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BEST SAILPLANES OF THE LAST 25 YEARS

MODEL 25TH ANNIVERSARY BUILDER

FREE FLIGHT'S
TOP 25 MODELS,
PART 1

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CLASSIC CONSTRUCTION PROJECT —
THE DRAGONFLY

25 YEARS OF
RADIO HISTORY

NEW CONSTRUCTION
FMX-4 FACETMOBILE:
SCALE 3-VIEWS AND FULL-
SIZE PEANUT PLANS!

EVOLUTION OF
ELECTRIC FLIGHT

Flight Test:
THE AIRPLANE FACTORY'S
KOMBAT 40 BASIC TRAINER



CHOOSE YOUR WEAPON

Whether you're into speed, sport, scale or duration, Cox has the right engine for you.



The Cox Texaco .049 has become the standard for 1/2A R/C Duration flying. Now, to meet the competition requirements of both long and short tank events, the engine is available in two different tank sizes and also includes a "zero drag" spring starter. When competing in 1/2A Texaco & Duration events or out for a Sunday afternoon fun fly, smooth steady power and fuel economy is the secret to great performance! The Cox Texaco features a high velocity venturi for improved fuel economy and a 5 fin glow head for extra cooling when swinging a big prop.



The .05 is based on the popular Tee Dee .051 Competition engine. This is the lightest engine available with true carburetor and muffler.



Designed to run ultra fast with high nitro fuel on small props, the Killer Bee engines will clean up in Nostalgia Free-Flight. Available in both .049 and .051 sizes, the Killer Bees are ready for class 1/2A or A competition.



The .09 is a radio ready version of the powerful Tee Dee .09. The Tee Dee R/C .09 features true carburetion and muffler. Small size and weight allow the user to install this engine as a "Turbo-Boost" in most aircraft intended for 1/2A R/C flying.



The Dragonfly features an integrated throttle/muffler system, Snap Starter® for easy starting and oversized fuel tank with built in "clunk" system to allow inverted flight.



First introduced in 1973, the Black Widow is our most popular .049 reed valve engine! It's great for all types of control line models including 1/2A Stunt, Mouse Racing, Beginner Combat and Powered R/C Sailplanes, too.



Super Sportsters: 5 classic performers - and 2 brand-new ways to cut loose!



Wingspan: 55.5 in (1409 mm), Wing Area: 550 sq in (33.5 sq dm), Weight: 5-6 lb (2270-2700 g), Wing Loading: 21-25 oz/sq ft (63-75 g/sq dm), Length: 45.5 in (1132 mm), Engine Required: 2-stroke .40-.46 (6.5-7.5 cc) or 4-stroke .40-.70 (6.5-11.5 cc), Radio Required: 4-channel



Super Sportster 40 PRE-BUILT KIT

Before they became respectable classics, Super Sportsters had something of a reputation in R/C.

Each one had the same bold appearance and sleek looks, and the same uncanny gift for suiting performance to pilot. With control throws reduced, a Super Sportster could be as mild as any trainer; but with control throws bumped up, it was also known to be capable of anything — a plane that would avalanche in an instant and perform 'til your thumbs went numb.

And then as now, the shared secret of Super Sportster success was Great Planes Engineering.

Photo-illustrated instructions, high-quality woods, premium Great Planes brand problem-solving hardware, symmetrical airfoils with blunt leading edges...every Super Sportster has had them all, including the two newest versions.

The Super Sportster 40 Pre-Built Kit blends classic performance with modern convenience, in a 90% pre-built, all-wood ARF.

The Super Sportster 40 MK II updates yesterday's favorite with today's top technology.



Super Sportster 40 MK II

Wingspan: 55 in (1400 mm), Wing Area: 550 sq in (33.5 sq dm), Weight: 5-6 lb (2270-2700 g), Wing Loading: 21-25 oz/sq ft (63-75 g/sq dm), Length: 46 in (1170 mm), Engine Required: 2-strokes .40-.46 (6.5-7.5 cc) or 4-stroke .40-.70 (6.5-11.5 cc), Radio Required: 4-channel w/4 servos



"The improved MK II Kit updates our most popular sport plane ever with the best R/C kit design technology. Modern machines such as this custom die-cutter make it easier than ever for us to offer state-of-the-art assembly ease at a price any modeler can afford."

Don Anderson

Don Anderson, President and Founder, Great Planes Model Manufacturing.

Interlocking construction, wing sheeting that keeps the wing perfectly straight while it's still on the building board, stronger lap-joint wheelpants that "lock" to the strut — the MK II has it all and more, plus genuine Super Sportster handling.

All in all, Super Sportsters offer seven different ways to cut loose. And they're all from the leader of the pack — Great Planes.



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Super Sportster 20
Wingspan: 48 in, Engine: 2-stroke
.19-.25 or 4-strokes .20-.30



Super Sportster 40
Available in ARF or improved MK II Kit -
see above



Super Sportster 60
Wingspan: 61 in, Engine: 2-stroke
.45-.61 or 4-stroke .60-.80



Super Sportster 80/120
Wingspan: 72 in, Engine: 2-stroke
.61-.90 or 4-stroke .90-1.20



Super Sportster Biplane
Wingspan: 45 in, Engine: 2-stroke
.35-.45 or 4-strokes .40-.70

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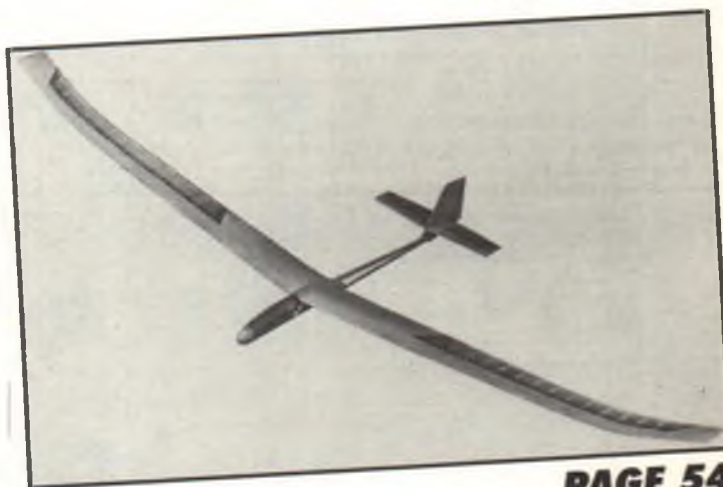
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ON THE COVER: Three 1/6-scale Gee Bees! The one in the middle is Burt Williams' scratch built 1929 Model A biplane, the Granville brothers' first production aircraft, while the two monoplanes are the work of noted Gee Bee authority Henry Haffke. In the foreground is a replica of the famous 1931 Model D Sportster that pilot Bill Rausch campaigned on the air race circuit from 1932 to 1935. The sleek ship in the background is a 1933 Model Y Senior Sportster that was flown in the International Air Races in Chicago. Photo was taken by Frank Gudaitis at the first Golden Age RC meet at the Old Rhinebeck Aerodrome.

MOST of these are READY BUILT! Just install your RC gear! AND..... they're on SALE!

NEW! Ready-Built and Covered "Sport 40" - great RC trainer is nearly ready to go FLYING!



BALD40 Baldwin's Ready-Built "Sport 40"
Introductory price \$139.00
 regular price \$169.00
 59" wingspan. A great RC trainer that you can learn to fly RC with. It's all built! Clear instructions for installation of your RC equipment. Install your radio equipment and the included hardware and GO FLY IT! For .40 to .46 engine, and 4 channel radio (ailerons, elevator, rudder, throttle).
SPECIAL \$139 PRICE extended until Nov. 30, 1996 !!

NEW! Ready-to-Fly (and PERFORM!) for Speed 500 motors!



HLCO6610 HL/Gerasis "Bella U.E."
Speed 500 Sailplane \$118.00
 59" span. READY BUILT and covered.

NEW! 21" yacht for electric power -- the MOST boat kit for the money we've seen!



TUR2502 Turbinia "Susan" Yacht \$36.40
 21" long scale yacht kit of molded ABS parts goes together like an easy plastic car kit! Put a SPEED 400 motor in it and your 2 channel radio unit and you've got a great RC scale yacht. Recommended for Susan are: any SPEED 400 motor, HT2000 3-Speed Motor Controller, any 4 to 6 cell nicad or dry cell battery, any 2 channel surface vehicle (non-airplane) radio.

Ready-built and covered -- BEST beginner's airplane and thermal soaring king!



GR4291 Graupner Elektro-Junior "Sport"
SPECIAL PRICE extended to November 30, 1996 \$167.00 !
 83" span, ready-covered wing, ready built fuselage, tail -- install GR1162 Motor and Prop and your RC gear.

NEW! Ready-to-Fly: only three hours of "work" to prepare for flight!



HLCO6600 HL/Gerasis "Bella U."
R-T-F Sailplane \$118.00
 59" span. READY BUILT and covered.

NEW! Install your radio and go WIN a One-Meter Class race!
HLIT207 Hobby Lobby/Tomasek Fully Built: "Exclusive" 1 Meter Competition Sailboat
\$350.00

39-3/8" long, 82" overall height, 620 sq. in. total sail area. Ready to use fiberglass hull, Kevlar rigging and sail sheets, trimmable ballasted keel. Ready for installation of a two channel radio with a sail control servo. Very fast boat and one of the most perfectly made products we've ever seen!



NEW! Unique high wing trainer will teach you RC flying FAST!



HCZ009 HL/Hacker "Katydid"
Almost-Ready-To-Fly \$99.00
 41" span FULLY built and covered. Use Cox .049 engine, and 3 channels RC.

NEW! Sporty low wing trainer will teach you RC flying and aerobatics!

HCZ110 HL/Hacker "Mantis"
Almost-Ready-To-Fly ... \$99.00
 41" span FULLY built and covered. Use Cox .049 engine, and 3 channels RC.



NEW! The RC trainer "kit" that almost builds itself! It SNAPS together!



PR109 HL/Precedent Hi-Boy 4 Prefab kit
Introductory SALE \$69.00 !
Introductory price extended to November 30, 1996, regular price \$87.80
 62" span sheeted foam wing and interlocking fuselage parts. Great trainer, for .40 engines, 4 channels.

NEW! Hand Launch Sailplane, or for SPEED 400 motor. It comes as you see it in this picture!



RUM39 JanR's Handsel 1200 HLG ... \$159.00
 47" wingspan, 344 sq. in. wingspan. Proprietary airfoil has slight undercamber at trailing edge, slight washout at tips. Empty 10.3 oz. White fiberglass fuselage and canopy, balsa wing and tail parts fully covered. For 2 channels and mini servos (rudder and elevator). Recommended Electric: GR6065 Speed 400 Motor with Prop ... \$27.00, B070600C Nicad ... \$42.00, HLJE10C Jeti JES 10 Compact for Speed 400 ... \$41.90

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We start by selecting the ideal materials for each component. Crankcases, for example, require (and get) high-strength aluminum specifically formulated for casting.

Then comes machining, where more unique O.S. methods and technology create the world's finest model engines.

Many machining tasks are performed by highly specialized, custom-designed, computer numeric controlled (CNC) production equipment.

Crankshafts are produced on a CNC lathe and milling machine. State-of-the-art computers also control the heat treatment used in surface hardening.

Five-axis CNC equipment completes the compound angle port machining of piston cylinder assemblies.



For best performance, pistons and liners are hand-selected, then matched to allow a total variance of only ± 1 micron between the specified piston and liner sizes.



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To mold-making and casting processes *alone*, O.S. brings over 40 years of manufacturing expertise. We also adapt proven full-scale engine technology where appropriate.

But metal machining isn't our only area of expertise. O.S. is equally innovative when it comes to crafting intricate engine components.

Complex assemblies such as pump units are assembled by technicians using specialized tools and fixture

jigs...then inspected and calibrated with O.S.-developed measuring equipment.



And to be sure that the O.S. reputation for excellence remains intact, we put every component of every new engine through rigorous quality checks.

Crankshafts are pulled at random from all production lots and tested to destruction for surface hardness and strength. On crankcases, even tiny burrs or scratches that are almost invisible to the eye spell "Reject."

No wonder O.S. engines have earned such a large, loyal following among plane, car, boat and heli modelers alike. Whatever your application, there IS a perfect engine—and it's available from O.S.

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WORKBENCH

By Bill Northrop

How Model Builder Was Born



It all started with the "Faultless Chick." This was a free flight biplane published as a construction article in a late 1949 issue of *M.A.N.*, as designed by Canadian Jack Luck. Around 1954, as I was edging toward radio control after many years of free flight, I struck up a pen-pal acquaintance with Jack, as he mentioned in the article about the possibility of converting the biplane to RC. Sure enough, he did, and sent me a print of the plans. It was my second ever RC project, following a considerably modified Royal Rudderbug kit.

Jack, who was to pass on in the mid '60s, as I recall, was having his biplane published in *Air Trails*, circa 1955. It was renamed "Barnstormer" by editor Al Lewis, but Jack had crashed his original model just prior to publishing. Could he use pictures of mine for the article? That was the first time one of my models appeared in print!

Being primarily a scratch builder in the truest definition of the term (according to Jeff Troy you must *design* and *build* from plans without the availability of kit parts), I managed to have a string of construction articles published in *Air Trails*, *M.A.N.* and *R/C Modeler*, starting in 1958 with a 40-inch span scale Great Lakes Trainer on single channel, escapement powered, rudder-only. Others to follow over about a 14-year period included "Li'l Beau Bipe," "Square Hare," "Duster," a scale Travel Air 2000, "Wild Child," "Big John O.M.T." (and later "B.J. the First"), "Galloping John," "T'Winger," "Sproose Goose," "Apprentice," and the 1/4-scale Gipsy Moth . . . not necessarily in that order. (Ahem, all of these and other plans are available from my plans service—get a catalog by sending two bucks to 2019 Doral Court, Henderson, NV 89014).

Some of these designs were published prior to April 1964, during a time when several other articles were published,

including reports on the Toledo trade shows, as well as the 1962 and 1963 Nationals in Chicago and California.

Several months prior to April 1964, I also opened a small advertising agency, with clients such as Hobbypoxy (Pettit Paints), Fireball Glow Plugs (Hal Swanson), and Dee Bee Electronics (Don "Quadruplex" Brown). This was all in addition to holding down a "regular" job in the engineering department of Hercules Powder Company, where I was concentrating mostly on the writing of specifications and work contracts between the U.S. Navy and Hercules in connection with the Polaris Missile program. Dealing with the Navy's Bureau of Yards and Docks was like taking a final exam in writing technical material in a very positive and legal fashion! This came in handy in later years when rewriting and editing parts of the *AMA Rule Book* as chairman of the RC Contest Board.

Why several references to April 1964? It was a significant time in the evolution of *Model Builder*. About that time, I was putting in long and mentally strenuous hours per day . . . Hercules during normal daytime working hours, and then burning the midnight volts writing magazine articles and creating advertising, all of which had to meet strict publishing deadlines. Under those conditions it was easy to become the victim of a virus bug which numbed the brain, made you feel even more fatigued, and just generally out of sorts. In order to combat this I was taking, according to instructions, Sinutabs, which were some help. However, in the small print on the bottle, which hardly anyone reads, it said, "Not to be taken by heart patients." Even if I had read it I would have thought, "So? I'm not a heart patient." WRONG! I was a heart patient and didn't know it until the morning that the usual "indigestion" pain was higher up in my chest, became totally unbearable, and the Gellucils and glasses of milk brought no relief. While sitting at the breakfast table my arms starting getting numb, I became real dizzy and felt myself going under . . . then, all of a sudden, as if someone switched on a light in a dark room, the numbness disappeared, the chest pain went away, and as I broke out in a cool sweat, my head felt as if a tremendous load had just been removed, leaving me totally drained but at ease and sorta "floating" in space.

Later, in the hospital, my doctor

shortened the above long description into two words—*myocardial infarction*—and added that I would be a (not free) guest of the hospital for two to three weeks! At the age of 41 years and seven months, I was fortunate to get off with a stern warning. I learned my lesson and took on a new philosophy toward life.

The decision about what to do with my working life (and taking me another step closer to *Model Builder*) was assisted by the late Walt Schroder, then editor of *M.A.N.*, when he telephoned me one day in August and made me a proposition: take over as RC Editor of *M.A.N.* starting with the January 1965 issue! It has been 32 years since that phone call, but I can still remember my reaction: "Are you kidding? Ed Lorenz knows more about radio control electronics in his little finger than I could even dream of understanding!" Nevertheless, Walt and I got together over Labor Day weekend and firmed it up. Walt put it this way in his "M.A.N. at Work" column in that January 1965 issue when my first column appeared: "Ed was such a long time (12 years) fixture and habit here at this office that it was hard to imagine what we would do without him, and of more importance, how we could fill this very large void. Now is the time for decision. The selection of a new contributing editor. Rules of the road for selection are easy but how to find the one person who can measure up to the standards set for the Radio Control department; who is known to the largest part of the RC fraternity; who has a way with words that will make this select group accept him; who has the respect of this same group; who knows his way around the manufacturing edges of our good sport and above all, who can put up with this testy (some say crusty) old man running the editorial department. Our selection of William C. Northrop, Jr., better known as 'Bill,' we think to be an outstanding choice. However, the only judges of this can be you the readers. So we ask that you take Bill to your heart and accept him as you did Ed Lorenz. We also ask that you take him to task whenever you feel it necessary as he is only as good as you want and permit him to be!"

Wow! Even reading that over 31 years later still gets to me. I can only emulate the current beer commercial, and say, "Walt, I love you, man!" Mighty kind words to get

continued on page 16

LOOKING GOOD.



"The easiest kit I've ever built"
— RCM Magazine

Sierra
Designed for your success.

Wingspan: 60" Wing Area: 660 sq. in. Weight: 5-6 lbs. Wing Loading: 18-20 oz./sq. ft. Fuselage Length: 51" Requires: .28-.46 2-cycle or .40-.60 4-cycle engine & 3-4 channel radio. The Sierra shown is covered using MonoKote® Yellow, Red and Orange, with kit decals, including windows, applied.

Top Flite's Sierra trainer. Easy to build, fly, and admire.



You've got Blue Angel dreams, visions of piloting jets and Corsairs... models with kick.

Now there's a new generation of trainer that puts more of that same excitement into your flights from Day One. Top Flite's new Sierra.

The Sierra combines Top Flite's high-quality, Gold Edition construction with the forgiving flight qualities recommended by R/C flying instructors. And it adds, for pure pleasure, realistic looks you'll find in no other trainer.

Easy to build.

No kit building experience is needed to succeed with Top Flite's new Gold Edition Sierra. Using state-of-the-art computer programs, Top Flite designers perfected its structure long before manufacturing began.

The kit's precisely die-cut, interlock-

ing parts practically assemble themselves straight and strong. Quality-minded hobbyists will find no short-cuts in the design—and no unnecessary challenges, either.

The included, computer-drawn plans and photo-illustrated instruction manual map out every building step. Keep the manual on hand after you're finished...it also guides you through those first flights!



Easy to fly.

Gentle, nearly self-piloting performance has been engineered into the Sierra. With its easy low-speed handling, you'll enjoy confidence-building flights and smooth, worry-free landings.

Parts for both rubber band or bolt-on wing attachment are included. The manual explains how to install both standard tricycle landing gear or optional taildragger, using bent wire tail

gear. You can fly the Sierra with either 3 channels or 4 with ailerons...and from the start, develop the skills needed for piloting more advanced sport models.

Get the best trainer technology on your side. Ask your hobby dealer for Top Flite's Gold Edition Sierra...sure to be one of your favorites even after your Blue Angel dreams come true.

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Assembly is simplified by computer designed, high-quality balsa parts that interlock perfectly.

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- Torque: 224 oz/in @ 4.8v
280 oz/in @ 6v
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- Weight: 4.2 oz
- Dual Ball Bearing
- Heavy Duty Horn & Hardware
- 15 Tooth Deep Groove Anti-Slip Spline



ACTUAL SIZE HS-805BB MEGA SERVO

Specifically designed for the avid quarter scaler, Hitec RCD introduces the HS-805BB MEGA 1/4 scale servo. Slightly larger than our current giant servo, it provides nearly double the torque. One great advantage to this servo is that you need only one HS-805BB servo where previously you needed two regular quarter scale servos to do the same job!

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oz/in @ 6v

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**Looks like a NiCd.
Lasts like two.**

A NiMH (nickel-metal hydride) battery may look like a NiCd — but compare performance, and the difference is unmistakable.

With NiMH Tx or Rx batteries in your radio, you have about double the storage capacity of similarly sized NiCd packs.

A standard "AA" NiCd and a NiMH "AA" weigh about the same — but while the "AA" NiCd can be charged to only 550-600 mAh, the NiMH "AA" delivers a full 1200 mAh.

That's double the storage capacity at the same size and weight. That means you can double run time without sacrificing space or adding weight...and stretch a single charge session into a full day of safe flying.

What's more, NiMH cells are environmentally friendly, with no disposal requirements. Plus, they're as easy to use as NiCds; follow the tips at right, and you're set to enjoy NiMH battery benefits at their best.

They're ideal for Tx and Rx packs in R/C systems — and available in a wide range of assembled packs, and in tabbed and untabbed cells.

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How to get the most from NiMH Batteries

Double run time is not the only difference between HydriMax NiMH batteries and NiCds. The tips below explain the differences and the best way to achieve top results with NiMH batteries.

- Charge HydriMax batteries no more than a day before expected use, as NiMH cells have a self-discharge rate roughly twice that of NiCds.
- Charge at standard rates of 750mA or below. Fast charge only with equipment specially designed for NiMH batteries.
- Allow longer charge times. NiMH batteries offer about twice the capacity of NiCds, and require correspondingly longer charge times.
- Use between 32-104°F. Extreme temperatures can cause rapid loss of stored charge.
- Use tabbed NiMH cells for pack building. Applying a soldering iron directly to untabbed cells may cause permanent damage.
- NiMH cells are designed for low-drain, long-duration uses. Discharge rates of 750mA or less are therefore recommended.

HydriMax

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2000



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Lifetime Warranty
& DAD Pad

NEW Pro "LE"
Awesome!
Power, Precision, Price



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- ★ Precision 5-Pole Motor
- ★ 60" Ounce Torque, .20 Sec/60°
- ★ All Iron/Oilite Bearings
- ★ 1.6" x .79" x 1.6"
- ★ 6 Mo. Unconditional Warranty

Don't get caught with a
"B" grade receiver!

