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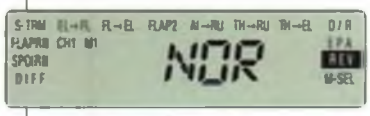

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ON THE COVER

This month's RC construction feature is something really special. Master craftsman Steven L. Stratt's outstanding 2"=1' replica of the 1918 Sopwith Swallow is not only built to Precision Scale standards, it's also engineered expressly for electric power, using a geared Astro 40. The intricately detailed WWI fighter took 1st place in scale at the 1992 KRC meet. Part one of a two-part article begins on page 20. Inset: This beautifully restored and maintained P-51 was photographed at Oshkosh by Tom Perzentka— story on page 64.

CONSTRUCTION

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MEMBER RCHTA

PLANE TALK

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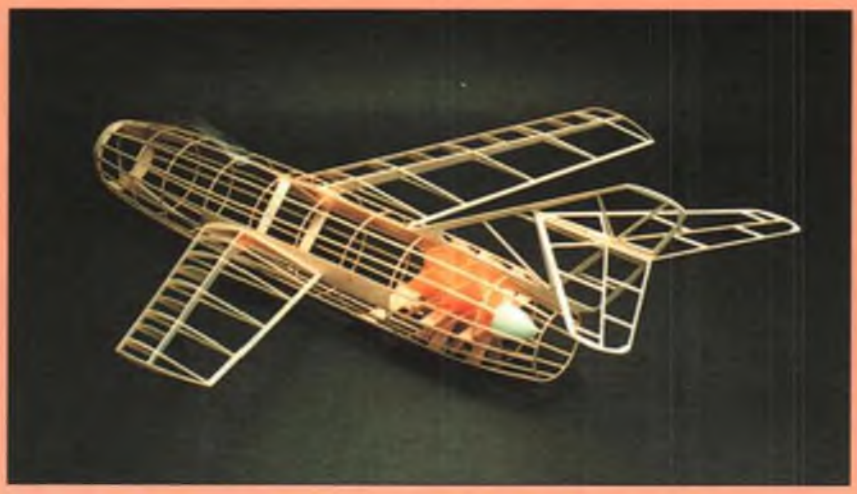
Rowena Voss holds a Bob Martin (now Dynaflite) Talon slope glider built by her dad, George, who did the Great Planes F-14 review in the October '93 *MB*. The Talon is finished with 3/4-ounce glass cloth on the fuselage, which is painted with yellow Perfect Paint. Wings and tail are covered with yellow MonoKote and trimmed with Hobby Lobby Superkote. A pretty pair! *George Voss, 1403 Lincolnshire Rd., Oklahoma City, OK 73159.*



Jiro Sugimoto of Nagoya, Japan is a man of few words. But they're the right ones—he ordered three one-year subscriptions for his friends! He also sent along these shots of his rubber-powered, ducted fan Peanut MiG-15. Jiro is one of Japan's leading free flight scale modelers; photos of his work frequently appear in *MB* contributing writer Bill Hannan's column. *Jiro Sugimoto, 2-36 Kitahata-Cho, Nakamura-Ku, Nagoya 453, Japan.*

This Dynaflite Fun Scale Corsair .40 was modified for control line flying by New York modeler Dave Swatowy. Powered by a throttle-equipped K&B .61, it does great takeoffs, touch-and-go's, taxis, and pulls like an ox. "On dead-stick landings you can hear how it got the name, 'Whistling Death,'" reports Swatowy, who's been flying CL for "only" 30+ years. "Try it, it's great—fly by feel, no dead batteries, no 'I ain't got it' and no frequency problems!" *Dave Swatowy, 103 Maple Pl., Yonkers, NY 10704-2233.*

Luckily, James Lindeman snapped this photo before the first flight of his 1938 Powerhouse. The lovely ship was covered with transparent green MonoKote and trimmed in white. "I pushed the battery and receiver forward into the fuselage for balance, but didn't check the connections," reports the 74-year-old flier. "The first flight was great, until I got it up real high to pick up some thermals and the receiver battery came loose. She came down full power into the trees behind me." James reports he has repaired the wing and tail surfaces and is building a new fuselage. Luckily, the Airtronics radio and Saito .45 four-stroke escaped damage. *James J. Lindeman, P.O. Box 164-154-2 Jones Rd., Lattimore, NC 28089-0162.*

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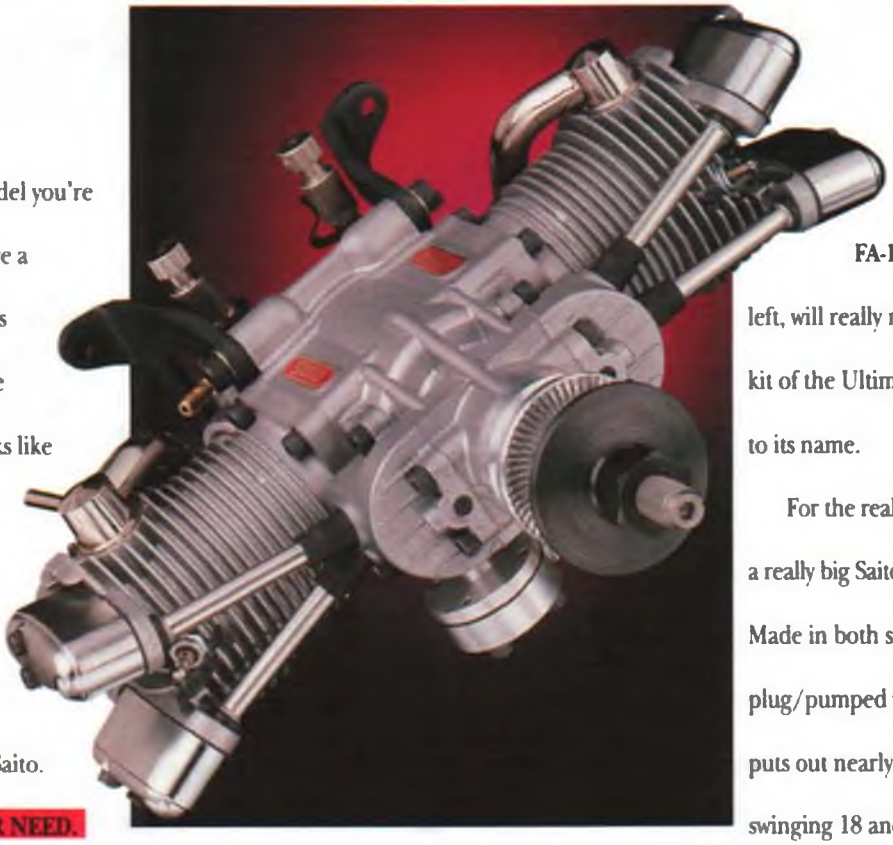
PLANE TALK

Tex Newman's "Dragonfly," published in the February 1976 *Model Builder*, has been one of our all-time best selling plans. This example was turned out by Wisconsin modeler George Reinbold. While the original was flown with both a Cox .049 and O.S. .10, George powers his ship with an O.S. .20, and uses a Futaba radio. He finished the wing with a combination of clear MonoKote and Sig Supercoat in neon colors to give it a dragonfly appearance. A real fun flier! *George L. Reinbold, 5620 Horse Shoe Bend Rd., Cuba City, WI 53807.*

You must be joking! Actually, we are. That "penny" is really about 5 inches in diameter, and the Aeronca C-3 is really a Peanut Scale model, reduced from Peerless plans and built by David Barfield of Marietta, Georgia. He really had us going there for a minute! David is a member of the Thermal Thumbers of Metro Atlanta and is "High Commander" of the Georgia Possum Patrol, an FAC-chartered squadron. *David Barfield, 2000 Trophy Dr., Marietta, GA 30062.*

"This ol' 'born again' model builder likes your ol' time plans," writes Jim Busch of Marion, Ohio. Jim started building again when he retired six years ago. His Miss America is in his 7-year-old granddaughter Kirsten's favorite colors of MonoKote, and is scaled down from the original 7-footer for an O.S. .15. His Piece of Cake is finished with Oracover and also flies with an O.S. .15. The "Bam Bam" on the wing is no doubt a reference to his 5-year-old grandson, Craig, who certainly looks the part! *James A. Busch, 377 Mt. Vernon Ave., Marion, OH 43302.*

WHEN YOU'RE READY FOR 4-CYCLES, YOU'RE READY FOR SAITO



Chances are, the scale model you're building now ought to have a multi-cylinder engine. This time, go all out. Put a scale engine in it. One that looks like the real thing. Sounds like the real thing. And delivers some really incredible performance.

In other words, get a Saito.

A SIZE TO FIT YOUR NEED.

J-3 fans will crave the beautiful **FA-60T**. Swinging a 12x6 at about 8500, its power and sound will make your J-3 the hit of the field.

The new powerhouse **FA-100T** swings an APC 14x6 at nearly 10,000 rpm, giving it enough zest for any .90 4-cycle size model.

The fabulous **FA-130TD**, shown at left, will really make your Goldberg kit of the Ultimate or Extra live up to its name.

For the really big planes, there's a really big Saito: the **FA-300T**. Made in both single plug and dual plug/pumped versions, the 300T puts out nearly 5 horsepower for swinging 18 and 20-inch props.

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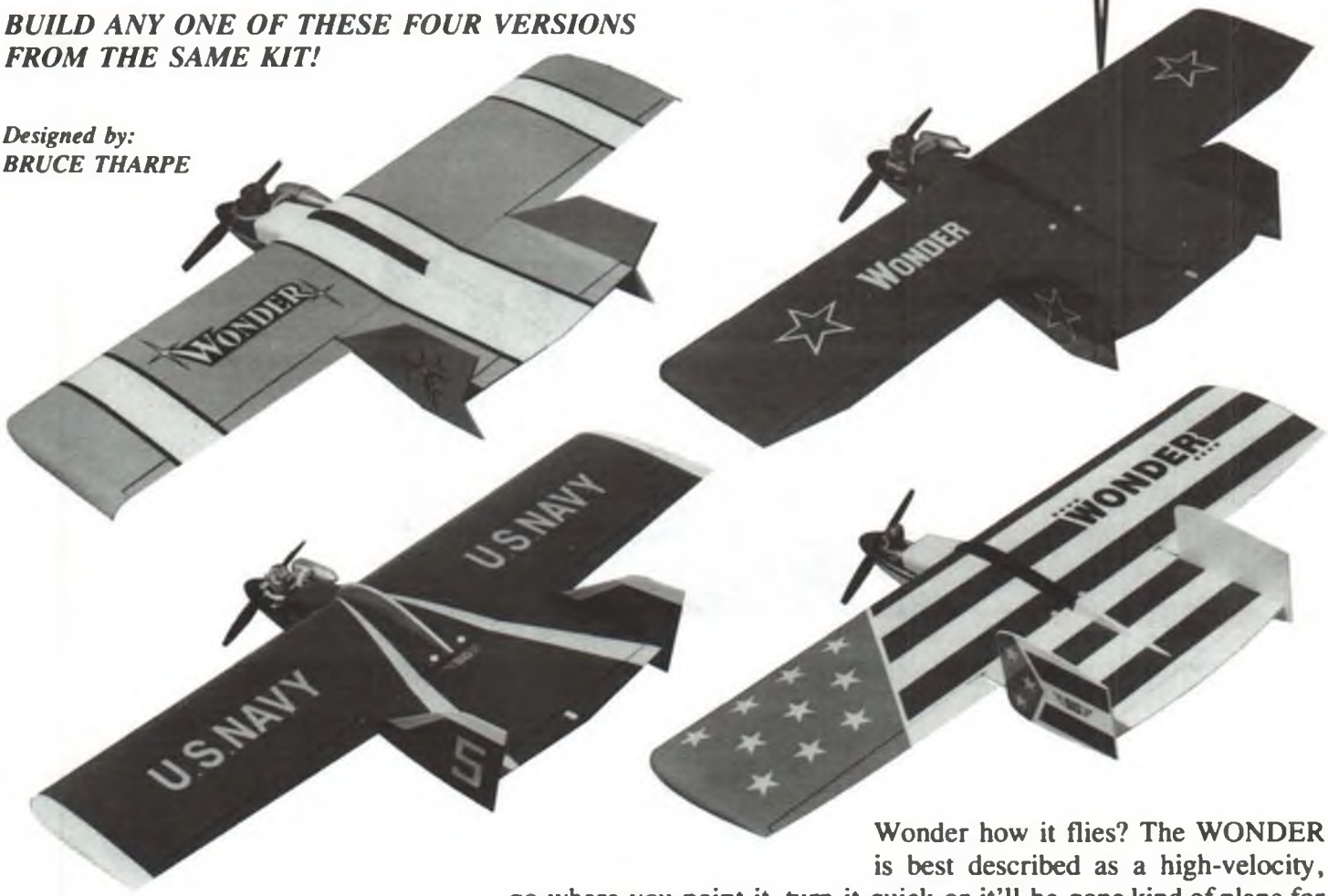

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MODEL DESIGN & TECHNICAL STUFF

BY FRANCIS REYNOLDS

• Landing gear struts
• Another use for servos
• A switchless radio switch

When I started out in the RC airplane game a great many years ago I preferred tricycle gears for good steering, lack of ground-looping, and prop protection; but in the last dozen years or so I have come to much prefer taildraggers. They are lighter, simpler to design and build, have less drag, require less maintenance, and are more versatile in landing and takeoff modes.

But whatever the arrangement, landing gears need struts, and I have had a lot of trouble with music wire struts. They are always getting bent in rough landings. Wire float gear struts, being more complex, are often a real mess to straighten or repair after a crash or an unreasonably hard landing.

I've been using hard sheet aluminum alloy landing gear struts on my taildraggers in recent years. They still get bent, but not as often as the old wire gears, partly because the aluminum strut is made wide at the fuselage for strength and tapers down to the wheels. (Music wire isn't easy to taper.) The aluminum gears are also a lot easier to straighten than the wire gears.

But a still better answer is composite landing gears. R/C America, 1003 Pomona Dr., Champaign, IL 61821; (217) 359-5116, puts out a line of excellent unidirectional fiberglass gears, developed by modeler Jack Huismann, under the name of Supergear. They will flex well for shock absorption, but are, for modeling use, essentially unbendable and unbreakable. Camber and toe-in are built in. The one I'm using works perfectly and never bends. It is also lighter than an equivalent aluminum or music wire gear.

R/C America currently offers nine Supergears to fit different popular large sport aerobatic and fixed-gear pattern models. They are being used in T.O.C. competition. Supergears are not cheap, however, as their manufacture requires a lot of labor.

INJECTION-MOLDED LANDING GEARS

For the lower-budget modeler mass market, I suggest an inexpensive way to manufacture landing gears which should be comparable in performance to composite gears and much better than metal gears.

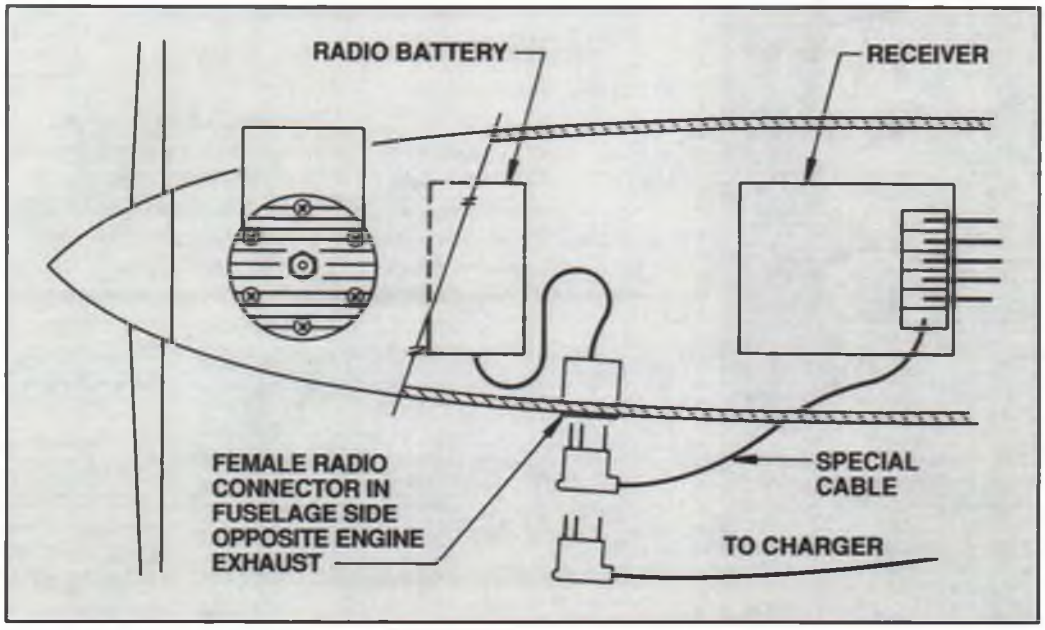
I have had some experience with injection-molded plastics. There is one moldable plastic which is above most of the others in strength and toughness (including nylon) and better than all others for resilience. It is frequently used to mold springs for applications which formerly used steel springs. The plastic I am speaking of is "acetal," which is manufactured under the trade names of Delrin and Celcon. It is available in rod and sheet stock, and for injection-molding.

According to a plastics handbook, acetal has a tensile strength of 10kpsi and a compressive strength of 18kpsi. It is lighter than epoxyglass. It doesn't yield—like a very hard metal spring, it will flex farther and farther without taking on a bend, until it finally breaks.

Acetal is a thermoplastic, which means it can be softened by heat and bent into new shapes. It thermoforms like ABS, polystyrene or acrylic. The do-it-yourself modeler can buy sheet stock, saw it to shape, and form it himself. I recently experimented with forming a piece of 3/16-inch sheet acetal using a hot air gun. It worked fine, but took a bit a patience to get the heat into the center of such thick stock. Don't force it; wait until it is limp. And don't get the surface too hot or it will blister.

My local plastics supplier has acetal sheet in black or "natural" (off-white) in thicknesses from 1/16 to 2 inches. The stuff is fuelproof but doesn't cement well. I have used it to make

continued on page 14



Francis has lately been using a different type of radio on-off switch in his models—a standard female RC system connector mounted flush with the side of the fuselage, into which a male connector plugs to complete the circuit. Discussed in text.

over the counter

QUICK-BUILDING WARBIRDS

The 54-inch span Spitfire pictured here is the first in a new line of exceptionally highly detailed ARF warbirds from Great Planes Model Distributors. The airplanes in the series use an interlocking wood structure covered with a composite material consisting of a polyfoam base, plastic skin, color layers and a fuelproof coating. The majority of the construction is already done for you; what remains is final assembly and radio and engine installation. If you *really* want to do it right, the Spitfire can be fitted with Hobbico's low profile retracts; wheel wells and mounting rails for the retract units come already installed. Recommended engine sizes are a .40-.46 two-stroke, or a .60-.80 four-stroke. From Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300.

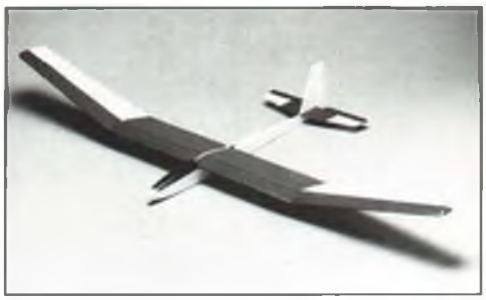
SOMETHING REALLY DIFFERENT

Robbe's "Skyflex" is an electric-powered Rogallo wing craft said to be so inherently stable and easy to fly that even a first-time beginner can handle it successfully. Controls are limited to right/left steering and on-off motor control for climb/descent. Even the simplest two-single-axis stick radio would be adequate and would in fact be the system of choice for this application. Robbe offers the 71-inch span Skyflex both with and without a geared seven-cell power system, and you can also get an optional high-performance battened "tuning" sail of ripstop nylon to replace the standard transparent plastic one. Looks like fun, doesn't it? From Robbe Modellsport, 170 Township Line Rd., Belle Mead, NJ 08502; (908) 359-2115.

WE'VE GOT THE ANSWER

One of many new models recently debuted at the Chicago RCHTA show was the "Easy Answer" from Global Quality Kits, a basic two-channel (rudder/elevator) RC glider that should prove popular for training and general all-around sport flying. Span is 78 inches, wing area 568 square inches, and the construction is all wood throughout.

One special feature that makes the Easy Answer ideal for beginners is the exceptionally strong fuselage; the sides and bulkheads are die-cut from Global's new 1/8-inch three-ply balsa plywood. We saw kit designer John Lupperger bend one of those sides beyond a complete "U" before it finally broke, and when it did, it was neither a sudden nor a clean break. Those wood fibers obviously did *not* want to let go! Global also offers that balsa plywood material in sheets of different thicknesses and lengths for scratch builders.



The Easy Answer lists for $38.95; check it out at your local hobby shop. From Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610; (714) 963-0133.

NEW COX ENGINES

On display at the Cox booth at Chicago were samples of the new Tee Dee R/C .05 and .09 engines, based on the familiar Cox Tee Dee .051 and .09, but fitted with "normal" type mufflers and RC throttle carburetors. Idle response and reliability are said to be greatly improved over anything that's been available for these engines in the past. The engines we saw were prototypes, but they should be in production by the time this issue hits the stands. If not, check with Cox Products, 350 W. Rincon St., Corona, CA 91720; (909) 278-1702.

SNAKE OIL LUBRICANTS

Robart is now producing a full line of high-performance lubricants and additives under the "Snake Oil" label—items including fuel treatment, engine treatment (use like an after-run oil), spray lubricant, bearing lubricant, 2-cycle oil and bearing grease, all of which include SP-10, an ingredient claimed to provide the very best protection against friction, corrosion, heat and wear. Look for them at your local hobby shop. From Robart Mfg., Inc., P.O. Box 1247, St. Charles, IL 60174.

feature foam wings, die-cut wood parts, computer-drawn plans, and decals. Check them out at your local hobby shop. From Ace R/C, 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (816) 584-7121.

RTF DISCUS

Hobby Lobby's latest catalog includes a number of items produced in the Czech Republic, one of which is a 9-1/2 foot span scale Discus sailplane that comes completely painted and finished and ready for radio installation. Fuselage is epoxyglass, and the wings are obechi sheeted foam covered with Oracover and have gate-type spoilers already installed. With its clean lines and a wing loading of 16 ounces per square foot, we'd bet the Discus is a fast, exciting ship to fly. It's described in detail in the catalog; write Hobby Lobby at 5614 Franklin Pike Circle, Brentwood, TN 37027, or call (615) 373-1444 to get your free copy.

"SIMPLE" 1/2A FUN SHIPS

Elsewhere in this issue are ads for Ace R/C's new "Simple Series" of sorta-scale 1/2A sport models—two WWII fighters, a P-51 and ME-109 at $34.95 each—and two aerobatic types, a CAP 21 (pictured here) and Extra 230, $39.95. There's also a Staggerwing biplane,

$49.95, for .09-.15 power. All five models span 35 inches, and the kits

MORE LASERS FROM PROCTOR

Three new additions to the line of English-built Laser four-stroke engines being distributed in the U.S. by Proctor Enterprises are the 160V, 180V and 200V V-twins. The 180V

was used on the 1st, 2nd and 4th place winning models at the World Scale Championships at Muncie. Complete info including price and availability can be had from Proctor Enterprises, 25450 N.E. Eilers Rd., Aurora, OR 97002; (503) 678-1300.

SHUTTLE Z HELI KITS

One of the most popular of the .30-size RC helicopters, the Hirobo Shuttle Z, is now being offered in a less expensive kit version, according to its U.S. distributor, Altech Marketing. Quality-wise, there's no difference between the two machines, as all of the parts and hardware remain exactly the same; there's just more assembly time required with the kit version. Check it out at your local Hirobo helicopter dealer. The Shuttle Z kits are distributed by Altech Marketing, P.O. Box 391, Edison, NJ 088180-0391.

A BEAUTY OF A P-47

For those who like large scale warbirds, Yellow Aircraft recently announced an 80-inch model of the P-47 Thunderbolt in both bubble canopy and razorback versions, for engines ranging from an S.T. 3000 to a Zenoah G62. The kit comes with pre-sheeted foam wings with the landing gear mounts installed; fiberglass parts include the fuselage,

cowl, control surfaces and a bunch of other parts. Scale accessories offered include retracts, wheels and tires, and spinner. Full particulars are available by contacting Yellow Aircraft, 203 Mass Ave., Lexington, MA 02173; (617) 674-2222.

LIL' BIRD RCHLG

Remember the distinctive planform of Dave Thornburg's big "Bird of Time" RC sailplane? Well, Sky-Bench Aerotech is offering

something very similar in hand-launch size—54-1/4 inch span—in both kit and pre-built form. The "Lil' Bird" is of all-wood construction, sporting a 270 square inch built-up frame wing with full balsa sheeting, and full-flying horizontal stab. The kit is priced at $29.95 plus $6 S&H and includes all materials and machine-cut parts. The pre-built version goes for $78 plus $15 S&H.

If you don't have much of a throwing arm, Sky-Bench also sells a Mini High-Start kit, designed especially for 1-1/2 meter gliders. Included is 30 feet of 1/8-inch diameter rubber tubing, two different lengths of high-visibility line, all hardware and a reel, for $19.95 plus $4 S&H. From Sky-Bench Aerotech, 58030 Cyrenus Lane, Washington, MI 48094.

PRETTY TWO-WINGER

That racy-looking biplane in the photo is the new "Great Baby Bipe" from Sure Flite, a 36-inch span sport job for .10-.25 two-strokes. This one should go together in a hurry—the fuselage,

wings and stab are all injection molded foam. Glass it, apply a low-heat film or just paint the foam directly—it's up to you. The kit includes a vacuum-formed cowl, aluminum landing gear, die-cut plywood parts, basic hardware and an instruction booklet, for a suggested list of $94.95. Produced by Sure Flite Enterprises, 571 Crane St., Bldg. H, Lake Elsinore, CA 92530. *continued on page 75*

When contacting the manufacturers/distributors mentioned in Over the Counter, please tell them you read about their products in *Model Builder* magazine!

MODEL DESIGN cont. from page 11

many things, and love it.

ANOTHER USE FOR SERVOS

Did you ever strip the gears in a servo, then note that when it was plugged in and the set was turned on, the servo motor wouldn't stop running until you moved the stick to a certain position? The significant feature of the gear stripping, in these cases, is that the feedback potentiometer (the pot) in the servo is mechanically uncoupled from the servo motor.

First a little review. Each of our servos has a motor, a pot, a gear train, and some electronics containing a pulse-width amplifier which is electrically controlled by the pot. Each servo gets an allocated electrical pulse from the receiver. The width of that incoming pulse is determined by the position of the corresponding transmitter stick.

The pulse-width amplifier in the servo generates another pulse, which is compared to the incoming pulse. If the servo pulse is shorter than the transmitted pulse the servo motor runs in one direction, and if it is longer the motor runs in the other direction. The pot is turned by the gears in such a direction that it shortens or lengthens the servo pulse as required to make it equal in length to the transmitted pulse, then the motor stops. This negative-feedback, self-balancing servo system is then nulled out; the control surface is where we commanded it to be.

But when we strip the servo gears in a crash, the pot is no longer geared to the motor (in most servos at least). The length of the pulse generated in the servo is then no longer changed when the motor runs, because the pot no longer turns. The two pulses can no longer be balanced by the system, because the feedback loop has been broken. The servo motor then continues to run in one direction until the transmitter stick is moved to a particular point, or the pot is turned manually to a particular point. For each position of the transmitter stick there is a different point on the servo pot where the system will null out, whether the gears are there or not.

And why am I explaining all this? For a practical reason. If we are building a small electric-powered RC car, boat, special retract system, robot, etc., we don't have to buy a drive motor and a speed controller to operate it; we can uncouple the pot in a servo and use the servo for a drive motor and speed controller. A proportional speed controller, with reverse, is part of the electronics inside the servo. The power for the "drive motor" will come from the receiver battery, except for a few very large servos designed to use a separate battery.

The standard-size, indirect-drive servo I opened up to study had a little pot-coupling clip which was readily removable. It was located under the main output gear, which was right over the pot. The micro servo I looked at had the output gear lightly pressed onto the pot shaft. One could uncouple the pot there by pulling off the gear and reaming out the press-fit area until it clears the pot shaft.

Center the pot by hand before reassembling the servo, if you want equal stick travel for forward and reverse of the motor; or preset the pot for any action you want, including no reverse. In many cases we would put this special drive-motor servo on the throttle stick channel, but it can be used on any channel.

Depending on what you want to drive with this special converted servo, you may want to gear the output up or down further. For high-speed applications of the servo motor, you may want to alter or eliminate the servo gears entirely and connect directly to the motor.

ELIMINATE THE SWITCH

Here is one of those "simplicate and add lightness" ideas that come along from time to time. I don't remember where I first saw it, but I've used it on three airplanes lately, and I like it. The idea is to do away with the typical on-off switch in our models; a pair of connectors can perform the same function with less cost, less weight, less installation labor, and more reliability.

The sketch shows how the connector is installed in the side of the fuselage. It lets you plug the pigtail from the receiver directly into the socket to turn on the radio, and you can also plug the charger into it to charge the battery. As sketched, the socket mounted on the fuselage is the the battery socket itself. If you prefer to keep the battery more readily removable, use an extension cable between the battery and the switching plug.

The male switching plug needs to be on a cable which has a second male plug to fit the receiver. I haven't seen such male-male cables offered commercially, but it's a simple matter to solder one up. The connectors with leads attached are available separately at model shops.

