS-300 helicopter demonstrated that a helicopter *could* fly. With the coming of age of helicopters, the autogyro just faded away.

Nowadays, only a few small manufacturers in the world make recreational autogyros, mostly for the homebuilt market. The Benson autogyro is one of the more famous ones. And you can build yourself a complete one seater gyrocopter for about $10,000. By the time of Pitcairn's death in 1960, he held thirty rotorcraft patents, and his Autogyro Company held 164. Many of the modern day helicopters borrowed Pitcairn's autogyro patents, a lot of them without consent. Eventually, the US government in 1977 lost a patent infringement lawsuit filed by the Pitcairn family and awarded the family $32 million. For more information on the development of autogyros you can find them in a book called the *Autogyro*, and some of the facts mentioned above are from the May 1990 issue of *Rotor and Wing* magazine.

Now let's look into the Whopper kit. For readers who are not familiar with RC heli-

copters, Schluter has always been known to produce some of the best engineered kits. All of Schluter's models have that typical German engineering quality like Mercedes Benz. Dieter Schluter was one of the first men to successfully fly an RC helicopter, in the early '70s *(We witnessed his first US demonstration of a Cobra at the '72 Aerobatic World Champs in Doylestown, PA. wcn).* The Whopper kit is packed in a very colorful box. Inside, all the hardware is separated into 11 plastic bags. Inside each bag there are three or four more bags. The instructions clearly tell the modeler which bag to open and what parts are needed from the bag. Unlike some helicopter kits, where all the nuts and bolts for the entire model are stuffed into one hardware bag, Schluter kits always have only the nuts and bolts that you need for that particular assembly step packed inside that same numbered bag. This kit's packaging, instruction, and attention to detail deserve an A. It's definitely a pleasure to build.

As all the nuts and bolts are metric, the 5.5mm open end wrench that comes with the O.S. engine is a very useful tool. Alternatively, a 7/32 socket wrench will also fit all the 5.5mm nuts. The kit comes with all the necessary Allen wrenches. Be careful, the edges of the aluminum side frames may be sharp. All the machine cut metal parts and molded plastic parts mate perfectly. You do not need a file or a drill to modify anything (except to smooth the side frame corners!). Unlike building model airplanes, the modeler doesn't really "build" the model, for model helicopters and autogyros like this, they are "assembled." I used to *build* a lot of balsawood airplanes, but since I started *assembling* model helicopters a decade ago, I became spoiled. There is no need to wait for Ambroid glue to dry *(With CA, who waits? wcn),* no cutting or sanding, and no MonoKoting. Especially when assembling a fine kit like the Whopper where all the parts fit, I just do not think I can ever build a plane again. (I take that back, I am going to build a Quicki-500 next.)

It took about 27 hours from opening the box to finishing the Whopper. The breakdown of how long it took me to build the Whopper is as follows:

Bag 1. Assemble the main frame structure, 2 hours.

Bag 2. Main rotor drive mechanism, 1/2 hour.

Bag 3. More rotor drive mechanism, 1 hour.

Bag 4. Undercarriage and tail boom, 1/2 hour.

Bag 5. Main rotor shaft and swashplate, 1 hour.

Bag 6. Engine mount, 1 hour.

Bag 7. Assembling the main rotor head, 2 hours.

Bag 8. Elevator bellcrank and servo tray, 1 hour.

Bag 9. Build and paint the balsawood tail surfaces, 6 hours.

Bag 10. Assemble and install fuel tank, 1 hour.

Bag 11. Install landing gear, glue and paint wheel pants, 2 hours.

Finishing the rotor blades, 1 hour.

Installing RC equipment, 2 hours.

Glue and paint the fuselage shells, 4 hours.

It took me 27 hours to put together the Whopper because I built it quite carefully, and read every line in the instruction manual. Before my Whopper was completely finished, I drove up to New Jersey to seek the guidance of my friend, David Ramsey, for the final touch. He probably has more experience with the Whopper than anyone else. He loves flying his Whopper. We finished my Whopper at two o'clock in the morning. Then Sunday morning we went out and he did the maiden flight.

I had an old O.S. 61 Long Stroke ABC engine in my Whopper. Before takeoff, we tached 12,900 rpm with a Graupner 11-7 plastic prop. The engine had previously suffered a crankshaft bearing failure, with the bearing cage traveling up the engine bypass, so it did not run all that well. But 12,900 is still quite good. A Robbe tuned pipe and header that was specifically designed for the Whopper was used. By adjusting the pipe length, we could definitely hear it when the engine came on the pipe. When the engine jumped on the pipe, that was when the rpm also jumped up from about 12,000 to 12,900. (Coming on the pipe

means the tuned pipe length was adjusted properly so the exhaust gas was resonating inside the tuned exhaust pipe to increase horsepower.) Standard 5% nitro fuel was used.

I did a few taxi runs to check out everything, then David (the Whopper authority) (*A graduate of Burger King College, no doubt. wcn)* took over the transmitter and lifted the Whopper off the ground. He made a slow right hand turn and said it was not pulling! After another right hand turn, the Whopper just gradually sank to the ground. No damage was done, except a bent landing strut. The second time we changed to 10% fuel and tweaked the engine carefully and then it flew well, but was still not climbing very well, even with at least 12,500 rpm.

Unlike airplanes or helicopters, the autogyro must be turned with the rudder, then some opposite aileron needs to be fed to keep the Whopper fairly level in the turn. You should not use the aileron and elevator to bank it and do a pylon turn. The model would simply slide sideways into the ground. After I made a few more turns, but the engine was just not pulling the model through the air; on every turn I would lose some altitude. My heart was beating like a drum. Let's land this thing!

Then David fired up his Whopper. He has a new O.S. 60 FSR engine that spins a 12-6 prop at 13,400 rpm. David says you should get at least 13,000 before takeoff. His Whopper leaped off the ground effortlessly! It climbed on turns, too. David even did a loop with his Whopper. He says he hasn't tried a roll yet, but if he does one, it's going to be a slow roll. He says he heard that a modeler named Mark Powelson had done one. Our recommendation is to make sure you install a new and powerful Schnuerle 60-size engine. I underestimated the power required to lift this 10 pound model through the air. Even though it will never fly faster than 50 mph, you still need a powerful engine to drag that big rotor disk in the sky. Without power, you are asking for trouble!

What happens if the engine quits? Theoretically it can glide, or autorotate down safely, but I can imagine if my engine quit, then I might as well say adios! Amazingly, the Whopper is very robust. I have crashed the Whopper at least five times. Every time it was either because of trying to lift the model off before the main rotor reached enough rpm, or the model ran over a bump and bounced into the air then as it fell down, the blades struck the vertical fin, or the engine lost power and the model sank slowly, or it ground looped.

To cure the power deficiency, I installed a new O.S. 61 SFN and now we are talking power! There are tricks to taking off successfully. Like any tail-dragger airplane, the Whopper has a severe tendency to ground loop. Therefore, before you attempt takeoff, you should try some taxi runs with the rotor engaged. Get familiar with taxiing at high speed, then try a takeoff.