*Big Daddy Pro LE, Pro Reflex and Pro Plus Include \$4.95-value Sonic-Tronic Fiberglass Serve Arms!

\$29.95*



\$26.95*
Plus



\$14.95



\$39.95*
Reflex

\$24.95



\$29.95
Reflex



** "Synchro-Mesh" Metal Gears Available For an Additional \$10⁰⁰ Each

Spec's	Big Daddy [†] **	Plus [†] **	Reflex [†]	Pro [†] **	Lite [†] **	Tina Reflex [†] **
Bearings	Iron/Oilite*	Iron/Oilite*	Metal Gears	Iron/Oilite*	Iron/Oilite*	Oilite
Torque @4.8v	140"/Oz.	80"/Oz.	130"/Oz.	44"/Oz.	42"/Oz.	40"/Oz.
† x 60° @4.8v	.24 Seconds	.24 Seconds		.24 Seconds	.20 Seconds	.20 Seconds
L x W x H	2.3" x 1.1" x 2"	1.6" x .79" x 1.6"		1.6" x .79" x 1.4"	1.4" x .7" x 1.25"	1.1" x .53 x 1.1"
Weight	3.5 Oz.	1.8 Oz.	2.1 Oz.	1.7 Oz.	1.1 Oz.	0.67 Oz.

† Futaba Horn Compatible * Shock-proof, Self-lubricating Meehanite/Oilite, .0005" Radial Clearance bearings.

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Over the counter

ACE R/C NEWS

The latest addition to Ace's "Simple Series" kits is the venerable AT-6. Designed by Fred Reese, the model uses the same 35-inch span, 188 square inch foam wing used in the other Simple Series monoplanes, with a very basic wood fuselage and tailfeathers. Construction should take no more than



a weekend. The AT-6 weighs in at 18-20 ounces, and is designed for an .049 engine and aileron/elevator controls.

The packaging is new, but Ace's new Tachmaster 3 optical tachometer is basically the



same as the earlier Tachmaster II. The unit has a large analog meter (eliminates the flickering common to digital tachs) with three individually color coded rpm ranges—0-5,000, 0-10,000, and 0-25,000. The required 9V transistor battery is not included. Assembled and tested, for \$57.95 retail. From Ace R/C, 116 W. 19th St., Higginsville, MO 64037-0472; (800) 322-7121.

COVERING MADE CONVENIENT

For you MonoKote addicts, Top Flite has come out with two specialized covering accessory



kits that offer both convenience and cost savings. The Covering Accessory Assortment contains basic tools including a Top Flite sealing iron, heat gun, SmartCut trim tool, hot glove, and



MonoKote cleaner/polish spray, for \$89.23. The Trimming Accessory Assortment includes a Top Flite trim iron, SmartStripe stripe cutting tool, star templates, and MonoKote trim solvent, for \$71.24. Plus, as an added bonus, both of these

kits come with a free iron sock and tack cloth. Both are available now at your local dealer. Top Flite, 2904 Research Rd., Champaign, IL 61826-9021; (217)398-6300.

HOBBY LOBBY GOODIES

Shown for the first time in the latest Hobby Lobby catalog are the Chinese-made Panther two-stroke engines, offered in



.40, .46 and .60 airplane versions; a .46 heli engine, and a .46 marine version with water-cooled head, flywheel and recoil starter. These are dual ball bearing, Schnuerle ported engines with ABC piston/liner and bronze bushed forged aluminum conrod, and

are supplied with mufflers. According to the HL folks, European importers consider the Panthers to be the best of the many model engines coming out of China these days.

Another new item is the Skimmer 400 electric sailplane, baby brother to the larger Skimmer that was introduced a couple of years ago. As its name suggests, the new model is designed for Speed 400 systems and six- or seven-cell NiCd packs. The V-dihedral, rudder/elevator, all-wood model spans 59 inches, covers 342 squares, and features the S3021 airfoil. A companion item to



the Skimmer 400 is Graupner's GR6065 power system, consisting of Speed 400 motor, 6x3 folding prop, capacitors, wrench, etc. From Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444. Catalog 28 is available for \$2.50.

JR'S METAL GEARED MICROS

If you read Sherman Knight's review of the NSP Dove II sailplane in last month's *Model Builder*, you know how impressed he was with the new JR NES-351 micro servo, the metal-gear version of the immensely popular NES-341. The 351 is identical in size but boasts a machined

brass gear train for the ultimate in strength and precision—Sherman used 351s for the Dove II's flaps and said he'd never had a more solid instal-

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

All material published in OVER THE COUNTER is quoted or paraphrased from press releases, furnished by the manufacturers and/or their advertising agencies, unless otherwise specified. The review and/or description of any product by MODEL BUILDER does not constitute an endorsement or recommendation, nor any assurance as to its safety or performance.



lation. The 351 weighs .2 ounce more than the 341 and is rated at 31 ounce-inches of torque. JR equipment is distributed in the U.S. by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

KOMBAT KOPTERS

Elsewhere in this issue, Jason Eib reviews The Airplane Factory's "Kombat 40 Basic Trainer." Due to be available by the time this issue hits the stands is the autogyro conversion setup that Jason talks about at the end of his article; it bolts to the fuselage in place of the wing and instantly transforms your Kombat 40 into an RC autogyro! According to



company owner Al Durel, the resulting Kombat Kopter . . . "flies very similar to an airplane as all controls are the same. Any pilot who has mastered a trainer will be capable of flying this machine. The Kopter will do loops, multiple snap rolls, stall turn 540s and can even hover into a wind." Sound interesting? Get more info from The Airplane Factory, 1135 Florida, Mandeville, LA 70448; (504) 626-7840.

ELECTRIC FLIGHT WITHOUT BATTERIES!

Back in the January '95 MB,

Bill Hannan reported on the novel condenser-powered electric FF models being produced in Japan by Union Model Co. Now Campbell Model Supply Co. is importing and selling these kits in the U.S. They come complete with power unit (motor, capacitor and switch), charger (takes two C-size dry cells), materials, tissue, wing jig, plans, glue and sandpaper, for \$29.99 plus \$3 S&H (and 6 percent sales tax in Michigan). Each order includes a free



sample of Campbell's Esaki tissue and a free Peanut plan. Order from Campbell's Model Supply Co., 37742 Carson, Farmington Hills, MI 48331.

NEAT STUFF FROM HSS

Hobby Supply South has been expanding their product line so fast that they've had to come out with a new updated catalog. Catalog #4 is 48 illustrated pages of all sorts of modeling goodies, both foreign and domestic—kits, engines, accessories, tools, building supplies, you name it. The catalog is priced at \$4 alone or can be had free with

a first order. One of the many new items listed in the catalog is the



88-inch span DH-82A Tiger Moth kit, produced in Britain by Flair. The kit is complete with all of the materials and hardware required, including fiberglass cowl and stainless steel

● flying wires, needing only adhesives and covering to complete the airframe. For .90-1.20 two-strokes or 1.20-1.50 four-strokes. Hobby Supply South, 5060 Glade Rd., Acworth, GA 30101; (770) 974-0843.

K&A'S MINI RENO RACER

K&A Models' "Dago Red" mini slope glider has been on the market for some time as a wood-fuselage, sheeted foam wing kit, but now it's also available with a fiberglass fuselage . . . and not only as a slope glider, but in an electric version as well. The main difference between the two is the fuselage—the electric fuse is lighter and has the nose already cut off for you. Both models span just 30.5 inches, have 188.72 square inches, and use an 8 percent



● thick Eppler 374 airfoil. Quoted weights are 12.5-13 ounces for the glider, 17-18 ounces for the electric with a Speed 400 motor, BEC motor controller and six-cell NiCd pack aboard. Kits are complete with wire-cut foam wing cores,

hardware, rolled plans and all necessary materials. K&A Models Unlimited, 9300 Yvonne Marie Dr. N.W., Albuquerque, NM 87114; (505) 890-7549, fax (505) 890-7532.

HELI FLYING SCHOOL

RC heli fliers who really take their sport seriously—be they novices just getting started or experts looking to further hone

● their skills—would do well to consider enrolling in the R/C Flight Training Center, run by five-time U.S. helicopter champion Ernie Huber at his 67-acre facility in Crescent City, Florida. The five-day course includes all meals and lodging. All instruction is done with school-supplied X-Cell helis and Futaba or JR radios; in the past seven years, over 520 students have logged 20,000 flights. Send for free information and class schedule: R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-0727; (800) 452-1677, fax (904) 698-4724. Outside U.S., call (904) 698-4275.

SCALE SAILPLANE KITS

Canadian model manufacturer ICARE Sailplanes recently added a highly prefabricated, 83-inch span Schleicher ASK-21 to its line of scale RC glider kits and semi-kits. The model sports a 516 square inch E-374 wing and comes with a white gel-coated glass fuselage and ready-to-cover obechi sheeted foam wings. A clear plastic canopy and all required hardware are also supplied. Suggested retail is a



● very reasonable \$199, but the kit is being introduced for a limited time at \$185. Shipping into the U.S. runs an additional \$15. For a complete catalog of ICARE's product line, send an SASE or \$1 to ICARE Sailplanes, 381 Joseph-Huet, Boucherville, Quebec J4B 2C5, Canada. MB

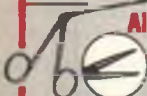
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Standard Panavise

Lock your work firmly into any position with just one turn of the knob! Tough yet gentle nylon jaws securely grip objects to 2-1/4" thick. Head unit tilts, turns and rotates. Base has holes for mounting. **PV301** List \$39.99 **Sale \$29.99**



Alligator Forceps

Fits into places too small for a hemostat, bent angle allows access around corners and curves. Small, delicate gripping jaw with two rows of teeth. Surgical quality stainless steel, 5-1/2" shaft. **ZNSPA6** List \$24.95 **Sale \$16.99**



Model Maker Hemostats

Stainless steel hemostats are ideal for gripping, pulling, reaching in clamping in tight spots. Box-joint construction with 3-stage lock, serrated jaws. **SM651FC** Curved, **SM656FS** Straight. List \$3.95 **Sale \$2.99 each**



Plastic Clamps

Sets of 2 Light duty plastic clamps for delicate work. Notched jaws help keep work-piece steady. Large: 7-1/2" opening, 2-1/16" depth. **EX5664** List \$4.95 **Sale \$3.99**
Small: 3-1/4" opening, 1" depth. **EX5663** List \$3.95 **Sale \$2.99**



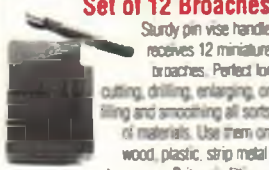
Mini-Clamp

A versatile tool for clamping in hard-to-reach spots or holding small parts. Rubber tips will not mar metal or leave marks on wood. **EN120-C** List \$3.95 **Sale \$2.40**



Mini C-Clamps

Three high-grade steel clamps with baked enamel finish. Cadmium plated screws with slotted ends resist welding splatter. Handy for fastening, holding and gluing small objects. Maximum openings: 1/2", 7/8", 1-7/8". **X7458** List \$6.95 **Sale \$4.99**



Set of 12 Broaches

Sturdy pin vise handle receives 12 miniature broaches. Perfect for cutting, drilling, enlarging, or filing and smoothing all sorts of materials. Use them on wood, plastic, strip metal, brass even Britannia fittings. **BR0140** List \$24.95 **Sale \$18.00**



Headband Magnifier

Comfortable head-band magnifier has optical quality, shatterproof acrylic lens. No distracting center post—lets you see 20% more than other viewers! Fits over glasses, and frame tilts up when not in use. **ED183** Working distance 14" power 1-3/4x. **ED187** Working distance 6" power 2-3/4x. List \$24.95 **Sale \$14.99 each**



Magnifier Lamp

Spring loaded metal adjustable arm has a 32" reach. Three-inch diameter, 3 diopter lens provides distortion-free 1.75x magnification. Lamp mounts on your table easily, and uses one 60 watt incandescent bulb. Adjustable metal clamp has 2-1/2" jaw. Color: black. **ML100** List \$39.95 **Sale \$14.00**



Hands Off Magnifier

2x magnifying lens lessens eyestrain. Double ball joint arms with alligator clips hold parts at any angle, leaving hands free to work. **EX55675** List \$19.95 **Sale \$8.99**



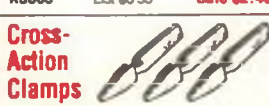
Contour Sander

It's easy to smooth and sand in the most inaccessible places! Two interchangeable tips (one flat and one curved) adjust to any angle and work on both flat and irregular surfaces. Slim plastic handle is 5-1/4" long. Includes two sanding bands. **AM7393** List \$10.95 **Sale \$8.00**



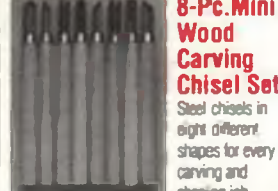
Alligator Clips

Practically indispensable for ship modeling. Use them as miniature clamps or for holding small parts. Attach them to the end of the rigging line you're working with—the weight will take the slack out and keep the line out of your way. Spring loaded, serrated jaws open to 5/16". Nickel-plated metal. 2-1/2" long. Pack of 12. **KS303** List \$3.95 **Sale \$2.40**



Cross-Action Clamps

Sell-looking, cross-action clamps hold small parts securely 2-1/4" long, 3 per set. **X7456** List \$3.49 **Sale \$2.99**



8-Pc. Mini Wood Carving Chisel Set

Steel chisels in eight different shapes for every carving and shaping job. Especially useful for solid hull ship modeling. Blades are 1-1/4" long, wooden handles measure 4-1/4". **SN773WC** List \$8.95 **Sale \$3.80**



10 Piece Riffler File Set

10 steel riffler files make sure you have the right one for every job! Each file is 5-1/2" long. Excellent quality at an economy price. **SN745RF** List \$9.95 **Sale \$6.99**



Carving Tool Set

The best set for three-dimensional carving, deep relief carving, groove cutting and shaping wood. Includes: straight chisel, skew bevel chisel, bent gouge, U tool and veining tool. Hand honed forged steel with hardwood handles in fitted storage tray. **EX58611** List \$21.95 **Sale \$12.99**



12 Piece File Set

Precision ground steel miniature files were designed with the modeler in mind! Set includes flats, tri-squares, rounds and ovals. Each file measures 4" from tip to end of knurled handle. Cutting edges are approximately 2" long. **FIL990** List \$19.95 **Sale \$9.99**



10 Piece File Set

Useful 10 piece set of 5-1/2" steel needle files, stored in a vinyl pouch. **CM1410** List \$16.95 **Sale \$8.99**



Aluminum Miter Box Set

Two 45° and one 90° slots let you cut precise angles in wood and metal. Aluminum miter box is 5-1/2" long, 1-3/4" wide. Set includes a 1-3/4" deep, 5" long, 24 teeth/inch razor saw blade and No. 5 knife handle. **EX55666** List \$11.95 **Sale \$8.99**



Badger Professional Airbrush Set

The most versatile of airbrushes! Dual action, internal mix set comes with three heads for fine, medium and heavy spray, allowing for thicknesses ranging from pencil line to 2" (50.8mm) wide. Color cup and one piece jar adapter are designed with force-fit feature for quick color changes. Self-lubricating teflon needle bearing prevents color back-up and eliminates needle wear. Pre-set needle adjusting screw for line control and non-slip one-piece trigger assures ease of operation. Teflon head seal prevents pulsating air flow, an Teflon siphon tube is removable for fast cleaning. Winged back lever design and non-slip trigger make re-assembly easy and provide more precise trigger control. Adaptable to right or left handed use. Good for thinned down acrylics, hobby lacquers, enamels, inks, dyes and watercolors.

Set includes: Badger Model 150 airbrush with fine, medium and large head assemblies with needles, attachable 3/4 oz. (22cc) jar, 1/4 oz. (7cc) color cup, 2 oz. (60cc) jar with cover, protective cap, an 8 ft. (2.45M) braided air hose, 1/4" (6.5mm) pipe thread fitting for adapting airbrush to a compressor, wrench for head and airbrush holder, plus instruction booklet. **BA158-7** List \$115.00 **Sale \$ 79.99**



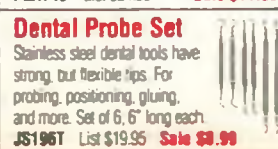
Set of Six Pliers

Drop forged, chrome molybdenum nickel plated steel. Spring loaded for long life and precision performance. Vinyl-clad handles assure comfortable grip. Six of the most frequently used pliers: needle nose, looping, small duck bill, large duck bill, cutter, and nipper. **JS156** List \$39.95 **Sale \$19.99**



Looping Pliers

Create your own strip rings, mast hoops or yard bands with ease. Stainless steel jeweler's looping pliers are 6" long, feature a hollow ground lower jaw and graduated upper jaw with looping sizes from 3/32" to 7/32". Contoured, easy-grip handles. Plastic storage pouch. **PLR748** List \$24.95 **Sale \$11.99**



Dental Probe Set

Stainless steel dental tools have strong, but flexible tips. For probing, positioning, gluing, and more. Set of 6, 6" long each. **JS196T** List \$19.95 **Sale \$8.99**



Master Cutter

Makes quick and accurate miter cuts in wood strips or plastic, and ensures that all cuts are identical. Fully adjustable from 45-90 degrees. Sturdy plastic and metal construction, assembles in minutes. 6" x 4". With five disposable blades. **AM7386** List \$34.95 **Sale \$22.99**



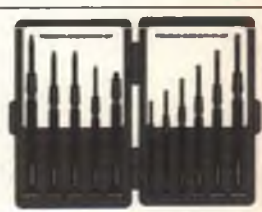
Planking Screws- Set of 10

Set of 10 Handy plastic thumb clamps. Easy to use, they serve a variety of modeling jobs—from planking wooden ship models to aligning the fuselage, bulkheads and wing ribs of model airplanes! **YUZ10** List \$13.95 **Sale \$8.99**



21 Pc. Precision Tool Set

Always have the right tool on hand! This 21 piece tool set is just the thing for building Pocher car kits, working on model trains or planes, and small tool and motor repairs. Set contains six slotted screwdrivers sizes 1-6; five hex nut drivers: 3mm-5mm in half millimeter increments; five open ended wrenches 4mm-6mm in half millimeter increments; two Phillips head screwdrivers, number 0 and 1; plus three hex key wrenches measuring 1.5mm, 2mm and 2.5mm. Conveniently packaged in a sturdy see-through carrying case, you'll find the tool you need instantly. **EX60008C** List \$17.99 **Sale \$9.99**



11-Piece Precision Screwdriver Set

Contains both slotted and Phillips head. Tempered steel blades, chrome plated handles with swivel heads. Packed in reusable storage case. **EN634C** List \$4.95 **Sale \$2.99**

us started on almost five years at M.A.N. as RC Editor and later as Managing Editor.

A year and a half period from late 1969 until early 1971 saw many changes in my personal life, including a move from the east coast to southern California and a new marriage. During this period I was firmly determined to continue in the area of writing and/or editing, particularly in model aviation. I remained active as a precision aerobatics judge and continued as chairman of the RC Contest Board.

It is hard to say exactly when or in what form the idea of starting a publication first germinated. In subsequent years, there were many times, particularly when still pasting up an issue as the sun was rising, that the word "Why" would strongly come to mind! There were several months of furtive inquiries into the model industry, of examining ways to finance the start (loans, partners, "shoestring," etc.), seeking advice in various directions, finding a printer, checking post office and copyright rules, setting up an office or using our home, etc., and of course, hiring of additional office help. One thing that gave us some confidence at the start was the fact that, for better or for worse, the publisher of the new magazine would not be totally unknown

to the hobby. My recent position with M.A.N., my activity as a Nationals contestant (in RC Scale), holder of the FAI World Altitude Record from 1965 to 1968, Chief Judge at the AMA Nationals for RC aerobatics competition starting in 1968, RC Aerobatics World Championship judge beginning in 1969, as well as being chairman of the AMA RC Contest Board, meant that I would be known to the modeling public and to the model industry.

My wife Anita, though she may have regretted it on many future occasions, definitely provided the final vote of confidence when she said, "Let's go for it!" We printed up direct mail flyers for the model public to order subscriptions, and for the hobby industry to hopefully place advertising. Some of our next door and across-the-street neighbors came in and helped fold, staple, stuff envelopes, and stick on stamps (no permit mail this soon in the game). We both felt there should have been a small ceremony to celebrate the end of peace and quiet as we dropped the bundle of mail in the post office. When it went in the slot, we were committed! By the way, as you may have guessed, the decision on the financing was to go "shoestring"!

The last preliminaries to the opening issue might be properly summed up by my own opening paragraphs in that memorable first "Bill Northrop's Workbench" column: "Many weeks ago, when the thoughts

of publishing my own magazine first started to become serious, I said to myself, 'You're nuts!'

"Later, when the thoughts persisted in spite of my efforts to dismiss them and I disclosed the idea to friends, they said, 'You're nuts!'

"Still later, when the thoughts had turned into physical actions, and the advertising brochures and rate cards had been mailed, the first person to call me was Jack Stafford, manufacturer of several balsa kits, particularly the very successful Minnow and Midget Mustang Formula I Pylon Racers. His first words, after asking if he was talking to me, were, 'You're nuts!'" (Incidentally, with that call he officially placed the first paid advertisement in the first issue of *Model Builder!*)

Oh yes, it may have been subliminal remembrance of one of my early model magazine purchases—published by the Polk brothers, Nat and Irv, called *Model Aircraft Builder*—but after many titles were considered, we chose *Model Builder* as the name of our publication.

By this time, the date of the first issue was determined, September 1971 (my birthday month) and we set off for the 1971 AMA Nationals at Glenview Naval Air Station, north of Chicago, where I was again to be Chief Judge for RC Aerobatics, and a great place to expose our intentions to the active model public. John Worth,

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By the way, if you have a hard time reading our tiny print, you really should get a Lazy Bee - it's so easy to see!



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then AMA Executive Director, invited us to set up a booth at the contestant registration site in one of the Navy hangars, where we could take cash orders for subscriptions (\$5 for one year, \$9 for two!).