I prefer the old style Futaba G plug, which has the leads coming off at right angles, for the external switching plug. This makes for a neater, lower-drag installation, because the short external wires lie parallel with and close to the fuselage. The leads to the plug angle through the fuselage wall as shown. As usual, you should mount your "switch" on the side of the fuselage away from the exhaust goo.

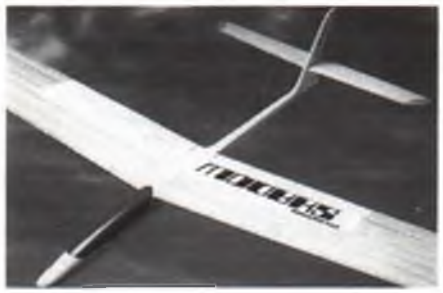
Another advantage to switchless receiver switching: it is much more visible. I can see whether the plug is in or out at some distance. Checking the position of a switch takes a much closer look.

PARTING WORDS

If you want to see the houses get smaller, pull back on the stick. If you want so see them get bigger again fast, pull back on the stick some more.— David Collette.

And: A nose heavy plane doesn't fly well; a tail heavy plane doesn't fly long. **MB**

Confidence off the winch.



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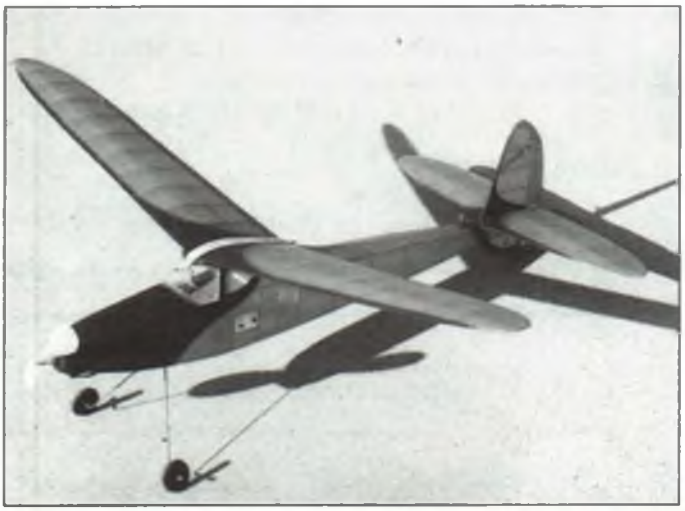
WHAT OUR READERS ARE UP TO

Roger also reports on a new electronic speed control from Lofty Pursuits and has a brief update on the Aveox brushless motor he's been testing.

I've been saving up photos that readers have sent me over the last few months and now I'm pleased to share some of them with you.

Phil Moore, a charter member of the Silent Electric Flyers of San Diego and long-time electric modeler, has been experimenting with Cox's Failsafe radio system and presently has it installed in an electric Comet Sparky, originally a rubber-powered free flight from the 1940s. The plane weighs a scant 7 ounces including radio and battery pack. The Cox radio system includes the receiver, rudder servo and arming switch; with 150-mAH batteries, the average motor run is just over 2 minutes. Phil's model is covered with tissue and dope.



■ LEFT: Old-time rubber designs make great schoolyard electrics with small power systems. Phil Moore flies his Comet Sparky on three cells and steers it around with a simple Cox Failsafe rudder-only rig. Flying weight is only 7 ounces. ■ RIGHT: Missouri's Jerry Smartt, who likes to refer to all of his models as "Smarttybilts," turned out this graceful electric sailplane, dubbed "Arrowplane" on account of the fiberglass arrowshaft tail boom. Geared motor turns a Graupner 15-inch lightweight folding prop.

■ LEFT: The Solar Eclipse is Jerry Smartt's "solarized" modification of an Airtronics Eclipse motorglider—wing contains 30 solar cells which power the motor through a four-cell NiCd buffer battery in the fuselage. ■ RIGHT: One of the best possible RC trainers and also a real threat in seven-cell O.T. electric competition is the Cleveland Playboy Sr. Vince Masa built this V-dihedral cabin version (could also be built with a pylon fuselage and/or a polyhedral wing) from an old Leisure Electronics kit. Leisure kit designs are now being produced in Canada—see text for details.

The models of Jerry Smartt of Warsaw, Missouri are no stranger to the pages of the modeling press. His "Arrowplane" is a 49-ounce V-tail electric sailplane with a pod-and-boom fuselage. The pod is a 1/4-inch honeycombed balsa core skinned with 1/64 plywood; the boom is a carbon fiber arrowshaft. Jerry says he's going to experiment with lighter wing construction and fewer cells in an effort to lighten it up.

Another of Jerry's models is the "Solar Eclipse." It flies with a combination four-cell flight pack and 30 solar cells wired in parallel. These cells provide 10.11 volts at 1 to 2 amps. It flies, but could do better with lighter and better solar cells. Jerry is an

■ LEFT: What started out as an Astro Sport kit wound up looking like a crop duster, thanks to some rather major mods by Tony Turley. Tony reports spirited performance from either a geared Astro 02 or direct drive 05.■ RIGHT: Sig's Four-Star 40 makes a fine electric conversion, as Tony Turley found when he modified this one for Astro 25.

outstanding tinkerer and I know that by the time this column is published, he'll have something even better.

From Vincent Masa of Brookline, Massachusetts comes a photo of his beautiful Cabin Playboy, built from an old Leisure Electronics kit. Vincent says it's an enjoyable aircraft to build and one of the easiest planes with which to train newcomers. The model has a 68-inch wingspan and performs well with a geared Astro 05 motor, a seven-cell 1700-mAH battery pack and a Jomar SM4 speed control. *(Editor's note: The Playboy, Lanzo Bomber and other popular Leisure Electronics kits have been out of production for some time now, however, we understand that Stuart Pearce of Spirit of Yesteryear Model Aircraft Co. has picked up the line and is offering them once more. For info, contact Stuart at 40 Holgate St., Barrie, Ontario L4N 2T7, Canada, or call 705-726-6208.)*

Bob Grindle of Chula Vista, California is a meticulous builder and the photo of his Davey Systems Flybaby really doesn't do the plane justice. Bob relates an interesting story that illustrates the significant effect that weight has on our models. The Flybaby's first flights were with a geared Astro 035 with a 1400-mAH six-cell pack and a 10x8 prop. The plane weighed 43-1/2 ounces, had a wing loading of 22.8 ounces per square foot and an APR of 0.0907 (see the May through July 1993 issues of *Model Builder* for an explanation of APR). It didn't fly too well—in fact, it hardly flew at all.

Bob then removed the gearbox and changed to a 900-mAH six-cell pack and an 8x6 prop. After the change, his Flybaby weighed 35 ounces, the wing loading went down to 18.3 ounces per square foot and the APR was up to 0.1405. While still not ideal, performance was much better. Remember, *keep your planes as light as possible.*

What looks like a crop duster in one of the photos is actually a highly modified Astro Sport by Tony Turley of Dunbar, West Virginia. The model can fly with either a geared Astro 02 or a direct drive Astro 05. The mounting holes for the 02 and the 05 are identical, so he can switch between the two motors in minutes.

Tony also did an electric conversion on a Sig Four-Star 40, shaving 6 ounces from the airframe by eliminating unnecessary parts and cutting additional lightening holes. The wheel pants were purchased from Fiberglass Master, and Tony designed the cowl himself. It uses a geared Astro 25 with a 16-cell, 1700-mAH battery pack and a Flightec SEC-II speed control. Neon orange covering finishes off this bird—you can see it in five states!

Finally, there's Tom Dougherty's modified Telemaster—the big 150-inch one sold by Hobby Lobby. Actually, "modified" is an understatement. It looks like a Telemaster on the outside—Tom increased the wingspan a bit, but in all other respects the lines are unchanged. Inside it's a different story.

The model is powered by six large Mabuchi ball-bearing motors that are equivalent to a 15 or 25 motor. Power is supplied by 112 1400-mAH cells wired as seven parallel packs of 16 cells each. Each motor will swing an 11x6 prop for about 5 minutes. These motors suck up in excess of 200 amps when running; that's about 3,200 watts of power, or over 4 horsepower. The wingspan is about 13 feet, the wing area is 3,213 square inches and the plane weighs 44 pounds ready to fly, giving a wing loading of 31 ounces per square foot.

Now for the interesting stuff. How did Tom get 200 amps of current down some copper wires? He didn't! The wing spars are made from aluminum channel—the top spar is the positive power connection and the bottom spar is the negative one. The wing is joined using aluminum rods, and the fuselage is built around an aluminum tray that serves to anchor the wing assembly.

The next problem was the speed control. Tom tried one, but 24 feet of aluminum channel carrying 3 kilowatts of power makes a great radiating antenna. The first time Tom tried an electronic speed control in his workshop he sent all of his other planes' receivers into fits. Clearly he would interfere with every other plane at the field! To solve the problem, Tom devised a relay switching system that turns on two motors first, then two more, then finally the last two with increasing travel of the throttle stick. This creates an effective speed control without the fancy electronics and interference. Oh, by the way, it flies just as a Telemaster should—like a kite!

LOFTY PUSUITS SPEED CONTROL

Just recently I visited with Douglas Ingraham of Rapid City, South Dakota. Doug's company, Lofty Pursuits, manufactures a lightweight electronic speed control that can handle battery packs of up to 14 cells. While in Southern California on vacation, he was kind enough to take a drive down the coast to personally deliver one of his speed control units. We spent a pleasant couple of hours watching the RC gliders perform at the world-famous Torrey Pines cliffs and discussed things electric.

Nice building job on this Davey Systems Flybaby by Bob Grindle. Motor is a direct drive Astro 035 on six cells. Story in this month's column illustrates the importance of building light.

This photo doesn't even begin to illustrate the sheer size of Tom Dougherty's huge Telemaster. Span is around 13 feet, and the thrust comes from six big Mabuchi motors. Batteries? How does 112 cells grab you? More in text.

Doug had installed color-coded Sermos connectors and a Futaba radio connector ahead of time at my request. However, all you need to know about installing these connectors is explained in the concise and

well-written instruction booklet. The novice should have no trouble wiring the unit. Doug's only caution is that if you have no soldering experience, practice on some scrap wire first, or have someone experienced solder the connections for you.

Once the connectors are installed, the instructions guide you through some testing procedures that require a digital voltmeter (DVM). Performing the tests enhances your knowledge of the speed control unit and how it works, but since the connector installation procedure is so simple and straightforward, unit testing really isn't necessary.

Should the speed control unit not perform as designed, the instructions detail some troubleshooting procedures. These steps will show you how to fix the problem on your own or, if the unit is too far gone, will instruct you to send it back for repairs. Doug says the worst case repair will only set you back $30.

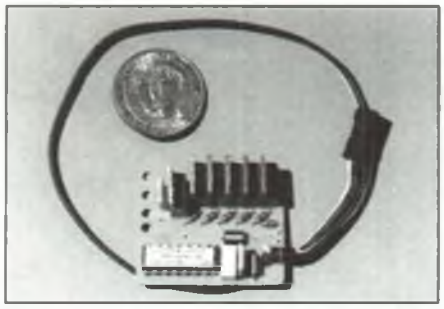
The Lofty Pursuits speed control is unique in that there are fewer than 20 components; six of them are the power FETs. A microprocessor (a small, special purpose computer chip) controls the unit. A section of the instructions is devoted to circuit operation and makes interesting reading, if you're into computer programming and operation.

I tried my unit in one of my motorized gliders running an Astro Flight 05 motor on seven cells and an 8x6 prop. Throttle response was smooth, linear and had a very good feel. There was no radio interference throughout my test flights—something with which I've had trouble in some other speed control units. I plan to use it for a long time.

The Lofty Pursuits Speed Control, model LPSC-1, retails for $99.95 postpaid and is available from Doug Ingraham, c/o Lofty Pursuits, 2274 Aster Court, Rapid City, SD 57702; (605) 343-8760 (between 7 and 10 p.m., Mountain time). South Dakota residents add appropriate sales tax. The speed control is also available from SR Batteries, P.O. Box 287, Bellport, NY 11713; (516) 286-0079.

AVEOX BRUSHLESS MOTORS—AN UPDATE

On the subject of new products, I recently received one of the new brushless motors from Aveox, Inc. for testing. Brushless motors have been around for years in industrial and military equipment, but the technology has been such that it has not been cost-efficient to produce these motors for model aviation use—until now. Aveox has capitalized on new silicon technology to manufacture brushless motors along with a companion control unit. They carry a line of five motors capable of handling up to 16 cells. My test motor (AVX 1405) weighs 9 ounces and the control unit weighs 3-1/2 ounces. I did some static RPM and current draw tests on my motor using a 12-cell, 1300-mAH battery pack with the following results:



This month our columnist reviews the new Model LPSC-1 electronic speed control produced by Lofty Pursuits. Small, light, reasonably priced and will handle up to 16 cells.

Prop	RPM	Amps
APC 8x4	16,500	34
APC 8x6	13,800	45
Zinger 9x4	13,400	44

Having run the motor on the bench (with no loose papers around!), I can report that it is powerful and smooth. Some members of the local electric club did some dynamometer tests on one of these motors and found the efficiency to be around 80-85 percent over a wide range of input voltage. I don't want to delve further into how it works just yet—let's save that for later when I've had a chance to test it in a plane. At that time, I'll be able to give you a full discourse on how the Aveox brushless motor works in theory and in practice. From what I've heard from other modelers and read in newsletters, it looks like a winner, and I'm anxious to give it a real workout.

Roger Jaffe, 6462 Sunny Brae Dr., San Diego, CA 92119; (619) 463-4455 during business hours, Pacific time. ***MB***

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CUTLASS 10

The Cutlass 10 is an exciting model for power or slope flying! The kit features die and machine cut parts, clear canopy, foam core wing, decals, hardware, and plans with illustrated construction notes. Span: 34 in., Area: 220 sq. in., Weight: 22-32 oz., Engine: .10-.15 2C, Radio:2-3 ch. req'd.

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POWER SCALE SLOPER

The P-51 Mustang Power Scale Sloper has been designed to give you all of the thrills and excitement of flying a WW II fighter as a slope glider. The kit features pre-built, pre-sanded component parts ready for your choice of finish; all wood built-up construction, clear vacuum formed canopy and exhaust stacks, complete hardware, and instructions. Span: 50 in., Area: 428 sq. in., Weight: 32 oz., Radio: 2 ch. req'd. A/E

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The Sukhoi SU-26 30 is an aerobatic ARF capable of spins, point rolls, knife edge flight, Lomcevaks, and more. The kit features pre-built, pre-finished EZ component parts ready for final assembly; molded cowl, clear canopy, complete hardware, and instructions. NO building, NO sanding, NO painting...just a few evenings of EZ assembly. Span: 49.5 in., Area: 446 sq. in., Engine: .25-.36 2C/.48 4C, Radio: 4 ch. req'd.

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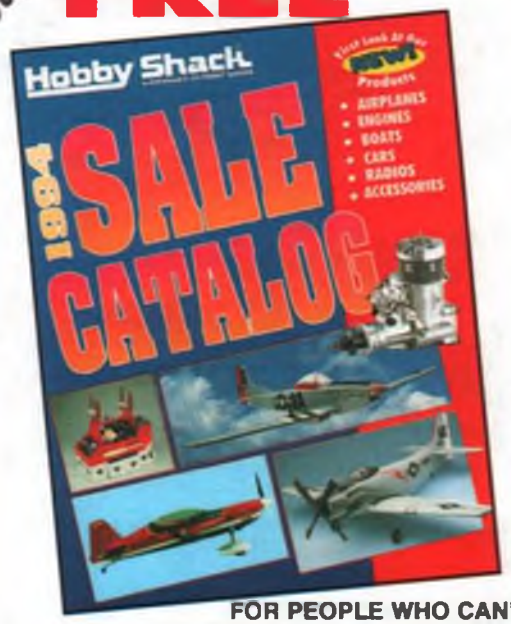

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■ ABOVE: A 3/4 rear view reveals the 12 scale rib stiffeners and the tiny opening in the wing for the pilot's upward view. Also evident is the typical Sopwith gap under the fin for adjusting the horizontal stab's angle of incidence and rigging. ■ RIGHT: The author (right) and his buddy Dave Baron, who has been the test pilot for the Swallow project from the start. Model was originally flown with an Astro 15, then a 25, and is presently flying with a geared Astro 40 running on 18 cells. Loops from level flight are no problem with that much power, and the model easily cruises at half throttle. ■ FAR RIGHT: Disassembled nose section shows many interesting fitting details. The dummy carburetor intake pipe on the fuselage side slides in and out and serves as the electric power system arming switch. Here the geared Astro 40 has been set in place and is waiting to be strapped down securely with rubber bands.

the 1918 Sopwith Swallow

Airdrome's Steven Stratt presents the first of a two-part story on his truly magnificent electric-powered Precision Scale project, deemed "Best Scale Airplane" at the Keystone RC Club's 1992 Fun-Fly, the most prestigious electric meet in the U.S. Full-size plans for the Swallow are available both from Airdrome and Model Builder Plans Service.

Swallow

BY STEVEN L. STRATT

THE SOPWITH SWALLOW *Designed by Steven L. Stratt*	
SCALE	2"=1'
WINGSPAN	60 in.
WING AREA	720 sq. in.
FLYING WEIGHT	104 oz.
WING LOADING	20.8 oz./sq. ft.
POWER	Astro 40 on 18 cells.
RADIO	Four channels required.

Airdrome, an Electric Scale plans service, was founded in the early 1970s when I tired of toothpick-propped, screaming, messy, madly vibrating "gas" jobs that hurtled, jet-like, skyward, jerking spasmodically through totally unscale-like maneuvers!

Like many of my age, my boyhood was largely spent devouring an endless number of 1930s pulp magazines such as *Flying Aces* and *Battle Aces*, building rubber-powered flying models and dreaming of becoming a fighter pilot. For me, WWII made half of this dream come true as I graduated from single-engine advanced, class 43-D, only to be sent as co-pilot in B-17s in the 8th Air Force, winter of 1943. Eventually completing a harrowing combat tour, I never forgot my original desire, or the romanticized memories of the now-antique charm of "sticks, wires and fabric"—WWI's flimsy machines.

Gradually I developed in immense interest in the overnight design and structural evolution of fighting aircraft, focusing on the remarkable pioneering concepts in German aircraft, with the generous assistance given me by Peter M. Grosz, author and historian. Since then I've delved into the "Golden Age" of the '30s and for a while, entrusted my design efforts to monoplanes, always selecting historically significant subjects.

■ ABOVE: Incredible cockpit and Vickers gun detailing on the author's prototype Swallow. He even went so far as to make the pilot's head, stick and rudder bar move with the servos! Many of the detailing techniques used here will be explained in the concluding article next month. ■ LEFT: Dummy radial engine is made up of Williams Brothers Le Rhone cylinders; crankcase is cut out as needed to fit over the Astro motor and gearbox and is held in place with two small screws. Brass plate atop the cowl reads: IN THE EVENT THE PROPELLER OR ENGINE BEING REMOVED, GUNS MUST BE RETIMED.

Empennage details. The steerable tail skid (also scale) goes a long way toward making the Swallow handle well on the ground.

View of the Swallow's nose with the cowl and motor removed. The 18-cell battery pack sits directly under the motor mounting plate and is arranged in an unusual configuration such that three of the cells stick up through the plate just behind the motor.

Typical of Sopwith aircraft, the Swallow used a split-axle landing gear arrangement, duplicated on the model with miniature bungee cord.

This quest for unique early monoplanes suitable for electric power from WWI on up to the Golden Age led to the delightful Sopwith Swallow parasol. Tom Sopwith designated it the "S.635 Sopwith Swallow Monoplane No. 2, 110 hp Clerget (actually a Le Rhone), Experimental—Oct. 1918," since it followed the earlier, rather similar unarmed "Scooter" of July, 1918. This apparent repudiation of the RAF's anti-monoplane bias was probably due to the appearance of the Fokker EVs, later D.VIIIs, in 1918.

Both the Scooter and the Swallow used the standard F.1 Camel fuselage with some modifications to the cockpit position. The Swallow used a Boulton & Paul Serial #B9276 fuselage, and differed mostly from the Scooter by having a greater span and more wing area. Furthermore, its wing was set higher above the fuselage to allow for the installation of twin Vickers guns. They were spaced farther apart than the original Camel and were uncovered, lacking the Camel's hump, probably for better forward visibility. A centered, single ring-and-bead sight was used for this second "military" gunned version.

Both monoplanes had been hastily designed and built, without the sophisticated structural features of the remarkable wooden cantilevered wing of the Fokker D.VIII, and too late for further development to meet late 1918 combat requirements. Nevertheless, the Swallow has a nifty, agile look and the model bears out its WWI aerobatic potential.

The Swallow's thin, cambered, swept wing was built in one piece, without a typical center section, and rested on four cabane struts. Braced on top with four single landing wires on either side, from the apex of a tall pyramidal cabane, it resembled earlier Morane parasols. Underneath, it was braced by twin wires emanating from the top of each undercarriage strut. Additional wing strength was achieved by 12 external top rib stiffeners at the top center. Leading edge false ribs enhanced the airfoils' shape.

I decided to increase the tail surface area and wingspan especially for electric flight; the plans indicate the scale outline. The size difference is hardly noticeable and easily qualifies for sport or stand-off scale competition. A scale-sized tail, plus a full cockpit and scale, closed-loop cable controls, combined with the familiar lethal-looking Camel fuselage, make it a formidable glow-engined precision scale competitor. As a model, it is more stable and less twitchy than its biplane predecessors.

It was decided to replicate the Swallow's earlier appearance with bared metal panels and cowl ring, and mahogany stained plywood panels. You can go a step further and burnish the aluminum surfaces with a typical early Sopwith "swirl" pattern geometrically applied, as seen on many Triplane, 1-1/2 Strutter and Camel photos. Aft of

continued on page 53

BY BILL FORREY

Robbe's Red-Hot 'Calibra' Motorglider

Just because it's labeled a "motorglider" doesn't mean you have to be interested in thermal soaring to thoroughly enjoy this electric. Speed and aerobatics are the Calibra's forté!

The Calibra is one of several very high performance, highly prefabricated electric motorgliders produced in Germany by Robbe Modellsport. It has a span of 2100mm (82 inches) and is designed to handle power systems from 10 to 27 cells. Its controls are simply ailerons, elevator and throttle; a computer radio for mixing spoilerons is strongly recommended.

Robbe actually offers two separate versions of the Calibra. The sport version we built comes with Robbe's exclusive "Plura" molded thermoplastic fuselage and can carry up to 16 cells; the more expensive competition version, for up to 27 cells, is called the Calibra-PRO and features a lightweight epoxy-fiberglass fuselage with removable nose cone. Both versions come from the factory with foam core wings presheeted with ayous veneer. (Ayous looks a lot like obechi.) The ailerons, servo wells and servo lead channels are factory pre-cut. The horizontal stab is sheet balsa with hardwood inserts for the nylon bolts. The vertical fin is molded as part of the fuselage; there is no separate rudder.

With such a level of prefabrication, all that's needed to get the Calibra ready for flight is finish work—join the wings, cut and face the ailerons, glue on the preshaped leading edges, shape the wing and stab tips, install your radio and motor systems, etc. The accompanying photos tell the basic story.

Painting and covering the Calibra takes almost as much time as the construction. Our model's flying surfaces were covered with Goldberg's Ultracote and the fuselage was painted with Coverite's 21st Century

YIPPEE! The Calibra really excels at high-speed maneuvers, and although far from a 1:1 power-to-weight ratio, the ship is very clean and retains energy well enough for big climbing zooms and loops. Photo by John Lapperger.

paint, which we found sticks very well to the Plura plastic fuselage. Just layer it up thinly in three or more coats and it will look great with no orange peel.

The bottom line is, if you can work uninterrupted and can devote some serious "spare" time to the project, you can have a Calibra ready to fly in a week, maybe two at the most, depending on your abilities and free time. When you're done, you will be rewarded with a model that flies very well, is loads of fun, and looks really high-tech!

ROBBE'S CALIBRA MOTORGLIDER

WINGSPAN	82 in.
WING AREA	536 sq. in.
FLYING WEIGHT	70 oz.
WING LOADING	18.8 oz./sq. ft.
OVERALL LENGTH	40 in.
RADIO	Three channels minimum (ailerons, elevator, throttle); fourth channel recommended for spoileron mixing.
SUGGESTED RETAIL	$159.95 (Sport version as tested); $219.95 (PRO version); $156.95 (Calibra-Soft).

Distributed in the U.S. by Robbe Modellsport, 170 Township Line Rd., Belle Mead, NJ 08502; (908) 359-2115.

(Editor's note: For those who like the looks of the Calibra but who aren't sure they're ready for such a high-performance ship, Robbe offers a simpler six-cell version called the "Calibra-Soft," which looks basically the same but has a 72-1/2 inch polyhedral wing and no ailerons. It features the same construction and level of prefabrication as the standard Calibra, and sells for about the same price. Contact Robbe Modellsport for full particulars.)

THE CALIBRA IN COMPETITION

At 598 square inches total surface area (536 for the wing, 62 for the horizontal stab), the Calibra exceeds the required FAI minimum of 550 square inches for the F5B 10-Cell Sportsman class, if you'd like to try your hand at competition. However, if you're really serious about competing, you'd do better to choose the Calibra-PRO, due to its lighter epoxyglass fuselage.

For this review, Robbe furnished one of their top-of-the-line 10-cell cobalt competition motors, the KE 525/4 PRO, along with a Robbe Dynamic-E 10x6 folding prop and Turbo-Spinner. To complete the power system, we used a 10-cell, 1,000-mAH Sanyo SCR battery pack, one of the new Astro Flight Model 205 speed controls, and AFI Zero-Loss connectors. Radio was the relatively new Futaba 7UGFS glider system.

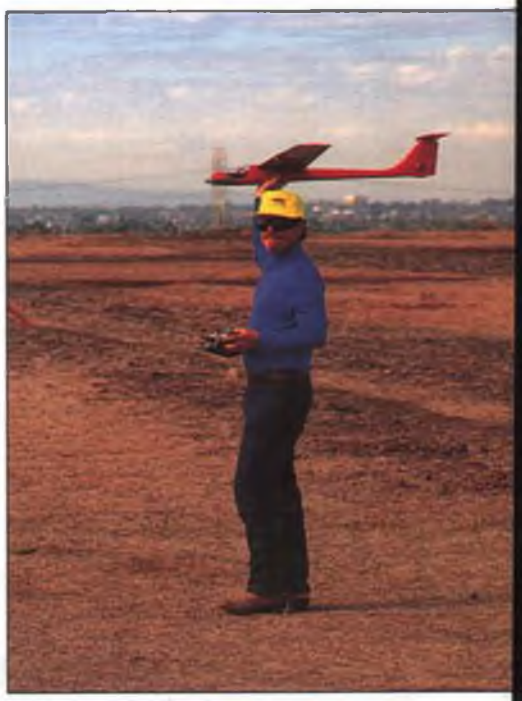
FLIGHT PERFORMANCE

Utilizing the truly superb KE 525/4 cobalt motor and the aforementioned prop and battery combination, our test Calibra is a really hot performer. On the 10x6 Robbe prop, the average accumulated motor run time was 1 minute and 42 seconds using multiple climbs of 15 or 20 seconds each. In 30 seconds our Calibra easily reached 600-700 feet of altitude—roughly twice the height that a good thermal duration sailplane would get on a typical 12-volt winch launch. The 15 to 20-second power bursts were more than adequate for getting back up to thermal hunting or aerobatics altitude.

The Calibra cruises by with the ailerons in the spoileron mode. This is one clean airplane, and with a wing loading of almost 19 ounces per square foot and the very fast HQ 1.5/9 airfoil, it doesn't like to slow down. Spoilerons are an effective way of getting the ship on the ground before it winds up in the next county. John Lupperger photo.

After our first flying session, we learned from the engineers at Robbe that for the very best climb performance with the KE 525/4 PRO motor, we should really be using a 12-1/2x6-1/2 prop—quite a bit bigger than our 10x6. The closest thing we had available was an 11x7 Graupner Scimitar, which we tried the next time out. The rate

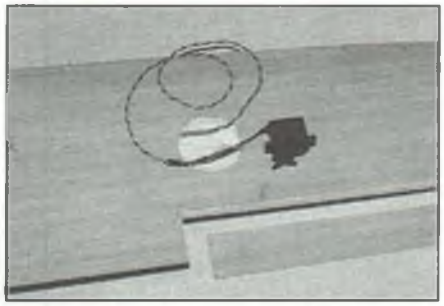
Our author and resident RC Soaring columnist with his latest project. Pretty color scheme is based loosely on the Arizona state flag; flying surfaces are covered with Goldberg Ultracote, fuselage is sprayed with Coverite 21st Century paint. Photo by Bob Slitt.



"Do I really have to do this?" The author, dressed for the occasion with a Robbe cap, about to launch for another exhilarating flight. The "wart" on the fin is a homemade cover (made from a plastic spoon) for the elevator servo arm. Scene is Estancia High School in Costa Mesa, California. Lupperger photo.

High performance electric power systems can build up quite a bit of heat in flight, even when run intermittently for short bursts. It's important that the motor be completely cooled down before going up again. Same goes for the flight batteries before putting them back on charge. A couple of small electric blowers like those seen here can speed up the cooling process alot. Lupperger photo.