Like the full-size Pitcairn autogyro, the Whopper has a neat clutch mechanism for engaging the engine to spin the main rotor. Looking at the picture, you will see a toothed gear underneath the propeller. When the engine turns, the gear is turned by the engine. You must use at least a five-channel radio, with the fifth channel used for engaging or disengaging the rotor drive. The rotor drive should be engaged until just before the model lifts off. If you forget to disengage the rotor drive after the model lifts off, the autogyro will immediately spin around in the air and probably crash. The reason is that, unlike a helicopter, there is no tail rotor to counteract the rotor torque when the rotor is being driven. When an autogyro is flying in the air, there is no need for a tail rotor because the main rotor is free wheeling, so there is no torque exerted on the fuselage. This, again, is the difference between helicopters and autogyros.

David suggests it's easier to takeoff from smooth grass than concrete, because on concrete the autogyro would gain too much forward speed before the main rotor has a chance to spin up to speed. Even though higher forward speed produces more air stream to windmill the blades, the blades have inertia and it takes time to accelerate them. For taking off from grass, the engine can have a chance to rev up and spin up the rotor. If you look at the pictures, you will see the engaging mechanism is simply a cup with an O-ring pushed onto the spinning aluminum cone.

Very unfortunately, there are no brakes on the wheels, therefore you cannot rev up the engine in order to rev up the main rotor to operating rpm. It will be awesome to install one of those DuBro wheel brake systems for RC model airplanes. On the Whopper, as you increase the engine idle to full power, the main rotor does not wind up to full rpm immediately because the aluminum cone probably slips inside the O-ring. And that's why the propeller may develop so much thrust that it pulls the model forward at 20 mph down the runway before the main rotor has accelerated up to final rpm. With practice, you will master it. This is what makes the Whopper stand out from the run-of-the-mill RC airplanes and helicopters.

The other tendency of the Whopper on takeoff is to bank to the right. Remember the full-size Cierva autogyro wanted to bank to the left on takeoff? Well, it is for the same reason; the Whopper main rotor head may not be rigidly attached to the main rotor shaft, but it is a "stiff teetering" rotor as on all the model helicopters. Therefore, the uneven lift tilts the Whopper rotor disk to the right and banks the model to the right. (To the right because the Whopper has a clockwise rotation main rotor, so the advancing side is on the left, and the advancing side produces more lift.) The pilot needs to hold some left cyclic stick to alleviate the rolling problem. By the way, Whopper's rotor head is identical to that on the Schluter Scout and Magic model helicopters.

One suggestion; don't try to build your balsawood tail surfaces too prettily. You will most likely have the rotor blades coming

down and striking the vertical fins on one of your first few flights. It won't happen in flight, but when you make a bad landing, or a severe bounce on takeoff, it's guaranteed to happen! The pictures show some damage due to my bad takeoffs.

My friend, Gary Frank, came up with a very good idea that I actually recommend you try on your first takeoff. To prevent ground looping, and also to make sure the main rotor will spin up to speed, Gary wrapped a 20-foot plastic ribbon around the tail wheel. He would hold on to the ribbon until the engine had a chance to spin the main rotor up to speed (with a Skytach we measured that in flight the rotor is spinning at about 900 rpm), then Gary would run with the Whopper while providing just sufficient tension to prevent the model from ground looping. Slowly, Gary would release one side of the ribbon, and the Whopper would continue running and leave the ribbon behind in Gary's hand. This method worked almost every time . . . except once . . . when Gary released both strands of the ribbon at the same time and the Whopper took off with the ribbon on the model! The picture shows it, and it actually looked prettier with the ribbon on there. And it flew better, too! It flew better probably because the ribbon dragged the tail straight to help keep the model flying straight, and it dragged the tail down so the main rotor was tilted slightly more and thus more air flowed into the rotor disk. This is probably why the instruction says the Whopper flies best with a slight tail heaviness. I think from now on I will leave the orange streamer permanently on the model.

Flying the Whopper is different from flying planes or helicopters. My friend, David Franklin, who only flies helicopters and no airplanes, had no problem flying the Whopper. And he did his first takeoff from a concrete runway. Airplane pilots must remember to use the left stick (the rudder), to turn, not the right stick (we're talking Mode II). Probably 1/4-scale RC airplane pilots will have the easiest learning curve with the Whopper because they are used to doing coordinated aileron/rudder turns. The best advice I can give is to follow the instructions

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PLANS CATALOG

ILLUSTRATED LISTING OF MODEL BUILDER PLANS

Continuation of our complete Full-Size Plans List, with an illustration of each model listed.

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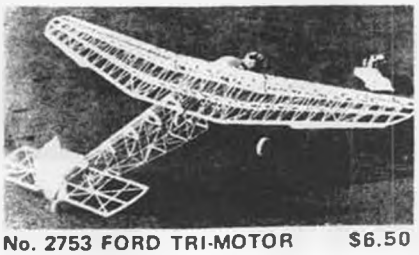
No. 175-O.T. FLYING QUAKER $10.00
First gas model kit by Megow, 1937. Span 7 ft. Redrawn by Phil Bernhardt.

No. 2751 TOP SLIDER $8.50
R/C Slope Racing glider. Will sport fly in light winds without ballast. Ken Willard.

No. 2752 CUT-LESS $5.50
Half-A R/C Pylon Racer for 2 ch. radio. Elevator and aileron. By Dave Katagiri.



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Super-light rubber scale model of famous Tin Goose, 32½" span. By Tex Newman.

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Famous Elbert Weathers Class C gas job. Used takeoff dolly. By Phil Bernhardt.

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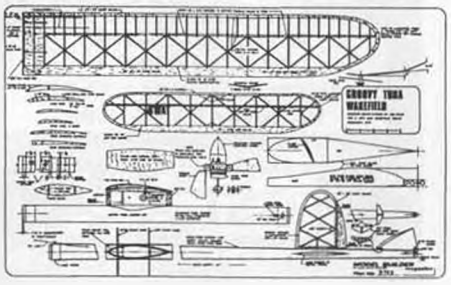
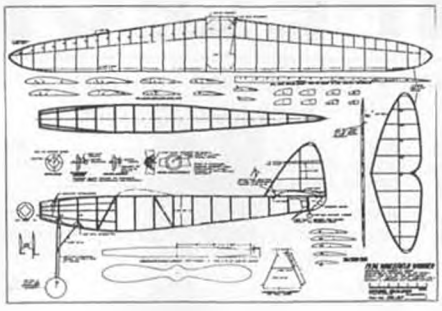
Navy airship-based "Sparrow Hawk" biplane, 1-1/2" scale C/L. Charlie Smith.

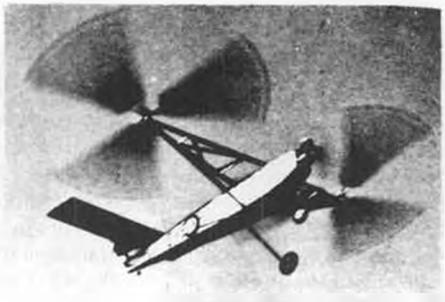
No. 3752 CALL-AIR SNOWCAR $7.50
Radio controlled, semi-scale prop-driven snow car, .30-.40 engines. Fred Sanford.