We had already arranged for article contributions (and I really mean contributions, as these were on the cuff . . . "shoestring," remember?) for that first issue; by Bob Upton, for his low-wing sport RC model "Beanpatch" construction article; Nats articles and photos by Bob Stockwell on RC Pylon and John Donelson on Soaring; the first of many Peanut Scale models published with full-size plans by the late, great Walt Mooney; a 1"=1' scale Fairchild 22 by the late Tom Laurie, for RC or free flight; plus RC Pattern and RC Scale articles and photos by the Editor/Publisher. Forty pages in all, plus cover, with a cover price of 50¢.

Incidentally, two of the "people" listed on the MB staff in the first five issues—Wm. Prince (Circulation) and Charles R. Brown (Subscriptions)—were actually our two cats, Prince and Charlie Brown. Anita and I were the only ones in the office. We had

to do something to build up the staff!

Anyway, during the '71 Nats, while I was out at the various flying sites getting photos and information for articles, or overseeing the pattern judging, Anita was back in the hangar selling subscriptions like mad for a totally non-existent magazine like it was going out of style. I think the pitch had something to do with, "The premier collectors' issue," etc. But it sure worked. I remember as we were driving home to California after the Nationals, that we counted the cash and checks received, amounting to more than a thousand dollars, and considered taking a boat to South America!

The final and most productive factor in getting *Model Builder* off to a . . . er . . . flying start was again connected with my aerobatics judging activity. As the U.S. judge for the FAI World Championships, my presence was requested for the Seventh Radio Control Aerobatics World Championships in Doylestown, Pennsylvania, in September, 1971. This was the first time ever that the U.S. was to be host to the RC

World Champs. It was a tremendous success, and as a result, 60 competing pilots representing 22 countries were in Doylestown, along with supporting visitors and spectators from all over the world.

From *Model Builder's* point of view, the timing was perfect. The first issue (September/October 1971) had just come off the press. We shipped about 2,500 copies to Doylestown, set up a booth in one of the industry tents, and spread the word (and many free copies) to modelers from at least 21 countries and the U.S. You can read all about it in the November 1971 issue of *Model Builder* (our lead time was very short in those days).

The above account only touches on the highlights of MB's birth. There were many incidental factors that played a part in getting it all together. However, every one of the factors somehow related to the great and special fraternity of modelers in the hobby who somehow, knowingly or unknowingly, contributed to the birth, the growth, and hopefully the continuance of *Model Builder*. MB

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1971



1996

Welcome to *MODEL BUILDER'S* 25th Anniversary Issue!

In the following pages, you'll read and see some of the best from the past 25 years... what developments and designs our columnists feel are most significant...where the hobby has come since 1971. In the November issue, we'll take you "Back To The Future" by bringing you into the current picture. And in December, our columnists will take you 25 years into the future, to see what each special area of modeling will be like in the year 2021.

Thank you for 25 years of supporting MODEL BUILDER!



1971

MODEL BUILDER

1996



1971



September/October. MB's debut issue! 44 pages, sold for 50¢. Construction articles for Upton's "Beanpatch" and Laurie's Fairchild 22, reports on '71 Nats events.



July. Five building projects including Northrop's Travel Air 2000, Fairchild 51 by Bowers and the "SAM 5" A2 FF by Evans. "Jeep" racer and Sisu glider 3-views.



October. Lots of '73 Nats coverage; full-size Piper Vagabond Pnut plans and articles for the Comet Zipper O.T., RC Super Doubler and 22-inch Edotype FF floats.



November. Reports on Masters Tournament, WWI Jamboree and FF Nats; two 3-views, Reese's C-150 RC and Stalck's C-Quell FF construction features, plus three more.



September. Building Col. Bob Thacker's RC Baby Bowlius, Sicuranza's Firedrake 1/2A FF and Bowers' Pursuliber O.T.; results of MB's 1st Postal Proxy Pnut contest.



October. RC scale and pattern at the 1976 Nats; construction for seven RC, FF, and CL models and a battery charger; full-size Udet U-12 Pnut plans; two 3-views.



April. Five construction articles including the RC Miss Arpiem, Volare A-2 glider, Cloud Chaser O.T. and Box Boy ukie; plus fascinating history of Megow Models.



November. Now up to 144 pages, \$2.00. Had 1978 Nats CL coverage, articles for Seidler's 2'-1" Travel Air D4D and Jumbo FF rubber scale Pazmany PL-4A by Bennet.



March. Northrop's Duster biplane and Patterson's Mystery sloper featured; also full-size Zephyr canard rubber dwgs. Thornburg proposes RC hand launch glider event.



November. Coverage of Indoor and RC Scale W/C; plans for Bridi's "Mama Mia!," Stahl's Fokker D-8, Megow Fairey Battle and Pnut Jodel; Jimmie Allen story, pt. 1.



November. 1/4-scale Waco CTO by Larry Scott, Garami's Half-Pint O.T., full-size plans for Sherman Gillespie's Gadfly, top placer in 1979 MB Postal Pnut contest.



October. Another big 1/4-scale from Scott, a Krier Great Lakes; plus Struck's New Ruler O.T. and Mooney's Saiman 200 Pnut/CO₂. Forrey's first RC Soaring column.

To give you newer readers an idea of what's been featured in Model Builder through the years, we've gone back and randomly selected one issue from each year, pictured here along with a brief synopsis of the contents.



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April. Nice 2'-1" electric Franklin Sport biplane by Gilchrist; also the Templeton Mk. II 1/2A CL by Martin, Kovel's Bellanca Aircruiser O.T., Morane-Saulnier Pnut.



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September. Coverage of 1st ISS RCHLG meet and N.W. CL Regionals; building Jolly's Flinger RCHLG, Granier's MG-2 O.T., RC Razorblade and Boston Beany Bostonian.



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October. Projects include an RC balloon, 1/4-scale Desert Duster ultralight, 1941 Curtiss O-52 O.T. and full-size plans for No-Cal Beech Staggerwing by Lidberg.



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December. FAI FF team selection, O.T. CL stunt at '86 Nats, last of 3-pt. CO₂ article; Evans RC tailless, Aerona Tandem O.T., Lidberg's No-Cal Ballerina racer.



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April. Featured two rubber scales: Stinson Senior Trainer O.T. and Nakajima 50 by Schreyer; CL Laser 200 stunter by Polish champ, Butman's Travel Air 2000 Pnut.



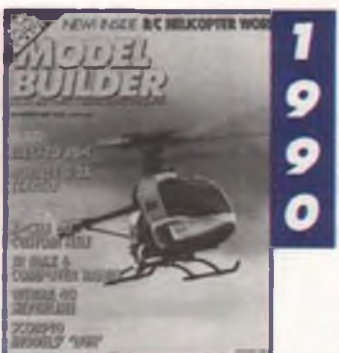
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August. Beautiful Meyers OTW-160 RC biplane by Rohrbeck, Flying Aces Commercial O.T. rubber, Astra Kapteler tandem-wing Pnut; also 1st of 3-pt. story on Good bros.



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May. Brimfield Float Fly report; construction includes the RC Humongous Sage Hen by Alman/Edwards, Ehling's G.E. Cabinet O.T., Berryman's Martinsyde S-1 Pnut.



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November. Featured are R.G. Schmitt's small electric schoolyard scale JN-1 and a Tailor Hornet in 1/2A RC Texaco size by N. Rosenstock; also five product reviews.



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August. Report on the '91 Nuremberg Toy Fair; three product reviews; the 1st of a 2-part construction article for Ruff's RC Martian Spaceship, an MB bestseller.



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May. Gee Bee issue! Vern Clements reports on the 1st flights of Benjamin's Gee Bee R-2 replica; building a 7/8"-1" CO₂ FF Gee Bee R-1/R-2 Hybrid by R.J. Theiss.



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July. Electrifying the Minimax 1000 glider, three product reviews; plans for an electric RC scale Kitefox by Mikulasko, Herr's profile rubber P-38, and M-5 Pnut.



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February. Construction features for Al Wheeler's RC Waco YMF-5 biplane and Pnut scale Avia BH-7b racer by Stan Fink; three product reviews, plus four meet reports.



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January. Coverage of '94 FAC Nats; construction includes the Electro-Screamer ducted fan by Belfort, Darkow's Kayaba Ka-1 CL autogyro, and DH-6 Pnut by Mooney.



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June. Reynolds' 1944 "Molite" CL biplane, record-setting "Mini-Quark" Ministick by Tagliacoco, Mooney's Of Ironsides Pnut; making Iron-on markings; three reviews.

HANNAN'S HANGAR

BY BILL HANNAN

“One of the beauties of modeling is that there is no end of new things to learn.”

If our lead-in quotation sounds familiar, it should, having been written by fellow columnist Francis Reynolds in the April 1995 *Model Builder*. Australian model publication editor/compiler Merv Buckmaster felt it deserved repeating, and we agree.

A DAY IN THE HANGAR

Nope, not Hannan's Hangar, but the world's largest building, where Boeing 747s are constructed. How big is it? Twelve million cubic feet of open space! Doesn't that sound like a great place to hold an indoor contest? Keith Varnau and the rest of the Boeing Employees' Aerodynamic Modeling Society (BEAMS)

thought so, and Don Long, Director of Manufacturing, agreed to allow use of the hangar.

There's a well-known line from the baseball movie "Field of Dreams," which said something like "Build it (a stadium) and they (the audience) will come." The BEAMS put a slightly different spin on that concept, changing the idea to "They will come to build it," meaning a model airplane, if you make the invitation attractive enough. How about offering free AMA Cub kits, highly motivated instructors, displays ranging from Gil Coughlin's fleet of Pistachios to giant scale models from the Eagles RC model club, a flight simulator, an operational wind-tunnel

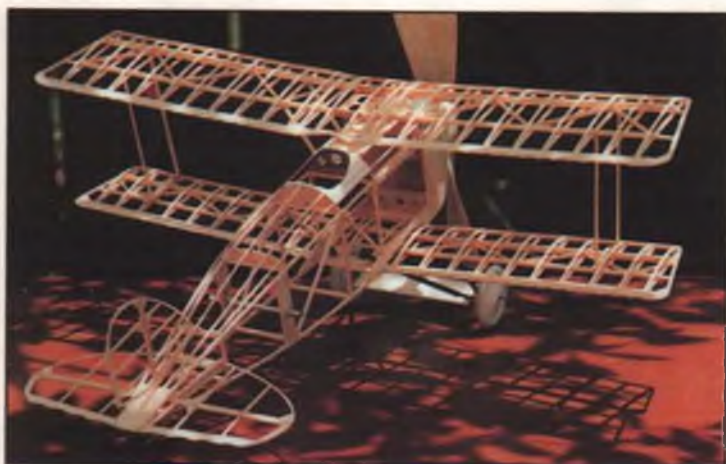
and a full-size sailplane? All this plus free pizza and soft drinks!

The response was terrific, with 1,300 people building and mass-launching AMA Cubs. Our photo shows only about one-fifth of the entrants, but certainly accents the enormous size of the site. What an impressive place to fly!

Although participants were of all ages, Contest Director Ed Lamb was particularly pleased by the many youths who attended: "It was gratifying to see so many of the younger generation responding to the opportunities to learn and enjoy building and flying model airplanes." Assistant CD Al Borer agreed: "I feel privileged to be part of it. It's a small



Just a portion of the 1,300 entrants in the BEAMS contest, forming a human AMA Cub. Look at the size of that hangar! Those round objects in the background are Boeing 747 engine nacelles. Photo by Mary Moore.



Intricate structure of rubber-powered, 16-inch span Czech Aero A-18 by Terry Pittman, of Virginia. Note the fine workmanship and instrument details in cockpit.



Another Otto Kuhl masterpiece is this free flight scale CO₂ powered Granger Archaeoplaryx. Note the beautifully sculpted pilot figure in cockpit. The full-size original is in the Shuttleworth collection at Old Warden, in England.



Heinz Neumann of Germany works on his free flight scale Sperry Messenger, while Pipie the mini-parrot is perched upon his shoulder. Birds of a feather?

thing to give back to our youth, our enthusiasm for aviation and our love of model airplanes."

Congratulations to the BEAMS for masterminding this meet, and to the Boeing Commercial Airplane Company management for their support of our favorite hobby.

SPEAKING OF BIG BUILDINGS . . .

Paul McIlrath sent us a clipping regarding the closure of the Langley NASA subsonic wind-tunnel. The government is considering "adaptive uses" for the huge (434 by 222 by 97 feet) 64-year old facility, although it cannot be substantially altered. Surely someone in our audience of creative thinkers could suggest a use? Write: Wind Tunnel, c/o Air & Space/Smithsonian, 901 D St. S.W., Washington, D.C. 20024.

SPEAKING OF WASHINGTON . . .

Bruce Augustus, editor of the Society of Antique Modelers newsletter *SAM Speaks*, received a fascinating letter from Frank Nelson, of Newark, Delaware. Frank was recalling his teenage years when he organized the Washington, D.C. Capitol Model Aeroneers club, with encouragement from the late Paul Garber of the Smithsonian. For their emblem, the group chose a drawing of the U.S. Capitol dome, surmounted by a pair of feathered wings.

One Friday night, Frank was asked by expert modeler Norm McMorro to help test-fly his new microfilm model, in preparation for the next day's Constitution Hall indoor contest. Norm was a Western Union bicycle messenger who really knew his way around Washington. Being a friend of the House Office Building security guard, Norm gained permission to fly his model in the

lobby. Unfortunately, the room was too small and drafty. Frank remembers: "Not being one to give up easily, Norm thought of a better place. We packed his 3-foot wingspan model in its cardboard box, slipped down into the basement, and followed along a rather dark tunnel, which had a narrow-gage railway. We soon emerged into what I realized was the bowels of the Capitol building! It was then about midnight.

"We tip-toed our way totting this box, up into the dimly lit rotunda of our nation's capitol. There, in the shadowy perimeter, we quietly assembled the model, cranked in a few thousand eggbeater turns on the rubber motor, and gave it a launch. Norm had made the right adjustments, and it flew beautifully . . . slowly and silently climbing and circling, just overhead of, and unobserved by, the occasional security guard who happened to pass through that august hall.

"Satisfied with its performance, we repacked the fragile model, retraced our steps out of the building, and returned to our homes on Norm's bike, not saying a word to anyone.

"Next day, Norm nearly won his indoor event. A few years later, he was flying a P-38 over Europe, and I found myself an engineer on the old aircraft carrier Enterprise."

HOW'S THAT AGAIN?

Betty and Duane Smith sent a newspaper clipping describing the "Starlark," a flying model of a proposed full-size aircraft designed by Bob Walker. The model was described as being made from "lint, wood and foam"—surely, we thought, there must have been a misprint? Nope, it turns out that Mr. Walker actually employed a coating concocted from clothes dryer lint, sawdust and spackling compound. It seems that the lint contains cloth fibers, which contribute rigidity to the structure. The unorthodox craft is expected to

safely at low speed and be exceptionally quiet, certainly worthy goals.

NEW FROM PECK

Peck-Polymers favored us with a copy of their latest catalog, compiled by Vera Dudley. The 52-page publication includes a varied selection of products, including model construction kits from 10 different manufacturers, gas engines, electric motors and an amazing selection of CO₂ systems by Brown Junior, Gasparin, G-Mot, Heibi and Davis.

Also offered are RC blimps, RC equipment, model plans, building materials, adhesives, covering, propellers, winders, paint, model building books and much more. Four bucks will bring you a copy from Peck-Polymers, P.O. Box 710399, Mantee, CA 92072-0399.

ROSCOE TURNER BOOK

Authored by C.V. Glines, *Roscoe Turner: Aviation's Master Showman* thoroughly examines the life and exploits of one of the world's most flamboyant pilots. From obscure beginnings in Mississippi, Roscoe chose to become a WWI balloon pilot, an aerial stuntman, barnstormer, movie performer and renowned racing pilot. A tireless self-promoter, Turner was simultaneously publicizing aviation in all its many facets, to everyone from the general public to movie stars to politicians and corporate executives.

He won the Thompson Trophy race three times, the Bendix once, and achieved a 2nd place in the speed category of the England-to-Australia MacRobertson race. An audacious and usually underfinanced risk-taker, Turner was instantly recognizable because of his self-designed "uniform," waxed mustache and his pet lion, Gilmore, who accompanied him on many publicity flights.

After retiring from racing, Turner remained active as a pilot, airline founder, school director, aircraft dealer, and vocal



Master scale model designer Claude McCullough, of Iowa, behind his wonderfully crafted Gwinn Aircar Model II. The 32-pound 1/3-scale RC machine is powered by an O.S. 320 Pegasus four-stroke, four-cylinder engine.

advocate for aviation in all its forms, including, to some extent, models.

Author Glines generously recognizes Don Young for his vital longtime association with Roscoe. It was our good fortune to meet Don while conducting research for the Williams Brothers Wedell-Williams racer kits, and learn of his experiences first-hand. Certainly Don's contributions to Roscoe Turner's adventures far exceeded any aircraft mechanic's job description!

Apart from some questionable assertions relating to Gee Bees, we highly recommend this 340-page hardbound book to anyone interested in aviation's Golden Age. Illustrated with more than 50 photos, it is published by the Smithsonian Institution Press, and should be available from most aviation book sellers.

READER FEEDBACK

In response to our quotation by Pierre Chaussebourg in our June '96 column, regarding the utility of model building,

Harold Bickford, of Berkeley, California, wrote: "I would argue that model building and flying are important, since such activity is inherently different from instant gratification and tends toward patience and perseverance. Such qualities, I think, are simply necessary in the solution of problems big or small, and serve to illuminate the idea that we do make a difference in our time and place. 'Model building builds model boys' read the old Comet motto; it seems to me that it fits right into all of this for boys and girls of all ages."

SIGN-OFF

We would like to share a Boeing BEAMS model newsletter suggestion for becoming a better model builder: "Ask questions . . . Build another airplane . . . Fly it . . . Ask questions . . . Refine your design . . . Fly it . . . Read model related books . . . Practice . . . Practice . . . Practice . . ." Amen!

Bill Hannan, Box 210, Magalia, CA 95954. MB



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Delamination Strength	A	D	D	C+	D	C+	D
Slots or Holes	A	A	A	A	A	D	D
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ELECTRONICS CORNER

BY ELOY MAREZ

25 Years of Radio Control Evolution!

Twenty-five years! Imagine, *Model Builder* magazine, started by Bill Northrop in his living room with, he once told me, \$35 capital, has been around for that long. With that in mind, let's take a trip down memory lane and see what has come along, RC electronics-wise, since those early days.

We're talking about 1971 now! "Propo," being short for "proportional," as it was called then to differentiate it from the still-in-use multi-channel reed equipment, was pretty well established. All manufacturers had gone propo, though one of them, Ace R/C, was still producing its Pulse Com-

mander, a single-channel unit with a magnetic actuator. Ready to fly, the complete system sold for around \$75.

That was still the age of American-made RC equipment, with radio systems of many more brands than are currently in use being available. We never knew and will never know which were the most popular at any given time, though in retrospect, it seems as if Orbit Electronics, a major innovator in those early days, was definitely the original king of the hill. Sometime in the early '70s, Orbit appeared to give up its position to Kraft Systems, which maintained it until the influx of foreign equipment toward the end of the decade. Actually, the demise of both Orbit and Kraft was, at least in part, due to the sale of both companies to larger entities not previously experienced in the model airplane hobby business and who simply were unable to survive in a (to them) alien market.

Those early days of Kraft and Orbit were also the days of "a hundred bucks a channel"—and also before the era of discount marketing hit us.

They were probably well worth it, as the equipment was highly labor-intensive, being all hand soldered and made mostly from discrete components, as specialized RC-only integrated circuits (ICs) had not yet made the scene. In fact, it was about this time that Orbit and Kraft first started using a three-wire and later a proprietary servo IC, which contributed greatly to the efficiency and reliability of these important units.

At this point in RC time, single-stick transmitters (which had a large knob on top of the stick with which the rudder was controlled) were popular, with all major manufacturers offering at least one such model. This was before multi-featured systems appeared, the advanced ones having a trainer system (another Orbit innovation) and possibly a roll button, referred to then as a "slow roll" button.

Sounds crude, doesn't it? Well, by today's standards, it was—but believe it or not, when I flew my first RC airplane in 1952, the equipment was even cruder—but that's another story! Anyway, in addition to Kraft and Orbit, in the early '70s you could have chosen from equipment manufactured by:

Ace R/C—Produced the first of many later fine proportional kit systems, the Digital Commander.

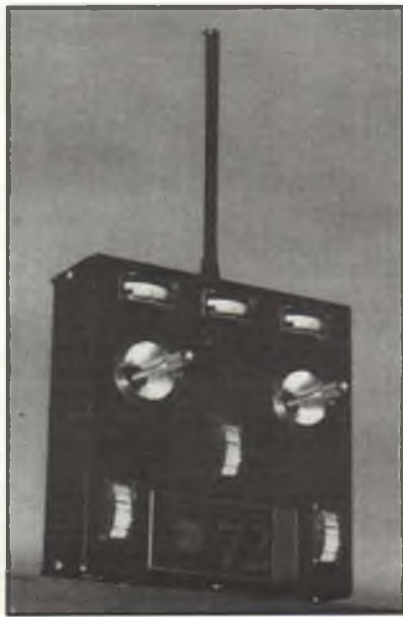
Cannon R/C—The same Bill Cannon who's producing today's smallest proportional equipment, though his systems were then pretty much the same size as the others.

EK Logictrol—Normally configured radios, appeared to have some success for a while. Like Kraft, EK produced a popular "Brick" airborne system, the receiver and two servos being contained in one case.

Heathkit—RC in a kit, based somewhat on Kraft designs, but with mechanical differences.

Mathes R/C—Basic systems designed by a true RC design pioneer, Don

In the mid-'70s, Pro Line was the equipment of choice for many top competition fliers. The Challenger II system was introduced in 1975, was a five-channel setup with semi open gimbal sticks.



■ LEFT: Cox was once involved in the "full size" radio market, distributing Sanwa-made systems in four- and six-channel versions. Of course, Sanwa is much better known today as the manufacturer of Airtronics equipment, one of the "big three" major RC system producers.

■ RIGHT: The only Six Meter transmitter to appear that was not merely a modified 72 MHz system, circa 1972. Designed by our columnist and later donated to the AMA Museum. More in text.