The Calibra straight out of the box. As you can see, most of the tedious work is already done for you; what remains is mostly final construction and finish work. All hardware is included. Wings are white foam cores sheeted with ayous veneer, which is similar to obechi. Servo wells and aileron hinge lines come pre-routed.



One really nice touch by the Robbe designers is the silver plastic tube for the aileron servo leads. Bill's servos of choice for this project were Futaba S5102 metal-gear micros. Note that the aileron has been cut loose from the wing and the adjacent edges faced with balsa.

ROBBE'S KE 525/4 PRO MOTOR

A good friend of mine, Bob Sliff, is presently a pilot on the 1994 U.S. F5B team. Two years ago he was the manager for the winning U.S. team. He has been to several international electric meets where truly cutting-edge motor technology was in use. According to Bob, the latest 700-series Robbe PRO motors are equal to the best of the Plettenberg and Astro Flight FAI competition motors, and are going to be tough to beat at the next World Championships.

For the Calibra review, Robbe supplied a KE 525/4 PRO motor, recently developed for 10-cell FAI competition. It's rated for up to 14 volts, or a recommended 10 cells. It can handle up to 70 amps for as long as 30 seconds, but reaches maximum efficiency at 36 amps. The brushes are mounted in machined aluminum heat sink holders to dissipate brush heat. Noise suppression capacitors are mounted on a circuit board inside the motor. Motor length (not counting the shaft) is 2.85 inches, and the maximum case diameter is 1.72 inches. The 5mm motor shaft has a flat ground into it for a set screw type prop adapter. Unloaded, the KE 525/4 reaches 1,150 rpm per volt (11,500 rpm on 10 cells at 1V each).

It doesn't get any better than this. The Robbe KE 525/4 PRO motor was designed specifically for 10-cell FAI competition and is without question as hot as any comparable motor available anywhere. Not inexpen-sive, it is nevertheless extremely powerful and a beautifully crafted piece of work.

An important new feature of the new PRO series motors is the adjustable, elliptical flux ring, which enables the user to tailor the motor's power precisely to suit the model and the prop. Working from the factory set position, the motor can be adjusted by the equivalent of about one wind. For instance, by adjusting the commutator from the factory preset 0 degrees past -3 degrees (medium) and up to -6 degrees (hot), and by setting the flux ring from 0 to 60 degrees, the KE 525/4 can become the equivalent of a KE 525/3 (if there was such a motor) at zero-zero. It's all explained in the motor instructions.

Note that there are no cooling air inlets in the Calibra's fuselage. Cooling air to the motor is supplied by Robbe's unique Turbo-Spinner, which sucks in air and passes it through the specially designed spinner backplate and motor support ring and then through the motor itself. This air flow through the motor is important, as it cools the windings, the magnets and the brushes for optimum performance and long life. It's also important to keep the inside of the motor clean. Flying from a grass field will go a long way toward keeping dirt and other foreign materials from entering the motor through the spinner. ***MB***

Robbe supplies the fiberglass cloth for joining the wing halves, you supply the epoxy—in this case, E-Z Lam from Aerospace Composites was used to good effect. Wax paper wrapped around the wet layup gives a smoother finished surface, which means less sanding required.

of climb with this prop appeared to increase somewhat. Two of the four expert observers present didn't feel the climb was increased, or if it was, not by much. However, as the pilot, I would argue the climb was indeed better. Overall motor run time was shortened by about 20 seconds.

A definite improvement with the larger prop was the model's ability to tolerate more pilot error during the climbout. If allowed to climb too steeply, the model didn't appear to slow down as quickly as with the 10x6. However, forward speed was not noticeably increased, so the wings were not able to contribute additional lift to the increased thrust.

The Calibra features a low-cambered, thin Quabeck airfoil, the HQ 1,5/9; the numbers indicate a 1.5 percent mean camber and 9 percent thickness. Given our test model's flying weight of 70 ounces and wing loading of 18.8 ounces per square foot, it's obvious that what we have here is a fast flying, aerobatically capable aircraft. And that actually describes the Calibra's performance pretty well.

The Calibra can and will slow down to work a thermal, but "slow" is a relative term. Slowed too much, the HQ 1,5/9 wing gains much drag, loses efficiency, and the sink rate increases noticeably. Those who are more practiced and familiar with sailplanes flying at 9-11 ounces per square foot, with 2.5 percent mean camber airfoils and camber changing abilities, would say this airplane works thermals at "fast" speeds. Yes, the Calibra will climb out in moderate to strong lift, but you have to keep the airspeed up to do so.

continued on page 55

PLUG SPARKS

BY JOHN POND

Notes from the SAM Champs

This columnist has been to many SAM Champs—all but the first Bong Field meet—and has to say that for the 1993 meet, Contest Manager Bill Booth, Sr. of the Fresno Gas Model Association did a crackerjack job of seeing to it that everything went smoothly, including getting the field in top shape (for instance, filling in the deep water ditch at the main entrance). Bill went so far as to draw up an excellent map, mostly for the benefit of the free flighters, indicating all the hazards and best routes for retrieving models on a motorbike.

Probably the biggest surprise was the weather over the five days of flying. On the average, the day would start out overcast but with no lack of lift, then burn off at mid-day with resulting stronger thermals. Temperatures never exceeded 75 degrees—much to the relief of everyone who expected better than 85 degrees with those

Good-looking Megow Commander by Arizona's Bob Angus was one of 27 entries in the new Brown Junior RC event.

The only person we know to have ever built a Rassitoodus, Bob Rooman of Springfield, Missouri entered a beautiful Ryan STA in RC 1/2A Texaco Scale.

Nary a SAM Champs goes by that someone doesn't show up with an Earl Stahl Fokker D-VIII for the FF O.T. Scale event; this one flown by SCIFS member Ron Boots. Photo by Mik Mikkelson.

Jerry Rocha (left) and Ed Hamler fly identical AVRO 560s in 1/2A Texaco Scale, placed 1st and 3rd respectively out of 21 entries.

Another Brown Jr. event entry, a really pretty Joe Weathers Mystery Man, also participated in the Concours judging. Not many of these classic ships have been built—probably on account of that complex gull wing arrangement.

Being weighed prior to official flying is Don Blackburn's Folly, a Rod Doyle design that appeared in the 1937 Zaic Yearbook. Took 1st and 3rd in the two Brown Jr. events.

dreaded dust devils periodically ripping through the flying area.

What's more, it actually rained! As luck would have it, on the nights when rain did fall, it was in such light amounts that no visible wet spots could be seen the next morning. This turned out to be a terrific blessing as it kept dust on the field to a minimum.

Best part of all, the wind never picked up to any appreciable degree. This was a real boon for the free flighters, as they were easily able to retrieve their models. In all the years that this writer has been attending meets at Taft, this was, without a doubt, the most pleasurable contest of all. Contest Manager Bill Booth is to be congratulated on arranging such good weather with Jupiter Pluvius.

Everyone who entered and flew in the Taft SAM Champs will agree that FF C.D. Jim Persson and RC C.D. Steve Roselle both did outstanding jobs of organization. The logistics of frequency control were amply handled by Harry Jenks of SAM 51, who was on the job every day for five days. Flying? Needless to say, some pretty terrific times were put in on both sides of the field. Of course, the RC flying was quite prominent due to the large number of models involved in the flyoffs. And those flyoffs were something else! The boys soon discovered where the lift was and a remarkable number of max times were recorded. Most impressive was the RC Class C L.E.R. event, with 17 fliers in the flyoff. Thanks to the perseverance of the AMA's Radio Frequency Committee, we now have 50 distinct channels at our disposal. Imagine, no frequency conflicts, and 17 competitors all flying at the same time! Wotta sight!

The RC events began on Monday, and what better way to lead off the SAM Champs than with unscaled Antique

continued on page 46

One of several Concours entries was this pretty free flight Berkeley American Ace, little brother to Henry Struck's Class C New Ruler.

Bill Booth Sr. (left), this year's SAM Champs Contest Manager, with Bill Cushenberry and his Miss Canada Rubber Cabin model.

Who else but Eut Tileston could tackle an unusual subject like the Waterman Arrowbile and make it fly well enough to place 5th in 1/2A Texaco Scale?

ELECTRONICS CORNER

BYELOY MAREZ

• Building an Intermittent Short Circuit Detector • Silicon-Controlled Rectifiers

You didn't think that just because we goofed up the schematics back in November, we were going to stop printing them, now did you? Well, that's all been taken care of now, and actually there was some benefit to the whole thing, as it let me know how many of you were interested in the subject, and I can follow up on it here and now.

Said material had to do with a latching type of indicator used to trace down those pesky intermittent opens in any electrical circuit. Great, you say, but what about the opposite problem, in that instead of an intermittent open, you have an intermittent short to trace? There is a somewhat similar circuit, built around the same kind of silicon-controlled rectifier (SCR), which does just that.

The Servo Driver JSM from Custom Electronics, a useful tool for testing for proper servo operation and installation. Available with or without connectors.

Refer to the schematic. Simply connect the suspected circuit, whatever it may be, to the test points indicated. Then wiggle, pound or whatever you have to do to make things short out; when they do, even for a fraction of a second, the LED will come on and stay on. After you have eliminated (or think you have eliminated) whatever is causing the short, press the reset button, which is a normally closed switch, to make the LED go out, and retest. For the casual user, the battery can even be made external from whatever enclosure the tester is built into, and simply disconnected to reset things.

SILICON-CONTROLLED RECTIFIERS

SCRs have shown up in two circuits here in EC lately; it must be time for a short discussion on what they are and how they can be put to work.

The SCR is a "thyristor." Or vice versa. Actually, the SCR is a member of a family of semiconductors that go by the name of thyristors, sharing many functions with another family member, the bidirectional triode thyristor, better known as simply a TRIAC. Depending on the actual circuit application, they have somewhat similar characteristics, though SCRs are primarily used in controlling DC currents, while TRIACS are more often found working in AC circuits. Basically, they are both current switching devices, and since their introduction back in the 1950s, they have successfully replaced many electro-mechanical units such as relays, thyratrons, magnetic amplifiers, variable autotransformers, fuses, timers, rheostats, vacuum tubes and even power transistors.

Sounds like a component worth knowing more about, doesn't it? To begin to understand the SCR and its function in a circuit, let's first review another relative, though not one considered to be directly in the thyristor family. It is the common rectifier diode, a very simple two-lead device—refer to the sketch. Basically, we can consider the diode to act as a sort of one-way street to a direct current. When connected to a voltage source, positive to anode, and negative to the cathode, the diode is said to be forward biased and current will flow. If the connections are reversed, the diode is said to be reverse biased and only a very small current will leak through.

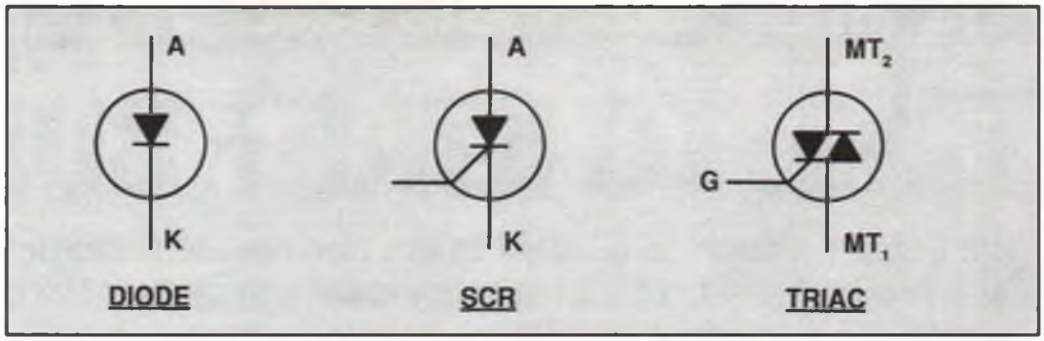
Diodes are rated according to the highest voltage that can be applied safely, the total current they are capable of passing, and in certain applications, forward/reverse bias current difference is a consideration and is referred to as the front-to-back ratio.

Now refer to the sketch of the SCR. Looks kinda like a diode that mutated and grew another leg, doesn't it? In a way, that is exactly what happened; in this case the new leg is a control element, called a gate. Note that we still have an anode and cathode, as in the basic diode, and it acts pretty much in the same manner, except that now the gate allows us to control conduction as desired.

In normal use, the SCR is connected with positive voltage to the anode, negative to the cathode. Initially there will be no conduction. However, if a voltage positive in respect to the cathode is applied to the gate, even for the shortest possible period, the diode will go into conduction. And, most important in many applications, it will stay in that state even upon removal of the gate voltage. The only way to stop conduction is to reduce the anode-to-cathode voltage drastically. Depending on the actual characteristics of the SCR in use, this may have to be almost to zero.

It should now be easy to see how an SCR can be used as a switch, or switching device. Though it may look like a mechanical switch would have to be used anyway to turn that gate voltage on, remember that this gate voltage can be generated by any one of hundreds of ways in solid-state circuits, and the SCR circuitry can be designed to trigger at any desired level. For example, one could hook up an SCR so that when the volume of an automotive stereo reaches a predetermined high level, it would trigger and blow the bloody thing up. I will be glad to furnish such a circuit!

As described (rather simply, I will admit), the SCR is being used to apply or remove a voltage to some other circuit. It is extremely reliable in this application when compared to mechanical switches or relays. SCRs do not wear out, and there are



Similarities—and differences—between three common solid-state devices: a rectifier diode, an SCR, and a TRIAC. Symbols: A—Anode; K—Cathode; G—Gate; MT1 and MT2—Main Terminals 1 and 2. See text for operation and applications.

no contacts to bounce or stick or pit. Additionally, SCRs can be used to vary the amount of average power being applied to a load by simply switching them on and off at a given rate. For example, using a 50/50 ratio of on to off time, the load, whatever it might be, would operate at half power.

The TRIAC has basically the same characteristics as the SCR, except that it can be triggered to conduct in either direction by application of the proper gate signal. Therefore, it is most useful in AC circuits in which as much of the available voltage as possible must be delivered to the load. As you can see from the sketch, the TRIAC looks like two parallel diodes facing in opposite directions. Obviously, when AC is applied, one will conduct during the positive cycle, the other one during the negative cycle.

You probably own more SCRs and TRIACs than you know; one or the other is used to remotely turn on your television, start your automatic coffee maker in the morning, and control the speed of your Dremel Moto-Tool. Great gadgets, huh?

INDUSTRY NEWS

Cannon R/C Systems, formerly Cannon Electronics, manufacturer of what must be the smallest and lightest proportional RC systems available, is not only sporting a new name, but as of October, has relocated in the Las Vegas area. The new address is 2756 N. Green Valley Parkway #405, Henderson, NV 89014; (702) 896-7203. By now, things should be in full swing, with production and service of all previously available Cannon equipment.

The big question from many of you will be: "What about the new smaller, lighter system we have been hearing about for some time?" According to information obtained directly from Bill Cannon just before this was written in early November, he expected to be shipping by the start of the new year. Let's hope Bill's plans all worked out; I know a lot of you small airplane fans have been waiting for the release of this new radio. In the meantime, I'll share whatever news comes my way, and possibly a complete review of the equipment when it does become available.

• • •

Custom Electronics is sporting a brand new address: RR1, Box 123B, Higginsville, MO 64037; (816) 584-6284 or FAX (816) 584-6285. CE produces a line of useful electronic accessories that help make life in RC a bit easier. In addition to bringing you their new address, I have a couple of new Custom Electronics products to tell you about.

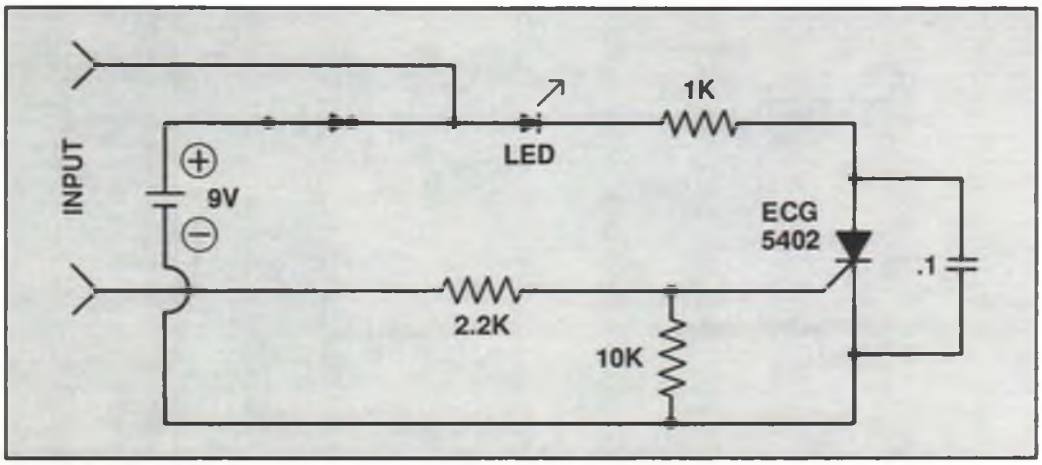
Custom Electronics' receiver-to-servo adapters are available to match most popular receivers and most popular servos without resorting to plug butchering or wire splices.

The CE Universal Radio Adapters allow you to mix and match receivers and servos of different brands. It will make the proper mating between Ace/Deans, Airtronics, Futaba G and J, Hitec, and JR receivers, and Airtronics, Futaba J, Hitec, JR and World Engines servos. The Universal Adapters are approximately 4 inches in length and priced, fully assembled, at $5 each.

Then there is the CE Servo Driver JSM, a handy device you can use to operate the servos in your airplane without your receiver and transmitter. Believe me, this makes servo installation and operational testing easier!

The Servo Driver JSM is self-contained, getting its power from four internal N-size alkaline batteries, or from your airborne NiCd battery if you so desire. It includes a single-axis, spring loaded, center return stick assembly, and both center and throw adjustments so that the stick action can be adjusted to closely simulate that of your transmitter. Also, it contains a 0-400 milliampere meter which measures the current draw of the servo. This will tell you instantly if your servo is operating normally. It will also tell you if your installation is free and clean or if you are putting an unnecessary strain on the servo and seriously increasing its current consumption. Added stresses on the servo can lead to premature servo failure and probably much sooner to another "I ain't got it!" because the battery was unnecessarily discharged.

The CE Servo Driver JSM is priced at $49.95 without connectors or $54.95 with two CE Universal Connectors. All CE products are available through major hobby shops, Ace R/C, or direct from the address given. ***MB***



A companion to the open circuit detector described (but with the wrong schematic) in the November issue and corrected in the January issue, this SCR circuit can detect intermittent short circuits lasting only microseconds. A handy troubleshooting aid!

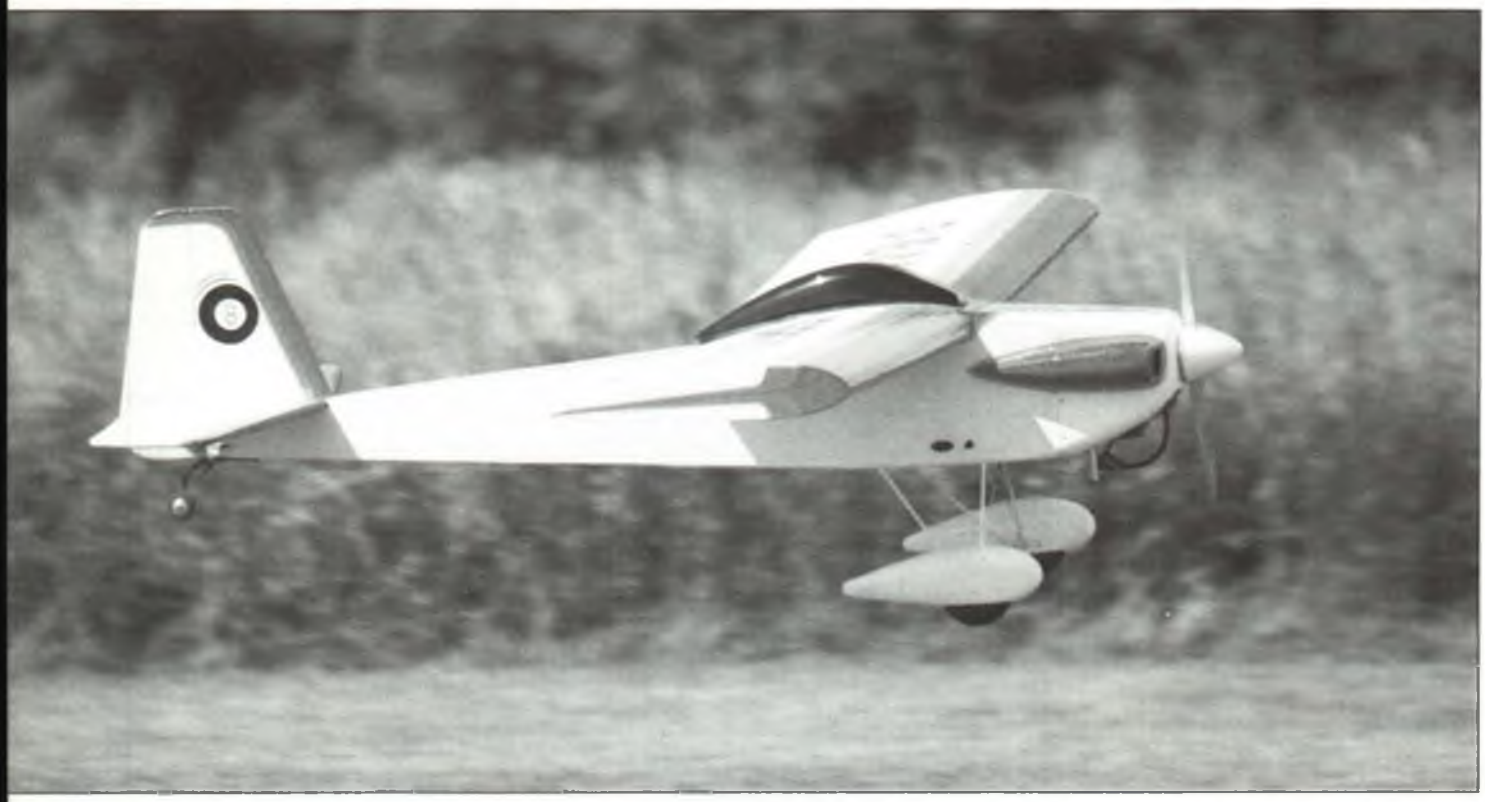
TIME TO START BUILDING!

The list of products of interest to Big Bird devotees continues to grow. Here are just a few that have crossed our columnist's desk over the past couple of months.

A lot of interesting things are happening around the Big Bird hangar as the 1994 flying season looms ahead and I progress through my winter building mode. Several new Big Bird items have arrived at my shop, many of which will help you with your latest projects. Let's take a look at some of the new stuff out there.

• **Robart Manufacturing** supplies several useful tools and equipment for Big Bird use, one of which is their Model Incidence Meter, a precision instrument with a jeweled movement and an anti-parallax scale. The pointer is centered at zero and there is a 10-degree scale on either side of zero. Two sliding swivel attachments let you attach the device to your wing, horizontal stabilizer or firewall. It can also be used to set the fuselage datum line at zero prior to checking the wing and tail incidence.

The incidence meter is supplied with an 18-inch aluminum bar, which often proves to be too small for our large planes. Robart's Tom Walker tells me that they can supply a separate 36-inch bar on request; the price is $10 and the part number is 404029M. The 36-inch bar should allow you to achieve the correct incidence of the flight surfaces on



■ **ABOVE: Dave Reid sent this photo of his latest Big Bird, the "8 Ball Special," being kitted by his company, Reid's Quality Model Products. Columnist Bruce Edwards got hold of one and is in the process of putting it together for an upcoming review article. The ship has an 85-inch wingspan and uses a G-38 or O-42 for power.**
■ **RIGHT: Dry Ridge Models' J-3 Kitten (pictured) and its hangar mate, the J-4 Sportster, are large scale models that don't require a lot of power. Both are excellent trainers for the fledgling Big Bird pilot who wants to start out with a scale ship.**

any of the Big Bird models currently available. Order yours from Robart Manufacturing, P.O. Box 1247, St. Charles, IL 60174.

• **If you're looking** for a new project, give Bob Holman's plans and kits some consideration. Bob sent me a catalog of his entire line of scale planes; many are 1/4 or 1/3 scale. I've looked closely at some of Bob's kits at the Northwest Model Expo. They are excellent quality with outstanding wood and fiberglass work.

One of the most interesting of the kits is an import from England, a 1/3-scale Tiger Moth designed to use Mick Reeves' Torquemaster belt reduction drive. Included are over 400 pre-formed metal brackets, which at least partly explains the kit price of something on the order of $1500. The finished product should be extremely accurate; kit designer Ian Castle owns two full-size Tiger Moths.

Bob offers five separate plan and kit catalogs, ranging in price from $4 to $6 each. Write to Bob Holman Plans, P.O. Box 741, San Bernadino, CA 92402, or call (909) 885-3959 for ordering information.

• **Need documentation** for your present scale project or some future project? Look no further than Bob Banka's latest Scale Aircraft Documentation and Resource Guide. Listed are more than 5,000 different color Foto-Paaks (800 alone were added last year) and over 22,000 three-view drawings.

I was visiting Bob's booth at the 1993 Northwest Model Exposition and asked him if he had ever come across any three-view drawings of the Whitworth Whitley. In less than a minute, Bob handed me an 11x17-inch drawing and an 8-1/2x11-inch specification sheet. I thought that was a darn good effort on Bob's part, as the Whitley is not the best-known plane in aviation circles.

The 1994 Scale Aircraft Documentation and Resource Guide is available for $5 from Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626. You can also order over the phone by calling Bob at (714) 979-8058.

• **Some folks** who have never flown RC planes of any kind decide they want to give the hobby a try and want to get involved with Big Birds. Many of them insist on starting out with a scale model or one that looks much like a full-size aircraft. Unfortunately, there aren't many Big Bird trainers on the market. And scale planes, even some of the less complicated designs, are usually a handful.

Bill Pottage builds very nice models. his most recent being this pretty 1/3-scale J-3 Cub from the Balsa USA kit. Engine is a Quadra 52, which flies the 32-pound plane very realistically.

However, two planes I can recommend to the newcomer that are simple and scale are Dry Ridge Models' J-3 Kitten and J-4 Sportster. Both are 1/3-scale models of full-size ultralight aircraft and are offered by Dry Ridge in plans form only. The J-3 Kitten has a 120-inch wingspan and weighs only 13 pounds. Wing loading is 16 ounces per square foot. Recommended engines are a .61-.90 two-stroke or .90-1.20 four-stroke. If you wish to try electric, an Astro Flight Cobalt 60 on 28 cells would also power the two models adequately. I have recommended these planes to a number of Big Bird novices and those that gave them a try have been very satisfied with the results.

I've looked over the J-3 Kitten and J-4 Sportster plans and they seem easy to follow. The construction handbook is well written and should be helpful to a total novice. Emil Agosta, owner of Dry Ridge Models, will be more than happy to assist you if you correspond with him at Dry Ridge Models, 59 McMurray Rd., Weaverville, NC 28787; (704) 658-2663.

• **Should you like** either of the above-mentioned Dry Ridge models but don't want to do all of the parts cutting yourself, there's an alternative way to go. Doug McMillan, owner of All-American Kit Cutters, informs me that his company would have no trouble cutting a kit from Dry Ridge Models' J-3 Kitten or J-4 Sportster plans. You can contact Doug at All-American Kit Cutters, 365 Dutch Neck Rd., Highstown, NJ 08520; (609) 443-3175. A self-addressed, stamped envelope is necessary for written correspondence.

• **Another source of kits** made from plans is a gentleman by the name of Joe Grasso. Joe was recommended to me by Chuck Gill, owner of The Aeroplane Works. For more information, contact Joe Grasso, 221 Fox Hollow Rd., Glen Gardner, NJ 08826; (908) 638-6902.

• **Fiberglass wheel pants** and cowls for Dry Ridge's J-3 Kitten and J-4 Sportster are available from Fiberglass Master Inc. I've seen several examples of their glasswork; the parts are sturdy and well made, with few pinholes to fill. A complete catalog can be had by sending a buck to Fiberglass Master, Inc., Rt. 1 Box 530, Goodview, VA 24095, or call (703) 890-6017.

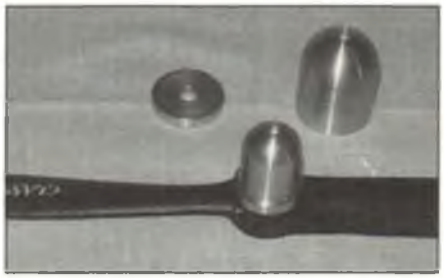
Bob Holman is the U.S. agent for this exact (and *very* expensive) 1/3-scale Tiger Moth, kitted in England by Ian Castle.

•**The 8 Ball Special** is the latest kit from Dave Reid, who operates Reid's Quality Model Products. The plane is an 85-inch span sport model that uses a Zenoah G-38, Quadra 42 or one of the large twin four-stroke engines over 2.3 cubic inches. I appreciate the fact that Dave doesn't call his big sport ship a "giant scale" model. All too often, anything big has the word "scale" attached to its title or description, whether it deserves it or not.

Dave asked if I would care to do a review on the 8 Ball Special, and of course I was happy to oblige him. The kit arrived about a week later and I was quite impressed with the nicely cut foam wings and the quality of the wood. Included also are a bent sheet aluminum landing gear and a Fiberglass Master cowl. The 8 Ball Special will normally sell for $249.95 but is available for a limited time at an introductory price of $199.95, from Reid's Quality Model Products, 16 Main St., Phelps, NY 14532-0144; (315) 548-3779.