No. 3753 GROOVY TUNA $7.50
Top-notch Wakefield design from 1973-1975 FAI U.S. team member. Jon Davis.



No. 375-O.T. 1936 WAKE WINNER $5.50
Englishman Albert A. Judge's Wakefield Cup design. Redrawn by Phil Bernhardt.

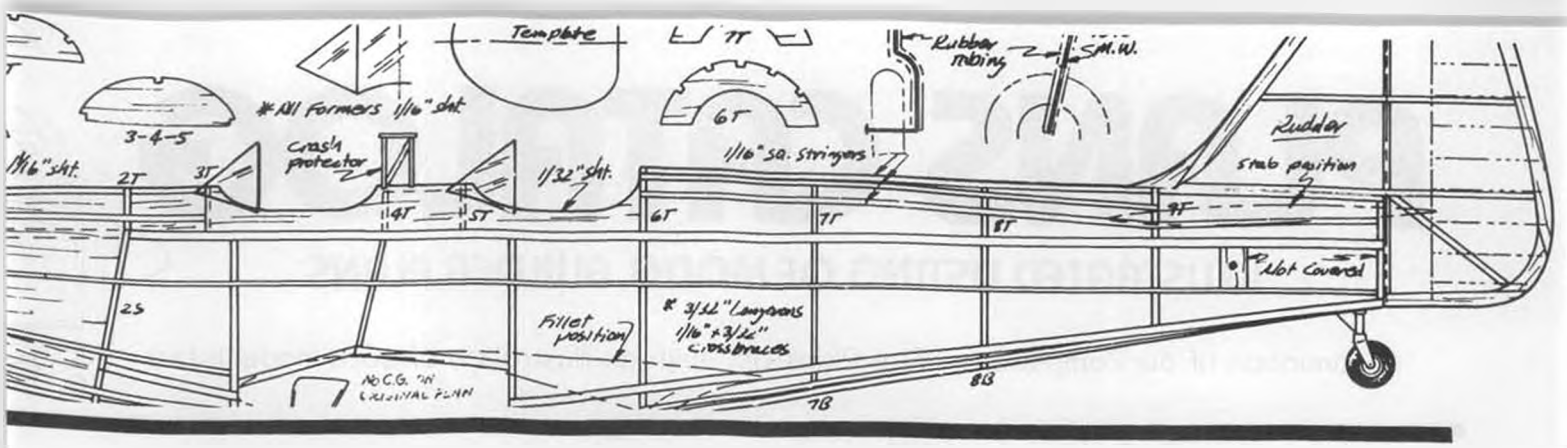


No. 4751 R/C AUTOGYRO $9.50
Semi-scale twin rotor R/C autogyro for .35 engines. Very stable. By Skip Ruff.

No. 4752 OKIE BIRD $8.00
Red hot Class A/B free flight. Plans show sub fin and rear fin types. By Jim Clem.

No. 475-O.T. G.H.Q. SPORTSTER $10.00
From July 1936 M.A.N., also kitted by G.H.Q. By Louis Loutrel. Phil Bernhardt.

No. 5751 FLEET BIPLANE $10.00
Fast-building 2" Sport Scale R/C model of famous 1930 bipe. By Romey Bukolt.



No. 5752 SEA FURY $8.00
Semi-scale model of WW II British fighter, for 1/2A R/C pylon. Jerry Holcomb.

No. 5753 GREMLIN $7.50
Sharp little Half-A C/L Stunt model. Will do complete schedule. By Tom Dixon.

No. 575-O.T. MERCURY $10.00
Designed by Ben Shereshaw, kitted by Scientific. 72" span. By Phil Bernhardt.

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All sheet balsa trainer with long history. Span 52", .19 power. By Bill Northrop.

No. 6752 SKYFARER $7.50
Rubber powered 1" scale model of trike geared high wing cabin. By Earl Stahl.

No. 6753 SHRIKE $7.50
Hot Half-A free flight, with good looks, and top performance. Bill Langenberg.

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Popular .020 Replica of Bay Ridge cabin Cl. B job. Span 34". By Phil Bernhardt.

No. 7751 LITTLE BOMB $5.00
Minimum area 1/2A pylon racer for two channel radio. By Wm. Nielsen, Jr.

No. 7752 THE ALIEN $4.50
Pendulum controlled flying wing pusher for Brown CO_2 power. Daniel Walton.

No. 7753 ULTRA DART $5.00
Monster 39" span Delta Dart for sport and Unlimited Rubber. Dave Linstrum.

No. 775-O.T. BOMBSHELL $9.50
Famous winner of Class C gas at the '40 Nats, by Joe Konefes. Phil Bernhardt.

No. 8751 SOPWITH TABLOID $10.00
Sport Scale WW I biplane for 3-channel radio. Span 42", .19 eng. By Chris Moes.

No. 8752 VOLKSPLANE $4.50
Great performing rubber powered profile scale. Span 24". By John Oldenkamp.

NO. 8753 FRITZ, HLG
$4.00
A pylon style, high performance HLG, with DT system. Different! Jim Parker.

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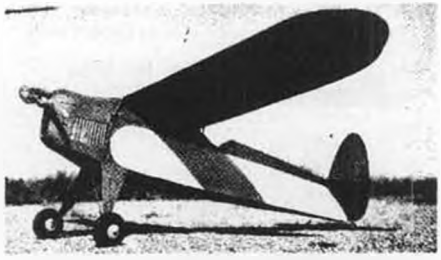
Canadian Roy Nelder's beautiful rubber ship. A real classic. By Phil Bernhardt.

No. 9751 BABY ALBATROSS $21.50
Exact R/C scale model of famous Bowlus sailplane. Span 122". Col. Bob Thacker.

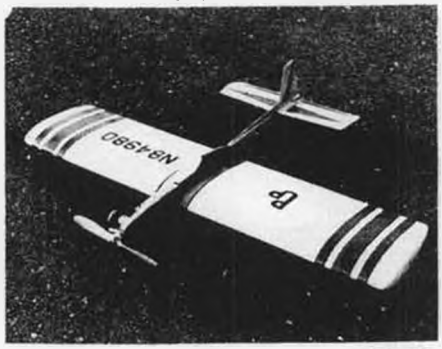
No. 9752 FIREDRAKE $7.50
Half-A free flight featuring fast climb, flat glide, penetration. Larry Sicuranza.



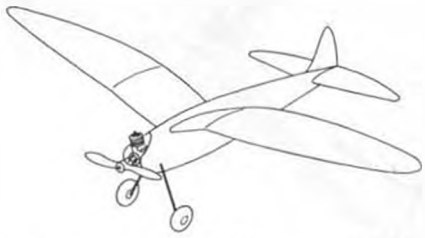
No. 975-O.T. PURSUITEER $10.00
Smart looking 1938 Pete Bowers design Span 60", area 575. By Phil Bernhardt.

No. 10751 THE LITTLE ONE $8.00
Economy size, .40 powered pattern ship has rolled ply fuselage. By Dick Sarpolus.