Orbit Electronics was going strong in 1975. Introduced the "Hawk" system in two-, three-, four-, and five-channel versions. Miniature transmitter measured only 5 by 5-1/2 by 1-3/4 inches and featured Dunham sealed open gimbal sticks. Such a tiny transmitter as this would never be accepted by serious modelers today.

Designed for tight installations, Ace R/C's Digital Commander Three Servo Block (circa 1975) had three servos contained in one case. More popular were the "brick" units produced by EK Logicrol and Kraft, both of which incorporated two servos and the receiver into one case.



orange case. At the time it had the smallest receiver then available.

Mathes.

Micro-Avionics—To me the ugliest radio ever made, being cased in a wood-grain enclosure. Later purchased by Orbit, and continued—thankfully in orange cases.

PCS—To the best of my knowledge, this company initially started separately, but was later absorbed by Kraft Systems and produced by them as a secondary line.

Pro Line—High-quality systems which quickly became popular with serious competition fliers.

RC Manufacturing—One version of their transmitter featured a unique U-shaped antenna.

RS Systems—Common sport system, came in a distinctive

At about this time the first imports were starting to rear their heads, all of them being marketed by already established U.S. distributors, usually under their own label. Some that I can remember were:

Hobby Lobby—Offered a "Hobby Lobby 5," plus probably others.

Hobby People—A Los Angeles based mail order house, offered a multi-channel "Phoenix Masters" system and a two-channel "1+1."

Micro Craft Corp.—Its "Space Commander," probably the first plastic-cased transmitter to appear, was not exactly greatly accepted. The case was also later used by Orbit, with its own electronics, also

without much popularity.

Model Rectifier Corporation—Still with us today, MRC was marketing radios under its own name, some made by the then-unknown Futaba, but also probably other companies. They were first to introduce an FM system to this country, the 776-FM.

World Engines—Its "Blue Max" was available in various channel configurations, including a two-channel "Digit Migit."

World Engines—Then importer of O.S. engines, this company advertised a radio system also produced under the O.S. label. I don't remember ever seeing one.

Most of these imports were cheaper, and in most cases of decidedly lower quality than our homegrown equipment. However, they did have an

impact on pricing, and more or less forced the major American producers into introducing a lower class of system, usually offered as a "sport" system, meaning that it was not really intended for the serious competition flier. As mentioned in the case of Orbit, Kraft Systems also tried a plastic-cased transmitter, though theirs was completely assembled "offshore." Neither was as good or as well accepted as their totally U.S. produced first-line equipment.

On a personal note, during those early '70s, I was somewhere between being a technician and Sales & Service Manager for Orbit Electronics. During that period, like all others who held a radio amateur license, I was flying on the 53 MHz band, which we referred to as "Six Meters." Though all major makers



The 1977 Kraft Sport Series KP-4A four-channel system sold for \$299.99. featured no frills but incorporated what was then state-of-the-art circuitry and mechanics.

Orbit's \$1,000 "Elite" was one of the so-called "super radios" unveiled at the 1975 Toledo show; it sported a gilded case and one of the first LCD readouts seen on an RC transmitter.





Cannon Electronics has long been known for its mini radio systems; the "Super-Mini" was introduced in 1978 and was billed as the world's smallest digital proportional system. Of course, today's Cannon miniature airborne components make these look huge by comparison!

ffered equipment on that band, I always felt somewhat left out, since all such equipment was really only modified 72 MHz gear and not really designed from the ground up for us "hams." Being now in a position to do something about it, I proceeded to design the only true "Six Meter" transmitter available then or now. Naturally, it was received by all ham RCers with great delight, so much so that it was accepted by the AMA Museum, though I don't know if it is now on display at Muncie or not.

Frequency-wise, this being before the CB radio invasion with its rash of illegal power amplifiers, we were still flying on 27 MHz, and of course we had the seven 72 MHz frequencies to pick from. All of the equipment then was on AM, and since we had 80 KHz spacing between channels, the transmitted signals were atrocious, to say the least—even those emitted by the top line equipment. But it was all within the legal requirements, which also included crystal tolerances so broad that now and then two radios would appear, labeled as being on the same frequency, but effectively so far apart that they could fly simultaneously without interfering with each other.

The receivers were no better; they were so broad that had they been designed to play music or speech, they could honestly have been tagged as "high fidelity." But again, it was all according to specs. When properly tuned and adjusted it worked well, and no one can fault the makers at this late date. We all knew it could be better, but at greater cost, and the weak links in those days were not ones that would have been greatly improved by narrower band equipment.

Physically, some really good gimbals and servo mechanics had been developed. The circuitry, like the transmitted bandwidth, was adequate; it was all rather basic and followed then-accepted guidelines, with a lot of duplication from one maker to another. The servo pot was a problem then as it is today, and a couple

of companies tried replacing it with variable capacitors, with some success but without great hobbyist acceptance.

FM appeared in early 1979; *Model Builder* introducing it to the U.S. flier with an article on the MRC 776-FM, with an explanation of the differences and advantages between it and AM. However, since FM was legal only on the ham frequencies at the time, there was no great exodus to this new transmission mode. Now that I think of it, I never did update my answer to the Six Meter flier's prayer to FM; maybe that's why it did not take either!

Interestingly, I find the first reference to coreless motor servos in the same MRC article; apparently they were furnished with MRC's top systems. My research of magazines of that era and my personal files did not uncover any mention of these definitely improved servos prior to that.

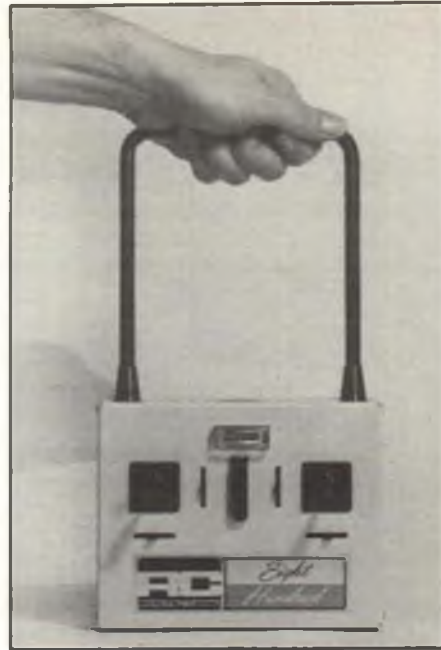
The MRC 776 had another improvement which I liked greatly but which was never used by any other manufacturer. Remember that this is back before microprocessor radios with their ability to adjust trim authority as one desires. The 776 used a wheel-driven pot with full 270 degrees rotation, instead of the usual 80 degrees obtained with the lever-actuated trim pot. The results were much finer trim adjustments being possible, something I really enjoyed.

The first Futaba ads appeared in the June 1973 magazines, showing some normal looking square aluminum-cased transmitters, and probably the forerunner of the sloped case that was to become their trademark for so many years. It did not create much stir on the scene, certainly nothing to indicate that it would grow to have the impact that it ultimately did.

Things were pretty much status quo through the rest of the '70s. There were few major changes, some of which did not catch on and disappeared in time. Some of the changes have survived, with improvements; servo reversing, dual rates, and servo travel adjustments—the latter under various and sometimes confusing names. The only other significant change was the disappearance of the smaller U.S. radio manufacturers, and though we did not know it then, the beginning of the end for the major ones.

The late '70s and early '80s saw more lasting changes. FM was by now legal on 72 MHz and most manufacturers were offering equipment on that mode, most of them ultimately dropping AM completely for their aircraft systems.

On the supply side, two important companies were born around this time. Sanwa equipment, previously imported on a rather humble basis by Cox, made a more serious appearance under the Airtronics label. The company immediately established a good reputation that continues to this day. And in a somewhat unexpected location (a few blocks off the Las Vegas



A California-based company, RC Manufacturing, offered this unique antenna on its early '70s systems. Probably worked well but was never popular.

strip), Circus Hobbies was started, with its own line of then-unknown JR radio systems. We now know it as Horizon Hobby Distributors, who still supplies us with the popular JR radios.

What else happened in the early '80s? Two very important things! PCM happened—sometime around '83, as near as I can tell by the ads. It brought along some confusion, being first touted as a new type of radio frequency invented especially for radio control, which of course it isn't. Such encoding had been in use for years in military "fly by wire" airplanes and even telephones. Nowadays, all that so-called "digital" audio and television equipment available can rightfully be referred to as PCM—it's mostly a matter of marketing.

(The other important '80s happening took place in December 1981: the first Electronics Corner column appeared! And I'm proud to say, that except for a couple of times when it did not appear due to space limitations, I have yet to miss a month!)

So, in a nutshell, that's how we got to where we are today. Obviously, I've left out a detail or two and surely a name or two; radio control as we now know it was born during this period, and it would take much more space than is available here to describe it step by step. Suffice to say that a lot of effort was expended by a lot of people to bring us today's level of sophistication and reliability, and we should all be thankful. If for nothing else, we should be thankful that, except for some highly specialized equipment, well designed and manufactured radio systems are available to us for far less than "a hundred bucks a channel"!

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



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FREE FLIGHT

BY BOB STALICK

•Bob Stalick's Top 25 Free Flight Picks, Part 1

It was 25 years ago that *Model Builder* made its appearance. All kinds of models were featured, and free flight played a major role. Numerous columnists guided the discussion, including Mel Schmidt, Ron Evans and Tom Hutchinson.

As the current FF columnist and the one with the longest term in office, I have reported on much of what has happened in free flight during the past 25 years. So, when *MB's* editor called recently to ask that I do a couple of columns featuring some retrospectives of the past 25 years, it became an enjoyable challenge to determine what to feature. Over the next two months I've decided to present the 25 most impressive models, by category, in FF during the past 25 years in the hobby. One design per event. And I get to choose the events and the models. Wotta deal!

AMA GAS EVENTS

I divided these into small and large classes. Many distin-

guished designs were in contention for both of these classes, but my final decision was clear.

Small AMA Gas

Which well-known design has continued successfully into this current period of carbon fiber component models? Which model still appears in the winning circle in such diverse locales as Cat. III fields in the east, to the broad expanses of Lost Hills? Tom Hutchinson's Maverick.

The Maverick is a perfect embodiment of design features. It has pleasing lines, reasonably thin airfoils, a rear fin and modestly high pylon. It is easy to build, and continues to be very competitive. It was the 1978 NFFS Model of the Year winner and is still being kitted. The Maverick has gained new life recently with the new Russian high-performance engines and is flown success-

fully in F1J as often as it is in AMA events.

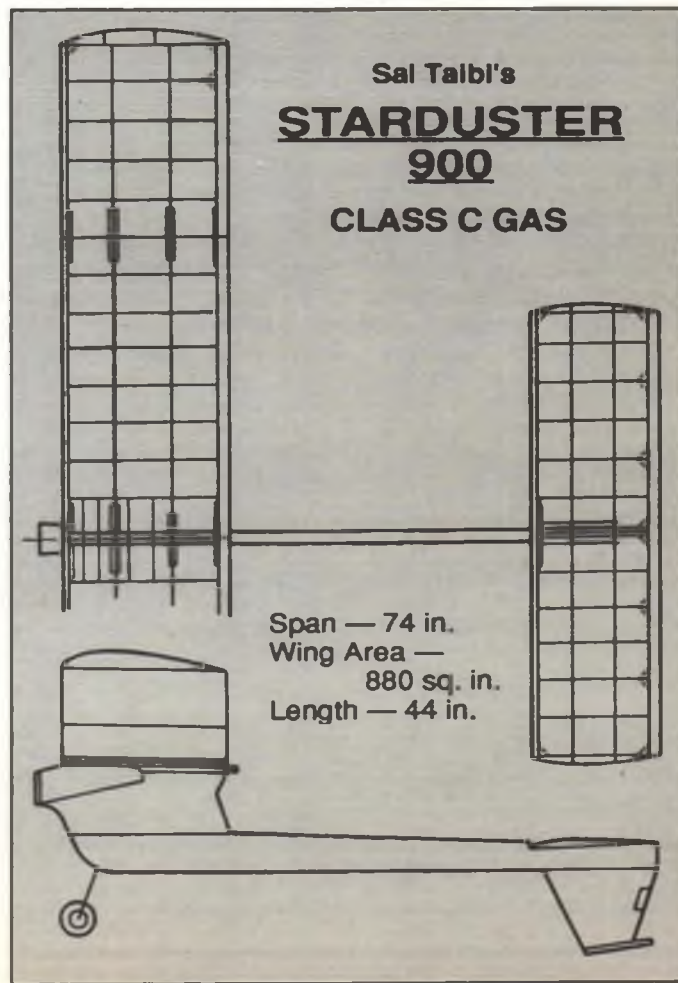
Large AMA Gas

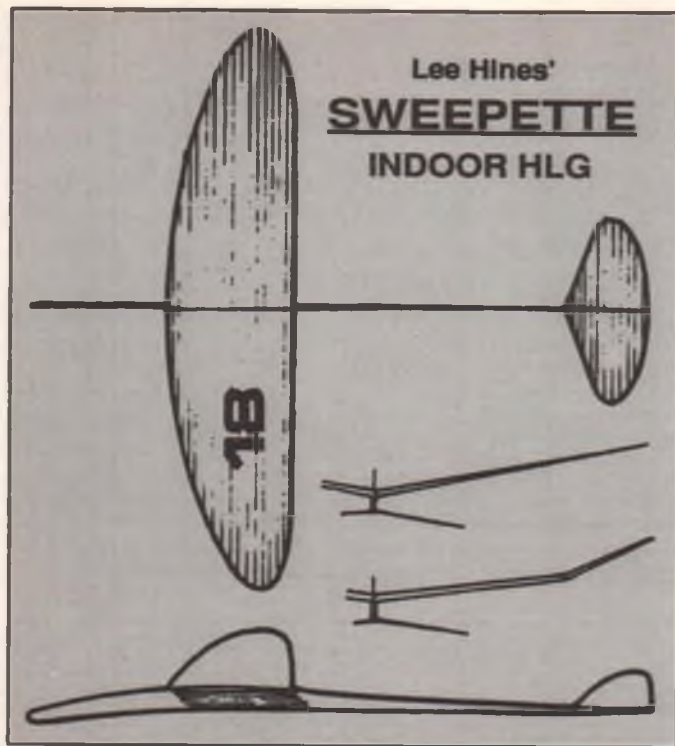
This one was more difficult to select. I considered a number of designs, but one stood out. This design was considered the best of its type, and it was a consistent winner during its post-Nostalgia heyday. In fact, the NFFS Nostalgia rules were specifically written to keep this model from being eligible. My selection: Sal Taibi's Starduster 900.

The Starduster was built by more free fliers than any other model during the 1960s and '70s. The NFFS named it the Large Gas Model of the Year in 1984. I recall at the 1967 California Nats, seeing young Mike Taibi walk into the hangar with a kit and build it on site, competing and winning Junior C Gas later in the week. I watched Stardusters clean up



Legendary Wakefield flier Bob White with the seventh in his ongoing series of twin-fin, rolled tube fuselage, high-nylon models; this one placed 3rd at the 1971 World Champs in Finland and was published as a construction feature in the June 1972 *Model Builder*. Our columnist picked Bob's later No. 22 Wakefield, winner of the 1987 World Champs and very similar in appearance to the one pictured, as his top choice for the F1B category.





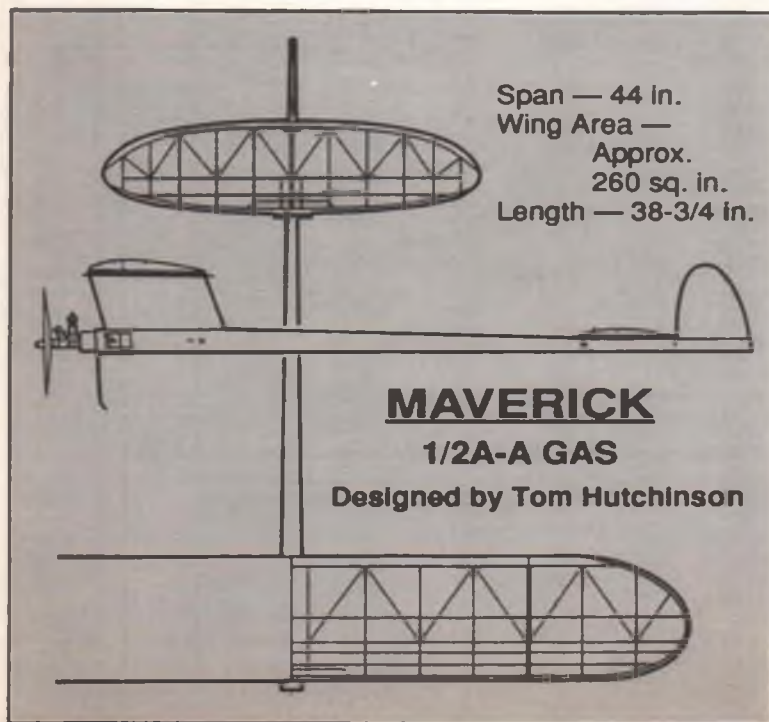
in local and national competition year after year. It was not the pioneer in the high-thrustline, low-fin school of thought, but it represented the type well and brought all of these design features into one successful concept, so much so that the pretenders that followed it were simply knockoffs.

SPORT FREE FLIGHT

This column doesn't spend much space extolling the

virtues of sport free flight, but I've found that many of our readers are more involved in and interested in sport FF than in any of the competition events. This is a difficult category, however, the model that many of us cut our gas model teeth on was a rugged, easily built, foolproof, sure flier: the Veco Dakota.

The Dakota was an all-balsa biplane designed by Joe Wagner in 1949 to be flown



MAVERICK

1/2A-A GAS

Designed by Tom Hutchinson



Just before circle towing came into vogue, the lowline glider to beat was the Ultimate Dragmaster, designed by the late Tom Hutchinson and chosen by Bob Stalick as the top all-time A-2 (F1A) Glider. Projected span was 70 inches, and the airfoil was the newly developed Kazzanowski 6F-6.

with the then-new OK Cub .049. It was literally impossible to build the model so it wouldn't fly. The Dakota was designed for small fields, so it featured a tight left climb and a somewhat tight and steep descent. The model was available well into the 1980s. A timeless classic!

FAI EVENTS

FAI events have been the hotbed of change in free flight. Many of the technological developments that affect other FF events have come from FAI. Within the last five to ten years, the scene has changed dramatically. Now the field is dominated by cottage industries which produce everything from component parts to entire airframes. With the exception of F1J, my choices for the selected designs in the FAI categories intentionally predate the current condition.

F1A Glider

Once upon a time, this event was called A-2 glider, towline glider or Nordic glider. This was the event for the fittest fliers, since quite a bit of running was often involved. More recently, circle tow and other refinements have made it less of an endurance event. My selection is a model that was designed just before the circle tow began to dominate this event: Tom Hutchinson's Ultimate Dragmaster.

Tom designed this model around the newly developed 6F-6 airfoil, supposedly the ultimate

glider section. Tom's glider was a high aspect ratio model for its time. It was easy to build, and was an excellent flier. Although the wings had an inherent weakness in their design, the model was hard to beat prior to the advent of circle tow.

F1B Wakefield

The Wakefield event has undergone dramatic changes since its inception and is now as complicated to build and fly as can be imagined. As with F1A, I have chosen a design that exemplifies the classic tradition of the event prior to the involvement of contemporary technology: Bob White's No. 22.

The preeminent model designs of the 1970s and '80s were Bob White's Wakes. Bob's models were characterized by twin fins, high pylons and tubular fuselages. In 1974 and 1988, the NFFS awarded to Bob the Wakefield Model of the Year. When others began experimenting with various "improvements" to performance, Bob remained true to his ideals, and he remained competitive until he stopped flying the event. This model and its flier/designer brought the Wakefield trophy to the USA in 1987.

F1C Power

Of all the FAI events, F1C has been the most affected by the cottage industry and the buy-and-fly model craze. The number of fliers in this event continues to dwindle as the event continues to be refined. Models now have wingspans over 100 inches and feature electronic or multi-function timing mechanisms that make minute changes in the flight characteristics, to the extent that 10-minute flights are

considered common enough to require changes in the international rules.

My selection for the F1C model is the Summerwind by Doug Galbreath.

Doug's model was the last of the identifiable F1C models. It had a reputation as a first-rate design, even though it never won a World Championship. The Summerwind has been built in different sizes and flown in AMA classes to several longstanding records. Although it is now a dated design, it shined brightly as a model for its time.

F1G Coupe d'Hiver

F1G began as a fun event that could be flown while awaiting the onset of warm weather, when the "real" models could be unleashed. Eventually it achieved international status and became a small mini-FAI rubber event featuring some of the same kinds of technical developments that afflict Wakefield.

My F1G selection is Joe Foster's Coupe.

Joe Foster is a free fliker who seems to find time to build and successfully fly just about every event on the schedule. His models are well designed and can be built and competitively flown by just about anyone. Joe Foster's Coupe is a recent design which features a high aspect ratio wing and a tubular fuselage. It has been recreated by a number of modelers who have flown it to high placings in local, regional and national competitions.

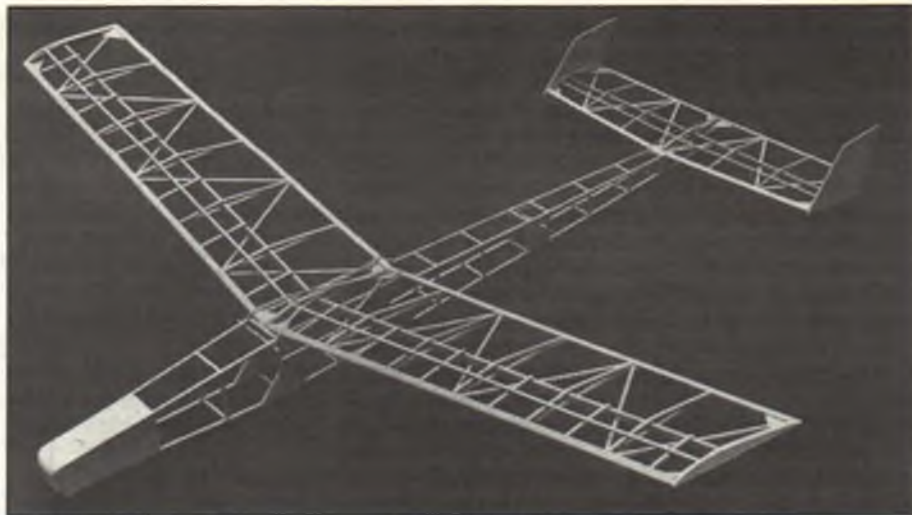
F1H Small Towline Glider (A-1)

A-1 Glider has suffered from limited participation for as long as I can remember. It remains an event that is flown at mini-FAI events around the country and internationally. One design that continues to return to mind is my choice for this category: Warren Kurth's Jetstream.