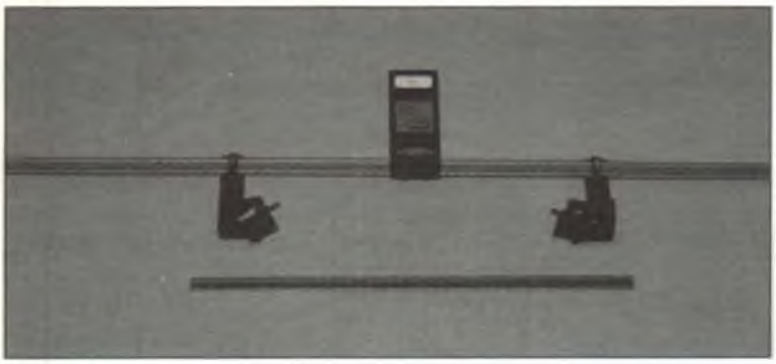
•**There have been** occasions when I would have liked a spinner on my plane that was just about the size of the propeller hub—something similar to a P-47 or AT-6 spinner. There hasn't been much available in the past except solid aluminum nuts that were usually too small for our purposes.

However, Tru-Turn Precision Model Products now manufactures hollow machined aluminum prop hubs in sizes that we Big Bird fliers need. Two examples that arrived at the Big Bird hangar were the "A" style (flanged at the base, pictured sitting on a Master Airscrew prop) in 1-1/4 inch diameter and a 1-3/4 inch "B" style (straight sides). Unlike spinners, these prop hubs are meant to sit flat on the face of the prop. Like all Tru-Turn products, these are machined from aluminum bar stock and are of Tru-Turn's usual high quality.



Here a Master Airscrew Classic series propeller has its appearance enhanced with one of Tru-Turn's new aluminum propeller hubs. Two sizes and styles are shown—see text.

For more information, call or write Romco Mfg. Inc., P.O. Box 836, South Houston, TX 77587; (713) 943-1567.



For those who need the extra length, Robart Manufacturing can supply a 36-inch bar for their Model Incidence Meter. The short 18-inch bar (short for some Big Birds, that is) is original equipment.

THE SIGN-OFF

I'd still like to know what the Big Bird pilots are doing in your area. Photos are always welcome. If you have a particular subject you would care to see discussed here, please let me know. Often I am able to devote an entire column to a subject that is of general interest to other Big Bird builders and pilots. ***MB***

ELECTRIC FLIGHT from Hobby Lobby

Sale price until April 1, 1994!

A. MT2001 **Alto Electric A-R-F** **$127.00**
73" span for aileron, elevator, motor control. Slopes, thermals, aerobatics! Fully built and covered.

B. GR4280 **Biene Elektro Sailplane** **$189.00**
Ready built! 63" span, superb thermal soarer.

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D. GR4264 **ASW 22 B270 Electric Sailplane** **$219.00**
105" wing span, magnificent plastic body, balsa sheeted foam wing sailplane for the inexpensive GR1165 drive unit.

E. NL001 **Hughes 500 Electric Helicopter** **$189.00**
34" rotor diameter. Great trainer. Also available in a partially assembled kit for $269. This has mechanical parts in operating form and broken in.

F. HLA130 **Freshman Electric Sailplane** . . . . . **$39.00 — SALE! $29.00**
72" span balsa kit, 3 channel very easy flyer for GR297 Graupner Drive System.

G. MID169 Midwest **Electric 'HOTS' Basic Kit,** List $69.95 . . . . . **SALE! $19.00**
41" span, for SPEED 600 motor or .10 gas engine. Aerobatic 4 channel easy-to-build balsa kit is a great performer! When you order "Hots" ask for our special prices on electric flight and radio installations. **Limited Quantity. Please order by phone to assure delivery. No backorders when sold out!**

H. HLA131 **Graduate Electric Sailplane** . . . . . **SALE! $49.00**
Balsa kit, majestic 96" wingspan soarer. For rudder, elevator, throttle control, ailerons optional. Use GR1165 drive system. On our Video 3.

J. HLDS002 **Skimmer Electric Sailplane** **$48.00**
70" span conventional balsa kit for rudder, elevator, motor control. **Guaranteed** to get to thermal height.

K. HLBW001 **PS Flyer Electric** **$39.90**
79" span balsa kit, for 3 channels, very gentle flyer. Use our 3:1 Gear box with motor GR179530 and our big lightweight folding prop GR2870.

L. NEW! HLV001 **Raptor Electric Boosted Sailplane**
Raptor's price and performance are revolutionary! Call Hobby Lobby for FREE CATALOG 23 which has complete description of this highly prefabbed fiberglass sailplane. Call (615) 373-1444.

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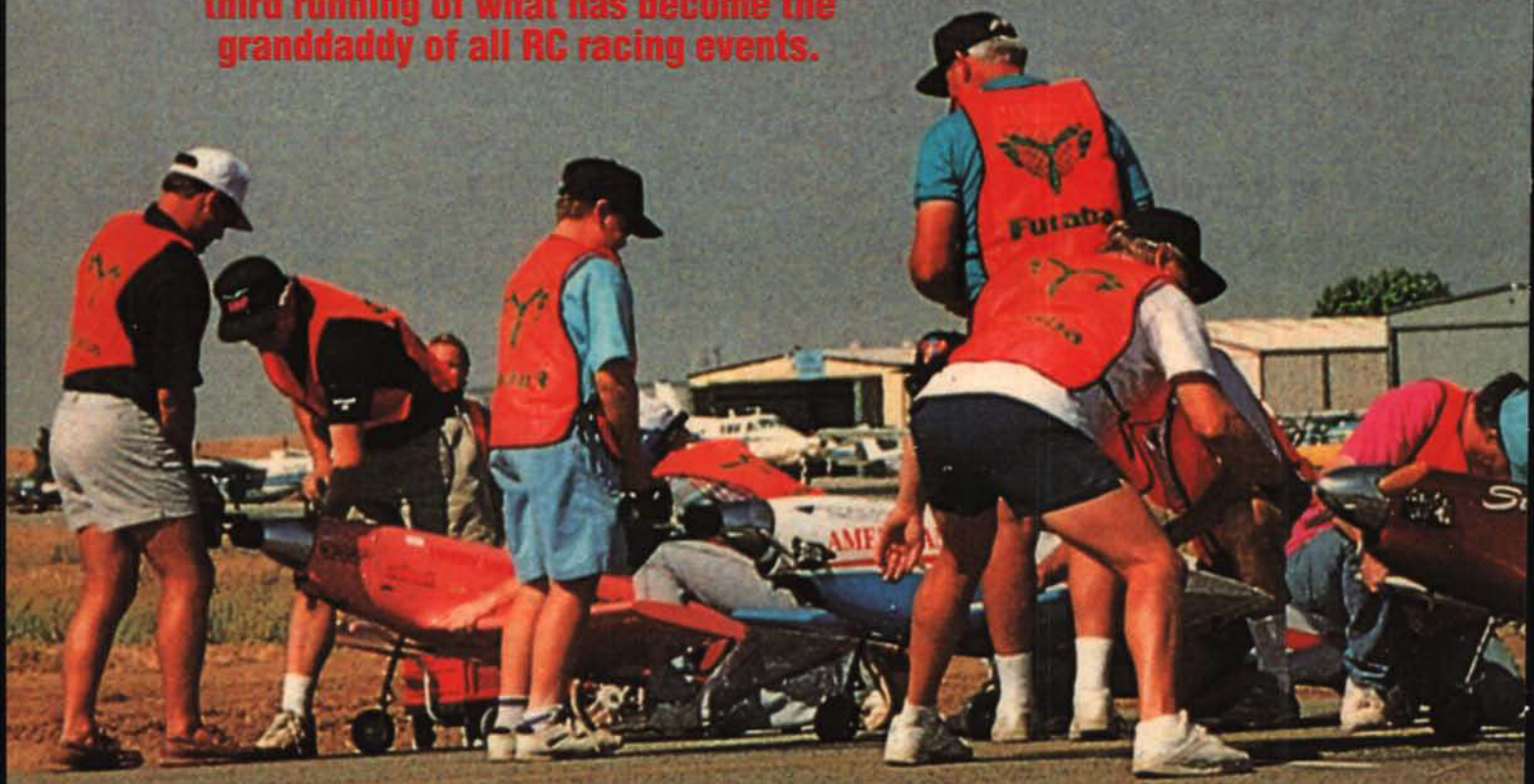
One of the M&K (Miller/Krohn) Racing Team entries, the Lancair IV flown by Kent KcKenna to 1st place in the Unlimited Gold Class. Powered by an Aerrow 200 engine (used by several contestants), the sleek racer qualified at 154.07 mph.

Madera racers are colorful, to say the least, and often the paint scheme is extended to entries in both classes—witness the colors of the Excalibur Race Team, from Sacramento, California.

Bigger and better than ever, Unlimited RC racing is definitely here to stay! This was the third running of what has become the granddaddy of all RC racing events.



The 1993 Madera Unlimited RC Air Races

Formula One racers in 42 percent scale will have a class of their own in '94; this one was used as a pace plane at Madera.

Well-known scale builder/flier Dennis Crooks didn't fare too well this weekend, but redeemed himself by winning the prestigious Scalemasters two weeks later.

BY ELOY MAREZ

On the starting line, four Unlimited Class racers await the signal for engine start. These large aircraft require much in the way of support equipment and pit crew.

Chip Hyde, one of JR Propo's team fliers, flew his Horndog Aircraft kit T-6 as well as he flies everything else and is seen here headed for No. 1 pylon.

Another well-known scale builder/flier, Diego Lopez, with his Duckwoods T-6, seen here with teammate Eric Thornton and a 12"=1' "Terrible Six," as they were known to some.

Muffled engines have become a way of life at many of our flying fields. Electric powered airplanes have definitely arrived, and the sailplane does have an unmatched grace while in flight. But there is nothing that excites the true airplane aficionado as does the sound of a racing mill—BIG iron in this case—completing a tight pylon turn and winding up, into the straightaway. And it's just this kind of sound and for this kind of action that the internationally attended Madera Unlimited RC Air Race has become a "must" event for racers and spectators alike. This year, the third such event, a reported 8,500 spectators came to watch a couple of hundred racers vie for over $15,000 in prize money, at speeds in excess of 150 mph.

The Unlimited is staged and operated by an organization named Endless Horizons, Inc., in the persons of Lesley Burnett and Nancy Bridi. While readily admitting that they themselves are not RCers, these two ladies do possess extensive business and supervisory training and experience, and have assembled a highly qualified group of expert RC fliers and industry leaders to assist them in all aspects of race operation. This includes a thorough technical and safety inspection of the aircraft and its control equipment to assure complete compliance with all of the published rules.

Two types of airplanes are flown, the most popular being the T-6 Class, which many competitors consider as an entry class into the faster Unlimiteds. The T-6s flown at Madera are 1/5-scale, with a wingspan of 101 inches. The only allowable engine is the Zenoah G-62, in stock configuration. This engine has a displacement of 3.78 cubic inches and is rated at 4.7 hp at 7,000 rpm. Minimum and maximum aircraft weight is 25 and 55 pounds (wet) respectively. Props (APC 22x10) and fuel (88 octane gasoline with 3 percent Klotz KL-310 oil) are furnished by the race organization.

After pre-race qualifications, only the top 40 entrants actually race, the fastest 20 flying as the Gold Class, the others being classified in the Silver Class. This year, T-6 pilots from the U.S., Mexico, Canada and Europe tangled in this highly competitive class.

The "Right Stuff" class of the Madera race is definitely Unlimited, with few aircraft and/or engine restrictions. The rules specify that the model must be of an aircraft that has qualified at the Reno National Air Races, with 100-inch minimum wingspan for a single-engine airplane and the Pond Racer; 122 inches for an A-26, and 112 for a P-38 or F7F. Maximum engine weight for single-engine aircraft is 14 pounds; for twins, 8 pounds each. All-up (wet) weight cannot exceed 55 pounds.

Thirty airplanes are selected after qualification flights, with 10 each in Gold, Silver and Bronze classes, as determined by their course speeds.

Qualification is based on the time required to fly two consecutive laps. Two or

1993 MADERA WINNERS

(The last figures listed are the number of points accumulated and the qualifying speeds in mph)

T-6 SILVER

1. Norbert Gruntjens, Germany: 46/102.22
2. Bruce Brown, San Diego, CA: 44/104.71
3. Don Moden, Salina, KS: 43/102.72

T-6 GOLD

1. Mike Adams, Pomona, CA: 43/110.21
2. Gary Hover, Caruthers, CA: 46/108.53
3. Fred French, Round Rock, TX: 42/109.47

UNLIMITED BRONZE

1. John Lockwood, Clovis, CA: 33/118.77
2. Bill Hempel, Tucson, AZ: 43/118.93
3. Cliff Adams, Pomona, CA: 36/120.48

UNLIMITED SILVER

1. Daniel Gray, Santa Paula, CA: 46/136.05
2. Paul Curley, Phoenix, AZ: 42/123.36
3. Duke Crow, Kingman, AZ: 34/131.84

UNLIMITED GOLD

1. Kent McKenna, Lakewood, CA: 36/154.07
2. Mike Heisel, Downey, CA: 46/139.70
3. Jeff Nickerson, Tucson, AZ: 29/141.99

The M&K (Miller/Krohn) Racing Team's Unlimited entry, a Hawker Sea Fury, was flown by Formula One flier Mike Heisel to a 2nd place win in the Unlimited Gold class. Qualified at just under 140 mph.

With Halloween only a couple of weeks after Madera, the nose art on Bob McClang's P-40 was right in character. The rest of the airplane is just as flawlessly finished.

three timers are used and the results averaged. Due to the large number of entries, two or three aircraft are timed at once, and a strict procedure with specified launch times has to be followed. Those that aren't fast enough to qualify may opt to remain in a backup status, referred to as the Medallion Class, and may replace a qualified racer who has to drop out for whatever reason.

The actual racing is done in four-aircraft heats, six laps, and using an air start. As in full-scale aircraft racing, a pace plane is used, with the four racers positioning themselves above and behind. When all are in position, the pace plane pulls away, it's "Gentlemen, you have a race"—and the excitement begins! Heat winners are determined by finish position; heat times are not a factor. The 1st through 4th place finishers are awarded 10 to 7 points respectively, with 2 additional points for completing the race. Thus, 12 is the maximum points possible to be won in each heat. Pylon cuts cost

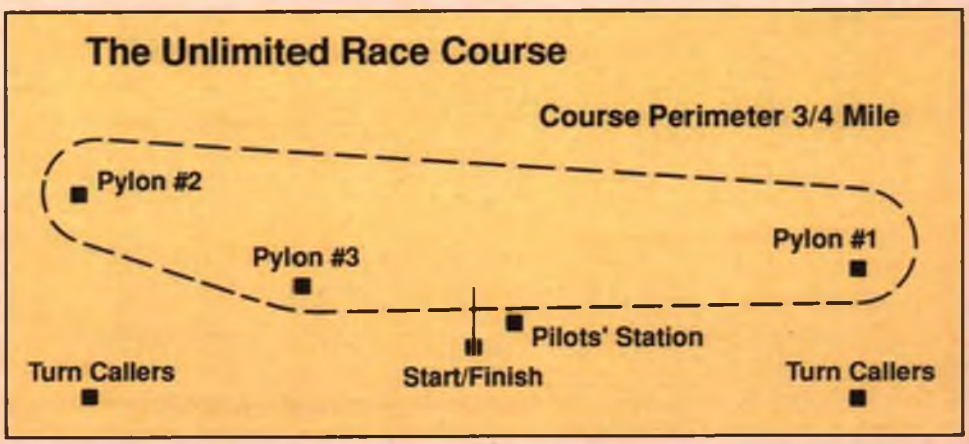
Viva Mexico! The team drove from far-off Culiacan, Sinaloa to compete at Madera. RC airplane racing of all classes is very popular with our southern neighbors.

The Red Dog Saloon, in Juneau, Alaska, is one of The Unlimited's sponsors, and annually sends its own race team. They must really enjoy California's warmth and sunshine!

An example of one team's effort seen at Madera—the all-yellow Braun Racing Team, all the way from Indiana with 17 team members, seven airplanes, motorhome, trailer workshop, etc.!

These valuable airplanes have to be protected from the elements; this clever folding hangar is available from the Tarp Shop, 4752 Felspar, Unit 102, Riverside, CA 92509.

An example of the type of facilities used at Madera—a radar speed gun provides instant display of the models' speed as they fly the course.



1 point for the first cut, 2 for the second, and three cuts earns you nothing, though 2 points are still awarded if you finish the heat.

Up to this point, its been mostly fun! But now things begin to get serious, as the top five aircraft in each class are advanced to the Trophy Race. This is IT, what the whole weekend has been about, and the excitement is high, with everyone pulling for their particular favorite airplane and/or pilot. Five Trophy Races are flown, one each T-6 Gold and Silver, and one each Unlimited Gold, Silver and Bronze.

The Trophy Race deviates slightly from the normal procedures in that five airplanes race, and two standbys, the ones with the next highest accumulated points, are in place to fill in should one of the chosen five abort for some reason. Race winner is determined by finish position, with a cut resulting in a one-position finish penalty. The Unlimited RC Air Race is, without a doubt, RC flying at its most challenging and exciting, not only for the competitors but for us spectators.

There is always a big "Why?" involved in an event of this type. Why risk all that money, time and effort, when it can all go down the tubes in a millisecond? As an ex-racer, I know these feelings all too well, but I know also the rewards, the gut-filling satisfaction that can come from taking on a difficult task and proving to yourself that you can do it well. The Madera racers are not there for the money, in spite of the smiles you see with those BIG checks. They are there because they are doers, those not content to be watchers. The wimps can and do watch others do things, they can keep their television sets—the doers go to the edge and LIVE.

This year there will be a new addition, in the form of Formula One Racing, with airplanes similar to the one in the photo being used as a pace plane. They must be models of full-size Formula One, Goodyear-type aircraft, scaled at 42 percent. The results will be airplanes of 80 to 100 inch span. Other requirements are still being formulated; those interested are advised to contact race officials for complete information.

An event such as the Madera Unlimited cannot take place without industry sponsorship, at least not at this grand scale. There are too many to mention here, but first and foremost is Pacer Technology, makers of ZAP cyanoacrylate adhesives and related "sticky" products that many of us use. Pacer also sponsors other prestigious RC events such as Top Gun and the Scalemasters. Major events such as these lead to many of the products that ultimately trickle down to all fliers, and we owe all of these sponsors a vote of thanks.

All matters related to, and definitely your entry to the '94 Unlimited, should be addressed to: The Unlimited, P.O. Box X, Torrance, CA 90507; (310) 320-8369; FAX (310) 320-8354. **MB**

FREE FLIGHT

BY BOB STALICK

The Return of Old Friends

Chuck Gode displays the subject of this month's full-size centerspread plan, the .010-powered 1/8A Spacer. Model placed 6th in the recent *Model Builder* MiniPower Postal Contest.

Long-time SoCal free flighter and one of the fathers of the National Free Flight Society, Vic Cunnyngham (left), holding a new Space Rod X. Fellow on the left is Richard Hanson, the District X AMA Vice-President. Photo by C.O. Wright Jr.

It's time to get reacquainted with some old friends. These are the folks you used to fly with and talk to at contests, folks you got to know well. Then, inexplicably, they just stopped coming around. You learned that they moved to another state or just stopped flying or became interested in other pursuits.

But the free flight bug never dies. One day a familiar figure appears at the field. A little less hair, perhaps. Maybe gray at the temples. Maybe a few pounds heavier. But it's him, all right. No model in hand, but after some conversation, he tells you that all of his airplanes are home in the garage—stored in the same boxes they were in when he stopped competing, maybe 10 or 20 years ago.

Seems that just a few days earlier he had stopped in at a hobby shop, heard about the contest and decided to come out and see what's going on. Soon he begins talking about his flying days. At the next meet, he shows up with a couple of his models—built during the Nostalgia period. *True* Nostalgia models.

These are the kinds of fellows you will meet this month. A couple of folks from the free flight past.

• • •

In October I used the Tow-Hi towline glider by Gerald Zeigenfuse as the Mystery Model. After the magazine appeared, I got a very nice letter from Gerald, who noted: "I am very pleased to see that I finally hit the big time. One of my designs made your Mystery Model list." Gerry went on to tell about his recent travels to the Cuckoo Challenge, where he found that Bill Saunders had kitted Gerry's Pogo design and was having a Pogo contest. Gerry competed with his original Atwood powered ship along with his son, Bob, and good buddy, Dan Kranis.

Gerry writes that he still does some flying, but not much free flight, due to the lack of a flying site in his area. He keeps his hand in the hobby with RC sailplanes and made LSF Level 5 (the highest attainable) in 1981.

Gerry noted that the Tow-Hi was a very successful model in the hands of his son, Bob, and placed 3rd at the 1980 Nats. The Tow-Hi was also enlarged to A-2 specifications where it was a colossal dud.

• • •

About 20 years ago, Dan Sobala moved from my area up to Portland, Oregon. From then on, competition in AMA gas events around here became much more predictable. Dan usually won 1st, the rest of us ending up farther down on the list. Then, after some eye problems and a change of hobbies, Dan gradually disappeared from the contest scene.

But then he reappeared in 1993 complete with his old models, and it's as though he never left. The Nostalgia-era Geefs and Zeeks were brought out and flown in Nostalgia and AMA Gas. Dan was involved in the flyoff for A Gas and ended up in 2nd place to Bruce Augustus, who was flying his Northern Light

.010 CONSTRUCTION FEATURE: CHUCK GODE'S 1/8A SPACER

When the *Model Builder* MiniPower postal event was in the talking stage, a number of local free flighters came up with their own .010 designs. Fellow WMC member Chuck Gode (known locally as "Lucky Chucky"), who has a love affair with Taibi's Spacer, decided that he would do one with a 100 square inch wing. Complete full-size plans for the model appear on the following two pages. Construction is very basic, so no construction notes are needed here. Just be sure to build it light!

A couple of flight trimming tips for you:

1. The model is best trimmed to fly right power and right glide. To do so, build in a very slight amount (1/16 inch) of wash-in on the right main wing panel. After covering the wing, double check this wash-in to make certain it is unchanged.

2. Check the balance—it should be as shown on the plans.

3. Tilt the stabilizer so that the right side is about 1/2 inch higher than the left side (looking from the back of the model).

4. Test glide the finished model after the above adjustments are completed. It should glide slightly to the right without a hint of a stall or dive. If it doesn't turn to the right, add more stab tilt. If it dives, add a shim under the trailing edge of the stab. If it stalls, shim up the leading edge of the stab.

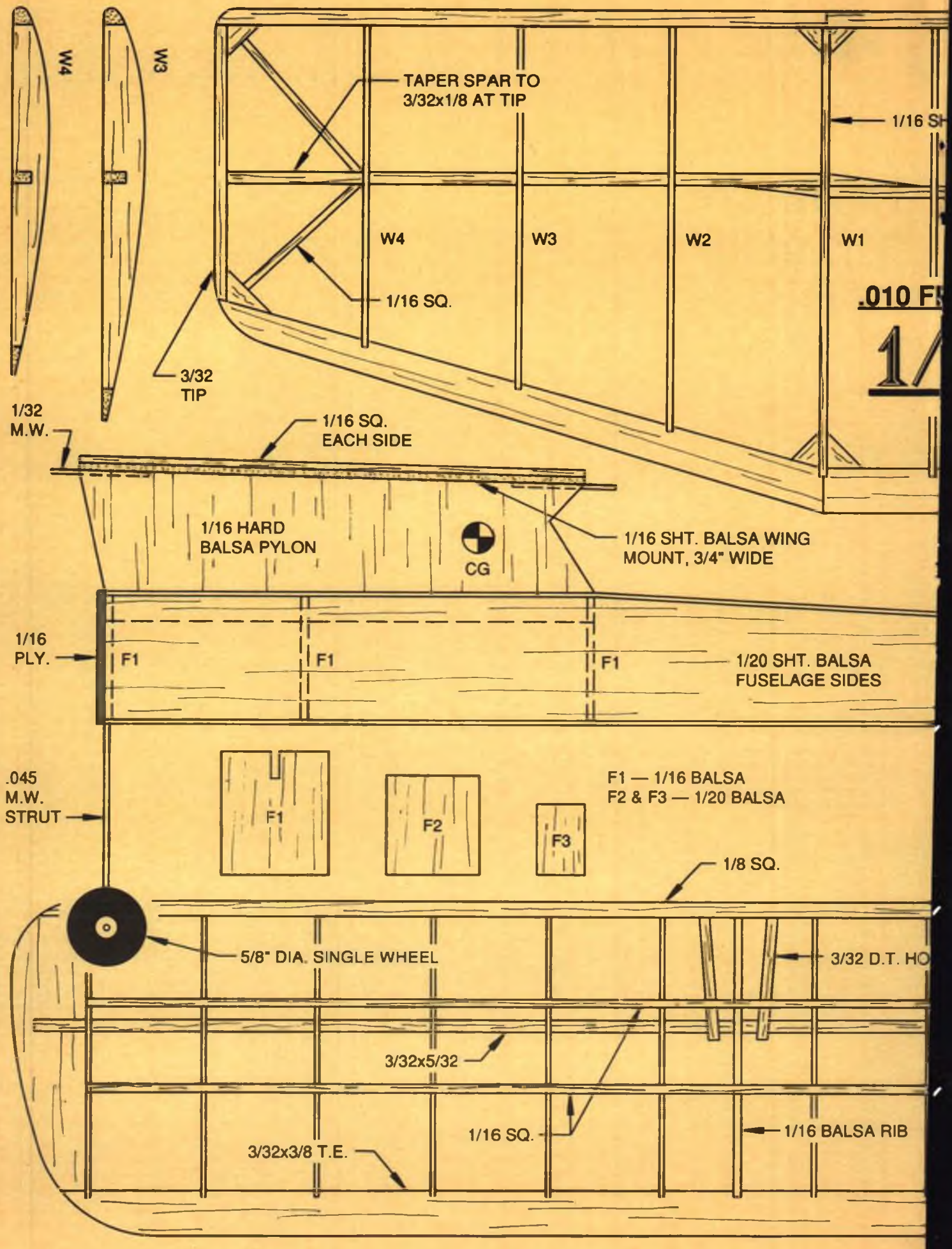
5. When you're satisfied with the glide, it's time for a test flight. My suggestion is that you use an eyedropper fuel tank mounted in a slot just behind the firewall on the left side of the fuselage.

6. Start the engine and launch the model with only 2 or 3 seconds of engine run. The model should climb gently to the right. Add engine run time until you get a safe pattern to the right for the full 10 seconds of engine run. If the model turns too tightly to the right, add left thrust to the engine. If the model doesn't turn at all or turns to the left, add right thrust.

7. If the model climbs well immediately after launch but doesn't continue its right turn toward the end of the power run, make adjustments with the rudder tab.

8. The Spacer is a good flying ship, even though at 100 square inches it's a bit larger than the typical .010 model. It climbs well and has an exceptional glide. With this big a wing, it also stays in sight a bit longer than the smaller ships.