No. 10752 MISTER MULLIGAN $10.00
Jumbo scale rubber model of famous Ben Howard racer, spans 56". Tom Houle.

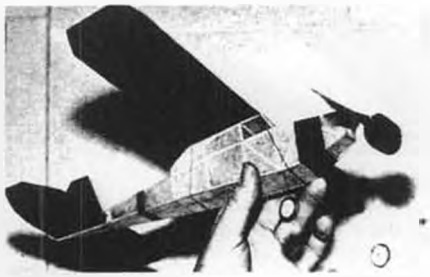


No. 10753 SUPER PUP $8.00
Profile C/L stunt ship for .29 to .36 power, 42" span. Easy-built. Mike Parenteau.

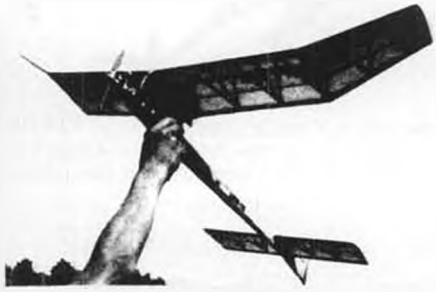


No. 1075-O.T. SKYLARK $8.50
Pleasing Class A/B Louis Garami design. Shoulder wing, 50" span. Phil Bernhardt.

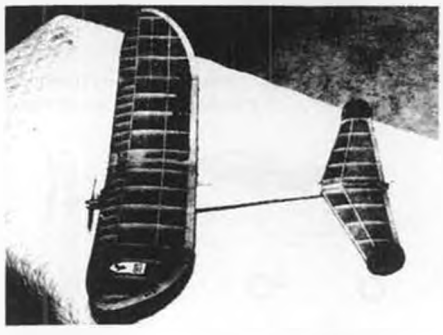
No. 11751 NAVY FLYING BOAT $12.00
"Composite" scale R/C flying boat biplane, 6 ft. span, 40-61. George Clapp.



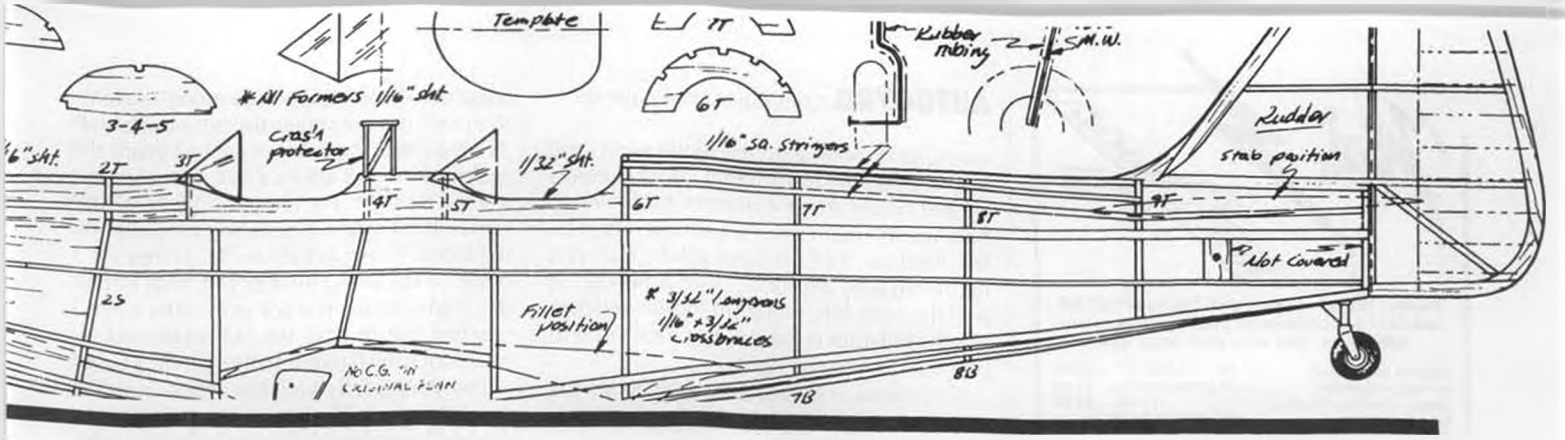
No. 11752 "TWIRP" $4.00
Beginner's fuselage rubber powered ship. Teaches stick 'n' tissue. By Dave Gibson.



No. 11753 "LUNAR-TIC" $5.00
Classic-looking, high performance Half-A free flight. Easy to build. Harry Murphy.



No. 1175-O.T. FOO 2-U-2 $5.00
A pre-Zipper design by Dick Obarski, reduced to .020 Replica, by Ron Sharpton.



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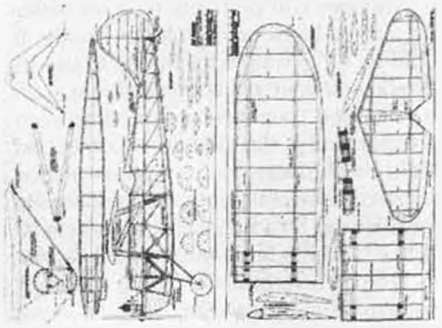

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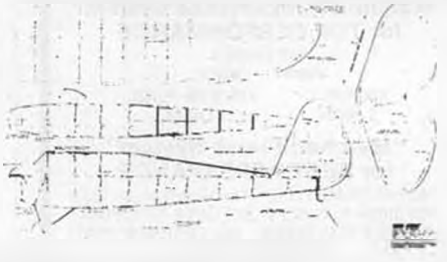

No. 276-O.T. "LONG CABIN" $10.00
Good looking, stable cabin gas model of the 1937 era. Span 78". Phil Bernhardt.

AUTOGYRO *Continued from page 95*

carefully on setting up the blade pitch, and use a powerful 60 engine. Both rudders should be set about 4 degrees to the left to balance the main rotor's torque exerted on the fuselage. For chopper pilots, can you figure out why left rudder trim is needed to pull the nose left, while on model helicopters the tail rotor is there to produce thrust to pull the nose to the right?

The reason is that on helicopters, it's the engine mounted inside the fuselage that drives the main rotor, so the fuselage is exerting an action on the rotor, and the fuselage feels the torque reaction. On the autogyro, the main rotor is driven by the wind, so there is no torque reaction. The bearings supporting the shaft have a very slight amount of friction, so the fuselage wants to yaw, along with the main rotor, to the right. That's why about four degrees of left rudder is needed. Make sure you cant the rudders about four degrees to the left before you fly the Whopper.

Looking from the top at the Whopper's vertical fins, you will see the two fins are canted outward at about 3 degrees. The reason for this is to provide some extra drag to help keep the tail dragging behind. It's sort of like increasing the weathervane effect. Our trailing ribbon provides the same effect as the canted fins to keep the tail trailing behind.