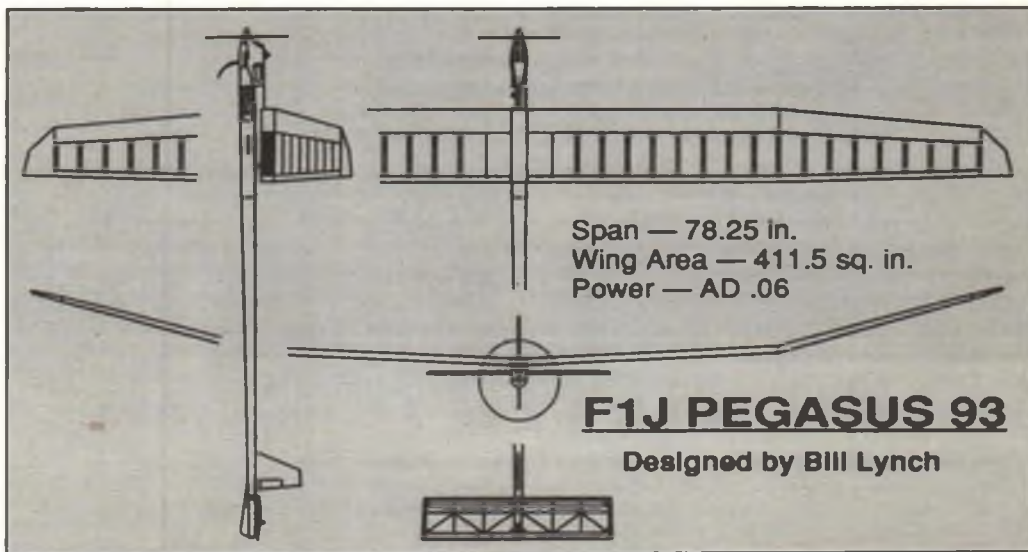
The Jetstream was a balsa-and-tissue model that was simplicity in itself. It had a rudimentary autorudder system and won many places at Nationals competition. It did for A-1 glider exactly what is was intended to do—recruit fliers to attempt the larger, and then easier to fly, A-2 models. It helped that Ambroid and then Midwest kitted the model and did a nice job of promoting it during the '60s and early '70s. I think the Jetstream is a fine model and worthy of consideration for anyone thinking of trying a towline event.

F1J Small Power

The Brooklyn Skyscrapers envisioned an FAI event that could be flown on small fields. They thought existing 1/2A models could be flown using contemporary engines and construction techniques. It was a noble thought. Today special 1cc engines are available and the high-tech components that dominate the F1C event are finding their way into F1J, too. However, it's still possible to be competitive with a model that can be built in your shop



John Oldenkamp's twin-engine Hotbox ranks as our columnist's #1 choice for the P-30 class. Was featured as a construction article in the July 1977 Model Builder. Note the use of the "cracked rib" construction in the wing and stab.



without much help from the component people: Bill Lynch's Pegasus.

Bill recently re-entered the FF competition scene and found his niche with F1J. He decided to apply some of the technology from F1C to the event. The end result was a series of models of which the Pegasus is typical. The Pegasus has been an F1J record holder and consistent winner of mini-FAI events in California.



What better choice for the top Sport Free Flight model than the classic Veeo Dakota? This 24-inch span all-balsa biplane was designed by Joe Wagner and was as close to a foolproof, sure flier as has ever been created.

AMA NON-POWER EVENTS

A few of the AMA outdoor FF events

have been around for many years. These include HLG and Mulvihill Rubber. Along with these two events, a popular newcomer has entered the scene: P-30 Rubber. These are the three events that make up this part of my selections.

Hand-Launch Glider

Many excellent and high performing HLGs have been built and flown over the years. There are as many gliders out there as glider fliers. My choice is for a classic: Lee Hines' Sweepette.

Over the years, this glider has been modified and flown by many fliers. It's been kitted by several entrepreneurs, and has been a staple of the genre for as long as I can remember. Indoors or out, it didn't seem to matter—it still won. Derivatives of the design were all over the place, and they won as well. It was the Sweepette that dominated its event for decades, so much so that the NFFS selected it as the Glider Model of the Year in 1970.

Mulvihill (Unlimited) Rubber

This is one event that has not been adversely affected by the advent of technology. New sources for rubber and the use of higher quality front end components seem to be the only recent changes. Consequently, a model designed 10 or 20 years ago is still competitive today. My choice is for a more recent design: John Lenderman's Le Nomade.

John competes in all of the rubber events. He once held a Coupe record that would still stand today if the rules had not been changed. Le Nomade is an easy-to-build model that flies extremely well, is goof-proof and nearly indestructible—traits of all of John's models. Other fliers have had great success with this design. It was also selected by the NFFS as the Large Rubber Model of the Year in 1988.

P-30 Rubber

The San Diego Orbiters were looking for an easy entry-level event that could not be "improved" upon by the experts. The secret was the adoption of the unmodified plastic prop, size and weight requirements for the airframe, and a limit on the amount of rubber. The event was right from the start and has needed no significant modifications. Many P-30 models have been published and kitted, but the concept designs by one of the originators remain the basis for all current incarnations.

My selection for P-30 model is the Hotbox by John Oldenkamp.

The Hotbox has all of the features that make this event what it is. The model features ease of construction, simple lines and performance. It can be built by a neophyte and still be competitive. Plans are available from *Model Builder*. The NFFS has seen fit to acknowledge both the event and this model as one of their ten best.

MORE TO COME

The above listing of models completes half of my selections. Next month I'll conclude my all-time 25 models and include in that list my choice of the most successful model of all time. Tune in next month for the rest of the best.

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1.4 oz	63"	plain	10 yds +	\$2.25/yd
2.0 oz	38"	plain	5 yds +	\$1.75/yd
3.0 oz	38"	plain	5 yds +	\$1.80/yd
3.0 oz	38"	satin	5 yds +	\$2.75/yd
3.0 oz	50"	plain	5 yds +	\$2.25/yd
3.0 oz	50"	satin	5 yds +	\$4.00/yd
4.0 oz	49"	plain	per yd	\$3.90
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BY FRANCIS
REYNOLDS

• The Last 25 Years In Model Building With Model Builder

I don't personally have a copy of Volume 1, Number 1, but I'm told that *Model Builder* is celebrating its 25th year of publication. Happy Birthday, *MB!*

How far has modeling come in the 25 years that this magazine has been supporting the hobby? Think back to 1971... seems like yesterday to this old-timer—and model airplane designing, building, and flying was already a mature art and science when I started cutting and gluing balsa (and bamboo) way back in 1930; but there has been much and very important progress in the hobby in "just" the last 25 years.

While a dedicated fraternity of modelers stick to the roots of the hobby (free flight and indoor models), the hobby as a whole has greatly expanded and become much more diversified, more expensive, less do-it-yourself. It now appeals primarily to adult males, and their average age is constantly increasing. The model airplane records which stand today are more impressive than those which stood in 1971, and there are many more classes of records now.

With that in mind, let's devote this month's column to a look back at a few of the major advances in modeling that

single photo or reference to model helicopters in that 1970 magazine. The closest was an ad for full-scale Benson Gyrogliders.

I'll leave the details of RC helicopter history to James Wang, but I do have a personal recollection. I remember thinking, back around the first issue of *Model Builder*, that RC model helicopters should be possible, and it would certainly be a fascinating development to work on; but I was too tied up with my career and raising a family to get involved in it at that time.

A few years later the first successful RC helicopters appeared, and with their arrival I lost interest in their further development—because another modeler had beaten me in achieving that "impossible" goal. The best part of the race was over for me. Now I'm finding similar original technical challenges in the development of RC ornithopters. (Some idiots go out of their way to look for trouble.) RC ornithopter development stands today about where RC helicopters stood in the mid 1970s.

RC Sailplanes: Another type of model which was in its infancy at the birth of *MB* is the RC glider (both thermal and slope soarers). In a 1970 model

models has definitely occurred within the *Model Builder* magazine years. I won't intrude into Roger Jaffe's bailiwick except for a bit of earlier history. The first electric-powered models were free flight, and they preceded the birth of *MB* by over 10 years.

I was in Europe in 1960, in international RC model competition. While there I bought some Graupner "Micromax" electric motors at the Lutgenau Spielwarenhaus model shop in Dusseldorf, Germany. These motors had gearheads of 4:1, 15:1, or 60:1 ratio attached. I don't remember ever seeing them for sale in the United States, and I suspect they are now long out of production, but they were wonderful. They were 3/4-inch in diameter, 3/4-inch long, and weighed less than an ounce, including the gearbox!

These motors were "coreless" types, like the best modern RC servo motors. (A coreless DC motor has the permanent field magnet fixed inside a rotating hollow armature consisting of nothing but a shell of copper windings and a commutator at one end.) The claimed efficiency of the Micromax motor was 70 to 80 percent—very high for such a small motor.

In my opinion the number of turbo-jet models will increase modestly and will continue to be demonstrated at meets, but I don't think they will ever compete in numbers with the ducted fans. Turbo-jet model engines are, and probably always will be, much more costly and more difficult to maintain and operate.

have come about during *Model Builder's* lifetime.

RC Helicopters: I think the biggest thing to happen in model aviation in the last 25 years was the development of RC helicopters. I just looked through a March 1970 issue of *American Aircraft Modeler* magazine (which I happened to have because I had a construction article in it, and a photo of my then 17-year-old daughter Pat was on the cover holding my model). I couldn't find a

magazine I found one small ad for gliders, a 72-inch towline glider kit (for \$3.95). There were no other references to sailplanes in that magazine. Up until the early '70s I can't remember seeing any RC sailplanes in the hobby shops or shows. When they did appear in the shows, they really stood out because of their huge wingspans compared to the powered models of the day.

Electric Flight: The great growth of electric-powered

But the point I'm driving up on is that the 15:1-ratio Micromax motor was recommended for electric free flight models which were originally designed for rubber or CO₂ power. The Micromax literature I still have (in both English and German) was dated September 1959, and it gives complete engineering performance data on the motors and information on how to make electric-powered model airplanes using the

continued on page 85

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A good first competition glider, the Kestrel has all the attributes a first-timer needs: low sinkrate, hands-off launch, flat glide, and rock steady approach with no tendency to fall off at the tip.

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THE DRAGONFLY

A blast from the past! In celebration of *Model Builder's* 25th Anniversary, we thought it appropriate to reprint one of our most popular construction features from the '70s. The Dragonfly is an RC fun ship that *anyone* can fly.

It seems we had just finished one of those fine dinners Mary Ann Lee cooks up, and continued to stuff ourselves with apple pie and ice cream, when Bob picked up a little stick fuselage rubber model and gave it a toss. It obediently floated across the family room and landed on the shelf where it lives between flying sessions.

"What we need is an RC that flies like that!"

I can't remember who said it first, but at any rate, a couple of weeks later we were out test flying our new "Dragonfly." Since then there have been a dozen built and flown with a wide variety of engines and radios. The originals were powered with .047 diesel engines and flown single channel. They have been powered with .074 OK Cubs and McCoy .098s.

When the decision was made to go to O.S. Max .10s, a whole new thing happened! They really didn't fly any faster, but just climbed like an elevator . . . in second gear. Consequently, we could make low, level, slow speed (5 mph) passes and climb back up out of sight. The eventual addition of elevators added funny loops to the list of aerobatics which already included wingovers, hammerhead turns, and spins.

Dragonflies have flown with Ace pulse rudder-only systems quite successfully. Mine, one of the original two, is still flying with a seven-channel Kraft system . . . operating just rudder and throttle. The left stick on my transmitter is for rent!

As a beginner airplane, the Dragonfly just can't be beat. The novice can learn which way is left . . . both coming and



Lettin' go is author and designer Tex Newman; the young fellow on the sticks is Jeff Lee, son of co-designer Bob Lee. For flight training, the Dragonfly falls into the same category as Old Timers—super stable, docile, slow enough that even first-timers can keep up with it.



How's this for an easy-to-service engine installation? O.S. .10 is bolted to a Kraft-Hayes mount.

going. Also, where he is over the ground as well as how to use just a little pressure on the stick, all in a short time. This approach to RC flying provides the beginner with a large amount of success in a short period of time with minimum repairs. One of our novices, Brian McCleave, had fewer

than ten flights on his Dragonfly when he soloed . . . full flight . . . takeoff through landing.

Up until a year ago there was a large open field just two houses up the street from my house. The neighborhood kids would all turn out for a flying session. We'd take

THE DRAGONFLY

DESIGNED BY

BOB LEE AND TEX NEWMAN

WINGSPAN 72 in.

WING AREA 728 sq. in.

AIRFOIL Undercambered.

OVERALL LENGTH 52 in.

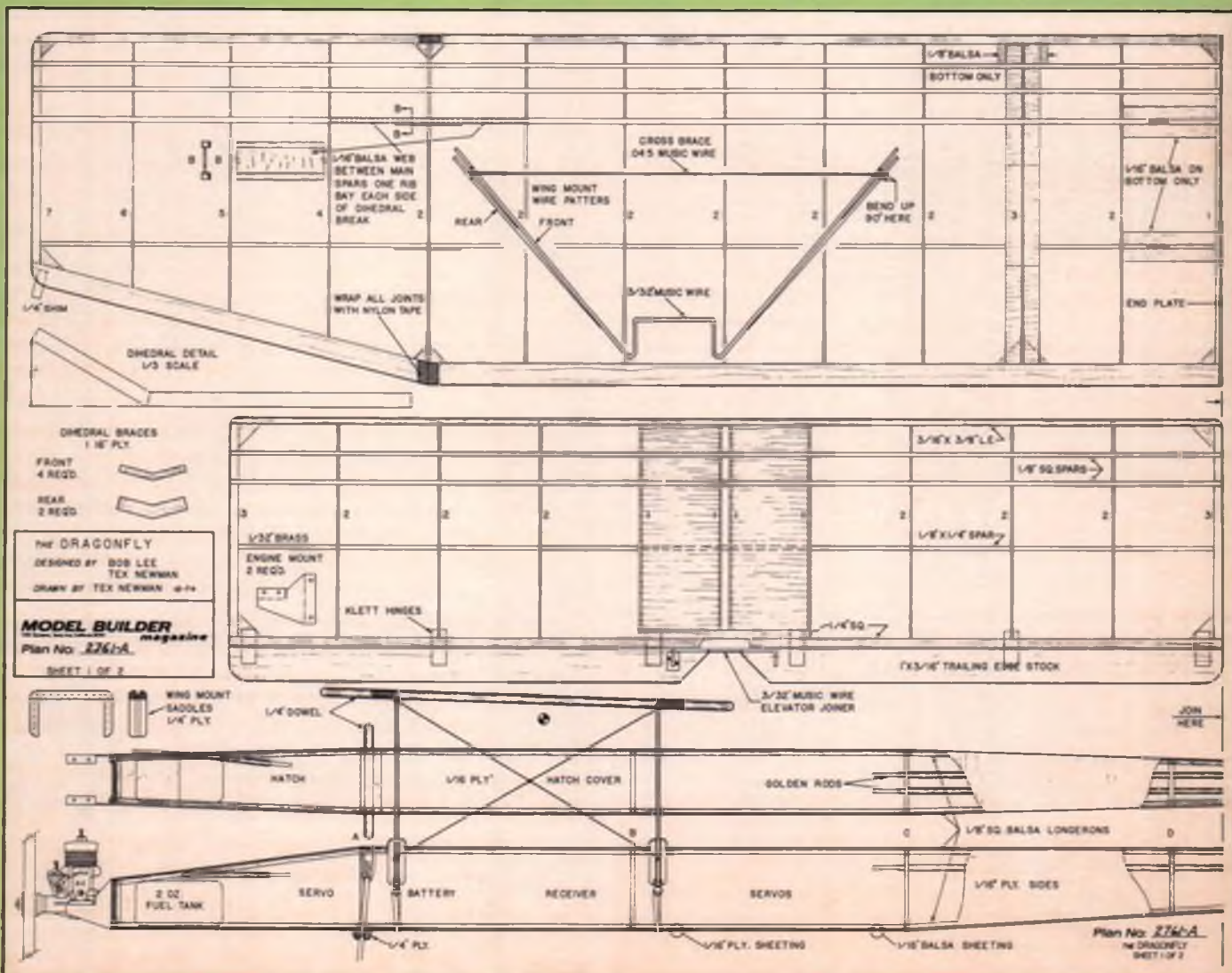
POWER10-.15.

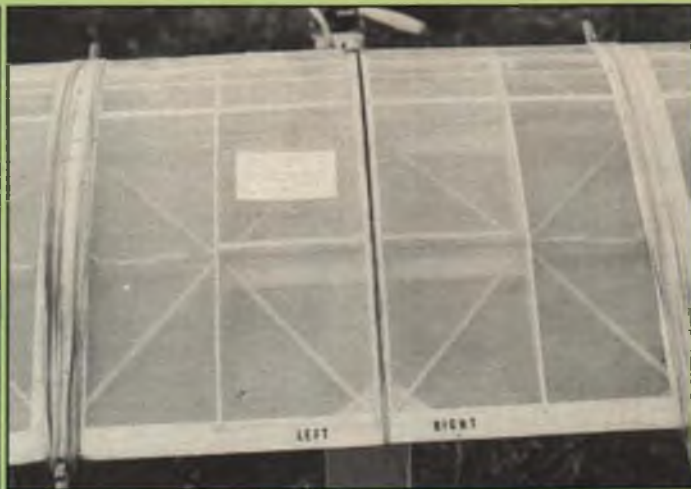
RADIO Three channels required (rudder, elevator, throttle).

CONSTRUCTION All-balsa wing and tail, plywood/balsa fuselage.

off and circle the field to gain altitude, then walk back to the front yard and lay in the grass while each one took a turn to fly for a while.

On one such summer evening, I was sitting in a chair on my driveway, flying, when a police cruiser passed ominously down the street. The driver looked first at me, then out his window at the sky, then back at me again. He turned around at the





■ LEFT: Fuel tank and radio are likewise completely accessible. Photo shows the Kraft "brick" (remember those?) in one of the prototype Dragonflies. Any of today's inexpensive "standard" servos would be perfect for this ship. ■ RIGHT: Plans show a two-piece wing, joined in the center with music wire rods in brass tubes. Could just as easily be built in one piece if storage and transportation are not a problem.

corner and came back and parked in the driveway.

"What are you doing?" he asked.

"Flying an airplane." I said.

"That's what I thought. Where is it?"

"Up there, over head . . . ah . . . would you like to fly it?"

"Oh no, I'd probably crash it!"

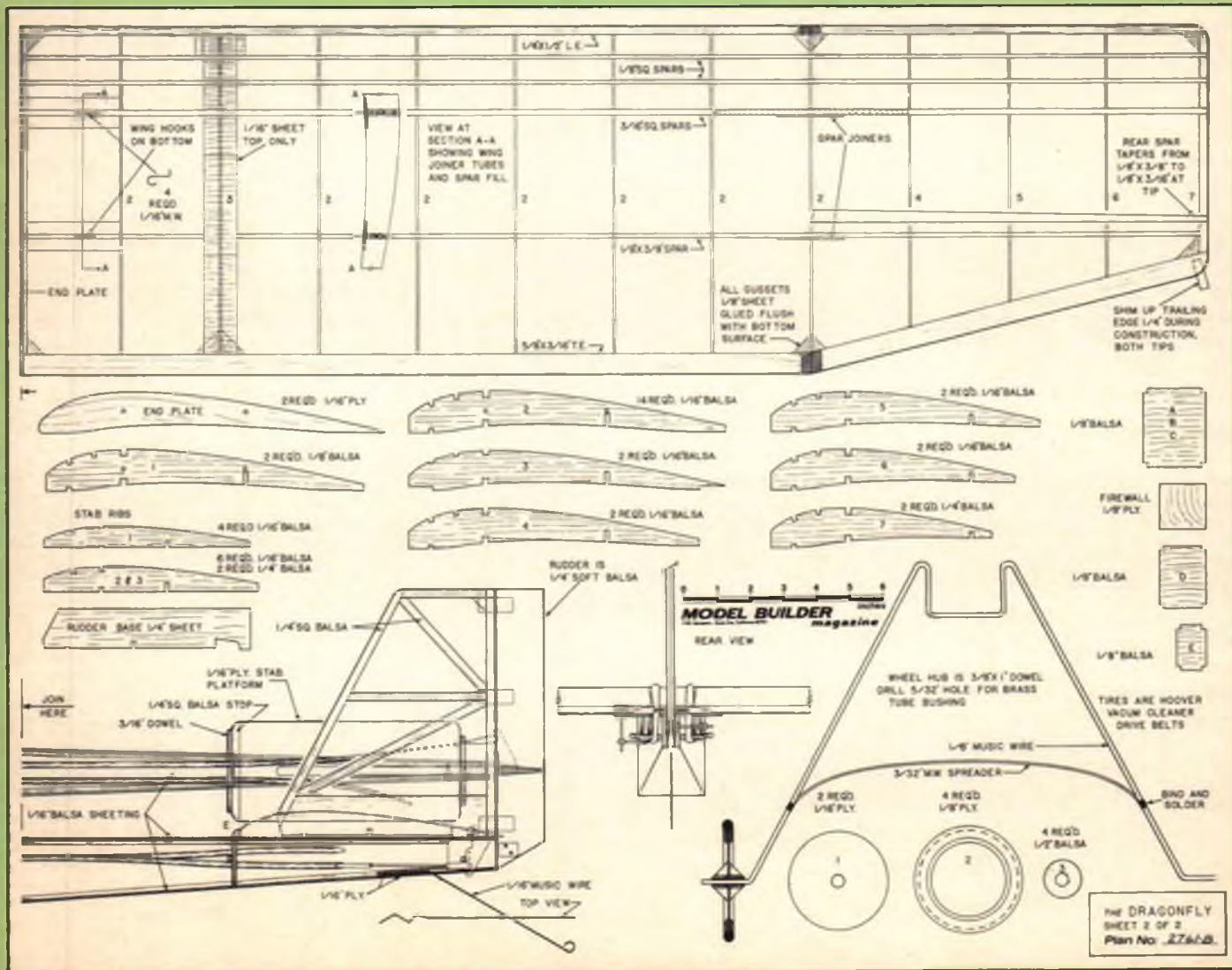
"Not this one! It's real easy, my wife even flies it. Come on."