Build it light, trim it out before your next contest and fly the wings off of it. Don't forget to set up the ship with a DT system—these little beasts thermal easily and can disappear in no time. I've lost two .010 models in just two summers by not installing a proper DT. ***MB***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BALSA PYLON
CG
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MOUNT, 3/4" WIDE
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PLY.
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1/20 SHT. BALSA
FUSELAGE SIDES
.045
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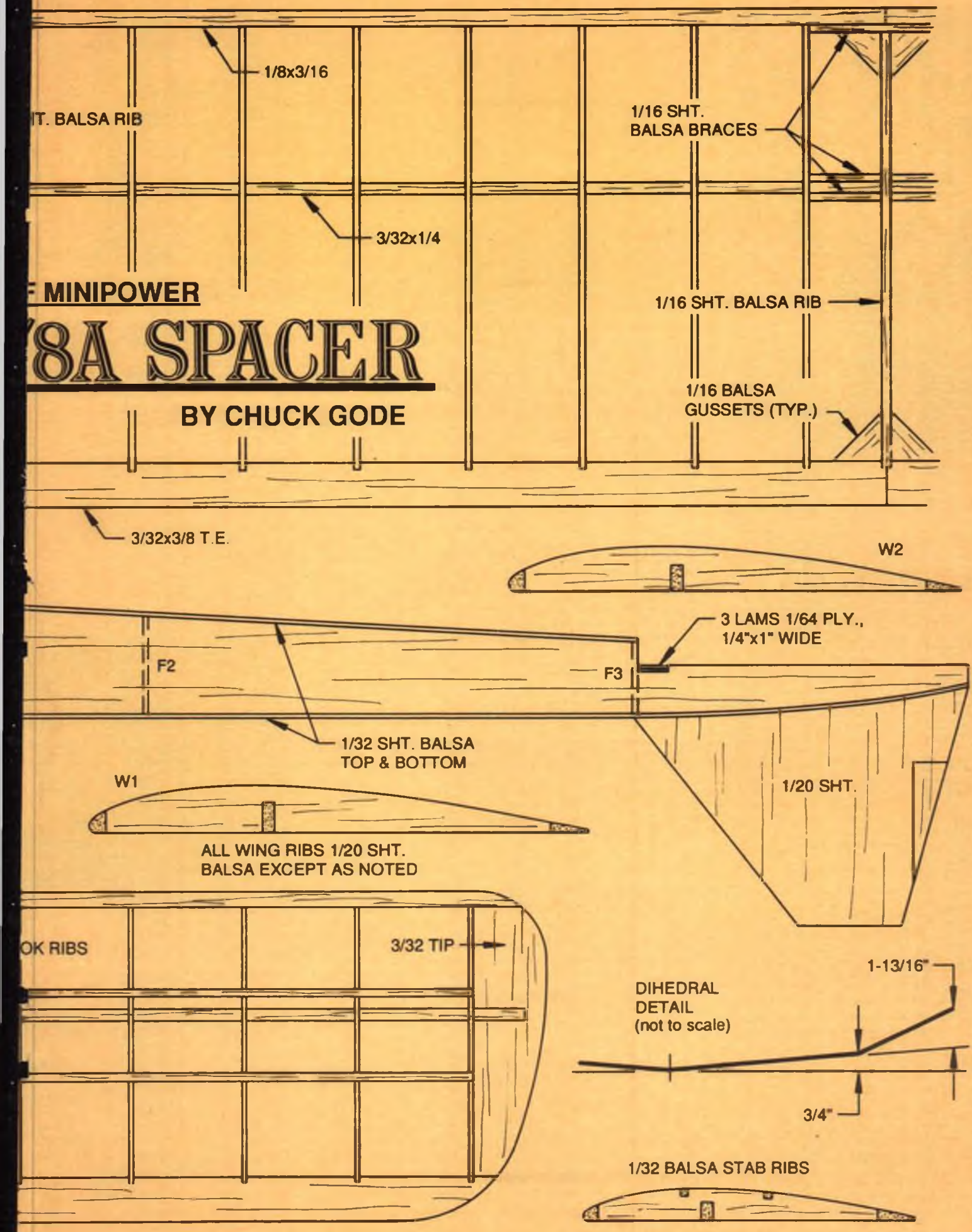
STRUT
F1
F2
F3
F1 — 1/16 BALSA
F2 & F3 — 1/20 BALSA
1/8 SQ.
5/8" DIA. SINGLE WHEEL
3/32 D.T. HO
3/32x5/32
1/16 SQ.
1/16 BALSA RIB
3/32x3/8 T.E.



F MINIPOWER

'8A SPACER

BY CHUCK GODE

Ed Lamb showed up at a recent WMC contest with a brand new Modelcraft Spook 72 complete with an Ohlsson .60. Just a month later, Ed won the Concours d'Elegance award at the 1993 SAM Champs in Taft, California with this same ship.

F1J model with an A.D. engine. Dan was flying his original Geef, built in the late 1950s and now powered by a Cox Tee Dee .15 Special.

Dan showed up at our second fall contest in 1993 as well, and took home his share of goodies. I understand that he heads south to Arizona for the winter, but I fully expect to see him next summer in the northwest, competing as though he had never stopped.

MARCH MYSTERY MODEL

I first came into contact with this unique 40-inch span Nostalgia era model when the late Bill Giffen showed up with one. One very noticeable feature of this ship is the underslung stabilizer, *a la* the FuBar. But the leading edge of the stab on this ship just doesn't flip down 60 to 70 degrees to dethermalize, it actually flips all the way around behind the fuselage in a DT configuration. Bill powered his by a Hornet .049, and at 220 square inches, the model featured an excellent climb for a Nostalgia design.

The question for you is: what's the name of this model? If you think you know, send it in to *Model Builder*. The lucky person to have his or her name pulled from among the correct entries wins a free one-year subscription. Not a bad deal, eh?

NOVEMBER MYSTERY MODEL WINNER

All 13 of our November Mystery Model correspondents knew it was a Stan Hill design--pretty obvious, given the model's configuration—and 12 of those were correct in identifying it as the Hammerhead, published in the September 1956 issue of Flying Models. *Herman Fessler, of Coon Rapids, Minnesota, was the name drawn at random to receive the complimentary one-year* MB *subscription.*

NFFS FOREVER

Some of our organizations have been around for so long that we take them for granted. The National Free Flight Society is one of them. Its leaders work tirelessly and without compensation to provide a voice and a communications link with modelers throughout the world.

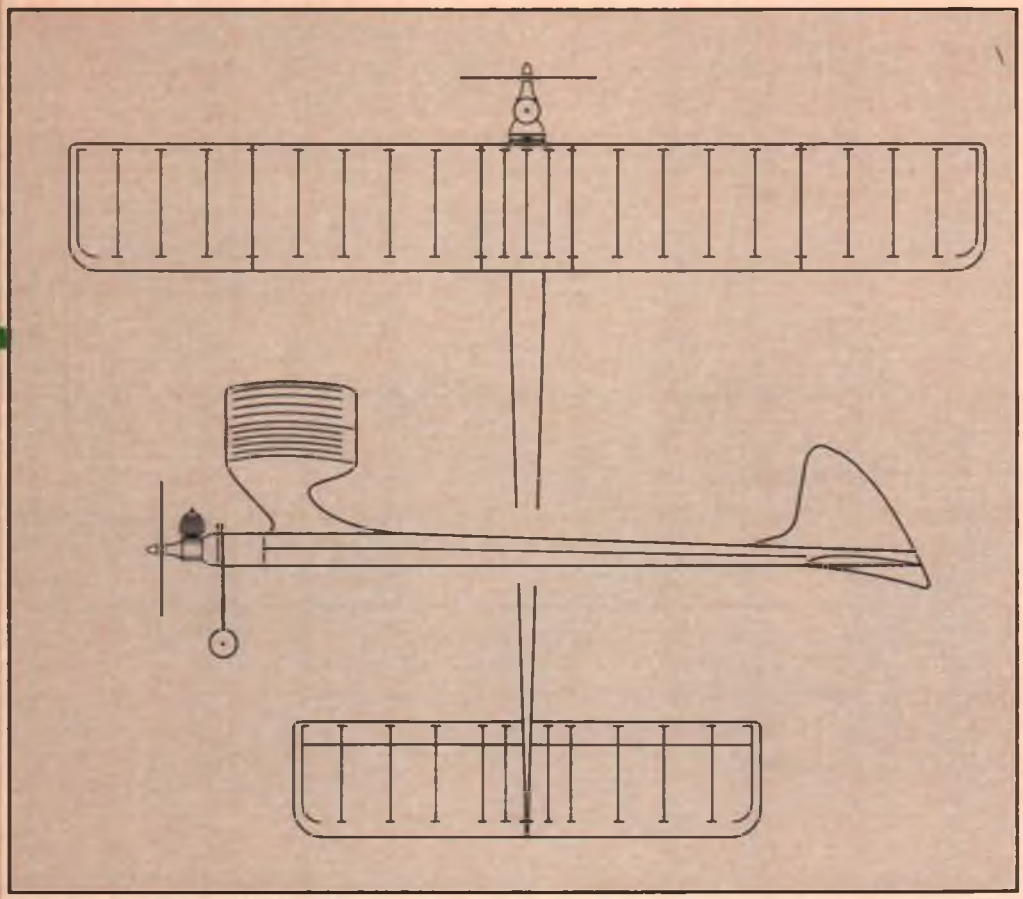
If you think the AMA cares about the relatively few free flighters here in the U.S., guess again. We don't make much of a dent in their scheme of things. It's only through the NFFS that we are able to make ourselves heard at the decision making level of AMA. Your support of free flight can therefore be best accomplished by supporting the National Free Flight Society.

If you think this is a plug for membership in the NFFS, you're right. Here's the deal. A check for $15 sent to NFFS, 19 Frederick Dr., Newport News, VA 23601 will get you a one-year membership and 10 issues of *Free Flight Digest*—the best free flight information and plans source available in America. If you are feeling bold, join for two years and pay only $27. When you send your money in, be sure to include your complete address and AMA number, and tell Ed Sullivan, the membership chairman, that you read about the NFFS in *Model Builder*.

Dan Sobala recently returned to the free flight scene in the northwest with this hot Rambler O.T. ship, powered by an O&R .60. The model has been in storage for nearly 20 years.

GEORGE MOUL'S FF RETRIEVAL METHOD

When I was younger, I frequently ran



MYSTERY MODEL

after thermalling free flights as they drifted downwind. Later I purchased a Honda Trail 90 that I used to track down those errant little beasts. When I got rid of my van, I had no way to haul the Honda to the field, so I was back to chasing on foot. Oh sure, I looked at mountain bikes, and I may try them one day. I am also looking to buy another van, so a Honda may be on the horizon again. I also recall reading in *Free Flight Digest* some time ago about a modeler in the southwest who chased after free flights on his horse.

However, this story is not about me or about chasing models on horseback, it is about George Moul, one of the Canadian fliers who consistently competes at our outdoor contests. George is a devoted rubber flier and usually enters all available events. At the Northwest Free Flight Championships last August, George entered his "Wailer" Mulvihill model and was flying up a storm. On one flight he hooked into a boomer thermal and also happened to have a too-long DT fuse. Needless to say, the ship went O.O.S. and soon George declared it lost, returning on foot after a futile chase. Of course, hope always springs eternal, and since he had his name, address and phone number prominently displayed on the ship, he had reason to be optimistic that the ship would be returned if found.

About a week later, after George had returned to his home in Vancouver, BC, he was pleased to receive a phone call from a local person who had found the model. Now, this is the rest of the story.

The freight train was lightly loaded and had only about a dozen or so cars as it chugged slowly into town. The engineer spotted something unusual ahead and instinctively slowed to get a look at it. There, just off the railroad right-of-way, was a model airplane. Stopping, he retrieved the model, put it into the locomotive's cab and lumbered his way into the railroad yard. After some good-natured ribbing from his buddies, he noted a name, address and phone number on the fuselage. He called, and a fellow named George Moul answered.

Soon, the model was picked up by Al Grell, who was identified by George as the local fellow who would pick up the ship. And at the next contest, George had the Wailer once again ready for competition. It had been out next to the railroad for only a couple of days and was in excellent condition.

So, when someone tells you how he retrieves his models, and if he goes on talking about his motorbike, his mountain bike or even his horse, tell him to call George Moul—he retrieves his free flights by train!

THE END

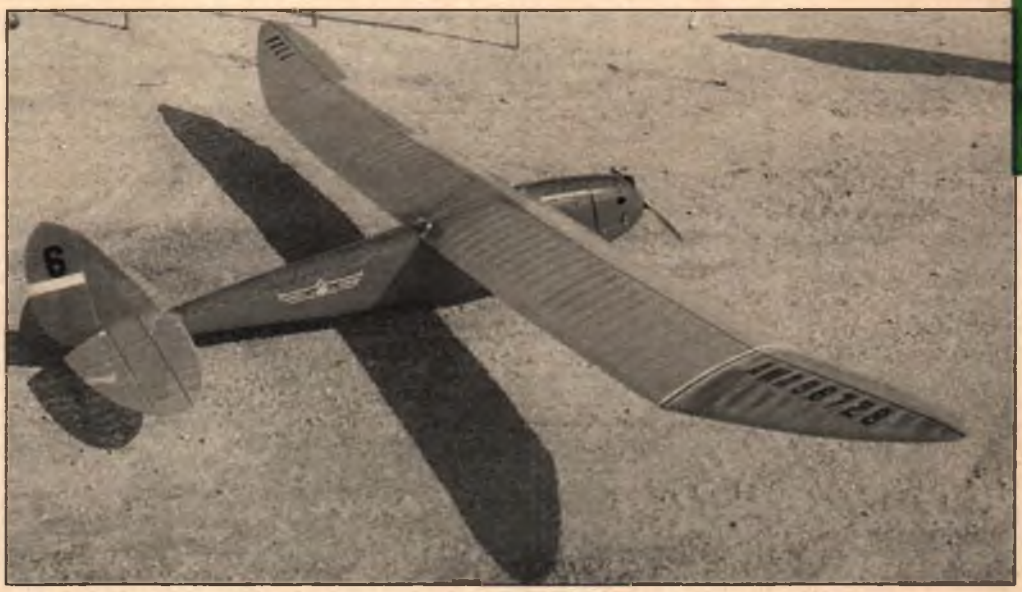
Tune in next month when we'll have the complete results of the *Model Builder* MiniPower event. Until then, catch a thermal for me. ***MB***

PLUG SPARKS *continued from page 29*

designs using Brown Junior engines for power. Don Blackburn of Amarillo, Texas won with a Rod Doyle "Folly" (see the 1937 Zaic Yearbook) with the excellent time of 32:25. He was closely followed by Mike McLaughlin, hailing from Lancaster, California, with what else but a Berkeley Buccaneer, also turning in an excellent time of 29:54. This really brought back memories for this writer, as he built two or more Bucs in the "good old days."

We would be remiss if we didn't also mention the flying wing originally designed by Tex Rickard of Texas and built for the Brown Jr. event by Eut Tileston. Eut, who needs no introduction to this column, had been carefully grooming this model for the meet and there was no question that the model flew great and looked like a shoo-in. But alas, problems arose and he ended up in 14th place.

Before getting into this write-up much farther, you are probably dying to know who won the RC Grand Championship. For the third consecutive year, it was Larry Davidson of Long Island, New York. This year was a very close finish; Davidson amassed 18 points, besting West Coast hotshots Don Bekins (17 points), Jim Kyncy (16 points) and Eut Tileston (14 points).



Very pretty 12-foot span 1937 design by the late Michael Roll, who also built this model. Interestingly, this one differs in several respects from the drawings that appeared in the 1938 Zaic Yearbook.

Larry Fair turned out this copy of the Ohlsson Original, equipped with one of Larry Jenno's Ohlsson .12 replicas. *Model Builder* offers plans for this nostalgic 42-inch span cabin job.

Over on the free flight side of things, Bob DeShields won the Non-Power division,

and the Power winner was Eric Marsdon.

The award for "Best Crash of the Meet" went to Dale Tower of SAM 49. With a Nelson .40 making an earshattering noise, his transparent blue MonoKoted Lanzo Bomber went up in its usual fast vertical climb. At an estimated 900 to 1,000 feet, the wing separated from the fuselage, and all heads turned to watch the model's death dive with the whine of the Nelson engine rising to an unheard-of scream. Not a pretty sight!

Lightly built Buccaneer Standard was Mike McLaughlin's choice for the Brown Jr. RC events. Coverite Micafilm covering is tough and helps keep the weight down.

One of the Texas contingent, L.A. Johnston, flies this hot DeBolt Blitzkrieg with O.S. .60 glow engine and single retracting wheel. Wow!

What helped make this six-day bash go by so fast was the number of interesting activities to attend, mostly in the evening. Sunday was completely covered by the MECA (Model Engine Collectors Association) Grand Collectogether, traditionally held in conjunction with the SAM Champs. Staged by MECA Coordinator Dick Dwyer, the trading and buying and selling went on all afternoon. There was a huge turnout for the prize drawing at the end of the day. Darn few fellows went home without a prize! Dwyer and company are to be congratulated on a well-run Collecto.

Besides the flying, there were other things to see and do on the field. Located on the corner of the FF and RC parking areas were a food concession (courtesy of the Mayor of Taft and the White Elephant restaurant) and several open-air shelters where cottage industries such as Aerodyne (Al Heinrich), Klarich Custom Kits (Harry Klarich) and Argo USA (John Targos) displayed their wares. All appeared to be doing an excellent business.

Held on Wednesday night at the Community Center in Taft, the Concours d'Elegance judging attracted a variety of well-built models. Although the number of entrants was down from the Lawrenceville Champs, the quality of workmanship was quite high. Concours winner was Ed Lamb's free flight Spook 72.

Two very snappy AVRO 560 models not only made a good appearance at the Concours judging but also walked away with the 1/2A Texaco Scale event honors. Jerry Rocha took 1st place with his ship, and rival SAM 27 member, Ed Hamler, who generally forms part of the winning team, ended up 3rd. **MB**

DEAR JAKE

Advice For The Propworn

DEAR JAKE:

I reckon you been wonderin' why you ain't heard from me and my brother lately. What with me and Atlee settin' all them distance and altitude records for RC models, you must be itchin' to know what we been up to these days. Well, me and Atlee decided to set the world speed record for RC planes this time.

We figured the fastest kinda plane is them you-control jobs what got a metal belly pan, little-bitty wings, and a great big motor. 'Cept them you-control ships ain't big nuff for a RC set, so we kept the idea and went bigger. We got us the belly pan off a Allis Chalmers tractor and put some barn shingles on for wings. Cousin Clyde over in Pine Bluff gave us the motor out a his bass boat. He never did bother to get the hull fixed after he hit that city feller water skier, so he wasn't usin' it none. We put in our best RC set to run the throttle and move the shingle flaps for control.

Atlee said it was impotent that we give our speed ship a fast paint job, so we went over to Shreveport and asked that sissy boy Lenny at the art store what the fastest colors was. Lenny said definitely red and maybe orange and yellow, so we give her a red paint job with some yellow and orange flames on the side. Atlee also said we needed to give her the right name, one that let everybody know how fast she was. I'm proud to say I came up with the name "Owl Snot." Like the sayin' goes, "Nothin's slicker than Owl Snot."

To set the record, we needed to fly a half mile one way and then come back through the same half mile goin' the other way. Too many trees around here, so we decided to do it out over the Gulf. We borrowed Cousin Raphe and his shrimp boat and parked her halfway between a couple a oil rigs that we knew was a half mile apart. Timin' was gonna be a problem, but Atlee figured if we flew her close enough to the oil rigs, they'd probably shoot at her, so alls we needed was one stopwatch on the boat. If we started the watch when we heard the first shot from the first oil rig and stopped it when the first shot was fired from the other rig, devidin that time into half a mile would tell us how fast we was goin'.

For launch and recovery (You like them big words? We got em outta a NASA colorin' book.) we set up a catapult to sling her into the air and we figured we'd just fly her into the shrimp nets already hangin' on the boat to get her back. To make sure she'd snag the nets, we put a hook on the back of her, just like the Navy.

When the time came the Gulf was calm and there weren't no winds, so we fired her up, checked out the controls, and let her rip. She came a slingin' off the catapult and roared into the air. Only problem was she didn't quite get clear of the boat. That danged hook snagged a line, and when the slack run out, old Owl Snot started towin' the shrimp boat. The rest of the plan worked fine. They did shoot at us and Atlee ran the stopwatch, but I think towin' the boat really slowed her down. Is 178 miles a hour good

enough for the record?

Hugo Baphrume in Backwater, LA

Dear Hugo:

I'm afraid not. But cheer up, congratulations are still in order. I checked with ESPN and 178 miles per hour is an American record for shrimp boats. In fact, you just missed the world record of 181 miles an hour, which was set by a Haitian shrimp boat entering the Bermuda Triangle in the grip of a tractor beam.

Jake

DEAR JAKE:

The August 1993 column mentioned the use of Post-It notes for covering and believe me it works, but not exactly as suggested. You should only stick down the front of each sheet, not the back. Then, by overlapping with many sheets, you get a covering just like bird feathers. And don't worry about the weight 'cause as you know, big heavy birds fly just as good as little dinky ones. Even an ostrich will fly if you get it going fast enough, I promise.

The test plane I built was tossed into the wind and promptly flew away. Caution: If you launch it downwind the "feathers" ruffle up and it crashes, just like you thought. For the same reason it can't be used in RC because a downwind turn causes ruffling and an immediate crash. But when used for free flight, into the wind, it flies out of sight until sundown. So help me!

Gordon in Tabernacle, NJ

Dear Gordon:

So help you is right! Somebody better help you if you expect me to buy any of this hogwash.

First of all, big heavy birds don't fly just as well. They don't fly at all. Tune in Sesame Street if you don't believe me. Big Bird never flies anywhere, unless it's with a first class ticket. And the only way an ostrich will fly is if you drop it down a mineshaft. Is that what you mean by get it going fast enough?

You say your test plane was launched upwind and promptly flew away. Then you caution me that a downwind launch results in a crash. How did you test a downwind launch if your airplane had flown away?

Finally, you bring up that old fallacy about an RC plane making a downwind turn and somehow having the air pass over it from tail to nose in the process. Anybody with half a brain knows that this is pure nonsense and that negative airspeed in a downwind turn only happens to RC helicopters. (By the way, on a helicopter you have to install the Post-Its with the sticky edge up, because rotor downwash is the primary airflow.)

Jake **MB**

HANNAN'S HANGAR

BY BILL HANNAN

"Variety may be the spice of life, however color is its charisma."

Our lead-in quotation, by Bic Parker, certainly applies to model aircraft, as convincingly demonstrated by our selection of photographs this month. Keep this in mind when choosing your next project. No matter how carefully constructed and detailed, a plebeian paint and mundane markings scheme will underwhelm everyone, especially scale judges!

SPEAKING OF COLOR

Mark Garvey, of Cedar Rapids, Iowa, suggests that some of the metallic tissue available from gift stores can add real sparkle to models. Although too heavy for serious duration model purposes, Mark says: "Who in this hobby is really serious anyway? I know I'm not. My basic interest is in having a good time."

I.D. MODELS

From full-color to the opposite extreme—flat black. We refer to the WWII identification models. Originally hand-made from wood and later manufactured from such materials as plaster of Paris, hard rubber, paper mache and low-quality plastic, these models have become sought-after collector's items. Now a Texas firm is offering reproductions of more than 60 1/72-scale I.D. types ranging in wingspan from 5 to 23 inches. Each model includes a display box and walnut mounting pedestal, or may be suspended via a string hole as was often done in military bases during the war. Prices range from $56 to $135, depending on the subject. For more information, call Classic Aircraft Collections, Ltd. at (800) 245-0576. Thanks to Jim Alaback for this report.

MODELS IN THE MEDIA

The prestigious *Arizona Highways* magazine devoted a page of its November issue to the Flying Aces Club Cactus Squadron. Authored by Melanie Lee Johnston, the article offers an unusual but favorable look at free flight scale models and their fliers, with the accent on the popular mass-launched events: "Fliers wait patiently for their planes to lose power and, hopefully, land gently atop the fluffy alfalfa. A few do this. Most of the planes land with enough force to make an onlooker express thanks that there are no passengers aboard."

Two photos, by Richard Maack, illustrate the feature. One shows Dick Howard launching his Mr. Smoothie racer, while the other depicts Jane Schlosberg's beautiful Bristol Scout with its usually taut tissue sagging in the early morning dew.

Arizona Highways thoughtfully furnished the names and phone numbers of club members David Smith (602-892-0935) and Ralph Hudson (602-275-7310) for readers who may care to attend future contests. Interestingly, the article took over two years to reach publication, and although over 300 photographs were taken, only two were used. (See, model magazines are not the only slow movers!)

THOUGHTS FOR THE DAY

Chuck Munda, who custom builds models for customers, says: "RC, I do for others. Peanuts I do for me." Bill Kincheloe offers a new spin on an old Balanese proverb: "I have no art, I just do things as well as I can." And Don Campbell, of the Detroit Cloudbusters, opines: "I have a skill that improves with age. Each year I get better at forgetting."

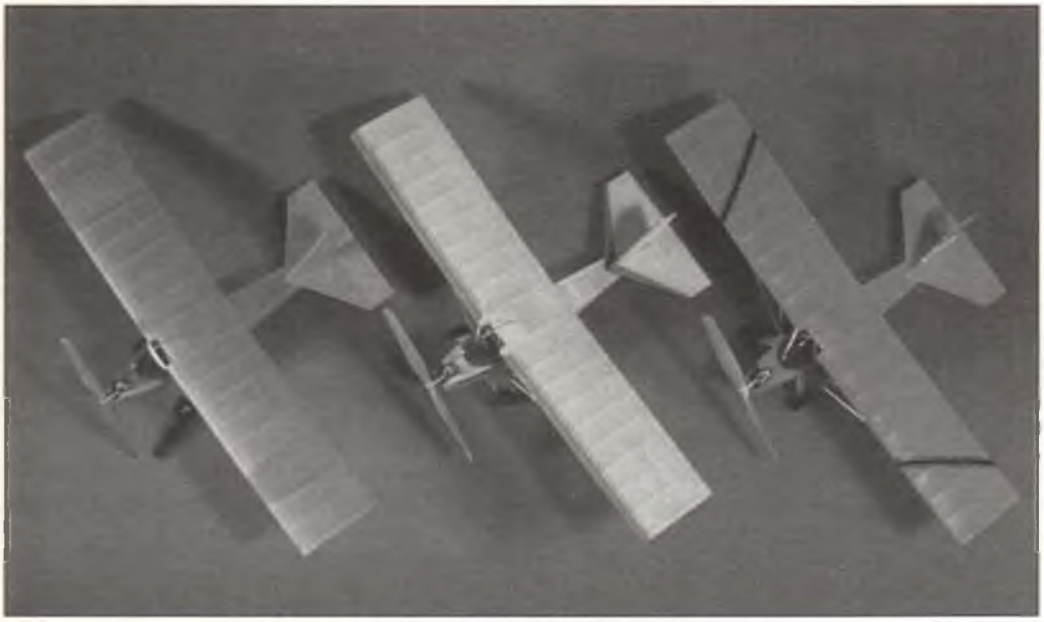
RUSSIAN RIDE, ANYONE?

Ed Whitten and Stuyve Pell sent copies of *New York Times* advertisements promoting rides in, and a chance to try the controls of, a MiG 29, MiG 31, Su-27 or L-39 jet aircraft in Moscow. These "flight packages," featuring flight plans which customers help design, start at $6,000. If any of *MB's* readers can swing that, just call (800) MIGS ETC. Honest.

GEE BEE NEWS

The New England Air Museum Gee Bee R-1 reproduction was dedicated on June 17, 1993, and a videotape of the ceremonies is now available. Featured are a talk by Dr. Norma Granville, Zantford "Grannie" Granville's daughter, about the early days of the family, presentation of a commemorative plaque by Charlotte Granville Haberern and historical reviews

Don't be fooled! Henry Haffke's vivid "sorta scale" RC Gee Bee R1/R2 Long Tail racer is actually a highly modified Peashooter. The 6-1/2 pound model spans 60 inches and is powered by a K&B .40.



Yellow, white and orange HI-Max free flights by Frantisek Barta, of the Czech Republic, demonstrate the variety of color options available when modeling full-scale ultralight aircraft. All are powered by Gasparin CO_2 systems.

of the original Gee Bee R-1 and R-2 racers by Robert Stepanik. Constructed during the Depression, the Pratt & Whitney engines were borrowed, and low-cost automotive components were employed where practical. Among these were 1914-17 Model T Ford steering rods used for aileron actuation, 1928 Chevrolet gear shift knobs atop the throttle quadrant levers, and a 1931 Indian motorcycle handgrip topping the control stick! Amazingly, both racers were constructed in a scant 90 days.

By contrast, the museum reproduction consumed over eight and a half *years* and still lacks a few details, according to project co-coordinator Dick Gilcreast. Among the notables in the audience during the dedication were Howell "Pete" Miller, chief engineer on the R-1 and R-2; Harold Smith, who manufactured the Smith propeller of the R-1; George Agnoli, who painted the original markings and arranged for those on the reproduction as well; plus many members of the Granville family. History-minded readers may order a copy of this 58-minute Eclipse Communications tape by writing to Studio 16, 16 Ridgeview Terrace, Springfield, MA 01105. Cost is $19.95 plus $3 postage and packing.

MORE GEE BEE TIDBITS

Ted Blakeley, of Boring (!), Oregon, recently purchased one wheel pant, the airframe and engine data plates from the original Gee Bee R-1. How's that for choice souvenirs?

We've learned that the segment of original Gee Bee R-2 fabric shown in our November *MB* column belongs to Premo Galletti, of Springfield, Massachusetts.

A full-size reproduction Gee Bee Z is well underway, according to Walt Grigg, being constructed in Florida by Jeff Isher and Kevin Kimball.

Auto license plates bearing "GEE BEE" are owned by Vern Clements, of Idaho; Henry Haffke, of Vermont; an unidentified member of the New England Air Museum; and Don Foster, of Massachusetts. Quite an exclusive "fan club"!

MODEL STAMP COLLECTOR

Mel Houch, of Orange, California, assisted by his patient wife, Sheri, specializes in aviation postage stamp collecting, especially those dealing with model aircraft. He feels his collection is nearly complete, lacking only one 1974 Cuban stamp featuring a model towline glider. Can any reader help him out? Contact Mel at (714) 771-3056.