So far I have only flown my Whopper with the original wide chord blades that came with the kit. These blades are about 3.5 inches wide and have a strange undercamber airfoil shape. The Whopper was developed with assistance from Fokker Aircraft Company, so I assume those fellows probably knew what they were doing. Well, in September 1990, Robbe came out with a new blade design for the Whopper. The new blades are three inches longer, but the chord is only 2-1/8 inches wide. The new blades have a Clark Y style flat bottom airfoil, and there is a strip of lead weight along the entire leading edge. The lead is there to increase rotational inertia. The lead is already glued in, the modeler simply needs to cover the blades.

As usual, Schluter blades are well made. I have just finished building a set of these narrow chord blades. However, I have recently whacked off my fins again, so I did not have a chance to test the new blades. But Dave Ramsey flew the new blades and claims at least 50% efficiency improvement over the old blades. David says with these new blades I probably would not have needed to install the new O.S. 61 SFN engine. I am not sure if Robbe will have these new blades as standard in the kit, but if you have a Whopper, David highly recommends getting these new narrow chord blades.

David told me that in order to avoid building a new tailplane every time the blades strike the tail, one guy built a horizontal tailplane out of plywood, and the vertical fins out of rubber! Except for the balsa tail, the Whopper is as strong as a tank. We crash test ours many times (not voluntarily). Do check the 8mm cross shaft inside the main rotor head after a crash to make sure it's still straight. For chopper pilots, please remember there is a spinning propeller on the front! I have not flown RC planes for a while, and I am so used to watching out for the spinning main rotor only, that once I reached out to grab the Whopper and almost stuck my hands into the spinning prop!

Everything falls together while building the Whopper. The main rotor head and swashplate are exactly the same as on the Schluter Scout, Junior and Magic helicopters. Put some grease on the elevator bellcrank. The fuel tank is a tight fit in the hole on the frames. The tank will look distorted for a few days, then it will become rectangular by itself. The die-cut plywood is not cut deeply enough, and this was a chore to cut. The fuselage is made of typical plastic canopy material. It is extremely tough; mine survived five crashes.

The engine mount holes need to be drilled by the modeler. An electric hand drill will do the job. Make sure the holes to be drilled are marked carefully so the gear mesh for the rotor spin-up mechanism is smooth. A washer might be needed on the engine crankshaft to ensure the propeller will clear the spinning nylon gear.

Remember, the nylon gear will be sliding in and out, that's how you engage and disengage the rotor drive. Unlike a model helicopter, there isn't any way of checking whether the blades are tracked, or causing vibration, because the model cannot be hovered like a helicopter. Therefore, balance the two rotor blades statically at home. So far, both sets of my Whopper blades came from the factory at almost identical weight and no balancing was needed. Use the paper pitch gauge that comes with the kit for setting up the blades. I have experimented with deviating from the factory-suggested pitch setting by increasing one degree or reducing one degree, the results were awful! With the new narrow chord, flat bottom airfoil blades, the pitch angle should be set such that the bottom of the airfoil is parallel with the flybar.

All the one-seater full-size home-built autogyros have two-bladed teetering rotors to reduce cost. But the original Pitcairn and Cierva autogyros had three blades. I suspect the Whopper will probably fly a lot better with a three-blade main rotor. Actually, it would be quite simple for Robbe to use its three-bladed scale helicopter rotor head on the Whopper. Then there would be no need for flybar and Killer paddles, so the cost should be about the same. A three-bladed rotor is considered axisymmetric, and should provide better lift and handling characteristics than two blades. Note, two-bladed rotors are not axisymmetric about the main shaft. Furthermore, by using Schluter' existing three-bladed rotor head with very soft O-ring, there would be less rightward rolling tendency on takeoff.

Well, right now I can't think of anything

else to advise you. The kit is about $400. If you want a kit RC autogyro, then the Whopper is the only game in town. For the amount of hardware and engineering in the kit, it is not a bad deal. In certain respects, the Whopper is even more sophisticated than some full-size homebuilt autogyros. Many full-size autogyros do not even have a rotor spin-up system. The pilot uses the hand to flip the blades to get the blades started, then hops in the seat and charges down the runway. The single-seat Benson gyrocopter also does not have sophisticated helicopter style cyclic control. Instead, the pilot's joystick is attached to the tiltable rotor hub. The pilot controls the tilt of the main rotor disk by using his joystick as a leverage arm to tilt the teetering hub to tilt the rotor disk.

Therefore, the Whopper can be considered as state-of-the-art because it has cyclic controls and spin up mechanism. Of course, to add challenges, you can always try a takeoff with the Whopper without using the spin-up. Remember how much fun James Bond had with his "Little Fish" autogyro in the movie, "You Only Live Twice?" Well, here is your chance to enter a new dimension of RC flying. But if you whack off the tail fins on the first flight, don't say that we didn't warn you. Nothing ventured, nothing gained! ***MB***

CHATTER *Continued from page 75*

the program mix circuit will activate only when either idle-up 1 or idle-up 2 is on.

A neat feature on the JR PCM-10 is its ability to remember the programming mixes even after you erase them. For example, if you don't like the PITCH to ELEV mix, then just hit the clear key to erase the program mix. But next weekend, if you decide that you want the PITCH to ELEV mix again; no problem, just type in PITCH to ELEV and the old program will come back. Even though I have used my 9VH and PCM-10 for more than a year, I am still learning new things about them. If you really enjoy model helicopters, then I highlyrecommend the Futaba 9VH or JR PCM-10. No, they are not cheap, but the large screen display which can show the pitch curves and throttle curves can really help you visualize what's going on.

These high tech radios truly enhance and expand the flexibility of modern helicopter models. But also remember, you do not need these high tech radios to have fun flying choppers. They are like adding gourmet spices to the food to enhance the dish.

Another trick that you might want to try with the programming mix is to mix in some aileron with the elevator to improve the loop. Have you noticed that in a loop most models tend to corkscrew slightly to the left? The reason was explained when we were discussing phase delay earlier. Usually at the bottom of a loop some right cyclic is fed in. I have not yet narrowed down how much roll cyclic I should mix in to make a straight loop. For now, probably the best bet is to correct the leftward rolling tendency yourself rather than depending on the mix.

Now, let's go over the basics of how to do loops, rolls and other aerobatics. As I am far from being the best FAI pilot in the world, the following suggestions are based on my experiences and discussions with top pilots such as Robert Gorham, Cliff Hiatt, and Tom Dooley. Robert and Cliff both agree that the most important trick to perfect maneuvers is a straight and fast entry.