And so he did, for five minutes or more, asking lots of questions. Finally he said, "I hate to do it, but I've got to get back to work. Have a nice evening."

Phew!

Enough of this, I could tell stories all night, but you'll enjoy flying your own Dragonfly and having your own fun more than reading. So let's get to work!

First of all, call up your old flying buddy and build a pair. They are ten times more





Tex is right when he says these airplanes are lots more fun in pairs—both MB's editor and his friend Lee Mollinger built Dragonflies back in the early '80s, and what a blast they were! Lee's was stock except he made the fuselage out of cardboard, something he'd been experimenting with at the time. He flew his airplane at night with an on-board lighting system; with one, two and three engines (nacelles rubber banded to the wing); and as a seaplane with a pair of large Sure-Flo foam floats and a heavily modified O.S. .25 in the nose. The .25 was later swapped for an O.S. .20 four-stroke. Phil's O.S. .10 powered Dragonfly had constant-chord wingtips (easier to build) and spruce spars, the Wj dihedral break was moved one rib bay inboard, and the vertical tail was a bit taller. Wheels were 4-1/2 inch Trexlers. Sure miss those good old days . . .

fun in pairs. Besides, a 12x48-inch sheet of 1/16 plywood makes four fuselage sides and all the other little plywood pieces needed for two.

FUSELAGE

Cut out two fuselage sides. Glue on the 1/8 square longerons, making one left and one right side. Add bulkheads A, B and C and pin in place over the top view. Note where the 1/16 plywood sheeting goes on the bottom to reinforce the wing and landing gear mounts. Draw the nose together with the firewall and add the nose plywood sheeting. Bulkheads D and E are put in after the filler block at the tail. Install the tailskid between pieces of 1/16 plywood and cross-sheet the remainder of the fuselage bottom with 1/16 balsa. The top may be sheeted after the pushrods have been installed.

FLYING SURFACES

The wing and stab are very conventional in construction. The wing is built in two sections and joined with two 6-inch pieces of 3/32 music wire. These slide into 1/8-inch O.D. brass tubes sandwiched between the main spars. The panels are held together with hooks and rubber bands on the bottom surface. This allows the plane to be transported in a Volkswagen, and provides flexing on landings when the wheels first hit something other than the ground. The one thing to remember is the 1/4-inch shim under each wingtip trailing edge during construction; this provides tip wash-out and helps make stalls enjoyable. Wing rib No. 3 has 1/16 balsa sheeting on top to support the wing hold-down bands.

Build the fin from 1/4-inch square balsa and cover it before mounting in the slot provided in the stabilizer.

When building the stab, pin the leading edge, bottom spars and two pieces of

1/4-inch square trailing edge down over the plan. Next, glue in the 1/16 bottom sheeting. Add the 1/4-inch square trailing edge joiner, followed by all four No. 1 ribs, all glued on top of the sheeting. When the top sheeting is put on it will sand down to a smooth airfoil.

WHEELS

The wheels may look tricky, but they are really very easy. The vacuum cleaner belts can be found at hardware stores or any small appliance dealer. Tell them you're going to put them on a 6-foot model airplane and watch their faces. Be sure to get the size shown on the plan.

Cut all the pieces from the material specified. The hub is a 1-inch long piece of 3/8-inch dowel drilled for a 1/8 axle. Slide the disc No. 1 onto the dowel, adjust it until it runs straight when spun on the axle, and CA it in place. Bevel the edges of the two No. 2 plywood rings so they form a V for the tire to fit into. Glue the rings on one at a time to be sure they are properly centered on the disc. Sand the balsa hub parts No. 3 to a cone shape and glue over the dowels to complete the hubs. The tires are contact-cemented on after the wheels are painted.

WING MOUNTS

Bend up the wing mounts over the plan. Note that the front mount wire is taller to provide wing incidence. Lay Saran Wrap over the fuselage and epoxy the wing mount saddles together and onto the mount wires. Hold these assemblies in place with rubber bands under the fuselage in the location shown. Next, bend two triangles from .045 music wire. Make them 12 inches on each side. Place the middle section of one triangle around the upper end of the front mount wire and bind it in place with fine copper wire. Bend the rear ends around the lower sides of the rear mount wire. Cut off any excess. Do the same with the other triangle, starting at the top of the rear mount wire. Bind the brace wires on each side where they cross. Check the alignment carefully and solder all the joints. The 1/4-inch dowels are bound to the wire mounts with fishing line or string, and epoxied.

ASSEMBLY

The brass motor mount shown is pretty, however, a ready-made mount is more durable. Bolt the engine on and hook up the servos. Spend a little extra time here to be sure everything moves the right direction and works freely.

Our Dragonflies are covered with transparent MonoKote for good visibility. The fuselages and wheels are finished with two coats of K&B resin.

Test-glide your Dragonfly. Give it a good shove. It should float a hundred feet, land on its wheels and slowly settle on the tailskid. If it stalls or dives, adjust by sliding the wing mount back and forth on the fuselage.

FLYING

The Dragonfly will take off from a smooth runway with an .049. Bob makes the most beautiful takeoffs with his, but he never touches the stick until the plane is twenty feet in the air . . . while I'm on the controls immediately and somehow still manage to hit things before getting off.

The Dragonfly is great for thermal or slope soaring, crop dusting, parachute dropping, but mostly for having fun. We're sure it will make you a happy Model Builder! MB

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THE BEGINNINGS OF THE BIG BIRD MOVEMENT

Ever wonder how the large model craze got started? Bruce talks about the early days and some of the personalities behind the products and services that brought us to where we are today.

MODEL BUILDER is celebrating its 25th Anniversary over the next three issues, and each of us columnists has been asked to write something special. I don't suppose I will be around for the 50th Anniversary, but I do hope that my continuing contributions will lay a good foundation for those who follow.

I thought our readers might find it interesting if I could locate some of the people who were instrumental in bringing the Big Bird and Giant Scale movement to life—how they became interested in large models, and perhaps even find out what they're up to these days.

In the early '70s, when *MB* was just getting started, Big Birds and Giant Scale did not exist as we know them today. There were, however, a few pioneers trying larger planes, not the least of whom was *Model Builder's* own Bill Northrop. Bill entered a 1/4-scale DeHavilland Gypsy Moth in RC Scale at the 1961 Nats. It had a span of 7-1/2 feet and weighed 15 pounds. Unfortunately, problems with the Forster .99 spark ignition engine kept him from making an official flight that year, but by the time the Nats came around again in 1965, Bill had replaced the Forster with an old plain-bearing Fox .59 and had flown the model many times. He flew his entire scale routine at 25 feet, then found to his amazement that instead of judging the flight, the Navy judges had spent the entire time taking photos of his plane, filling out his score sheets after the flight was over! He took 3rd place and also received the Sterling Model Company's Flight Achievement Award.

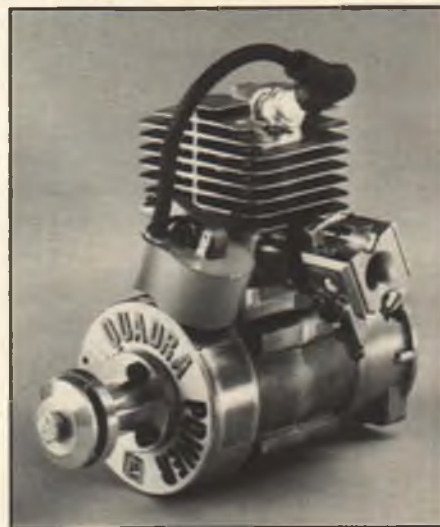
Bill and his wife Anita are now retired and living in Henderson, Nevada. It is a very busy retirement, though, because they

One of the best-known precursors to today's Big Birds was Bill Northrop's 1/4-scale DeHavilland Gypsy Moth, first flown in 1961. Photo was taken at the 1965 Nats, where it took 3rd in RC Scale and Sterling Models' Flight Achievement Award. Bill now offers plans for the model as well as an enlarged 1/3-scale version.



still organize and put on the annual International Modeler Show, held in Pasadena, California. Bill also has established a small model plans business, and whenever he gets a spare moment he works on a huge 10-foot span, 1/3-scale Gypsy Moth. I purchased a set of those plans and hope to build from them when I'm happily retired.

In 1975 or 1976, Ron Shettler started attending the Northwest Model Exposition (then sponsored by the Seattle RAMS club) and other model shows around the country. Ron had been working with 2 cubic inch Quadra chainsaw engines, converting them for model aircraft use; he had one mounted on a board and would fire it up with a prospective customer holding on for dear life so he could see how much pull the engine had. I was intrigued with the idea of flying larger planes and eventually purchased a Quadra, which I installed in a Bud Nosen Gere Sport biplane. The Quadra was the first of the commercially available



The 2 cubic inch Quadra was the first of the really successful chainsaw engine conversions for models (the one shown is actually the later 50cc version). Today's biggest Quadras are popular with the Unlimited RC Racing crowd.



■ LEFT: Possibly the most popular large scale model ever killed, Concept Models' 1/4-scale Fleet biplane, designed for Quadra-type gasoline engines. This example was built by Mike Bruce Edwards long before he took over the reins of the "Big Birds" column. ■ RIGHT: Before the big gas-burners became popular, Du-Bro offered a belt drive system that let you spin a large diameter prop with a standard .80 glow engine.



large displacement gasoline engines for models.

I found Ron Shettler still living in Vernon, British Columbia. He's still the same friendly fellow he always was and we chatted for about 45 minutes on the phone. He told me he sold 23,000 Quadra engines around the world for modeling use and then was approached by hang glider pilots to see if his engine could be used to extend their flights. The Quadra was used somewhat successfully.

Moving on, Ron helped Kodiak Research develop the Rotax two-stroke engines for ultralight aircraft. Today the Rotax is a well-respected ultralight engine and is produced in several different sizes, in both air- and water-cooled versions.

Shettler is now semi-retired but still serves as a consultant to people in the small engine industry. During our conversation he told me he had hoped the Giant Scale movement would develop more like the EAA, with a lot of experimental planes being tested. He also felt that a lot of the sporting atmosphere had been replaced

with modelers trying to outspend each other.

The Quadra's only real flaw was that it was a real shaker. My friend Bud Newby once fired up a Quadra in his basement, doors and windows open; unfortunately he had used an open sack of cement to hold down the picnic table the engine was attached to. The Quadra's rough run agitated the cement so badly that the basement was instantly filled with a cloud of cement dust! The engine was invisible and had to be shut down by throwing a heavy towel into the cloud in the general area of the roaring engine. No harm was done but Bud put the engine on the shelf for a time after that experience.

This story leads us to the fellow who solved the Quadra's shaking ways and turned it into a reasonably smooth running powerplant. Dario Brisighella is a self-taught machinist and a masterful one at that. He had been involved with go-karts for some time before he became interested in the Quadra problem. He had worked with the engineering departments at West Bend and Tecumseh, where he first became aware of flywheel overbalancing.

Taking the Quadra flywheel problem as a personal challenge, Dario did the initial flywheel preparation using the cut-and-try method. His local druggist let him use the drugstore scales to weigh his flywheels, even though after about the tenth try the druggist was becoming skeptical of Dario's chances for success.

It took 12 flywheels to get the correct overbalance. Several flywheels were used over so it took a lot more than 12 tries to get the correct balance. Once he had it perfected, he began to offer his rebalancing services to Quadra owners, with a guaranteed one-day turnaround.

His once did 22 flywheels in one day. That's a lot of work because no two flywheels are exactly alike, so each one had to be individually tailored.

The Brisighella overbalanced Quadra flywheel was a huge success, but Trail Manufacturing Company, builders of the Quadra, became concerned about the overbalanced flywheels' ability to stand up to a burst test. They sent one of their stock flywheels and one of Dario's overbalanced versions to a test facility. The stock flywheel failed at 55,000 rpm, but the test facility couldn't spin the Brisighella flywheel: fast enough to make it self-destruct.

Trail Manufacturing wanted Dario in their loop, so Quadra USA was born. Dario says that even though he later sold Quadra USA, which eventually closed, he still gets calls from modelers.

While innovative thinking on the part of Ron Shettler and Dario Brisighella helped the Giant Scale movement grow, other manufacturers saw opportunities to profit from the growing interest. New, bigger, better hardware was needed to support the growing size of planes.

In the mid-'70s Dave Gray was busy at Du-Bro developing a belt drive unit so that modelers could fly large planes using their existing .60-size glow engines, as opposed to buying converted gasoline engines. Dave's cardboard airplanes, powered with the belt drive units, created a lot of interest wherever they were flown. Dave's biggest triumph with the belt drive was with it installed in a 9-foot span Heath Baby Bullet. It was flown very successfully for several years.

Two organizations were formed dedicated to the Giant Scale and Big Bird movement. The first was the Quarter Scale Association of America, founded by Sid Morgan; the second was The International Miniature Aircraft Association, conceived by Lee Taylor.

The QSAA is dedicated to large scale models only, and was set up so that people living in the Las Vegas, Nevada area could govern the organization. Each year the



Another popular series of early Giant Scale kits was produced by Bud Nosen; the line included a 1/4-scale J-3 Cub, Citabria (pictured here with builder Dale Bossant, his first Big Bird), Aeronca Champ, Goro Sport biplane and several others. These were relative lightweights that came in at 9-10 pounds and flew well on .80 glow engines.

SAA has a huge fly-in at a dry lake near Vegas that draws scale modelers from all over the world. The QSAA has only a few hundred members, probably due to its governing structure being prohibitive.

The IMAA was formed when a group of dedicated Big Bird enthusiasts took Lee Taylor's idea and formed the organization at the 1980 Toledo show. The IMAA grew into a large organization (11,000 members in chapters around the world) dedicated to big model planes of all kinds, not just scale. "Big is Beautiful" is their motto, regardless of scale or sporting types, and the organization is governed by officers elected from the membership without regard for their geographic location. The IMAA is recognized by the Academy of Model Aeronautics as a special interest group that helps set the standards for safely flying giant models.

The seeds were sown for Big Birds and Giant Scale, and as their popularity grew, columns dedicated to them started to appear in the model magazines. The IMAA even started its own quarterly magazine called *High Flight*.

Bill Northrop wanted *Model Builder* to deal with all facets of model aviation, and seeing the enthusiasm that the new large model movement was generating, decided to add a dedicated column. Ron Shettler was the first "Mammoth Scale" columnist, beginning in May '78 and writing regularly until August '79. Lee Taylor took over with his intermittent "Giant Scale Flight Line" column, then Al Alman began writing a regular column, "Big Birds," in April of 1982. Bill knew Al Alman from the trade shows and knew of Al's involvement with the fledgling IMAA and with the E.W.H. Company. About a year after Al began writing for *Model Builder* he moved to the Tacoma, Washington area and we became close friends.

In 1988 Al's health started to deteriorate and I was able to assist him with his columns on an occasional basis. By April of 1991, Al was unable to continue the column. He joked that if he had known that he was going to live so long he would have taken better care of himself.



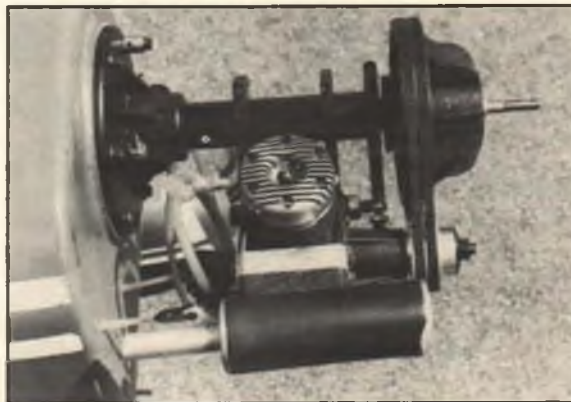
Released in the spring of 1979, the 1/3-scale Byron Originals Pitts S-1A was a hot performer, especially when equipped with the matching Byro-Drive power unit and a hot Schuerle .60. The Pitts kit by itself sold for \$189.95, featured molded foam wings, fuselage and tail, could be put together and finished in short order.

I had mixed emotions about taking over the column because I wanted my friend to get well and continue it himself, but that wasn't going to happen. The Big Birds column needed someone to take over on a permanent basis, so I accepted Bill Northrop's offer to do the column.

I didn't know the Gallant Models crew very well when they took over the magazine in late 1991, but over the last five years we've worked together to bring the best Big Birds column possible to our readers. If I hit a down spot they'll usually give me a couple of ideas to work with.

Through this column I became acquainted with countless fine folks, fellows like Dick Phillips, who was a past IMAA president and columnist for another publication, and Les Hard, former editor of *High Flight*. I'm presently writing the Big Birds column every other month and may return to a monthly column in a couple of years when I retire from my job as an electrical meter technician here in Tacoma.

The most difficult task Al and I found in writing the column is trying to entice our



The Byro-Drive on the Byron Pitts. As shown, the HP Gold Cup .61 with standard muffler would turn a 20x8 Zinger at 6,000 rpm—considerably more with a tuned pipe.

fellow Big Bird enthusiasts to write to us and send good photos. Correspondence sometimes gets pretty thin here at the Big Bird hangar. I always answer questions right away and general correspondence as soon as possible.

Don't forget to visit the Big Birds hangar next month when we will look back at the progression of products available to make giant models easier build and safer to fly.

Bruce Edwards, 8304 53rd St., Ct. W., Tacoma, WA 98467. MB

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Don Anderson



Don Anderson
President and Founder
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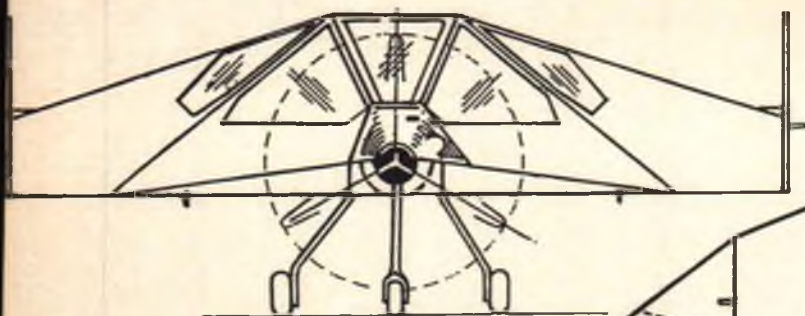
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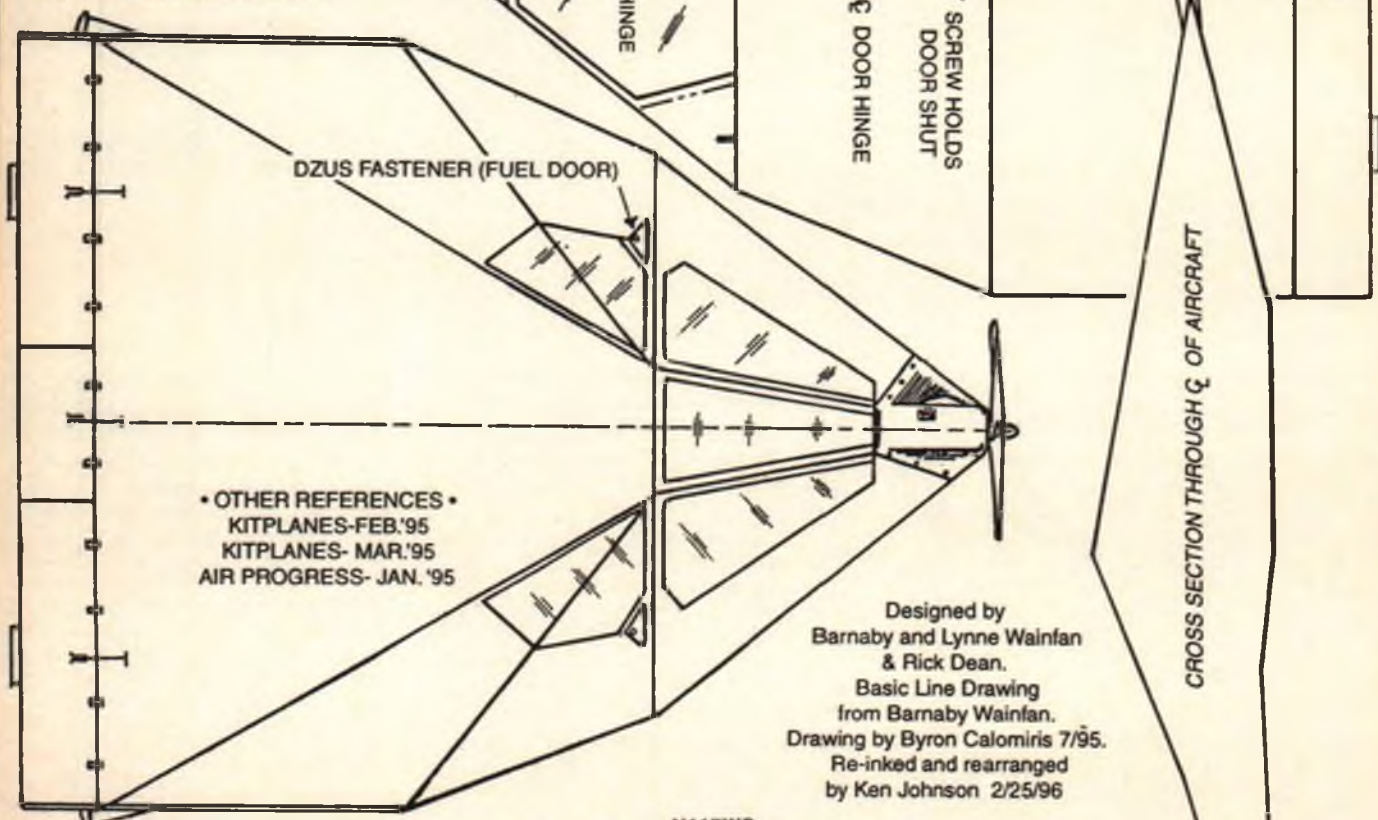
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LANDING GEAR OMITTED FROM BOTTOM VIEW

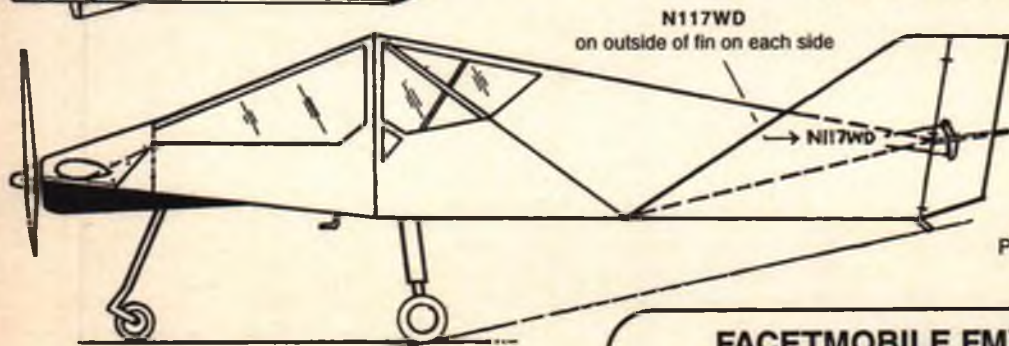
SPAN-15 FT. • LENGTH-19FT.5IN.
 WING AREA- 206.7 FT.²
 WT. EMPTY- 370 LBS.
 WT. GROSS- 620 LBS.
 WING LOADING-3 LBS./FT.²
 POWER- 50 H.P. ROTAX 50.3 DC
 FACETMOBILE FMX-4 N117WD

REFERENCE:
 EAA SPORT AVIATION-10/94



• OTHER REFERENCES •
 KITPLANES-FEB.'95
 KITPLANES- MAR.'95
 AIR PROGRESS- JAN. '95

Designed by
 Barnaby and Lynne Wainfan
 & Rick Dean.
 Basic Line Drawing
 from Barnaby Wainfan.
 Drawing by Byron Calomiris 7/95.
 Re-inked and rearranged
 by Ken Johnson 2/25/96



• COLORS •
 WHITE-TOPSIDE
 BLACK- BOTTOM
 FIN- ALL WHITE
 FUEL DOORS-BARE ALUM.
 PROP- CLEAR VARNISHED WOOD.
 NUMBERS-BLACK

NOTE: AIRCRAFT WAS FLOWN WITH
 BOTH 2 & 3 BLADE PROPELLERS

FACETMOBILE FMX-4 N117WD
 THIS DRAWING REVIEWED & APPROVED BY B. WAINFAN

THE FMX-4 FACETMOBILE

Ready to try something a little out of the ordinary? This Peanut Scale model of a homebuilt lifting body is guaranteed to turn heads and is a great flier to boot.