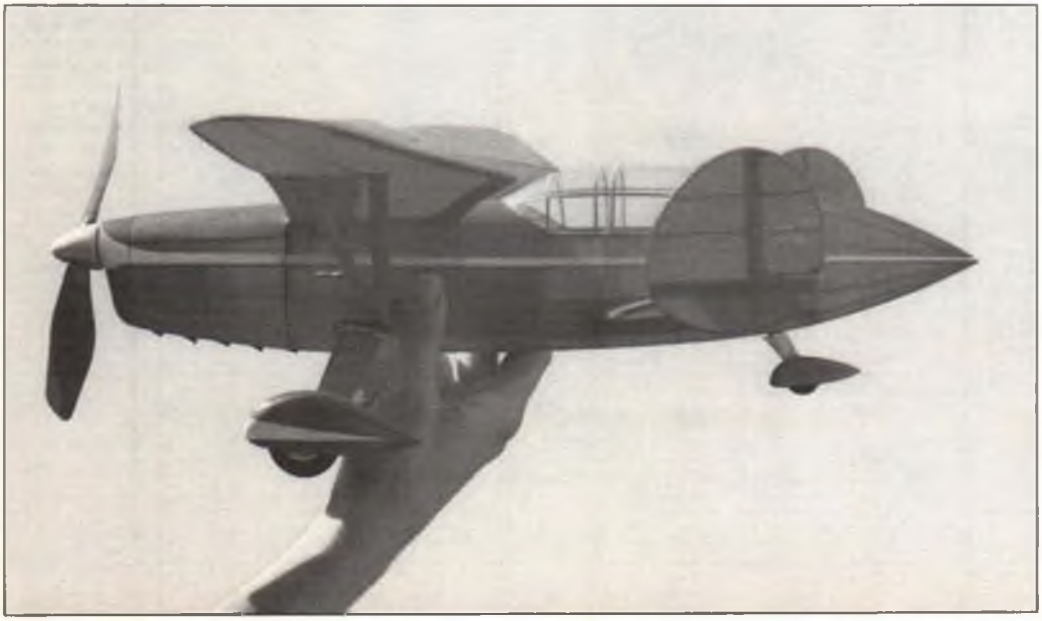
ENGINES VS. MOTORS AGAIN

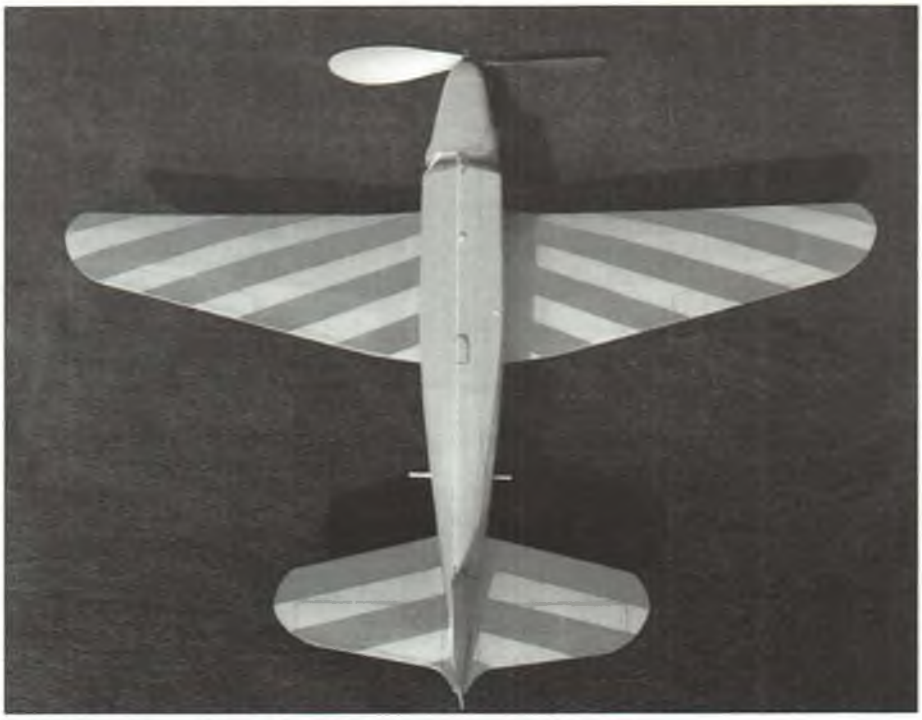
Letters regarding definitions of engines and motors continue to arrive. Like the infamous "downwind turn" controversy, this is a topic not likely to be resolved to everyone's satisfaction. However, here are a couple of contributions to the discussion:

S.B. Pell of Princeton, New Jersey says: "I was taught that if it was stationary it was a motor; if it moved (as on wheels or wings or in a hull), it was an engine. So the name would follow the function rather than the form alone. An electrical device could propel a locomotive or run saws and lathes. Ditto a wood-burning or coal-burning device that makes steam."

Lou Crane, Sierra Vista, Arizona, sees it this way: "Engines

Striking Delanne 20-T-02 tandem-wing by Terry Pittman of Annandale, Virginia spans 19 inches and features Brown B-100 CO_2 power. Plans were based on those from French modeler Gerard Porcher.





Another Terry Pittman production is this 21-inch span, rubber-powered Caudron Simoun.

and motors are power producing machines which convert energy from a form that does not directly do useful work to a form that does.

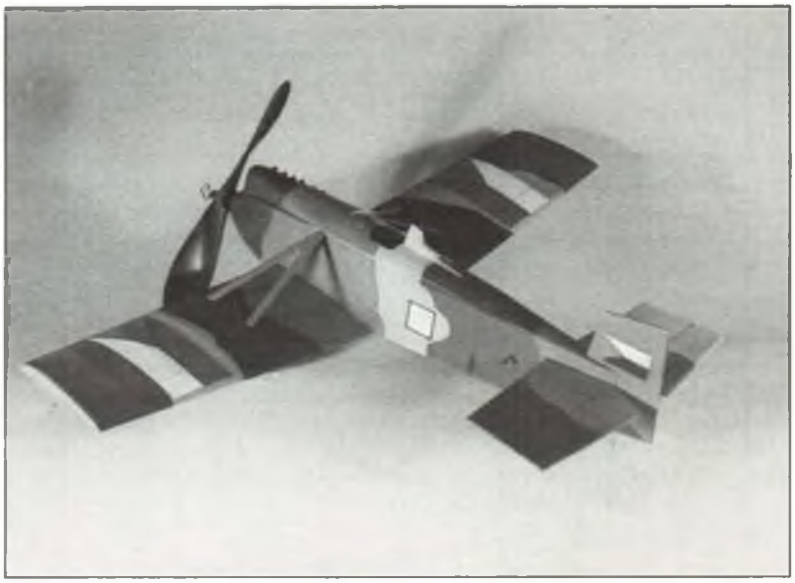
"*Engines* are supplied energy that cannot be converted to useful work. Engines convert energy to useable form, then convert that form to useful output. (Model aircraft *engines* convert the energy latent in the liquid fuel by combustion inside the machine, then convert it to useful work. Rocket, ramjet, pulsejet and turbojet *engines!* The thrust output is not present in useable form in the fuel, but generated by its combustion inside the engine.)

"*Motors* are supplied ready-to-use energy, stored or generated outside the machine, and convert it directly to useful output. (Rubber and electric *motors* use energy supplied from outside the machine, stored ready-to-use, and release it as useful output.)

"Steam 'engine'... as in railroad locomotive? There's a steam *motor* at the wheel drive cylinders. If you include firebox, boiler and cylinders, a locomotive is an *engine*. Same goes for a solar cell powered electrical model, steam turbine powered ship, but *not* a millrace on a stream or a hydroelectric power plant's turbines. The hypothetical crank-turning servo is a *motor*."

SIGN-OFF

"If a senior citizen tells you he can do anything he did when he was a teenager, he is exaggerating, unless he is talking about model airplanes—in which case he is probably being overly modest." Herb Weiss. ***MB***



Even a military camouflage scheme can be colorful, as shown by this multi-hued Czech Avia Peanut constructed by Takashi Sugihara, of Japan.

SOPWITH continued from page 23

these panels is the standard khaki green fabric covered fuselage and tail, with all bottom surfaces, including the wing, in "natural" clear-doped linen. All this and the big roundels create a most attractive model, authenticated largely by the top photo on page 269 of H.F. King's book, *Sopwith Aircraft 1912-1920,* published by Putnam, England.

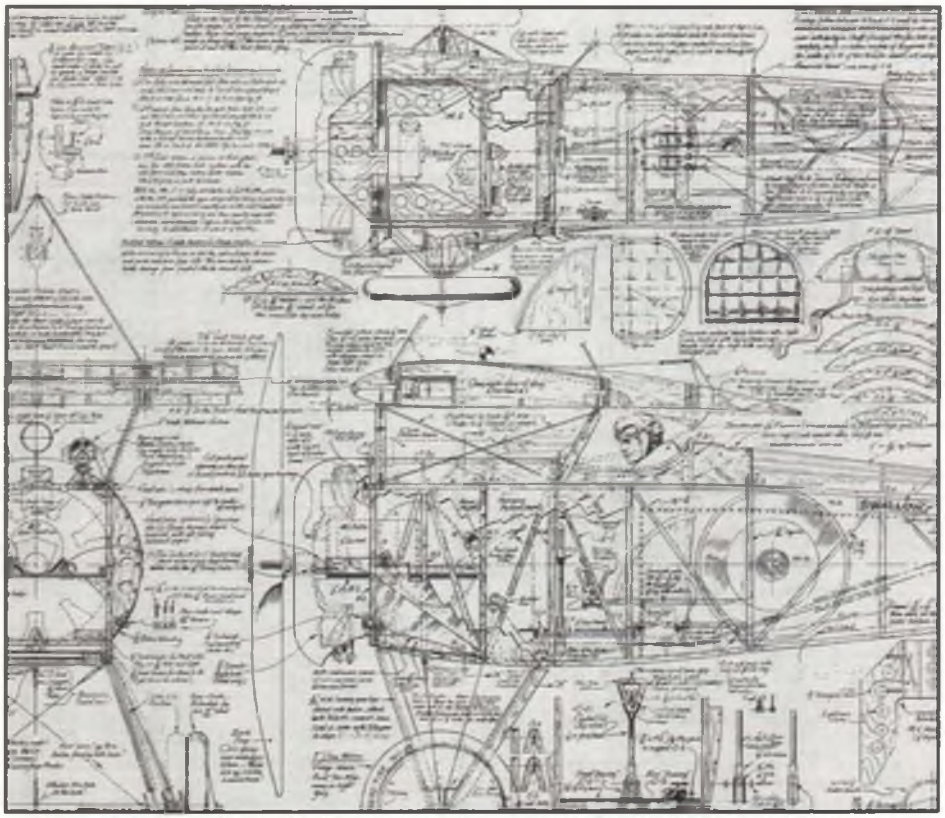
The more timid model finishers can find comfort in the less-spectacular, less-difficult later versions of the Swallow. They reveal a uniform gray over the entire nose aluminum and plywood panels and cowl ring. This scheme also solves the rough problem of finding an aluminum cowl ring of the right size and contour. You can simply make a typical laminated balsa cowl ring and paint it gray with perfect scale size and contour! Top English and other foreign modelers would actually hammer out sheet aluminum over a hardwood form for this... oh well! One last finishing reminder: the fuselage lacing was only on the starboard (right) side, as seen on many Sopwith types.

The lengthiest description of the Swallow appeared in the aforementioned H.F. King book. A shorter review appears in *Warplanes of the First World War, Fighters, Vol. 3* by J.M. Bruce, which shows a rare three-view which must be corrected by careful comparison with all the actual photos, as we have done on our plans. The best two photos of the Swallow are in *Vintage Warbirds No. 5, The Sopwith Fighters,* also by J.M. Bruce, published by Arms & Armour Press, 1986—England.

My original electric version of the Swallow in 2"=1' scale had a 60-inch span, 720 square inches of wing area, a geared Astro Cobalt 15, 12-cell 1,100-mAH SR battery, a 12x7 prop, and a total weight of 83.7 ounces, for a wing loading of only 16.7 ounces per square foot. All this in a full AMA precision scale electric model seemed remarkably light, thus encouraging me to go to a geared Astro cobalt 25, SR 14-cell battery, and a 13x8 prop for a total weight of 90.6 ounces and a wing loading of 18.2 ounces per square foot to better overcome drag.

I was indeed fortunate in having this version tested by the well-known Dave Baron on a rainy July evening in 1992. ROG was off soggy grass, and the flight was at about 20 mph, at almost full throttle. Visually it was very scale-like, with the slow, gentle motions we've seen in full-sized WWI replicas at Rhinebeck. But the duration was only 3 minutes. Dave's suggestions were to change to 1,500-mAH cells, reduce the prop to a 12x8 or 12x9 and create greater aileron differential by approximately 15 degrees at the lower horns.

The weight had now climbed to 95.9 ounces and the wing loading to 19.18 ounces per square foot. This resulted in significantly improved performance when Dave flew it five more times on a hot, windless day in August. Aileron response was more positive. Dave flew it mostly at



This partial view of one of the two Swallow plan sheets gives you an idea of the kind of detailing included on Airdrome's plans.

full throttle to determine its duration parameters for further flight planning and thus limited maneuvers to a few loops and touch-and-go's. Just as in all WWI aircraft, you must gain speed by nosing down, even before a Chandelle. Touch-and-go's were quite smooth.

Power-on landings were very smooth, with the 5-inch wheels rolling well over the dry grass field. However, as soon as Dave dropped the tail, the notoriously narrow tread often produced slow ground-loops, which were almost a standard trait for planes of that era.

Undismayed by this, he strongly urged that I take the Swallow to the KRC electric meet, adding that the much smoother grass there might cure its ground looping tendency, and that its scale realism would surprise many. It should, after all, be remembered that this stable, highly detailed electric does have a full working cockpit with joystick, rudder bar and pilot articulated by the servos, functional rigging, a scale landing gear, steerable tail skid, scale burnished aluminum cowling, hatches and closed loop cable controls, etc.!

(Actually the Swallow, as well as all other Airdrome models, could be built minus many of these details to save weight and still look and fly realistically in fun, sport, or stand-off scale events. This depends on how much time the modeler wishes to invest in his model and of course his skill level.)

I entered the Swallow in the 1992 KRC electric meet with its Astro 25 system and the 12x9 prop. As Dave had guessed, it attracted much attention. In the afternoon the sun came out and the gusty winds subsided somewhat. Dave flew the Swallow twice. On its first takeoff the Swallow mildly ground-looped back towards him from a sudden wind shift. Helped by its scale steerable tail skid, he simply realigned and took off again. Both of Dave's Swallow flights were purposefully conservative and non-aerobatic to emphasize the model's gently realistic scale-like WWI flight heritage. Landings on the well-groomed grass were smoothly executed as Dave had predicted. The Swallow was awarded 1st place in scale.

Power-on landings were very smooth, rolling well over the dry grass field. However, as soon as Dave dropped the tail, the notoriously narrow tread often produced slow ground-loops, almost a standard trait for planes of that era.

This being my first KRC attendance, I quickly became aware that spectacular electric aerobatic performance was common, and perhaps expected even from a 1918 antique scale model! With my mania for scale accuracy, this was quite contrary to, for example, English scale competition wherein slow, realistic scale flying characteristics befitting WWI subjects is highly prized. KRC seemed to emphasize rocket-like, zooming, rolling climbs, etc. In one instance, even a small Douglas DC-3 transport did this! However, there was certainly room for performance compromise.

Driving back from Quakertown, I visualized that an Astro 40 system would easily fit and would probably give the Swallow the needed additional reserve power to attain aerobatic ability and extend endurance. Hopefully, this wouldn't alter its scale flight realism. I discussed this with Dave and Larry Sribnick of SR Batteries and all agreed it was the way to go. Larry rushed a new geared Astro 40 cobalt and a custom-shaped 18-cell, 1,500-mAH battery, and the Swallow was easily and quickly modified, due to its capacious nose section.

Sunday, October 18, turned out to be a calm, sunny afternoon at Dave's flying haunt, the Southbury, Connecticut field—perfect for the Swallow's test of its aerobatic potential. While Dave quick-charged the new battery off his SR Smart Charger, I double safetyed all of the upper #12 snap swivels under the strutless parasol wing with 15-pound monofilament fishing line. The 10-ounce increase in weight on account of the new power system was easily absorbed by the Swallow's generous 5 square feet of area, and the wing loading was still a relatively low 20.8 ounces per square foot. Dave's advice to stick with the 12x9 prop, instead of the 13x8 that an Astro 40 would normally use, was followed.

To my delight, Dave, feeling the additional power, sent the Swallow up steeply in a "wet power" climb to about 500 feet. He then maintained level cruise at about 1/2 throttle easily in a rock-steady attitude. At full throttle he executed a few loops and slow rolls, without having to dive for extra entry speed. For three such flights, the Swallow exhibited gentle, trainer-like control, including spin recoveries, plus its newly acquired aerobatic ability without losing its scale-like traits. Even the landings were at last fully controllable without ground-looping.

Next month: Construction and detailing. **MB**

CALIBRA *continued from page 27*

For me, where the Calibra really shines the brightest is in precision high speed flight and aerobatics. It flies as if on rails. Although it has no rudder, if set up with only a slight amount of aileron differential (20 percent more up movement than down), it turns with excellent coordination.

Power-off multiple loops are virtual no-brainers—just dive, build up some speed, and pull back on the stick. Dive a little more with every loop to maintain your airspeed. Rolls are likewise very easy. Because the HQ airfoil is close to being symmetrical, very little (if any) down elevator is needed during the inverted portion of a fast roll.

If you like speed, you'll really like this airplane. The Calibra accelerates like some kind of airborne greyhound. Motor on or

Robbe's clever Turbo-Spinner and Dynamic-E folding prop are optional items designed for high-power motors such as the KE 525/4 PRO used here. The plywood firewall is a backplate for the nose of the Piura plastic fuselage and is used with motors of lesser power. With the Turbo-Spinner, the flat front of the fuselage gets cut away and the multi-holed motor mount gets epoxied in place. For this job, Bill used something called Stabilit Express (also available from Robbe), a very different kind of two-part adhesive which actually melts the surface of the Piura slightly before it cures, making an incredibly strong bond. No other motor supports are needed, and in spite of many landings—a couple being of the hard-knock variety—the joint has held up perfectly.

off, place her into a shallow dive and watch the speed pile up quickly. Bank into a turn, keep the nose slightly down, pull the elevator gently, and she quietly whistles through the turn without losing any speed or kinetic energy. Pull her hard through the turn and the Calibra comes around quickly with little loss of speed.

In conclusion, the Calibra, in its sport form, is a lot of fun to fly. Using battery energy sparingly with brief motor runs to gain height, you can dash around the sky for seven to ten minutes on a single battery charge with no thermal lift. In strong thermal conditions your flight duration is limited only by your airborne receiver battery. Speed, aerobatics, and soaring—the Calibra does it all! ***MB***

THROTTLES, ETC.

Guest columnist Orin Humphries takes the reins to explain the art and mystery of three-line control systems. To be continued next month.

The majority of control line model airplanes are controlled by two lines, one for "up" and one for "down." But that's not the only way to do it. Speed fliers use a one-line torque system. Using a special handle, they twist the line one way for up and the other way for down.

Some fliers, however, aren't satisfied with just "up" and "down." They want to do other things—control the throttle, drop a bomb, etc. A couple of years ago we featured a two-part article on two-line systems using electronics to operate such functions. But the traditional and much more common method of adding control functions is the three-line system.

While most CL fliers find two-line systems as basic as breathing, many of us gasp at the thought of figuring out how to install that third line. Last winter, Chuck Hitchborn, of Cimarron, Colorado, asked if we could go into some detail on the subject. "I would like to fly with three lines so I can utilize motor control, but I've never seen anything about how it is hooked up, what kind of bellcranks, how you operate it, etc.," Chuck wrote. "I wonder if you could do an article on this and carrier flying showing diagrams of the hookups and any special information whereby a layman like me can understand the complexities of throttled flight."

This was a topic to turn over to our "panel of experts," so we called upon carrier and scale enthusiast Orin Humphries for help. Orin has been writing how-to articles for northwest CL fliers thorough various regional publications for many years. True to form, Orin provided an excellent primer on CL three-line systems, which follows.

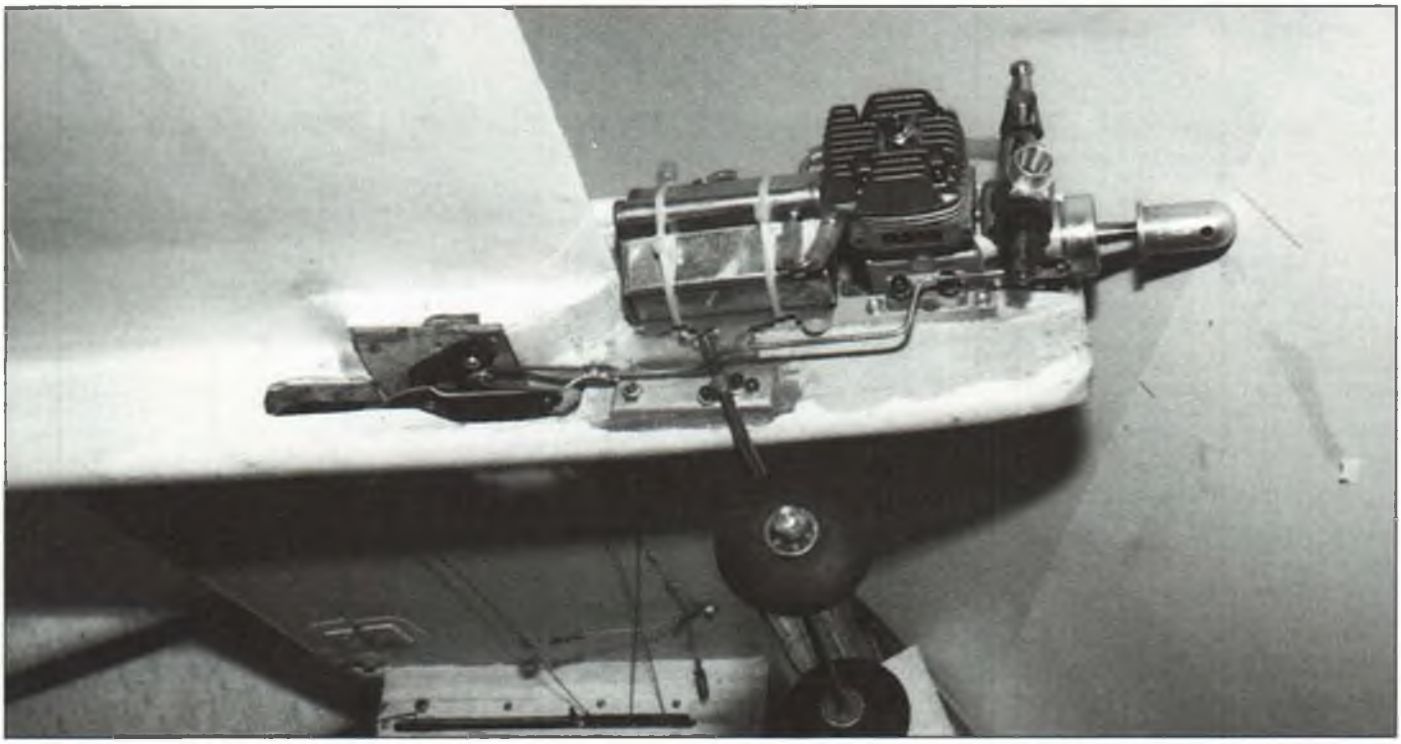
• • •

The heart of many CL models is their throttle bellcrank. Time and patience are required to include throttle capability in a model. Electronic throttle controls have been well covered and are an alternative, but the old mechanical throttle mustn't be overlooked. Neither system is simple or cheap. Herein are the bedrock basics of the mechanical system.

While preparing this work, I took my method completely apart and examined every piece of it. To be included here, each had to be effective, accurate and as painless as possible. A mystery was solved and two problems were eliminated. You and I will reap benefits from this re-examination no matter how much experience you may have with the mechanical system.

The modern three-line bellcrank was invented by J. Robert Smurthwaite, now of Baker City, Oregon, and sold under the J. Roberts trade name. The design has been changed and sold several times, and is marketed in its present form by Brodak Distributing.

The clever design features moving parts that keep the lengths and tensions the same in all three lines during throttle changes. The central feature is that the elevator and throttle functions don't interact to an appreciable extent when the bellcrank is properly installed. More on that later.



Orin Humphries' old reliable Curtiss Seagull Profile Carrier ship has all of its controls mounted externally—a good way to go for your first three-line model, as everything is accessible and easy to work on.

There are two parts necessary: the bellcrank itself and the matching control handle. As the pilot moves the throttle trigger, corresponding parts in the bellcrank move in unison. One of those parts is connected to the arm on the carburetor. Three control lines are used,

two outer ones for the elevator and the center line for the throttle. Moving the handle as if it were a simple two-line system operates the elevator.

The three-line bellcrank comes in two basic varieties: big/small and upright/inverted. The size you need is determined by the available space in your plane. Whether you should use an upright or an inverted bellcrank is determined by looking at your plan, finding the bellcrank location, and seeing which style will give you the most level shot from the bellcrank to the carb arm while avoiding your fuel tank. For example, a low-wing plane will use an upright bellcrank and a mid-winger could use either. Take your plans to the hobby shop and hold either style crank up to them if you're not sure. A high-winger won't have the bellcrank in the wing.

There is a lot of misinformation circulating about the location of the bellcrank. This is a matter of physics; an analysis shows that the location of the bellcrank platform has no "best" place. The location is virtually immaterial as far as what the plane does in the air is concerned. *The leadout guide's location is what's important.* The model must hang properly on its leadouts, just a little nose down, and the wings must be vertical (or a little bit rolled outboard if you won't be flying inverted), and that is solely a function of the guide location. If it hangs right, it flies right.

The bellcrank is mounted on a small 1/8-inch five-ply birch plywood platform. A groove must be cut into the platform to allow clearance of a moving part of the crank. The location of the mounting platform is determined by the need for throttle and elevator to be as independent as possible.

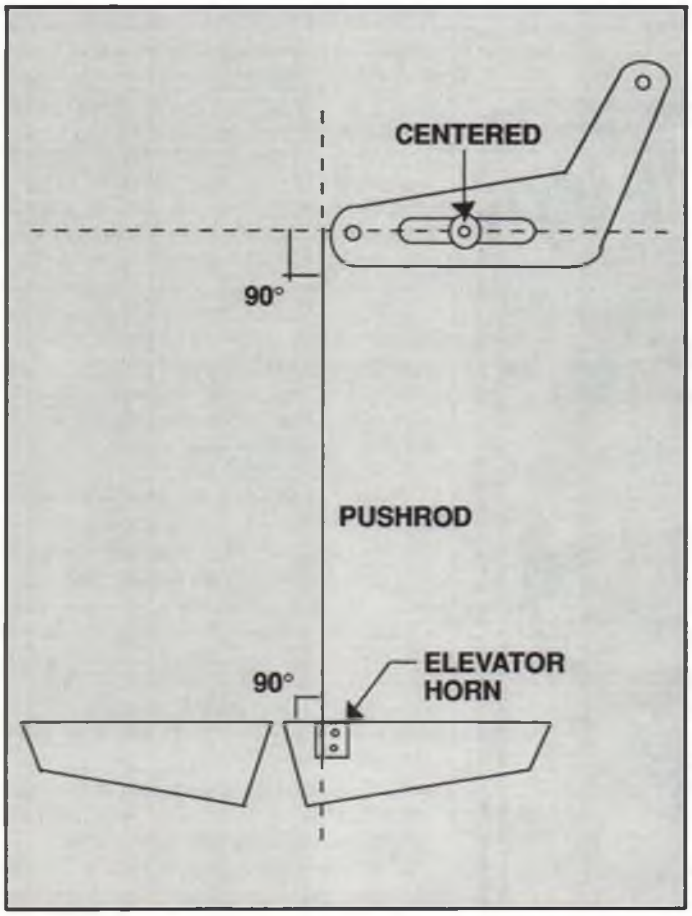
To achieve this, place the platform such that the slot in the base of the bellcrank, the elevator pushrod, and the elevator hinge line form a capital "I." It must be a squared I; not an italic I. (See Figure A.) That is, when the part that moves in the bellcrank's slot is in the *center* of the slot, not at either end, the elevator pushrod, connected to the bellcrank temporarily, must be parallel to the fuselage and perpendicular to the elevator hinge line. At the aft end of the pushrod when things are lined up like this is the location for the elevator horn. The final "reality check" is seeing that neither the elevator nor the throttle pushrods hit anything when the system is moved limit to limit. Be sure and check for full elevator at each throttle limit.

The bellcrank platform and the leadouts must be at the same angle, straight with each other. (See Figure B.) Contrary to a common belief, it is not necessary that the leadouts come out of the wingtip on the chord line, no matter where that is. For example, I put a Corsair's leadout guide three ribs in from the tip on the *bottom* of the wing. It was perfect in the air with good line tension, instead of rolling in on you like all those other Corsairs with their leadout guide up on the wingtip. But in such an installation, care must be taken to align the bellcrank platform with the leadouts, to avoid binding.

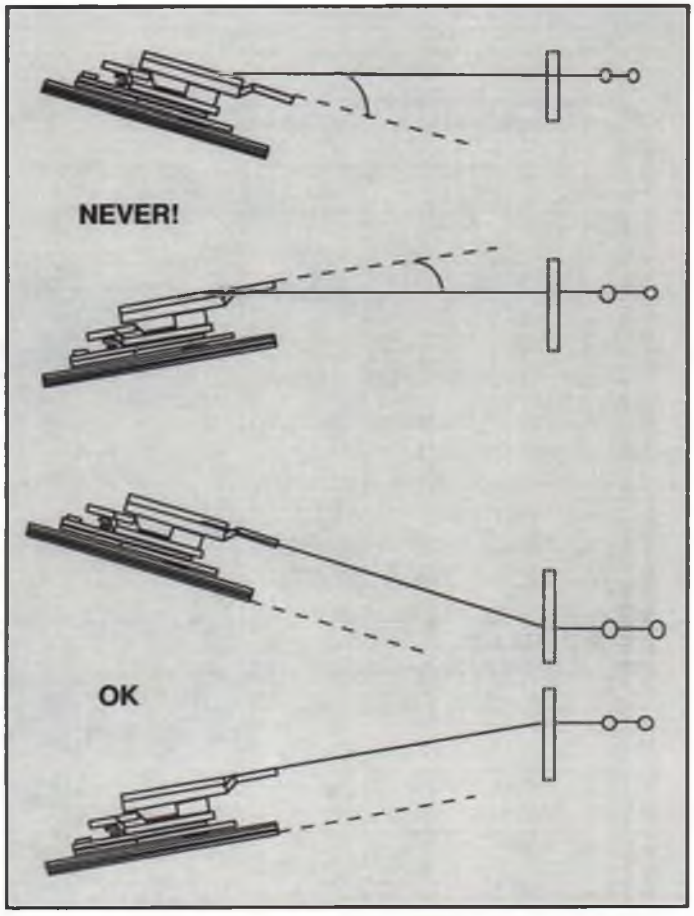
My recommendation for your first throttle project is to select a profile model. Linkage access and options are far better on these. Further, give some thought to the way I mounted the bellcrank on my Seagull; it's external for easy access and adjustment. The platform itself is mounted by four screws. As I am doing some work on this old model at present, the external mounting has been a blessing.