If you have seen their flights, then you have noticed that they haul the model way the heck out about a quarter of a mile, and then roar it in fast and steady. High rpm is the trick for fast flight. About 1650 rpm is right for almost all the 60-size machines on the market. (For hover, Cliff slows down the head speed to about 1350.) High rpm improves the entry into loops and stall turns. If the rpm is too low, the model tends to slow down or pancake forward when you pull the nose up. The drawback of rpms being too high is that the model accelerates slowly and the engine screams, but the model is not getting anywhere. Note that for .30-size helicopters, even higher rotor rpm is needed. Concept 30, Shuttle ZX, and Enforcer need at least 1700 to sing through aerobatics. Some even rev them up to 1900. But without any thrust bearing in the rotor head, I would

continued on page 104

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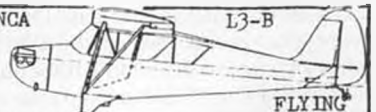

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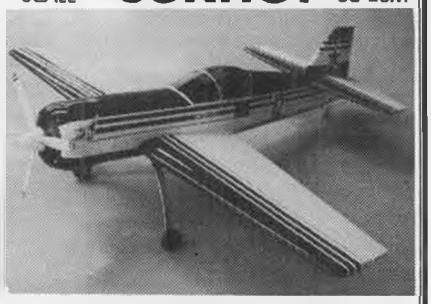

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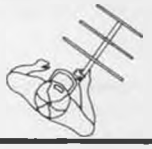

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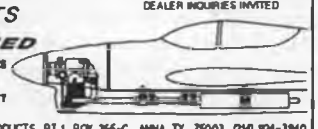

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CHATTER *Continued from page 101*

not recommend 1900 rpm. (Concept 30 SX is the only 30-size heli that comes with a thrust bearing in the rotor head.) In fact these 30-size helicopters all do beautiful aerobatics! However, the Concept 30 DX needs the lighter plastic Hiller paddles before you can roll it. With the heavy aluminum paddles, the DX is too s-t-a-b-l-e.

Cliff says the model must fly fast and level on its own power, gaining "synthetic" speed by diving the model will not work. This synthetic speed will bleed off very quickly as you pull up for a loop or stall turn. This means you must have a powerful engine, aerodynamically clean fuselage, efficient rotor blades, and make as minimal corrections as possible to keep the model flying straight. Any large correction will rock the model, which rubs away flight speed and simply does not look good. A jagged forward flight affects the judge psychologically, and makes you, the pilot, nervous too. This is why we need those fancy programs to make the model fly straight and level hands off.

An efficient blade means the blade surface should be clean; no dents and dead bugs. Contrary to belief though, a glass-smooth finish is not necessarily the best. The reason is that model rotor blades operate at very low Reynolds Numbers, thus the air flowing over the airfoil is laminar flow. Full-size rotor blades and wings have a larger chord and also move faster through the air, thus the Reynolds Number is about ten times higher.

At higher Reynolds Number, the air flowing over the surface is no longer laminar, instead there is a turbulent boundary layer which increases skin friction drag. Note, the boundary layer is only about one millimeter thick. This is why glass smooth blade surfaces can reduce drag by about 2 or 3%. But the drawback is that laminar flow separates very easily at high angle-of-attack. When the airflow separates, then we have stall and big time drag. Turbulent boundary layers can sustain higher pitch angle before the flow separates. Therefore, the benefit of mirror-smooth finish blades is that they have less drag, but the disadvantage is they stall earlier.

Figure 3 shows the difference between laminar flow and turbulent boundary layer flow. (The reason that turbulent boundary layer helps raise the stall angle is that the turbulent air inside the boundary layer causes the air molecules to move more energetically, thus the energetic boundary layer can sustain the more severe pressure gradient at higher pitch angle.)

The most guaranteed way to produce an efficient blade is to make the trailing edge as thin and sharp as possible. Figure 4 illustrates the difference between a sharp and a blunt trailing edge. A sharp trailing edge ensures the air flowing from the top surface and the bottom surface will mate smoothly together. If the trailing edge is blunt, then looking at the edge microscopically, there is a discontinuity and the flow separates and produces turbulent and extra drag.

Next time you build rotor blades, sand the trailing edge smooth and sharp, and apply the sticky film very carefully. Self-adhesive film is probably better than shrink tubing for the blades. Of course, the drawback is that a sharp trailing edge gets dinged very easily. Well, get a pair of cheap foam socks for your blades from Miniature Aircraft, or buy one of those quilted blade socks. Or beg your mom or wife to sew you a set. Finally, an efficient airfoil design can have almost 1/3 higher lift-to-drag ratio than an inefficient design. Efficient airfoils will be discussed in the future.

For the novices who will be doing their first loop or roll, the best advice is to have plenty of altitude, and just nicely bang the stick over. It's a piece of cake! To do a loop or roll for the first time, you do not need idle-up at all. Just practice flying straight and level at high speed. Once you've mastered keeping the model like an arrow on a rail, then just pull the elevator stick back "gradually." The stick will be at the full back position when the helicopter almost reaches the inverted position, then just hold the stick until the model comes around. After a dozen loops, turn on the idle-up 1, and pull the throttle/collective stick to half at the top of a loop. Always do the loop while flying into the wind.

Once you get better, then here is what Cliff has to say about doing a round loop (this is reprinted from the newsletter of the TORCHS club, of which Cliff is a member).

ADVERTISER'S INDEX

"Doing a round loop is easy . . . until you try to do a round loop! The first thing to do is get up a good head of steam into the wind before your entry. Try not to get synthetic airspeed by diving before your entry into the maneuver. Enter with about 7/8th collective along with the aft cyclic you desire; a small loop is easier to make round if you don't have a lot of power or airspeed. As you pass the first one third of the loop, back off of your aft cyclic and gradually decrease collective as you go across the top of the loop. You should be at about 1/2 stick or a little less (no more than 0 degree pitch) collective at the very top of the loop. After you pass over the top, start bringing in collective and more aft cyclic stick. You finish up the loop at the same altitude as your entry by pulling a little more aft cyclic and powering out with the collective."

OK folks, go practice your loops. Next month we will finish off this forward flight aerobatic article with rolls, stall turns, and tail rotor mixing.

Before we end, let's talk a bit about boosting engine power. Most Japanese engines, like O.S. and Enya 60s have relatively low engine exhaust port timing, in the range of 145 degrees. One way to boost the power is to raise the timing by milling out the top part of the exhaust port on the cylinder liner, to about 160 to 165 degrees. With a raised timing engine you can expect about 5 to 10% power boost. Why doesn't the engine come this way? One reason is that the manufacturers try to be conservative; more power may mean shorter life span. But many modelers who have reworked their engines say if the engine is well maintained then the lifespan will not be shortened.

I sent one of my O.S. 61 SFN to Miniature Aircraft for blueprinting. There is definitely a power increase. I don't know what they did, but it also idled better. I did check the timing, and it seems like they raised it to about 165 degrees. My friends Gary Frank and Peter Cooke also raised the timing on an O.S. 61 themselves on a milling machine, their result was even more phenomenal. Peter's unmodified Legend with this engine on 30% nitro fuel screams around the sky at 80 mph. It is not a five-minute job to raise the timing on an engine, therefore, it' worthwhile to pay $70 and let Miniature Aircraft blueprint the engine for you. I am impressed by the result.

By the way, if you want a stock engine that has brute power without any modification, then try a Rossi 60. It comes with 162 degree exhaust timing. For best results, buy the Rossi header and tuned pipe system. The header is rotatable, so the 12-inch long pipe can be bracketed to the tail boom. For X-Cell, Legend, and Excalibur, you need to purchase the aircraft version of Rossi 60, because the heli heat-sink head is too big to fit inside the cooling shroud. Schluter helicopters can use the heli version. There is only one difference between the heli and aircraft version, the heat sink head.