2,200 miles from its home base at Chino, California. During the trip Barnaby followed major interstate highways as much as possible, both for ease of navigation and in case he had to make a forced landing. He clearly had less than complete confidence in the Rotax; recounting the trip in *Kitplanes* magazine, Barnaby wrote: "... While it has never failed me, it has gotten my attention enough times to make me unwilling to fly for any prolonged period over unlandable terrain."

Then in October of 1995, Barnaby decided to fly the Facetmobile to Texas for another airshow. Soon after

The full-size Facetmobile is a most unusual aircraft. It was designed and built by Barnaby and Lynne Wainfan of Long Beach, California, a husband-and-wife aeronautical engineering team that has long enjoyed flying wing concepts in model form. In 1989 they decided to build their own full-size single-place lifting body light airplane; the first flight took place in April of 1993. The

unusual craft, dubbed "Facetmobile," has an all-metal structure and is fabric covered. For simplicity, they designed it with no curves or bends in the structure—everything is straight lines. Power comes from a 50-horsepower Rotax 503DC two-stroke engine.

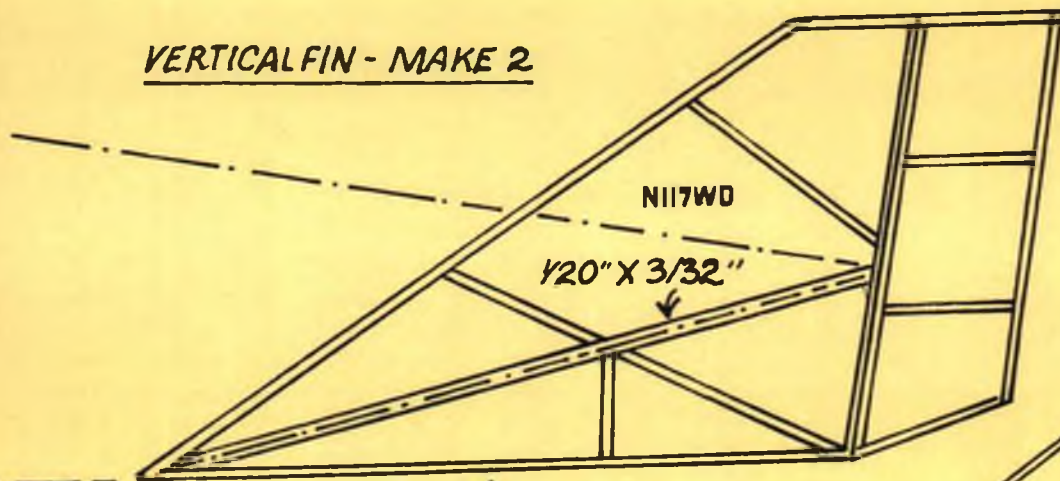
The Facetmobile proved to be a fine performer and was even flown to the 1994 EAA Fly-In at Oshkosh, a flight of over

takeoff from a stop at Blythe, California the Rotax began to falter and he turned back to the field. The aircraft came down short of the runway and struck a fence; Barnaby walked away from the crash but the plane was badly damaged. He has since begun work on a two-place, more powerful version of the Facetmobile—to be powered by a Lycoming aircraft engine.

Articles on the full-size Facetmobile can

The full-size Facetmobile and the models of it have caused a great deal of interest wherever they are flown. If you like something new and exciting in FF scale, this model is for you.

VERTICAL FIN - MAKE 2



SECTION C.

$\frac{1}{20}''$ SQ. Balsa

$\frac{1}{32}''$ SHEET PROP. BLADES (3)
 MED. HIGH PITCH

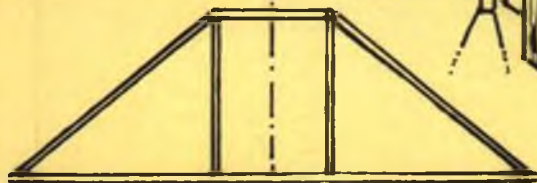
$\frac{1}{8}''$ SQ. HARD Balsa

$\frac{1}{64}''$ PLY HUB DISKS (2)

PROP. ASSEMBLY

NOSEBLOCK A

SMALL BLOCK



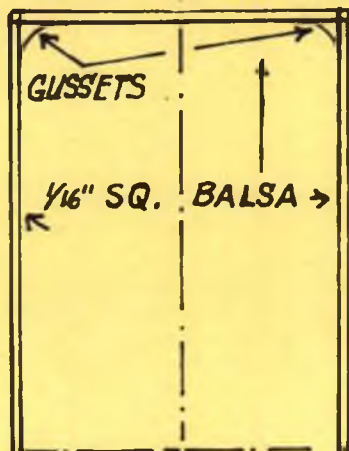
BULKHEAD

HORSESHOE FORMER

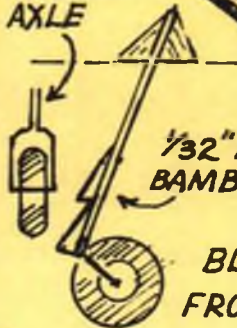
BULKHEAD A



NOSEBLOCK
 PAPER HUB



.015 WIRE AXLE



CUT H...
 ELEV...
 AT NO...

SECTION C.

.015 WIRE



MAIN WHEELS-2
 BLUE FOAM
 BAMBOO STRUT

Balsa - $\frac{1}{32}''$ SHEET

• FACETMOBILE LIFTING BODY •

BUILD & FLOWN BY BARNABY & LYNNE WAINFAN
 MODEL DESIGNED AND BUILT BY KEN JOHNSON
 SPAN 15 FT. - POWER 50 H.P. ROTEX-2 & 3 BLADE PROP.

WT. WITH RUB-7
 POWER-1 LOOP TAM
 $\frac{1}{16}'' \times 18''$ LONG

SECTION D.

FIN

ADD SPOT OF CLAY HERE

ELEVATE

CONTROL HORN

VERTICAL INTERIOR SUPPORTS WHERE SHOWN-AS X

SESHOE FORMER

TOPSIDE CONST. THIS SIDE

1/20" SHEET GUSSETS

BOTTOMSIDE CONST. THIS SIDE

CONTROL HORN

1/32" ROUND BAMBOO PIN

ERE & ELEVATE 9/16" SE.

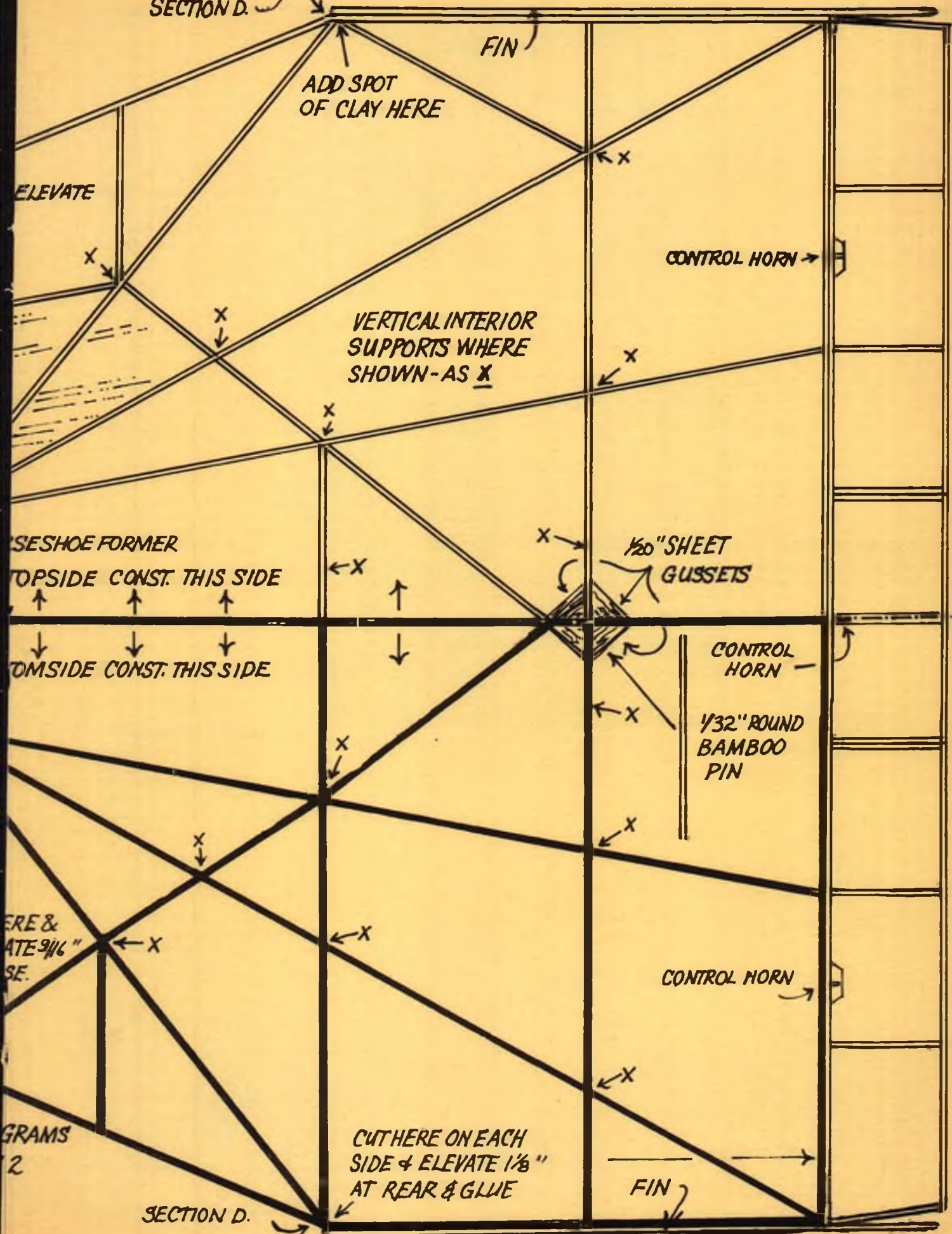
CONTROL HORN

GRAMS 2

CUT HERE ON EACH SIDE & ELEVATE 1/8" AT REAR & GLUE

FIN

SECTION D.



found in *Kitplanes* magazine (February '95), *Air Progress* (January '95) and *Sport Aviation* (October '94).

THE MODEL

The model for this article was built to 10-1/4 inches span, which is the largest that would fit on the magazine centerspread. (I've also built Facetmobiles in 13- and 20-inch spans.) The covering is tissue, while the large windshield area is covered with very thin cellophane (the clear wrapper from a Tetley Tea box). The three-blade propeller is scale, and the wheels are made from blue foam, spun on a Dremel tool. The full-size plane is white on top and black on bottom. My model weighs 7 grams with rubber. It climbs at a very steep angle without stalling. A small amount of weight on the right tip is required for turn trim.

The full-size Facetmobile and the models of it have caused a great deal of interest wherever they are flown. If you like something new and exciting in FF scale, this model is for you.

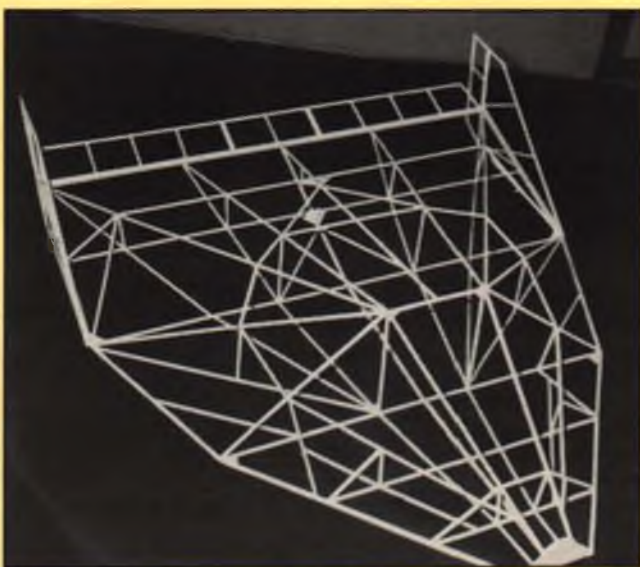
CONSTRUCTION

The plan shows the top side construction on the right and the bottom construction on the left. Build the bottom over the plan, using 1/20 strip balsa. After the bottom surface is pinned down and glued, cut notches in the outline at sections C and D. Prop up the front section 9/16 inch and cement, then prop up the back 1-1/8 inches and cement.

Make the "horseshoe" former



Keith Williams of Henderson, Nevada took this photo of the Peanut Facetmobile in flight at the famed blimp hangar at Testa, California.



Not a single curved stick to be found anywhere! Structure is almost entirely 1/20 square balsa.

and cement it to the pinned-down bottom surface. Now start laying in the longitudinal strips and attaching them to the top of the horseshoe. Cement the cross members in place. Vertical support struts are required where shown by an X on the plan. The elevons can be pinned down but not yet glued to the rear of the fuselage.

The fuselage can be lifted from the plan and completed in your hands. Add gussets where shown and make the landing gear struts from 1/32 round bamboo. Cement these in position using 1/32 balsa gussets to anchor them. The gear axles are .012 music wire bent over, wrapped and glued to the bamboo struts. Sheet the nose with 1/32 balsa and make the nose block, which is triangular on top and half-round on bottom. Build the two vertical fins from 1/32 balsa.

Cover the model with white lightweight tissue (I like the Ganpi paper from Aiko's Art Materials, 3347 N. Clark St., Chicago, IL 60657). Water shrink the tissue slightly. Don't dope the covering—that just adds weight. The elevons and vertical fins are covered on both sides. The elevons should follow the same line as the bottom surface of the rear fuselage, when tack-glued in position.

Build the prop as shown. The shaft is .015 music wire. The prop layout is drawn with the blades 120 degrees apart. The rear rubber pin is made from 1/32 round bamboo inserted vertically in the fuselage.

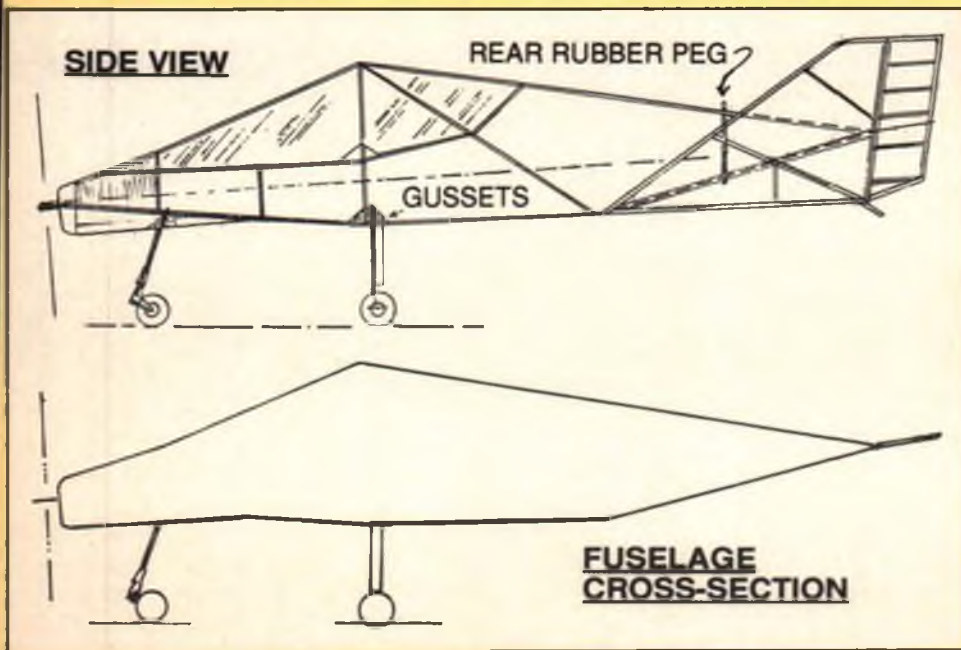
FLIGHT TRIMMING

This particular model was designed for indoor flying, but I suppose you could fly it outdoors in dead calm weather. My model flies on an 18-inch loop of FAI Tan II rubber with a cross section of 1/16 inch. Start with a few hundred winds and work up. A slight amount of right thrust may be required. Don't forget that little dab of clay on the right wingtip.

If the model tries to spin to the left, add weight to the right tip. Try to power up and power down. The Facetmobile flies best with a few winds left as it touches down. Launch it with the nose slightly up and a soft push away.

Good luck with your little lifting body. Mine flew great at the local gym and at the Tustin blimp hangar . . . until a bird spattered it while it was in flight. Ugh! I had to recover one whole side of the fuselage. It still flew great even after that.

Incidentally, the 13-inch model won Peanut Scale at the '95 Nationals, and the smaller one presented here placed 2nd in Flying Aces Peanut at the same contest. **MB**



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- How to repair damaged covering at the field

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ELECTRIC FLIGHT — THE EARLY DAYS

Electric power has come a long way over the past 25 years. This month Roger talks about the beginnings of electric flight, particularly the early work done in the U.S. by the Boucher brothers.

In honor of *Model Builder's* 25th anniversary, I was asked to devote this month's column to the historical aspects of electric RC flying. Although most of you know that reliable RC systems were available when *Model Builder* published its first issue, you may not realize that electric-powered aircraft and equipment have also been around since the late '60s and early '70s. Although technological advances had made RC available to most hobbyists by that time, technology had not yet put electric flight on the modeling map. But there were some bright and innovative modelers and even a few ambitious kit manufacturers that kept plugging away at electric flight.

Before I begin, I want to express my appreciation to Bob Boucher—deemed by many to be the father of electric flight—for the time he spent with me during a lengthy telephone interview. Since Bob and his brother Roland are responsible for about 75 percent of the history of electric flight in the U.S., our discussions were very enlightening. I also want to thank Bob Aberle for sending me a folder of informa-

tion stuffed with material compiled by Dave Durnford. Many of you know Dave as a mover and shaker of the British Electric Flight Association. His material provided a wealth of knowledge on European electric flight history. So . . . on with the show!

THE EARLY DAYS

References to electric powered model aircraft go back to the early 1900s. Some were merely put forth as ideas, others were said to have successfully flown. It's extremely doubtful, however, that any of them really performed as claimed because of the technology that existed at the time.

My research shows that the first documented flight of an electric model aircraft occurred in 1957. A report of the flight appeared in the September 1957 issue of *Aeromodeller* magazine. British modeler Col. H.J. Taplin flew a variation of the Radio Queen, a popular contest model of the time, using an American-built Emerson 24-volt motor that weighed 30 ounces. He wrote: "On paper—and on the ground—it was easy. Just connect

up to a couple of 12-volt car batteries and the motor revved up the power in no time to lift a reasonable load—but certainly not the batteries and all!"

The solution was silver-zinc batteries, the precursor to today's NiCds. Each cell weighed a little over an ounce; the Colonel's battery pack weighed about 22 ounces. There wasn't quite enough power to R.O.G., so five more cells were added. The weight of the model was now 8 pounds, and the motor produced 8,000 rpm at 8 amps. The plane even had three-speed motor control with idle, cruise and takeoff power settings.