Connecting the elevator and throttle rods to the bellcrank must be done neatly or they will hit other parts when moved. I make a single 90-degree bend in a rod, poke it through the hole, and wrap a little copper wire around the protruding end of the rod. This is then soldered and, if needed, filed down for clearance with other bellcrank parts or structural parts of the plane. This style has lasted for at least eight years of heavy use in my airplanes and none has ever failed.

I prefer to avoid using a clevis on the throttle portion because it has a sharp edge. It might hit the base and hang up. A linkage



When locating the three-line bellcrank mount, it's important that the piece that moves in the bellcrank's slot be centered and that the pushrod be at right angles to both the bellcrank centerline and the elevator hinge line.

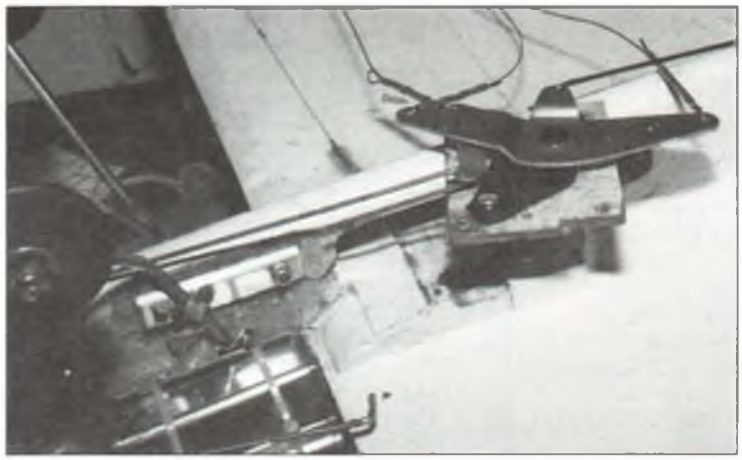


For smooth operation and to avoid any possibility of binding, the plywood bellcrank platform and the leadouts must be at the same angle. See text for Orin's comments on where the leadouts should exit the wing and also where the bellcrank should be located.

with a round corner appeals to me more. Another way is to make a yoke of 1/16-inch brass rod, loop it through the bellcrank throttle output hole, and solder the pushrod in between the ends. I recommend against using a clevis on the bellcrank end of the elevator pushrod, as it can come loose in a somersault landing unless you solder it shut. Never use two threaded clevises on a single pushrod, as it's possible that the rod could thread itself out of a clevis from vibration.

How does the three-line system really work, in simple terms?

The bellcrank is a lever system. The two elevator lines apply their tension loads to one side of the lever mechanism, which I will refer to as a heavy kid on a teeter-totter.



The 1/8-inch plywood bellcrank mounting plate on Orin's Seagull is secured to the underside with four screws, makes for easy removal and service.

The throttle line applies its tension load to the other side, acting as the light kid to balance it all. Because the tension in all lines is the same and you have two on one side and one on the other, you can see that the single line will be twice as far from the center (fulcrum) as the part where the two elevator lines apply their combined load.

Any brand of handle will operate any brand of bellcrank enough to throttle your engine. The smaller Mark I handle puts out 1 inch of throttle rod travel; the larger Mark II puts out 1-3/16 inches. The Mark I is the J. Roberts unit and the Mark II handle carries the brand, G-S, L-R, or whatever the Brodak version says on it.

I don't listen to the talk about where you should have the trigger during a pull test. It seems to me that the throttle has to be just as strong at all points of its operating range, since that is how it will be used. My trigger has been everywhere possible during pull tests over the years and never did I lose a system. And make up your own mind about which end of the trigger movement will be the high speed end; just make sure you have all of your throttled airplanes set up the same. It will come to pass that a gust will upset the bird at a bad time, and if your planes are set up differently you may move the trigger the wrong way in a panic. To make it easy to remember, I set up mine with the trigger moving forward for more power as in full-size aircraft, cars, tractors, etc.

Note that moving the trigger forward, toward the plane, will pull the throttle line toward you. This makes the throttle rod in the plane move toward the nose, forward. Look into the barrel of your carburetor and see what happens when the end of the carb arm moves forward. If the barrel opens, you're set. Simply connect the throttle rod to the carb arm when the carb arm is all the way back and the plane's outer leadouts have been pulled tight by an attached handle—not your fingers. If, however, forward motion closes the barrel, the best fix is to loosen the carb arm and rotate it 180 degrees from its factory-set location. Then, forward motion of the rod will open it.

To be continued. ***MB***

BY ART STEINBERG

Combat Models' A-10 Warthog

Looking for something a bit different? Here's a semi-ARF jet model that flies well, looks great in the air and can be powered with twin ducted fans or a single pusher-mounted engine—your choice.

The full-size A-10 Warthog is one of those beautifully ugly airplanes, one so perfectly suited for its mission as a coldly efficient tank killer that it has endeared itself to the pilots who fly them. The aircraft has an unusual configuration, being powered by a pair of jet engines located aft of the wing and sticking out from the fuselage. Combat Models, of San Diego, California, produces a highly prefabricated A-10 Warthog kit that offers the builder the option of using either a pair of .25 size ducted fan units or a single .40 to .50 engine mounted on the tail and swinging a standard pusher prop. The vast majority of those who decide to build this model will undoubtedly opt to install the latter. Being babes in the woods where ducted fans are concerned, we decided to go the single engine pusher route also.

The airframe for this model is constructed almost entirely of foam, with some plywood, balsa and spruce thrown in for reinforcement. There is still con-

Building team supervisor for the Combat Models A-10 review project was Dick Whitley, pictured here with the finished model. Finish is Pactra Formula-U sprayed on after first covering the foam surfaces with 3/4-ounce fiberglass cloth (an optional step, but one that adds durability to the finished model).

■ TOP: The Combat Models A-10 sure looks like the real thing patrolling the skies during Operation Desert Storm. For even greater realism, installation of a set of Robart retracts is detailed in the instructions. ■ LEFT: Cockpits don't get much prettier than this one. All parts and instructions are furnished in the kit. ■ RIGHT: A full complement of airborne weapons are supplied with the kit. Like the rest of the model, these are made of molded foam and are very light.

COMBAT MODELS' A-10 WARTHOG

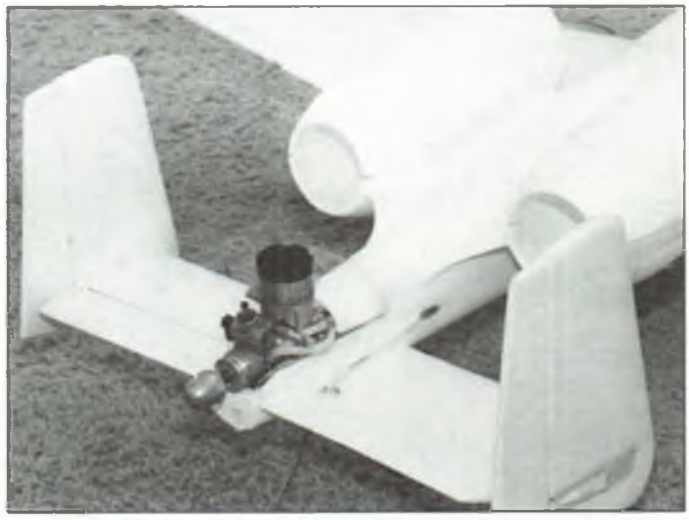
WINGSPAN	52 in.
WING AREA	423 sq. in.
FLYING WEIGHT	7 lbs.
WING LOADING	38 oz./sq. ft.
OVERALL LENGTH	47 in.
RADIO	Four to six channels required.
ENGINE	A single .40- .50 two-stroke mounted as a pusher, or two ducted fan .25s in Kress RK-720 fan units.

Produced by Combat Models, Inc., Fightertown USA, 8525 Arjons, Unit K, San Diego, CA 92126; (619) 536-9922.

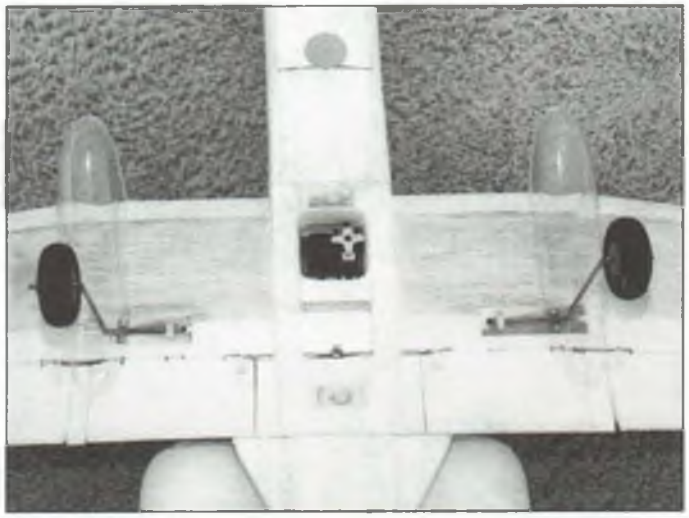
siderable work required to turn this kit into a finished airplane, however. It's not really an ARF, but not your typical you-build-it-all kit, either.

Combat Models designed its A-10 to readily accept the pneumatic landing gear system manufactured by Robart, specifically part #606 (main gear) and part #607 (nose gear). Detailed instructions and mounting hardware are included in the kit. The entire system adds 8 to 10 ounces to the total weight. The manufacturer claims greatly enhanced performance and realism when the retracts are used. But again, keeping things simple, we went with the fixed gear, and decided to concentrate on a highly scale appearance.

One of the nicest things about the Combat Models kit is that it comes with a complete array of armament, including bombs, missiles and even a Gatling gun. And as if that wasn't enough, they throw in a scale combat pilot complete with parachute, ejection seat and oxygen bottles. All of these accessories are precision molded out of foam. They look strikingly like the real thing when painted



■ LEFT: The A-10 Warthog kit as it comes out of the box. ■ RIGHT: For simplicity, Art chose to go with a single rear-mounted pusher engine—in this case, a YS .45, on account of its power and built-in fuel pump. For more ambitious modelers, two Kress RK-720 ducted fan units can be mounted in the engine pods.



■ LEFT: Underside view of the tail shows the sturdy wire tailskid which protects against propeller damage. ■ RIGHT: View of the Warthog's belly shows the standard fixed gear installation. If installing retracts, they'd go inside the clear plastic wheel pods. Note also the functional flaps—very useful in landings. Art recommends you don't leave 'em off.

and glued in place, and add next to nothing in weight.

In addition to a 30-page instruction book complete with illustrative photographs, the kit comes with a superb videotape, guaranteed to quicken the pulse of any RC or full-scale pilot. It begins with professionally filmed footage of full-scale A-10 operations, including actual combat scenes. Interspersed with these are realistic clips of a number of model A-10s, until a point is reached where it actually becomes difficult to differentiate the models from the full-size. By the end of the flying segments, the viewer is chomping at the bit to start building, and the tape takes a subtle shift into an instructional mode, clearly demonstrating the steps in assembling the model.

First, the directions show how to assemble the Gatling gun and the rest of the weapons systems, right down to specifying the particular grit sandpaper needed for smoothing the finish. Assembling the pilot comes next, and when painted as directed, I will stack this figure up against any high-priced pilot figure on the market for realism, right down to the authentic shoulder patch included with the kit!

Next, the large components including the wing and fuselage are covered with a light coating of spackle and gently sanded. For those who desire retracts, the video goes into a detailed, step-by-step installation sequence. Next, the wing is outfitted with the main spar, aileron horns, and hardware for the optional flaps.

After this, all surfaces are covered with 3/4-ounce fiberglass cloth, which is not included in the kit. This fiberglassing is not mandatory; it is intended only to enhance the durability and the appearance of the finish. Painting the bare foam is completely acceptable, and will result in an even lighter airframe. We chose to apply the fiberglass finish; the kit manufacturer claims it only results in a 4-ounce weight increase.

Ailerons are next cut out of the foam along clearly marked lines, and the movable tail surfaces and optional flaps are installed.

The videotape clearly covers all final assembly steps, detailing thoroughly the installation of a rear-mounted pusher engine. While it does show how nicely a Kress Jets RK-720 ducted fan unit fits into the engine pods, no extensive installation directions are included in the tape. Detailed instructions for a ducted fan installation are included in the printed directions, however.

Finishing the A-10 Warthog is simplicity itself, requiring only some masking and spray painting in the color scheme of your choice. We chose a three-color camouflage layout using Pactra Formula-U polyurethane paint.

The wingspan of the completed model is 52 inches, with an overall length of 47 inches. Ready-to-fly weight as specified by the manufacturer is 6 pounds, but it's not clear whether this is for the single engine or the twin fan version, nor does it distinguish between fixed or retract gear installations. But as the directions describe a retract installation with a single pusher engine, plus an extra servo for flaps, one must assume that this is the setup referred to in the specifications.

We decided to use a YS .45 engine in our

Warthog, mostly because pusher aircraft do not take kindly to being underpowered. I guess this is because without a propeller blast over the tail surfaces, plenty of flying speed is required for proper control. The YS was chosen for its brute power and also for its built-in fuel pump, which is highly advisable when it's necessary to install the fuel tank forward of the engine.

The only disadvantage of using the YS is that it is somewhat heavier than most engines in its class, in this case requiring a good deal of extra nose weight to get the CG just right. The instructions state that to achieve proper balance, up to 16 ounces of nose ballast may be required, but because of the heavier engine, we needed almost twice that amount. Our ready-to-fly weight came to 7 pounds, and with a wing area of 423 square inches, the wing loading came to a hefty 38 ounces per square foot.

Normally I prefer to fly pusher aircraft from paved surfaces, as the prop has limited ground clearance and can get chewed up on rough runways, especially when rotating during takeoff. Combat Models thoughtfully provided this airplane with an excellent wire tailskid which is designed to prevent just such occurrences.

We flight-tested the Warthog at our local paved airstrip on a warm and windless afternoon. Anyone who is experienced with pusher engines knows that you can't dawdle around on the ground while the engine is running, as the engine heats up quickly without the cooling effect of the propeller. So no time was wasted in lining her up and advancing the throttle.

Anyone who builds this type of model shouldn't expect to duplicate the aerobatic maneuvers of an Ugly Stik. This airplane should be flown just like any full-scale jet or ducted fan model, because it behaves very much the same. The A-10 is not designed for snap rolls and Lomcevaks, but it is perfect for realistically imitating the flight of its full-scale counterpart. It flies smoothly, rolls superbly, can be easily inverted, and will even fly knife-edge maneuvers. But I like it best for doing high-speed tactical turns and low level attacks.

In addition to a 30-page instruction book complete with illustrative photographs, the kit comes with a superb videotape, guaranteed to quicken the pulse of any RC or full-scale pilot. It begins with professionally filmed full-scale A-10 operations.

Landings aren't nearly as fast as I expected, given the extra pound of nose weight; lowering the flaps works like magic to slow the approach and final touchdown. There doesn't seem to be a tendency to drop a wing at low speeds, either. Of course, all that armament and the two big engine pods hanging out also act as an airbrake. My conclusion was that the flaps are a real asset to this model, and I would advise that they not be excluded.

Based on the flying characteristics I've observed, I would highly recommend the Combat Models A-10 Warthog to anyone considering entering the field of ducted fans. One could consider this model to be a ducted fan trainer, one that will allow an RC pilot to gain experience in handling military-style models without all the fuss and bother of trying to learn to handle ducted fan engines at the same time.

Of course, even if there is no interest in going on to ducted fan aircraft, this pusher engine version of this model will supply the same kind of flying fun and excitement. And besides, at a hundred feet up, you'll never see the difference!

For further information on the A-10 Warthog, contact Combat Models, Inc., Fightertown USA, 8525 Arjons, Unit K, San Diego, CA 92126; (619) 536-9922. **MB**

'93 OSHKOSH

An unequaled variety of aircraft, good weather and an extraordinary array of activities helped make the 1993 EAA Convention one of the most successful and enjoyable ever.

BY RICH GRAHAM

■ ABOVE: Pretty Ryan PT-22 dons up in pre-WWII Army training colors. ■ RIGHT: "Purple Passion" is what Claudio Tannini calls his eye-catching RV-4. Claudio has flown all over North and South America in the aircraft, which has appeared in a number of full-scale aviation magazines.

■ LEFT: WWI replicas such as this colorful 7/8-scale SE5A are becoming increasingly popular with homebuilders these days. ■ BELOW: Always a popular airshow act in their high-powered Christen Eagles, the Eagles Aerobatic Team of Gene Soucy, Tom Poberezny and Charlie Hillard—all top-rated competition aerobatic pilots.

An extremely rare B-24, "All American," makes a low pass amidst a spectacular pyrotechnics display—one of several crowd-pleasing flight demos seen at Oshkosh.

■ LEFT: Floatplanes were welcome at Oshkosh also, and flew all week from nearby Lake Winnebago. Photo by Tom Perzeolka. ■ RIGHT: Aerobatic pilot and aircraft collector Kermit Weeks of Miami, Florida is the owner of the last flyable Short Sunderland flying boat, used to hunt submarines in WWII. Every afternoon, Kermit flew it from Lake Winnebago to the fly-in and made several passes during the showcase of flight programs. Photo by Tom Perzeolka.

What would Oshkosh be without Delmar Benjamin and his fabulous Gee Bee R-2 reproduction? It's just as much of a crowd pleaser now as when he first flew it almost two years ago.

An estimated 800,000 people and 11,000 airplanes—including 2,280 showplanes—participated in the EAA's 41st annual event held in Oshkosh, Wisconsin, between July 26 and August 1. Convention Chairman Tom Poberezny said this year's convention was second to none—a tribute to the thousands of EAA volunteers, chairmen, officers, directors and staff members who contributed.

The convention again offered more than 500 educational forums, seminars and workshops led by the top names in aircraft design, construction, restoration, maintenance, research and development.

A breakdown of the 2,280 showplanes—the second highest number ever seen at Oshkosh—included 679 custom-built aircraft, 116 antiques, 639 classics, 162 contemporaries, 347 warbirds, 182 ultralights, 107 amphibians, 29 rotorcraft, 9 replicas and 10 "specials." In addition, Oshkosh played host to participants from 78 nations, including 2,323 registered foreign guests.

As part of the EAA's continuing tribute to significant individuals, groups, activities and engagements during the 50th anniversary of WWII, members of the Woman's Airforce Service Pilots (WASPs) were honored during the 1993 Fly-In. Established in 1942, the WASPs became the first American women to fly military aircraft—testing and ferrying airplanes, towing flying targets and engaging in non-combat flying activities. Several examples of the aircraft flown by WASP crews were on display, including a B-25 and a P-51.

The 56th Fighter Group, which destroyed more enemy aircraft in aerial combat than any other fighter group in the Eighth Air Force between 1943 and 1945, was also recognized during the show. Five Aces from the 56th were in attendance. P-47s flew several times in tribute to the Aces participating and to recognize the significant contributions of the group.

This year's Fly-In featured a number of firsts, including the establishment of a new world speed record during the Aeroshell Speed Dash. The Speed Dash featured five of the top Formula One finishers from last year's Reno National Championship Air Races. One airplane raced on each of the Convention's first five days. The top two qualifiers raced again on the final two days of the event. On Sunday, August 1, Jon Sharp flew his Formula One racer "Nemesis" to a new straight-line speed record of 277.56 mph. Sharp's time eclipsed the previous record by 16 mph.

Another first was the Breitling Masters of Aerobatics competition, which attracted several of the world's top aerobatic pilots. Competitors flew two programs—a four-minute free program accompanied by smoke and music, and a normal freestyle program. Yurgis Xairis of Lithuania captured top honors. The Breitling Swiss Chronograph Company provided $450,000 in total prize money for the series.

EAA Founder and Chairman Paul Poberezny greeted 52 ultralights and light airplanes from the "Spirit of Adventure Flight" that flew into Oshkosh as a group on Saturday, July 31. Six aircraft started the mass fly-in from Metropolis, Illinois, and picked up other aircraft along the way. It was the largest ultralight and lightplane group to have ever flown into Wittman Regional Airport.

Once again the convention provided unique opportunities for flying enthusiasts to get "up close and personal" with some of the most exciting and unique aircraft in the world. I suggest that everyone interested in flying make at least one trip to Oshkosh—you won't be disappointed! ***MB***

The ubiquitous AT-6 Texan is not such a simple aircraft, as this partially opened-up example proves. Beautiful restoration work. Photo by Tom Perzentka.

Don McMakin (center) and George Rotter finish working on a wing rib for a Ryan they were helping restore. They were participating in one of the many hands-on workshops at the convention.

Some warbird restorers go to extraordinary lengths in the name of authenticity; this P-51's wing guns are fake, but note the minute details, including the loading instructions on the door. Photo by Tom Perzentka.

Obviously an experienced air camper with his Aeronca Champ, Slim Caselman of Meadville, Missouri knows how to enjoy himself at a fly-in, even a giant one like Oshkosh.

*NEW SHOW HOURS

WRAM SHOW 94

FEB. 25-27

WESTCHESTER COUNTY CENTER
WHITE PLAINS, NEW YORK

★ FRI. 2-7PM – SAT./SUN. 10AM–6PM

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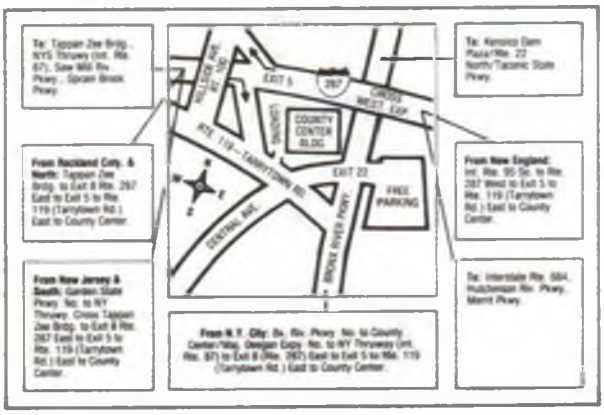


SPECIAL STATIC COMPETITION NOTICE. Read Carefully.

All judging will take place Saturday evening after close of show. Winners will be announced on Sunday. Registration of models will start at 8:30 AM Sat. and will end at 1 PM. Models may be brought in thereafter for display but will not be eligible for prizes.

All models must be operable & RC controlled. Trophies and/or prizes to be awarded. VCR's to be awarded in three categories: "Best-in-Show" flying, "Best-in-Show" cars and "Best-in-Show" boats. Top of the line RC systems for 1st place in each category. Trophies for other winners.

PLANES

• WWI • Post WW I (Military) • Post WW I (Non-Military) • Stand-Off Scale • Giant Scale • Pattern • Old Timers • Sport (Non-Scale) • Gliders • Helicopters

BOATS

• Scale (Military) • Scale (Non-Military) • Racing (Deep-V) • Racing (Hydro)

CARS

• 1/12 Scale • 1/10 Scale • 1/8 Scale or larger

JUNIORS

•All categories

BEST OF SHOW

• Planes • Boats • Cars

To obtain preregistration Static Competition forms, write: (include self-addressed stamped envelope) Allen Reinhardt, 2 Douglas Dr., Pleasantville, NY 10570.

SWAP SHOP

The WRAM's Swap Shop has become one of the major show attractions with thousands of individual items changing hands. To help eliminate "registration crush," the Swap Shop will provide for preregistration forms. To receive these forms send a self-addressed stamped envelope to: John Isbister, 4 Devon Rd., Larchmont, N.Y. 10538.

SPECIAL NOTE

This year there will be no restrictions in the number of built-up models a registrant may place in the Swap Shop.

ADVANCED TICKET SALES

Save time, order your tickets now—send check or money order made payable to WRAM, Inc. (allow 3 weeks for check clearance) and self-addressed stamped envelope to: Ed Alexis, 21 Pamela Rd., Peekskill, NY 10566.

One day Ticket: $7.00
Friday: $6.00
Under 12 yrs.: $1.00/day.

FOR ADDITIONAL INFORMATION

Call Jim Onorato at **203-438-4352**

The Need for Speed

Rotor speed, that is. James explains why a high rotor rpm is desirable for aerobatics and hotdogging, and also talks about some of the latest helicopter goodies from Horizon Hobby Distributors.

BY JAMES M. WANG

The key to doing crisp and agile aerobatics and 3-D hotdogging is to maintain a healthy rotor speed. People who have seen the anti-gravity demonstrations by Curtis Youngblood and Ray St. Onge will have noticed that their engines always sound strong and that they both maintain a high rotor rpm—around 1,700-1,800—throughout their flights.

For helicopters, both the thrust and control moments are generated by the spinning main rotor. A high rotor speed improves cyclic response in two ways: 1) The swashplate causes the Hiller paddles and blades to change pitch once per revolution, therefore, increasing rpm generates more cyclic inputs per minute; and 2) the faster spinning blades and paddles generate more aerodynamic force for the same degree of pitch change. The aerodynamic force produced by the airfoil and paddles is proportional to the velocity *squared*.

The biggest control response difference you will notice when the rotor speed is bumped up is a shorter transient cyclic response time. Transient response refers to how quickly the helicopter responds to a control input. A high rotor rpm will cause the model to react almost instantaneously to the pilot's commands. The time lag between a swashplate input and when the rotor disk starts to tilt, for any model or full-size helicopter, is about what it takes for the blade to spin 1/4 to 1/2 of a revolution. The exact delay can be easily calculated if you know the blade inertia and airfoil lift characteristic (the lift curve slope).

The steady state roll rate or pitch rate of the helicopter does not improve too much by increasing the rotor rpm. If you have already maxed out the swashplate tilt, and the rotor disk reaches its maximum deflection after 1/4 revolution, then the steady state roll rate will primarily depend on the roll inertia of the fuselage.

Another advantage of using a high rotor speed for hotdogging is that the faster spinning blades will maintain a strong rotor

The new .60-size Kait Omega Grand Prix was flown to a 2nd place win at the 1993 F3C World Championships in Austria by 1991-92 World Champ, Kazyuki Sensui of Japan. Model has modular aluminum side frames, an extra long tail boom and metal 10-SII teetering head—and that's just for starters. More in text.

inertia. When any sudden cyclic or collective command is fed in, the increased blade and paddle pitch generate more drag, which tries to slow down the rotor. The inertia of a faster spinning rotor helps prevent the rotor speed from bleeding down.

High rotor rpm is especially beneficial for helicopters with marginal engine power. A low-torque engine may bog down immediately when sudden collective and cyclic are fed in. But if the rotor rpm is high to start with, the rotor's inertia will delay the decay. This helps you complete the initial entry into the maneuver.

There are several ways to achieve a high rotor rpm. We can use a more powerful engine and/or lower drag main and tail rotor blades, minimize gear mesh friction, reduce tail rotor drive friction, and optimize the idle-up throttle/pitch curves. Most model helicopter blades have a 15-18 percent thick airfoil. Some of the more advanced model blade designs are starting to use 13-14 percent thick airfoils. The drawback of thin airfoils is a slight reduction in hover stability. Most full-size helicopter airfoils are 12 percent thick at the blade root and 10 percent thick near the blade tip. They can get away with it because they are inherently more stable than models. Also, to help maintain a high rotor speed, make sure the blades are clean, without nicks, peeled-off tape material or a blunt trailing edge.

The gear mesh friction and bearing drag for the main rotor system consumes about 20 percent of the engine power. The tail rotor system consumes another 20-25 percent. Obviously, having a smooth turning tail rotor is very important.

The new KSJ N-60RS competition muffler from Horizon consists of four machined aluminum cylinders bolted together instead of being welded. Available to fit O.S. and YS heli engines.

Finally, the single most important thing you can do to get a high rotor rpm is to program the radio carefully. I use the normal throttle curve and pitch curve for hovering only. Idle-up 2 is reserved for aerobatics and 3-D hotdogging. Once idle-up 2 is activated, the hover rpm jumps to 1,700, and never dips below that under any throttle/collective stick position. To do this, simply program the idle-up 2 throttle curve into a U-shape. The throttle will then be 100 percent open at full positive and full negative collective pitch.

At half stick, the carburetor throat should be about 60-80 percent open; the exact amount will depend on the particular model and engine. The idle-up 2 throttle curve is fine-tuned in flight by listening to the engine. The engine should scream at a near constant pitch under all hotdogging maneuvers.