A modeler called me from Frederick, Maryland, and we had an hour-long discussion on engines. He offered some sound advice to increase the engine power. Take a look at your tuned pipe header. Does the hole on the header side that mates with the engine exhaust port match in size? Most likely the hole on the header is smaller. Therefore, the exhaust gas rushing out of the engine is running into a wall and then eventually bounces into the header. He suggested taking a Dremel tool and opening up the header intake side into a funnel shape so the exhaust gas flows readily into the header. The second suggestion is to add a three-inch long silicone tube to the end of the tuned pipe or muffler. This effectively changes the tuning characteristic. He claims there may be 300 rpm gain on the engine at the top end. To tune the engine for maximum, simply cut off 1/4-inch at a time until the engine peaks. Another suggestion is the one we mentioned before; drill out the exhaust hole at the end of the Magna or Hatori pipe.

He also suggested using an air filter on the carburetor. He says the carburetor filter not only prevents the dirt and clutch lining powders from reaching the engine, it also provides a better air flow path into the carb. He claims a few hundred rpm increase is possible with the addition of a carburetor air filter. Finally, he says a really exotic combo is to add six ounces of propolene oxide, four ounces of toluene, and two ounces of acetone to a gallon of fuel. He says the propolene oxide is an oxidizer that adds oxygen for improved burning. The toluene and acetone helps mix the fuel. That's some-

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thing for you to think about.

I did not have a chance to explore all the suggestions made above, but I did Dremel out the tuned pipe header. I also tried some of Cliff Hiatt's blend of Cool Power 30% nitro fuel in my blueprinted O.S. 61 SFN on the Excalibur. That stuff is potent! There was a noticeable 5 to 10% jump in rotor rpm. I needed more blade pitch to absorb the extra power. The question is whether or not it will shorten the engine lifespan? I checked the engine temperature after the flight, but it was not running hot at all! Even if the engine life is shortened by 10%, what the heck, that 10% power boost is great . . . But the fuel costs $20 a gallon!

A good glow plug to use is the O.S. Number 8. The Enya 3 is also excellent. These plugs cost more than the others, but they last a long time and the engines idle and transition smoothly. The Fox RC long is also a very hot plug and works with almost every brand of engine. Fox plugs are very inexpensive, but the lifespan is shorter. The chap from Frederick suggests OPS 250 or 300.

I just had a quick chat with Dave Shadel, the World Champion in Formula 1 pylon racing. The discussion was about modifying the engine for extra power. The man knows engines! His machine shop makes and sells custom ABC pistons and sleeves for O.S., Webra, Rossi, and others. Depending on your engine, you can order a set of .60-size pistons and sleeves for about $90. These are machined from bar stock. My friend installed one in his O.S. 61 VF and is quite pleased. I am trying a set in my O.S. 61 Long Stroke in the Champion. I will let you know the results next time.

We will continue the forward flight aerobatic article next month. Dave Shadel's number is (619) 729-1658. ***MB***

HANNAN *Continued from page 63*

A second course, entitled "Model Making," is for 10 to 14-year-old students, and concerns blueprint-reading, measuring, cutting and painting.

Weiss wonders how many of the "kids over 16" are also "kids over 64."

IN CZECHOSLOVAKIA

Pavel Jelinek and Lubomir Koutny report some changes affecting modeling in their newly-free country. Materials such as balsa, tissue and rubber are scarce, and drastically changing economic conditions have made the cost of renting halls for indoor flying nearly prohibitive. By contrast, interest in 1/20-scale rubber-powered models is increasing, since they may be flown outdoors without incurring field expenses.

Lubomir also tells of a European Association for Small Models, and the Czechoslovakian offer of Free Flight Scale rules to the FAI as the basis for international competition.

INTERSCALE '91

Speaking of international matters, Nottingham, England will be the venue for an exciting indoor flying scale model contest scheduled for September 21-22, 1991. Rubber, CO_2, Electric, Peanut and Pistachio events are planned, in addition to a kit-scale division and pylon races for rubber-powered racing aircraft.

Two large halls, accommodations and eating facilities for entrants are available at Nottingham University. For those unable to attend in person, the Pistachio Scale class will be open to proxy participation. Liberal rules coupled with the minimal cost of mailing such small models should assure widespread international representation. Why not give it a try?

Interscale '91 is being conducted by experienced organizers, including Doug Sheppard and Reg Boor, so this should be an especially successful competition. Complete rules may be obtained by sending three International Reply Coupons (from most post offices) to cover return postage, to Dave Hanks, 90 Forest Road, Kingswood, Bristol, BS1 2EH, England.

HOW'S THAT AGAIN?

Howard Jones, of Australia, laments that some international events have not been announced far enough in advance, and says: "I can only hope to be lucky enough (to enter) before contests are for one-inch-span models!"

PROXY-PILOTING VIA VCR

Giving adequate instructions by mail to a proxy-flier has always been a challenging task, especially if a foreign language may be involved. Dan Walton, of Kansas, tried a high-tech approach recently, when sending his Lippisch Storch to California where Mike Myers was to fly it in the Northrop Flying Wing meet. Dan produced a highly detailed videotape, demonstrating exactly how to unpack, assemble and fly the model.

It must have been successful, as the model returned safely, accompanied by a first-place trophy!

ELECTRIC BOSTONIANS?

Genial Ed Toner, of New Jersey, suggests an electric-power variation on the popular Bostonian event. His prototype, based upon the De Havilland Puss Moth, is named "Electric-Pussy."

DOCUMENTATION GALORE

Regardless of your size preference, one can always obtain the best scale model accuracy by starting with good photos and drawings. Bob Banka, of Scale Model Research, now inventories more than 70,000 photographs and over 10,000 three-views, plus giving one-day order turnaround and first-class postage. Bob's 72-page catalog costs $4 and may be ordered from Scale Model Research, 2334 Ticonderoga Way, Costa Mesa, CA 92626. Please tell him *Model Builder* sent you!

THE ROCKETEER

News of the forthcoming Walt Disney movie *The Rocketeer,* conceived by comic-book artist Dave Stevens, has arrived from reader Bob Taylor, of Santa Maria, California, who served as an extra during a filmed segment representing a 1930s air race. The set consisted of hangars, a grandstand and a Bendix pylon for the assorted aircraft to fly around. From Bob's letter plus an article by Martha Sand in *Sportsman Aviation Booster,* we can conclude it was an *odd* assortment, including Bill Turner's repro Gee Bee Z, his "Miss Los Angeles" Brown racer, a Travel Air Mystery Ship repro, a Fleetwings Seabird, a Stinson Junior, a Great Lakes bipe, a Lockheed Electra and a "mutant half Waco UPF-7/half Gee Bee." Only in Hollywood. *The Rocketeer* is scheduled to open in theaters during July.

THE LADY FROM LENINGRAD

Charming Svetlana Fillippova, featured in Dan Rutherford's photo, is an accomplished builder and flier of control line models who attracted considerable attention during her participation in the 1989 and 1990 US Nationals. Her specialty is CL Stunt, however she also flew quite successfully in FAI Combat, placing 3rd at the Nationals. As Phil Cartier reported in *Model Aviation,* "Svetlana turned out to be a polished, competent pilot. She used her tighter turning ability well and scored clean wins over a couple of American gentlemen."