Modern full-scale combat helicopters like the Comanche, Apache and Tow Cobra use an electronic speed governor to maintain constant rotor rpm. Robbe/Schluter sells such a speed governor (CSC4, about $240—see the July '92 Chopper Chatter column) for model helicopters. Miniature Aircraft has a similar unit called a "Throttle Jockey" ($139 retail). Bob Sims and Wayne Mann both use Throttle Jockeys on their hotdogging machines. But by carefully programming the idle-up throttle and pitch curves, you can achieve near-constant rotor speed during most maneuvers without using a governor.

One drawback of high rotor rpm (greater than 1,800) is that the helicopter becomes overly sensitive to collective in hover. Idle-up 2 is mostly for aerobatics and not for long-term hover, so it's not critical. With a high rotor speed, any minor slop in the collective tends to show up as jitters in flight. Use your best servo on the collective. My choice is the Futaba 9201, JR 4131 or Airtronics 94735. All three have a coreless motor and a dual ball bearing output shaft. As mentioned in my 1993 World Champs article, JR will soon introduce its new series of "Super Servos" that have five to ten times the holding torque of the already excellent 4131 servo.

A good exhaust system also helps maintain a constant high rpm during maneuvers. My personal choices are the U-shaped Hatori tuned pipe, Miniature Aircraft's Magna U-pipe, or Helicopter World's Blackshark U-pipe. U-pipes provide a good power boost, and are extremely quiet. With a proper throttle/pitch curve setup, 15 percent nitro fuel is usually sufficient for doing 3-D aerobatics.

Now let's talk about some new helicopter items from Horizon Hobby Distributors, who import and distribute Kalt helicopters, KSJ accessories, JR radios and Webra engines in the U.S. Horizon now also has its own proprietary Revolution Helicopter Accessories line of specialty heli items. One is a universal ball link removal plier that will work with Kalt, Miniature Aircraft, Schluter and Rocket City ball links. Another item is a see-saw blade balancer with a top-mounted precision bubble level indicator. Still another Revolution item is a ball bearing supported graphite torque tube drive for the Kalt Enforcer ZR, Alpha II and GS Alpha.

This precision blade balancer is part of the new Revolution line of helicopter accessories from Horizon. Rotor blades bolt to both ends of the anodized aluminum body, then the wire shaft is placed over the edges of a couple of drinking glasses and the blades brought into balance as indicated by the bubble balancer on top.

Horizon is also offering a new .60-size helicopter, the Kalt Omega Grand Prix, as flown to 2nd place at the recent World Champs by Kazyuki Sensui, the 1991-92 World Champion. The Omega Grand Prix uses a modular aluminum straight frame design. The servos are integrally mounted to the frames to provide short, direct, straight control runs. Cyclic and collective controls are push-pull. It comes with a graphite torque tube tail drive, a Kalt 10-SII teetering metal main rotor head, G-10 epoxyglass fins, one-way hex start system, and a gel-coated fiberglass canopy. This quality does not come cheap, as the Omega Grand Prix will retail around $2,000.

To complement the Kalt helicopter line, Horizon has released a new competition muffler for O.S. and YS .60-size heli engines, the KSJ N-60RS. The whole thing is machined from bar stock aluminum, and the four cylinders are screwed together rather than being welded, to prevent fractures near the welds. A specially shaped internal baffle is said to drastically reduce noise without power loss. ***MB***

The 5th FAI F3C RC Helicopter World Championships

The U.S. fliers really cleaned up in Austria—top team honors and 1st place individual. Here's the full story on what they flew, along with some insights on the meet from Miniature Aircraft's Ted Schoonard.

BY JAMES M. WANG

Velden, Austria was the site of the 5th F3C Helicopter World Championships this past September. Velden is a quaint village located near the Italian and Yugoslavian borders, about halfway between Salzburg and Vienna. The contest site is engulfed with green hills and picturesque mountains. The weather for the contest was very pleasant—typical fall weather.

A total of 64 competitors from 27 countries participated, making this the largest F3C competition in history. Team USA successfully defended the World Champion title. Team Japan, for the second time in a row, came in 2nd. The Swiss team did extremely well and came in 3rd.

Japan's Kazuyuki Sensui, the defending 1991 World Champion, fell to 2nd place this time. Curtis Youngblood flew a pod-and-boom X-Cell 60 to win the 1993 Championship. Curtis is the only flier who has won the title twice; his previous win was in 1987.

Almost everyone at the contest flew a model with a fiberglass

U.S. F3C fliers captured the 1993 World Championship team trophy at Velden, Austria in September, 1993. Kneeling, from left to right: Wayne Mann, Curtis Youngblood and Wendall Adkins.

Curtis Youngblood's X-Cell 60 Custom. He's using Miniature Aircraft's extra large horizontal stabilizer and optional large, weighted paddles for improved forward flight stability. Note the 1/4-inch graphite arrowshaft used for tail rotor pitch control.

INDIVIDUAL STANDINGS

1.	Curtis Youngblood, USA	2988.66
2.	Kazuyuki Sensui, Japan	2959.23
3.	Yukihiro Dobashi, Japan	2849.91
4.	Daniele Graber, Switzerland	2846.20
5.	Seiji Suwabe, Japan	2832.78
6.	Wayne Mann, USA	2791.08
7.	Heinz Gasser, Switzerland	2783.32
8.	Shizuo Ishikawa, Japan	2668.31
9.	Joerg Roessner, Germany	2627.81
10.	Colin Bliss, Britain	2618.51

TEAM STANDINGS

1.	USA	6.	Denmark
2.	Japan	7.	Austria
3.	Switzerland	8.	Italy
4.	Germany	9.	Australia
5.	Britain	10.	Sweden

fuselage. In the past, it has been rumored that judges tend to favor the fuselage models for their aesthetic appeal. Fuselage models, in general, perform better forward flight aerobatics by virtue of their better penetration and speed. They also suffer more from wind during hover maneuvers, and are more difficult to access for maintenance. Contrary to the prevailing practice of flying "fast and big," Curtis flew his pod-and-boom X-Cell with surgical precision to capture the crown.

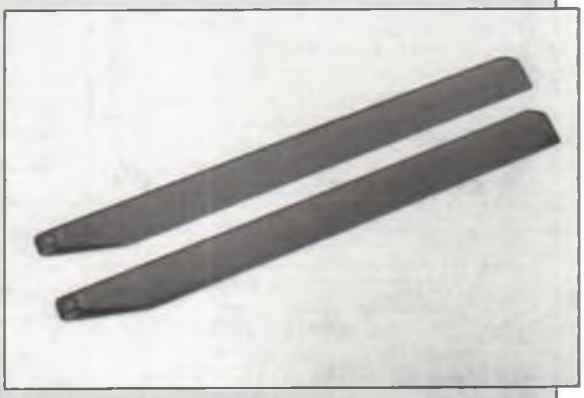
The 23-year-old Sensui flew the new .60-size Kalt Omega Grand Prix. His model had the Kalt Aggressor fuselage, optional KSJ 818 all-metal push-pull rotor head, MSK 50 gram Hiller paddles, graphite side frames, O.S. .61 SX-H ringed engine, KSJ silencer, KSJ multi-lamination wood blades covered with fiberglass, JR PCM-10S radio, JR piezoelectric gyro, wire drive tail rotor system, and the same tail gearbox as on the Kalt Alpha II. Takeoff weight was 10.8 pounds. The Omega Grand Prix will be distributed in the U.S. by Kalt's importer, Horizon Hobby Distributors.

Sensui and Youngblood were the only two using the new prototype JR "Super Servos," which should be available this spring. The beauty of these servos is that their "holding torque" figure is five to ten times higher than other high-quality coreless motor servos, including JR's top-of-the-line 4131. Holding torque is a parameter used by JR to quantify the ability of a servo to hold its position and centering under load. A high value means less deadband and less slop.

Third place winner was Yukihiro Dobashi of Japan, winner of the 1989 World Championships. Dobashi flew a Blackshark fuselage with retractable landing gear, Hirobo Eagle mechanics, YS .61SF engine and a Futaba 9ZHP radio. Fourth place winner was Daniele Graber from Switzerland. Daniele is the test pilot for Professor Sitar, the famous Austrian designer who pioneered fiberglass rotor blades in 1984. In 1991, Daniele Graber joined the Robbe/Schluter team, and together with Volker Heine, helped design the very successful .60-size Futura helicopter.

1993 U.S. F3C TEAM EQUIPMENT SUMMARY

	YOUNGBLOOD	MANN	ADKINS
Mech. Type	X-Cell 60 Custom	XL-Pro	X-Cell 60 Custom Graphite
Fuselage Type	Pod & Boom	Optima	Triumph
Weight	10 lbs. approx.	11 lbs. approx.	11.0 lbs. approx
Gear Ratio	9.0:1:4.3	9.0:1:4.6	9.0:1:5.6
Blade Length	680mm	710mm	680mm
Blade Type	Sym. Graphite	XL-Pro Wood	"S" Profile Glass
Blade Weight	180 grams approx.	200 grams approx.	195 grams approx.
Tail Rotor	Single	Twin	Single
Tail Blade	Sym. Graphite	X-Cell 30	Sym. Graphite
Tail Drive	Torque Tube	Torque Tube	Torque Tube
Driven Tail	MA/USA Locking Type	MA/USA Adj.	MA/USA Adj.
Bell/Hiller Ratio	1:1	1.6:1	1.6:1
Paddles	XL-Pro II	XL-Pro II	XL-Pro II
Engine Type	O.S. 61 SFN-H ABC	O.S. 61 SX-H	O.S. 61 SFN-H ABC
Carb Type	Super Tigre	608	Super Tigre
Exhaust Type	V-Tech	Magna-Pipe	Magna-Pipe
Push/Pull Controls	Col/Elev/Ail	Col/Elev/Ail/Rud	Col/Elev/Ail
In-Flight Mixture	No	Yes	Yes
Nitro	15-20%	30%	35%
RPM	Hover/Flight 1,700	Hover 15-1,600 Flight 1,730	Hover 12-1,300 Flight 1,800
Radio	JR PCM-10S Single stick	Futaba 9ZHP	Futaba 9ZHP
Servos	JR Prototype "Super Servos"	Futaba 9201	Futaba 9201
Gyro	JR 120	Futaba 153 Mod.	Futaba 153 Mod.



The graphite main rotor blades used by Curtis. The blades have a symmetrical airfoil and slightly swept tips, and are custom made by NHP in England. They are now exclusively distributed in the U.S. by Horizon Hobby Distributors.

Naturally, Daniele flew a Futura at the World Champs. We had an in-depth review of this excellent helicopter in the January and February 1994 *Model Builder*.

The other two members of the U.S. team were Wayne Mann (6th) and Wendall Adkins (13th). The USA's combination of 1st, 6th and 13th places beat the Japanese team's 3rd, 4th and 8th place wins to

continued on page 81

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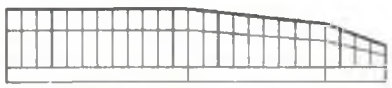

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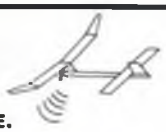

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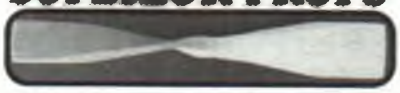

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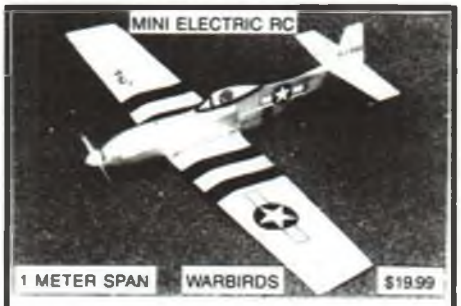

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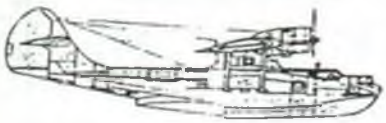

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THE COUNTER continued from page 13

TEXAS TIMERS

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NOTES FROM THE F3A WORLD CHAMPS

By all accounts, the recent F3A World Championships left something to be desired in the way of management and professionalism. Also, Rick speculates on the future of pattern, if the rules changes being proposed by the FAI F3A subcommittee go into effect in 1996.

Magazines like *Model Builder* require a minimum of three months of lead time to prepare each issue. I mention this to remind you that the delivery of topical, fast-breaking news is not the forte of this or any similar column. While I may be writing this in early November (and I am), you will not read it until early spring. That said, we will go to some late-breaking news, which, of course, will be very old news by the time you read it.

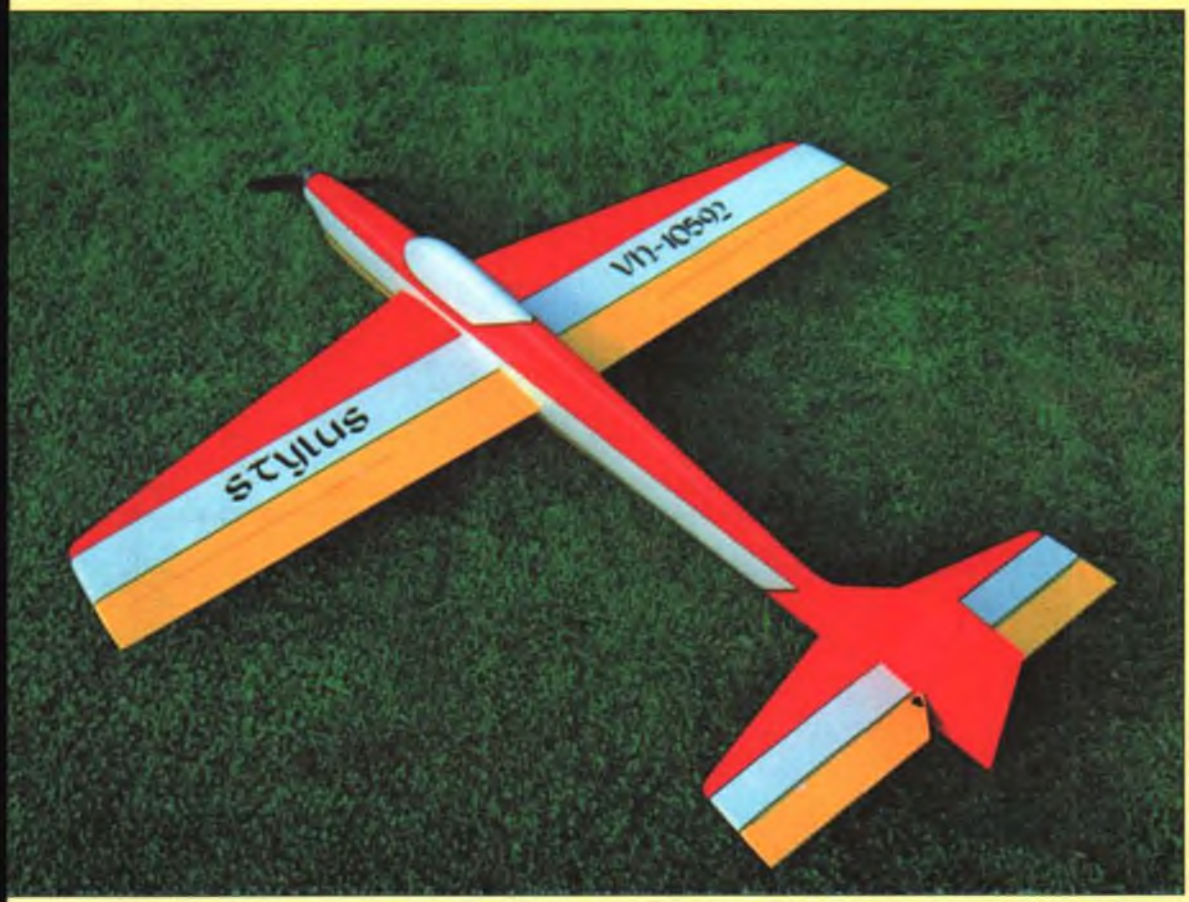
The results are just back from the F3A World Championships held in Austria; Hanno Prettner is once again the F3A World Champion. Defending Champ Chip Hyde of the USA was 2nd. Team Japan won the Team Championship. Team USA was 2nd. I can't report with any first-hand accuracy the whys and wherefores of these results, as I was unable to attend. I can tell you that, rightly or wrongly, not everyone was happy with the results of the judging, which is nearly always the case at these affairs. Unfortunately, the unhappiness on this occasion seems to extend beyond just the judging to the site, the jury, and even the way the contest was conducted. And not all of the unhappiness is confined to this country or even this continent.

Some items are not hearsay, but a matter of public record, and I can report on them:

1. Part of the finals were flown not just in the rain, but in a thunderstorm, raising a significant safety question.
2. The site chosen would not accommodate a proper "box" layout for the maneuvering areas because of the topography.
3. The finals were not flown in the format suggested in the FAI Sporting Code, being shortened from three rounds to two.
4. The judge from the same country as the winning team (Japan) was removed for cause (bias) by the jury after the preliminary rounds were completed. The scores for the preliminary rounds were not recomputed, but allowed to stand.

The above list doesn't really start to give you the picture. I would urge you to read the published accounts of those who attended for a more complete overview. I found them both informative and unsettling.

I do recall saying that the results from Austria would be interesting and educational, but this sort of thing wasn't what I had in mind. We can be proud of this: from all reports public and private, our Team USA members—Dave von Linsowe, Tony Frackowiak, Bill Cunningham and defending F3A Champ Chip Hyde—not only flew their very best under trying circumstances, but conducted themselves as gentlemen and fine representatives of our country



All the way from Down Under comes this photo of Les Bollinghagen's new Stylus design—66 inch span and length, 7.5 pounds, and an O.S. Hanno .61 for power. "Fantastic to fly," says Les. He's the man behind the fine line of Bolly props and pipes, and the Stylus will be a Bolly kit.

Ohio Masters pilot Matt Klein operates with this RC City Jekyll. YS .61 two-stroke powered, Futaba radio.

NSRCA District 1 Vice-President George Asteris of Swedesboro, New Jersey owns this Omen. Must be a "good" Omen; George likes it! YS 1.20, with a Futaba radio.

and our sport. And that, in the end, is what it's all about. Congratulations, gentlemen. You did a great job.

On to more pleasant considerations, like idle speculation on the future of pattern. The FAI F3A subcommittee on rules recently met, and the changes blowing in the wind for F3A pattern in 1996 and beyond reportedly will include these biggies: ALL engine displacement limits will be gone. In their place will be the present weight limit of 5 kilograms (11 pounds), plus a span and length limit of 2 meters (about 79 inches). In addition, the box will be opened up from 120 degrees to 150 degrees to encourage people to fly a bit closer, while retaining the 60 degree upper box limit. The National Society of Radio Controlled Aerobatics (NSRCA) Rules Committee may present companion proposals to these to the AMA RC Aerobatics Contest Board for the 1996-97 rules cycle. If the FAI proposals are adopted, and it appears very much that they will be, then the AMA proposals are probably a foregone conclusion. We've had changes before, but the impact of these, if they go through, will be huge, especially in regard to the engine displacement limit removal. We aren't talking about ripples in the pond; we're talking about waves big enough to surf on.

Fortunately, I believe that, if this bomb drops, most of the fallout will be positive and beneficial to the sport. An unhealthy situation has developed in recent years with pattern powerplants. Our suitable engine choices have always been limited to just a few types and brands, but lately, the only practical choice for serious competitors in the more advanced classes has become the 1.20 four-stroke, with about 90 percent opting for the YS 1.20AC and the remainder choosing very nearly the only other possible choice, the O.S. 1.20SP. Predictably, these engines are priced now within a few dollars of each other, and both are the most expensive models available in their displacement. Even a cursory reading of Adam Smith will tell you that, under these circumstances, this will happen every time.

All aircraft, big, little, and middle-sized, are designed to a set of flight tasks or conditions and designed around their powerplants. This has been an accepted fact of aeronautical life since Orville and Wilbur gave up on the bicycle business.

Bill Ahrens and his fine SL-1 at the '93 Nats. Futaba and YS make it go.

While this lack of competition has troubled some of us as consumers, it has had another unfortunate effect on our sport; it has helped keep new airframe design options limited. Some of these limitations are real, physical parameters, such as the size and weight of the available and legal hardware. Others, just as important, exist only in the minds of our most influential designers and top competitors. They are conventions, accepted norms, and the longer a given situation remains static, the more powerful and numerous they become. For a new design or idea to be accepted and become popular, it must not only perform well, but be trimmed to fit the preconceived notions of the time. The strongest preconceived notion of our time, at least in this country, is that only a supercharged 1.20 four-stroke engine in a mid- to low-wing monoplane will "get the scores."

All aircraft, big, little, and middle-sized, are designed to a set of flight tasks or conditions and designed around their powerplants. This has been an accepted fact of aeronautical life since Orville and Wilbur gave up on the bicycle business. Things haven't changed in this area, nor will they. *continued*

When the piped, rear-exhaust .60 two-stroke became the king of the hill and the old-style AMA pattern was the task, all of the pattern aircraft began to look (and fly) very much the same after a few years. It was a widely accepted convention at the time that a pinnacle of design had been reached, and further significant improvement of the breed, given the flight tasks and available horsepower, was unlikely. Along came Turnaround, and the tasks were changed. A noise restriction was introduced. Available horsepower stayed roughly the same. All over the world, the conventions went out the window and the lights went on over drafting tables. A period of frantic and diverse creativity followed.

In short order, we had new airplanes that looked and flew much differently. They were designed around the same engines, but to a different set of tasks. They were quieter, lighter, and more capable in the vertical flight mode. They handled better at low speeds, and were more adept at the snaps and spins required in the new schedules. All this was no surprise; this was what they had been designed to do. The surprise was that they not only did the new tasks well, but did the old tasks easily, and did them better than the best of their predecessors. The conventional thinking had been wrong; there *had* been a way to do it better all the time. To find this out, we had to get rid of the conventions. We did it by changing the rules.

A little later in pattern history, closer to the present day, more powerful long-stroke two-stroke engines with integral fuel delivery systems became available and the 1.20 four-stroke engine was introduced in competition form. As these new engine options gained in performance and reliability, more and more designs were created. A new wave of excitement, a new round of feverish head-scratching began. Again, some of the cherished axioms of the time got tossed out. There were new problems to solve. Out of it all, we got improved performance in the form of bigger aircraft that were easier to fly in the wind, easier to see, and easier to judge. We got improved vibration isolation techniques and hardware, and better propeller design. All this happened because the powerplant options were expanded.

We are now building and flying the third generation or so of these larger ships, and the new conventions have been stacked up and mortared in place. The airplanes must be of a certain size, and a certain shape, and above all, be bolted to a certain powerplant. Complacency is rising, and creativity is diminishing. The new designs rolling out are more derivative than original. We are again mostly reduced to arguing nonessential niceties such as the virtues of various fin shapes on the "presentation" and whether the wing trailing edge looks better swept forward or straight.

I can guarantee that this will no longer be the case if the proposed new rules become

the law of the flightline. All bets will be off the table. Not only will we have enormously expanded the list of legal and available powerplants, but we will have changed the flight tasks significantly at the same time. It isn't much of a stretch to predict another giant burst of pattern design activity, probably the biggest and most sustained yet. New hardware will no doubt become available in short order, because the handcuffs will come off the engine designers and manufacturers as well as the airframe designers.

Any specific predictions as to the final shape of the new things to come are a bit dicey, if only because so many new options will be open. Do you design for a slower and closer presentation with a smaller and simpler airplane, or do you go all the way to the legal limit with high horsepower and high tech to keep the weight down? Something in between? Do you power it with a large two-stroke or a small four-stroke or even (no, I'm not joking) an electric motor? I would expect that many of us will choose to design to the physical limits in size and weight because the power options will be available to handle the load, but I would also think that nearly every possible combination will be tried. It is very possible that we may settle on no particular "best" configuration, and end up with an average flightline that is permanently more diverse. This could even lead to a situation where people would have trouble claiming that all pattern planes looked alike!

Possibly the very best thing about the proposed changes would be that no present equipment would be obsolete overnight. The current airplanes would still be competitive, and the present 1.20 engines might still be a very good choice for power. The larger two-strokes, such as the O.S. 1.08 and the Webra 1.2, would be instantly viable options, and I would expect to see some rear-exhaust, pumped versions of these engines on the market even before the new rules take effect.

I'll make another prediction, for what it's worth. Should the new rules be adopted, many of the new designs will not only debut as wood/foam airframes, but will be kitted as such, or be available in plan and template form with foam cores, canopies, cowls, etc. Wood seems to handle the vibration level of the big bangers very well and wood fuselages have become more popular recently for that reason. Modern CAD design helps all the little pieces fit perfectly, and if you have a lot of experimenting to do, wood is a faster medium than glass. Whether fiberglass/foam or wood/foam, or even wood/wood, I do believe the overall trend in airplanes will likely be in the direction of lighter (relatively), slower, larger, and simpler. Along with that, let's all hope that the overall trend in pattern minds is to more openness, more creativity, and more acceptance of all the different ways there are to get the job done. ***MB***

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FAI CHAMPS

continued from page 71

take the team trophy. Sensui's 2nd place did not count toward the Japanese team score because he was the reigning World Champ, thus he was automatically invited to the contest.

All three members of the U.S. team flew .60-size X-Cells, but they were equipped very differently. Curtis flew a stretched pod-and-boom X-Cell Custom with aluminum side frames and a long carbon fiber tail boom. His model is powered by a veteran O.S. .61 SFN-H ABC engine. His setup is characterized by a high rotor speed (1,700 rpm in hover and forward flight) and the whining turbine sound of a Don Chapman V-Tech tuned exhaust pipe. Curtis uses a JR PCM-10S radio modified by his dad into a single stick. He uses the classic JR-120 mechanical gyro. The latest announcement is that Curtis has now become an official representative for JR.

Wayne Mann flew a carbon graphite XL-Pro with the new O.S. .61 SX-H motor. Wayne has increased his hover rotor speed from 1,200 to 1,500 rpm. He was also the only one sporting a twin tail rotor system. This optional item from MA has two tail rotors to improve yaw response and forward flight tracking. For more information regarding Wayne, check out our interview in the June 1991 *Model Builder*. We predicted back then that Wayne will one day become a household name for helicopter enthusiasts.

Wendall flew an X-Cell 60 Custom with carbon fiber side frames. He also used the proven O.S. .61 SFN-H ABC engine. The O.S. specs say the new SX-H puts out about 15 percent more horsepower than the SF-N, but some still believe the SF-N runs smoother. Wendall uses a two-speed setup (1,200 rpm in hover and 1,800 in forward flight).

Since all three U.S. team members flew Miniature Aircraft X-Cells, Ted Schoonard of Miniature Aircraft gladly accompanied them to Austria to provide moral and technical support. I asked Ted to write a few paragraphs comparing the U.S. team's flying with the Europeans and the Japanese. The following is Ted's summary:

"Curtis Youngblood flew his typical moderate speed, low altitude program, which we have all admired for years. He concentrated on small size maneuvers and pinpoint accuracy.

"Wayne Mann and Wendall Adkins flew relatively large, smooth maneuvers at high speed. Wayne and Wendall had their strong points in their aerobatics, while Curtis was looking good in all aspects of his flights. Of particular note were his autorotations, which were nearly flawless and arguably the best of the meet.

"Looking overall, the Europeans seem to have improved over the past years, with the Japanese remaining at their approximate previous level. Some European pilots were flying significantly faster than the rest of the field, due to the use of special prototype engines from Webra and Nova Rossi. Conversely, the Japanese seemed to have lost their power advantage, appearing a bit slower than in previous years. Similarly, in the search for more speed, the trend in fuselages is definitely non-scale, with sleeker shapes being the norm.

"One could argue that the general caliber of flying has improved, but some of the top pilots had not. The gap seems to be narrowing. Typically, problems continued with aerobatic maneuvers such the roll, and oddly enough, missing the cones in hover maneuvers. Many pilots, even the top ones, were missing the cones by large margins.

"Equipment does not seem to have changed significantly, with no evidence of any new trends toward alternate mechanical layouts or power sources. No four-stroke engines (which are now legal in FAI) were used. Nitromethane seems to be more widely used than in previous years. The Europeans still favor the typical S-camber or reflex airfoil blades, while most others opted for regular semi-symmetrical types. Curtis used symmetrical blades, which attracted some attention. Since most European and Japanese pilots prefer very low

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Curtis' radio of choice is a one-of-a-kind JR PCM-10S modified by his father into a single stick. Not surprisingly, Curtis has been named an official rep for JR.

hovering rotor speeds and faster aerobatics speeds, it is questionable whether they might switch from the status quo (due to the typical symmetrical airfoil's dislike for this type of setup).

"Factions are still split about the best type of exhaust system. The U.S. team, along with most Europeans, still use tuned pipes, while the Japanese and a few others remain with mufflers.

"One refreshing change was shown in Mr. Dobashi's use of retracts. It would be nice to see this become a trend, but it was not without some controversy. It seems as though, with the rules stating clearly 'skids at eye level,' questions were raised as to the legality of retracting the gears during the hover maneuvers. Who knows?

"All in all, the U.S. team put forth a fine effort, overcoming minor difficulties and working very hard. Chuck Wildey is to be commended for his organized and supportive effort on behalf of the USA. He and the team worked very well together. Of course, it should not be overlooked that Curtis Youngblood was the 'Class of the Field,' putting in flights that demanded the attention of everyone. He showed that practice, consistency and good equipment can take even a pod-and-boom helicopter to the World Championships."

If you would like to compare how model helicopter technology has progressed, there are detailed reports of the 1987, 1989 and 1991 World Championships in the 5/89, 9/89, 3/90, 5/90, 10/91 and 3/92 issues of *Model Builder*. Again, congratulations to the U.S. team! ***MB***

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