Dan Rutherford, former *Model Builder* control line column editor, had the rare opportunity of visiting the Soviet Union for a firsthand survey of modeling activities in Leningrad. Staying as a guest of Svetlana and her parents, Dan was able to sample life in this vastly different culture, gaining "a different perspective on international politics." He was surprised by the amount of western influence encountered in such diverse areas as clothing, music and other entertainment.

With Svetlana serving as guide, interpreter and go-between, Dan was able to visit with many Soviet modelers, including the engine specialists. One result of the meetings was a tentative arrangement to begin marketing some of these remarkably efficient powerplants in the US. Designed by Alexander Gievsky, two of the engines under consideration are a very lightweight .049 and a beautifully machined 2.5cc combat engine, which operates in the 30,000 rpm range. The supply situation was still uncertain at the time of this writing, however up-to-date information may be obtained by sending a pre-addressed, stamped return envelope to D&B Import/Export, 4705 237th Place S.E., Bothell, WA 98021.

Recently Dan had the opportunity of showing Svetlana around his corner of the world, and noted how quickly she adapted to American ways. ("These folk know a lot more about us than we do about them.") Her curiosity was insatiable, especially about US slang and, not so surprisingly, shopping malls.

Dan sums up her visit this way: "All in all, a fabulous experience . . . nothing like seeing America in the company of, and through the eyes of a Russian, to realize once again what a great country we were fortunate enough to be born into." We thank Dan for sharing with us, and look forward to more cooperation among the world's model builders.

SIGN-OFF

"When music and courtesy are better understood and appreciated, there will be no more war."—Confucius. ***MB***

POWER *Continued from page 90*

weighs a reasonable 47 ounces. It uses a High Sky on-off controller. Jon really likes the High Sky unit, as it is reliable, simple, and has a brake. It is $24.95 plus $1 shipping from High Sky, 3929 Kansas St. #9, San Diego, CA 92104. I have one too, and I recommend it. Jon considers the Electra to be a classic and the standard for fun sport flying.

Jon subsequently built the Airtronics Eclipse and used the Leisure Electronics long gearbox. This gives the Eclipse a nice streamlined look. He used a Futaba speed control, and found the climb to be very similar to the Electra. Suspecting some power loss due to the speed controller, he substituted the High Sky unit (this uses a relay, no voltage drop). This immediately gave a big increase in climb rate.

Jon's friend, Erik Bakken, flies an Astro Mini Challenger with six cells and an Astro Cobalt 035. It goes up like a rocket, and likes to fly fast. Jon found he was busy keeping up with it. It is a potent contest model.

Erik did have one problem. On an earlier flight the wing spar failed right at the edge of the center sheeting. The resulting crash was repairable, obviously. My advice is to always use spruce spars, and a music wire dihedral brace is a good idea too. Make sure it extends one bay or more past the center sheeting. The outer edge of the center sheeting is where stress collects, and that is where the spars will break on any model. Why center sheeting is so popular is anybody's guess. Perhaps it is there to prevent wrinkles in the covering from the rubber bands. It certainly causes more problems than it cures.

Thanks, Jon, for the photos, I would like to visit Norway someday! Till next time, fly electrics, fly anywhere in the world! My address is: Mitch Poling, 7100 CSW/MC, Box 734 PSC 2, APO NY 09220-5300 (regular US postage, 25 cent stamp); or outside the US: Normannnenweg 20, 6200 Wiesbaden-Biebrich, Germany. ***MB***

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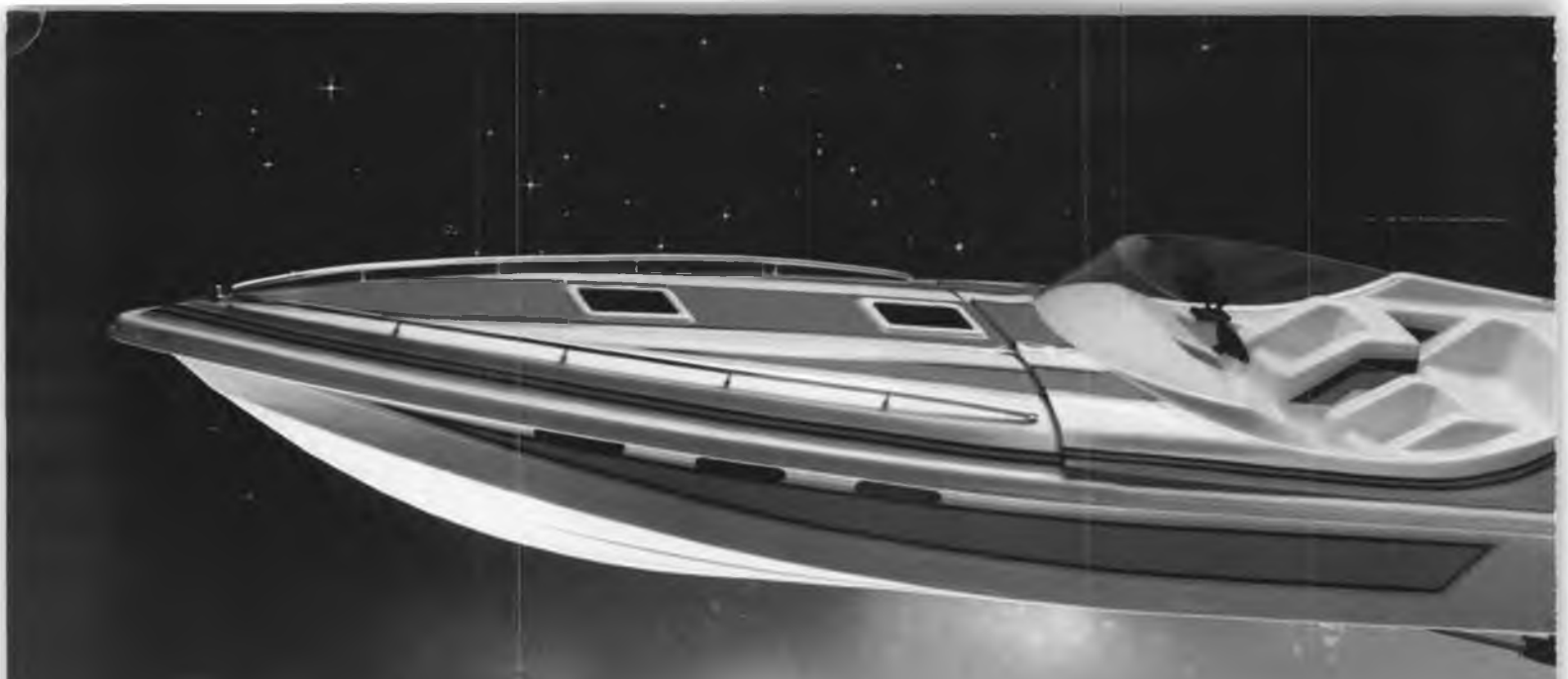

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