Dr. Ing. Fritz Faulhaber offered electric flight the use of a thimble-sized motor he had developed for camera shutters. German modeler Fred Militky, a prolific early electric experimenter who produced a series of electric designs, took that motor, called the Micromax, and in 1960



LEFT: Many of today's electric fliers have never seen Astro's pre-cobalt motors; pictured from left are the ferrite 10, 25 and 05 with their respective battery packs, circa 1976.



RIGHT: Bob Boucher with his Fournier RF-4 electric scale ship at the 1973 Nats, where he placed 19th—interesting story in text. The RF-4 later became an Astro Flight kit.



■ LEFT: Astro's "Rapid Charger," vintage 1974, was a far cry from the digital peak detection chargers we have today. ■ RIGHT: A few years after leaving Astro Flight, Roland Boucher (along) but 19th overall, indicating a pretty good flying plane. The first Astro Champ was held in 1974 with categories for R pattern, pylon and scale, FF scale and duration, and CL scale.

developed it into the Silentius electric free flight model, which was kitted by Graupner. In 1961, the Micromax motor was also featured in the Militky-designed "Elan," an indoor RC model. Militky continued to develop other electric models for Graupner including the Mosquito, the first successful commercial RC electric kit. Fred Militky publicly demonstrated electric RC flight at the 1971 RC World Championships in Doylestown.

But electric flight was still a novelty, with one experimenter doing his thing here and another doing it there with no real communication or coordination to pool effort or knowledge. There were still two major obstacles that had to be overcome. First, electric flight was very expensive, mostly because of the battery cost. Second, the available batteries were heavy and could not supply the power needed for a flight of any length, and could not be recharged many times.

A rechargeable battery based on nickel and cadmium was actually invented in 1899, based on the early alkaline battery design, but it was not until 1962, after some intense and innovative research and development, that Sanyo produced a practical sealed NiCd battery. Industry finally had a reliable, cost-efficient and low-maintenance rechargeable battery. Sanyo now holds over 175 patents worldwide for their battery design.

ENTER THE BOUCHER BROTHERS

Of course, no article on the history of

electric flight would be complete without including the contributions of Robert and Roland Boucher. Much of what we have available in the U.S. is because of their pioneering and entrepreneurial efforts in electric flight design and manufacturing. Bob and Roland, both engineers who were employed by Hughes Aircraft at the time, formed Astro Flight in 1969 and began experimenting with electric flight.

In our interview, Bob told me about their early trials with NiCds and ferrite motors. In 1972 Roland even submitted a world record claim of 29 miles, flown in 45 minutes—but the record was denied because there wasn't a category in which to put it! Bob also recounted various anecdotes about how hard it was to obtain formal permission to fly at glider fields. Conversations with the glider guys usually went something like this:

Bob: "Do you mind if I fly my plane here?"

Glider guy: "Is it a glider?"

Bob: "No, it's an electric."

Glider guy: "Well . . . no, you can't fly here because . . . um . . . it's not a glider!"

Being turned away at most glider fields, they tried their hand at gas fields, and while there usually were no objections, there were also almost no converts to electric power. It seemed the only people the Bouchers could interest in this form of flying were new pilots.

In 1973 the Bouchers took their electrics to the Nats at Oshkosh for demo flights, but were turned down—the only way they could fly was to enter an event. Bob

promptly entered his Fournier RF-4 in R scale. Out of 39 entries it placed 38th (static (he brought no scale documentation along) but 19th overall, indicating a pretty good flying plane. The first Astro Champ was held in 1974 with categories for R pattern, pylon and scale, FF scale and duration, and CL scale.

Astro Flight designed and kitted many models around their line of power systems among them the Electri-Fly and Bushmaster, Porterfield Collegiate and Partenavia P-68 scale models, and the Challenger and Mini Challenger electric sailplanes. Roland and Bob made a business decision to split up in 1975 with Bob buying Roland's share of Astro Flight. Roland formed Leisure Electronics and began experimenting with electric RC cars; his "Greenwood Vette," a Jerbee .049-powered RC car converted to six-cell electric, took the RC car market by storm and was the forerunner of what was to become today's highly complex competition electric racing cars. A few years later Roland began producing his own ferrite motor six- and seven-cell electric flight systems.

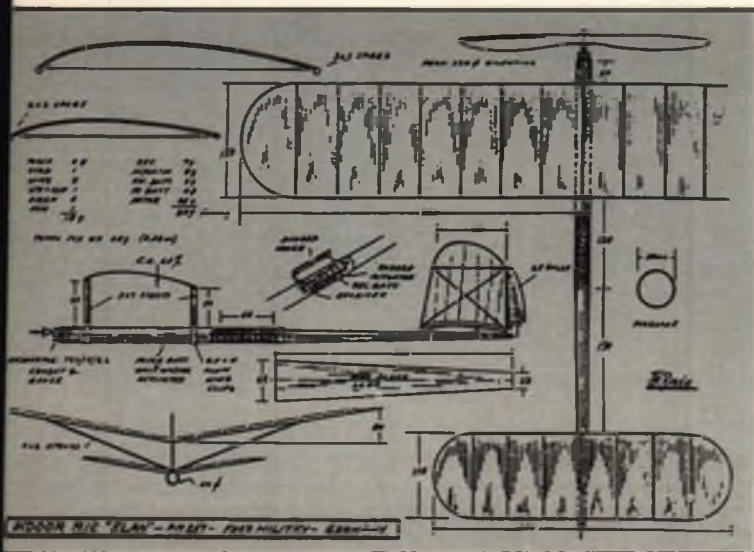
COMING EVENTS

The 10th annual DEAF Electric Fly-In will be held on October 5-6. Sponsored by the Dallas Electric Aircraft Fliers, the contest features a full schedule of fun-flying and competition, including three LMR events, best stand-off scale, weight lift and all-up/last-down. This fly-in is the oldest and largest of its kind in the southwest and is a great opportunity to learn. For more information, contact Greg Judy, 212 Freedom Ln., Arlington, TX 76018; (817) 468-0962.

Another electric event is the Ozone R/C Club's 8th Annual Gulf States Electric Fly-In. It will be held on October 26-27 at the Louisiana Polo Field near New Orleans. This fly-in will also feature fun-flying with LMR, all-up/last-down and competition for the Southern Electric Championship. For more information contact Paul Perret, 1780 Prytania St., New Orleans, LA 70130; (504) 524-3442.



Astro Flight's early history includes some RPV work; this 8-foot span flying wing was built under contract with Northrop Aircraft, was powered by two stock Astro 25s and made flights of over an hour. Gross weight was 22.5 pounds.



The "Elean," an indoor RC model by Fred Militky, a prolific early electric aircraft designer from Germany. Militky is responsible for numerous electric designs, some of which were killed by Johannes Graupner. Drawing originally appeared in Frank Zalc's 1981 Yearbook.

Bob remembers that even in the late '70s, they still had problems gaining acceptance at glider fields, so in 1981 Roland sponsored the Leisure Grand Championships for electric sailplanes and offered a \$1,000 first prize. Any model that used a Leisure motor qualified. All of a sudden, glider fields opened up to electric power. If you can't beat 'em, join 'em—or make 'em an offer they can't refuse!

Astro Flight introduced their cobalt magnet 035 and 05 motors in 1981. The motors were made in the U.S. to Astro's specs and were competitively priced at about \$75. The larger cobalt motors—the 15, 25 and 40—quickly followed the next year and the first 60-size motor was produced in 1984 for what is now the F5B category.

According to Bob, in the late '80s the RC car market exploded and the demand for electric powered aircraft increased. Tower Hobbies sold 10,000 Astro motors in just one year; Carl Goldberg sold 10,000 Electras in its debut year. Also in one year, a total of over 1,000,000 1/10-scale buggies and battery packs were sold.

The '70s and '80s also saw dramatic improvements over the basic NiCd battery. Our hobby has continued to reap the benefits of battery improvements done on behalf of commercial and industrial applications. Today we have 1700-mAH cells in the same size package as the 1200-mAH cells of 10 years ago. What's more, the 1700 is more reliable, has a lower internal resistance (allowing for a higher discharge rate) and weighs less to boot.

The '90s have seen European electric products make real inroads into the U.S. Graupner, Robbe, Simprop and other European manufacturers continue to



The Electro 225 looks as exotic today as when Astro first kitted it in the late '70s. Featured a fiberglass fuselage, built-up wood wing and tail, a single main wheel with wingtip skids, and two Astro 25s mounted as pushers on the wing.

develop high-quality kits, motors, gearboxes, propellers, etc. Hobby Lobby in Tennessee is a big promoter and importer of European electric products in the U.S.—their catalog is loaded with all kinds of interesting goodies. As you can see, aircraft design and motor and battery technology have come together in a timely and fortuitous fashion. The work of scores of brilliant and innovative modelers have brought electric powered flight to the forefront of the RC industry. Indeed, many of today's best RC pilots fly electric models.

THE FUTURE OF ELECTRIC FLIGHT

The electric RC pilot has a world of options open to him. Unfortunately, I believe what Bob Boucher told me during our phone conversation. He thinks it's strictly a "social problem" that electric flight is not nearly as popular as gas, saying that "No one has figured out how to make it happen." I've been writing this column for three years now, yet I know of only a dozen or so clubs in the U.S. and Canada that are primarily electric oriented. I constantly receive mail from potential electric modelers who read this column and see the ads for electric models but have

nowhere to go and no one to ask. Their comment to me is always: "I'd like to learn but there is no electric club in my area."

While retail hobby shops are usually knowledgeable about gas-powered flying and locations of gas clubs, most have little or no knowledge about electric. So the new electric pilot has a number of obstacles to overcome on top of the ones normally faced by any beginning RC pilot. While there are several electric-oriented mail-order outfits that are good sources of information, the local shop with a resident electric pilot behind the counter is very hard to find.

I think, however, that the wall that has hampered the widespread growth of electric flight is starting to crumble. I was fortunate enough to be the first club secretary for the Silent Electric Flyers of San Diego when it was formed in 1991. Our first roster contained 21 names; our latest member count is over 90—more than 400 percent growth in just five years! And our club does all the things that Bob Boucher believes are necessary to solve the "social problem." We've figured out a way to make it happen by: 1) publishing an extraordinary club newsletter; 2) sponsoring many club events and fun-flys; and 3) holding monthly club meetings with programs that share the knowledge of individual members.



The German-made Keller and Geist cobalt magnet motors were already being used by European E-modelers when Astro Flight began making its own cobalts; this is the first production version of the 05.

The history of electric flight shines with many examples of talented people making their dreams happen. The future of electric flight will be explosive—the technology is here, it's easy, it's affordable and it works for the masses. Those of us who are involved today need to pave the way for those who will follow tomorrow.

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A LOOK BACK—THE EARLY DAYS OF RC SOARING

Of all the modeling disciplines, none have evolved faster over the last quarter century than RC soaring. This month Bill takes us back to some of the early designs and manufacturers that helped make motorless RC flight what it is today.

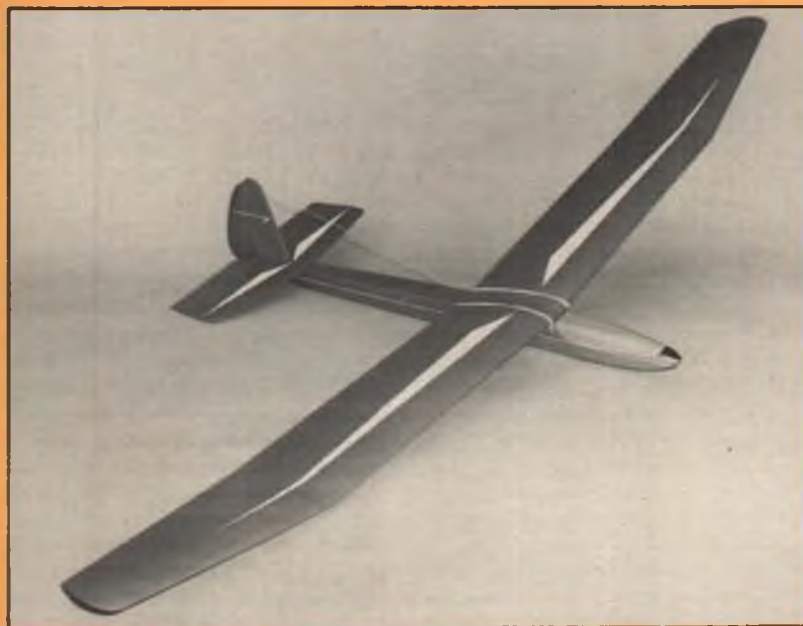
In this special anniversary issue we're going to take a time out to look back at the evolution of RC soaring over the last quarter century. It hardly seems possible that that much time has passed since Bill Northrop started *Model Builder*, but it's true. As I look back, I can't help but think that this magazine has always been one of RC soaring's best friends. *MB* is unique in that for practically this entire time, the editorial staff and management have always looked at model sailplanes and soaring as something very important and dear to its collective heart.

Take a look at the names of those who

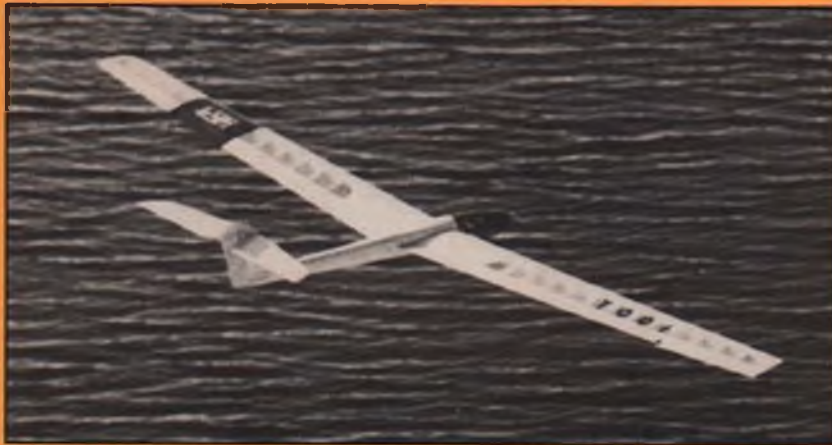
have contributed to *MB's* soaring past: editor/publisher Bill Northrop; editors Phil Bernhardt and Bill Forrey; columnists Taylor Collins, Le Gray, Dave Thornburg and Dr. Larry Fogel, and for the past 14 years, yours truly. Then there is the multitude of contributors in construction articles, product reviews and features: Dave Garwood, Rick Walters, Ben Clerx, Rick Lawrence, George Voss, Larry Enger, Mark Smith, Dave Thornburg, Neil Liptak, Glenn Cunningham, Ken Willard, Col. Bob Thacker, Le Gray, Chris Christen, Bert Striegler, Curt Nehring, Ross Thomas, David Manley, Andy McAfee, Randy

Warner, John Walker, Larry Renger, Randy Wrisley, Larry Jolly, Tom Williams, Al Patterson, Jim Ealy, Ed Depue, Dennis Tyson, Bill Young, Jack Headley, Pete Roehling, David Sanders, Lou Garwood, Stan Sadorf, John Lupperger, Jim Thomas, Bill Turner, Charlie Spear, Mike Charles, and probably a bunch more. Many of these guys are the who's who of model soaring, and all have all given time and talent to the betterment of silent flight through the pages of *Model Builder*.

During the past 25 years we've seen the adolescence and adulthood of RC soaring. It wasn't until the late '60s and early '70s that model soaring as a distinct RC category really came into its own. It was about this



LEFT: The biggest selling RC glider of all time, the Mark's Models (later Dynafite) Wanderer. Simple, inexpensive and a good flier, it was first produced as a 70-inch model, was later joined by a larger 80-inch model that was never as popular. Great Planes recently purchased Dynafite and plans to continue offering the smaller Wanderer in both kit and ARC versions. RIGHT: Soarcraft was an early '70s glider kit manufacturer, producing a number of high-quality scale and sport RC sailplanes. This 111-inch Libelle was Soarcraft owner Hugh Stock's scale entry at the 1974 L&F Tournament.



◼ LEFT: Bob Dodgson was a real pioneer of RC sailplane design and is still going strong today. The Dodgson Designe Todd, released in 1973, was one of the first sailplane kits with all-glass (Rapocore, actually), featured a molded fiberglass nose mated to a rolled balsa tailboom and could be built with either 78-1/2 or 100-1/2 inch wings. ◼ RIGHT: Hobie Alter's famous Hobie Hawk was introduced in 1974. Graceful elliptical dihedral and drooped nose made it stand out from all others. After Hobie stopped production, the Hawk design was purchased and produced by successive owners, including Bob Martin, Midwest and most lately, Ross Models.



◼ JP Models had some high-performance sailplanes in the early to mid '70s, the largest of which was the 134-inch Javelin II pictured here. Came with a pre-painted rolled plywood fuselage with fiberglass nose and could be built with your choice of V-dihedral, polyhedral or elliptical tip dihedral.

Before he became a top pylon racer, Dave Shade! was an LSF level IV soaring pilot and was working for Astro Flight; here he's pictured with Astro's 11-foot span ASW-17, circa 1973.

time that MB came into its own also. I entered the picture in the early '70s, cutting my teeth on free flight towline gliders like the Sinbad and Super Sinbad. I became interested in RC in the summer of 1975.

Mark Smith must have been in his early twenties when MB got its start. My earliest recollection of his kits under the Mark's Models label was the Windward, and a year or two later, the higher performance Windfree. Soon after he came out with what turned out to be the world's all-time best selling RC glider, the Wanderer. Later, the two-meter Mini Bird, Dave Thornburg's Bird of Time, Dick Odle's RO-8, and Blaine Rawdon's Mirage would be kitted. Somewhere in the '80s there was a slope ship, the Freedom, that was taken over from Craft-Air when the two companies merged

and became Dynaflyte. Two of Mark's last sailplane kit offerings, the Sensor and Apogee, were patterned after his 1983 F3B World Championship sailplane.

In the mid-'70s, Tom Williams, who started Craft-Air, was kitting his 72-inch Drifter, 100-inch Windrifter, and the giant Leo which spanned 12-1/2 feet and eclipsed the sun with 2,160 square inches of lifting area. Later he would create the 12-foot Sailaire (which is being produced today by Dream Catcher Hobby) with its rolled plywood tail cone and molded fiberglass nose, and a Windrifter spin-off, the SD-100. Craft-Air also produced a slope ship called the X-cell.

Ed Slobod was getting started with his Pierce Aero, the model that gave its name to his new model company. Later he would produce the Pierce 970 and the Paragon; the latter really put Pierce Aero Co. on the map and is still being made today. The Paragon gets my vote for the world's best trainer and a model that can still win contests . . . provided the winds stay below 10 mph. It's just a big, 118-inch span, super-stable, polyhedral floater with a turbulated flat-bottom wing. Once high in a thermal, you could set the Paragon's trims for a turn, put your transmitter down and come back minutes later to find the model still circling away merrily! Ed later developed the 14-foot Paramount for cross-country flying and the Gemini MTS for sport-level F3B/multi-task.

During the past 25 years we've seen the adolescence and adulthood of RC soaring. It wasn't until the late '60s and early '70s that model soaring as a distinct RC category really came into its own.



■ LEFT: Craft-Air was a major player in the RC sailplane market in the early '70s. The Drifter was a 72-inch glider designed to compete with the popular Pierce Aero and others in the same size bracket. Craft-Air's sailplanes were characterized by having the outer polyhedral break at 2/5 of a half-span from center. ■ RIGHT: Back in the mid-'70s the standard class ship to beat was the Airtronics Aquila. Early kits had a wood fuselage, later ones were glass. This particular example was built by former MB soaring columnist Taylor Collins for a product review article.

In the '70s, JP Models was ahead of its time with its 100-inch Javelin and Dart and 134-inch Javelin II. These had aspect ratios of up to 20:1, wing loadings below 8.5 ounces, and price tags under \$55. They too had rolled plywood fuselages that came pre-painted in white epoxy. There were even Javelins with elliptical tip dihedral built into the rib-and-spar structures. This was advanced stuff!

In the '70s, Hi Johnson was busy pioneering alternative model structures—particularly hot-wired foam wing cores, and also hard foam wing skins. He vacuum-formed ASA plastic fuselages and made his own linkage hardware. His models used little or no wood. He was one of the first to offer custom foam wing core cutting—you supplied the templates according to his specs, and he'd cut 'em. Hi was a man truly ahead of his time who died in a full-size sailplane accident around 1980. I was at the gliderport when it happened and saw Hi's takeoff.

Also ahead of his time was Bob Dodgson, who took foam cores and fiberglass to new heights with multi-control function wings and his unique "taco shell" fuselages. Bob's mechanical linkages were legend, and did what many an eight-channel computer radio is asked to do today with only a simple four-channel, four-servo rig. Bob is also believed to be the inventor of the "crow" mix for glidepath control. Through the years he created the Todi, Caliente, Maestro (I-III), Saratoga Windsong, Camano, Lovesong, Sabre, Anthem, Pixie, Pivot, Orbiter . . . a steady string of innovative designs that performed brilliantly with just simple radios. Today Bob is still a leader in the sailplane design and manufacturing business in spite of serious medical problems which he has toughed out.



The 3-meter Paragon from Pierce Aero Co. has been in continuous production for the past 20 years. Pat Potega flew this one to 1st place in Unlimited at the 1977 AMA/NSS Mats at Riverside, California. For a sturdy, lightweight Wander, the Paragon is tough to beat.

Hobby Shack made the 72-inch Das Slupen Thing and the 100-inch Das Super Slupen Thing for slope/thermal flying. They had (and still have) the Spirit of 76 all-foam glider for training or slope/hi-start flying. At one time they imported the Pilot line of gliders from Japan including the Thermal

Hopper, Reiher 3300 and 2500. Over the years they've offered the Pilot Harlequin and Global Explorer 2M, both designed by John Lupperger, and more recently the Whipit HLG and Gritter unlimited class ships from Poland.

No look back could be complete without a trip to Lee Renaud's Airtronics. Two of my first three RC gliders were the 60-inch Questor and 72-inch Square Soar (with V-tail!). First in the Airtronics line were the Esprit and Grand Esprit, two high-performance V-tail sailplanes with big spans and beautiful fuselages. They were prone to flutter at high speed, but they introduced the world to Lee Renaud as a sailplane designer. Then came the 80-inch Super Questor, sorta-scale 62-inch Cadet, the Olympic 99 (then the improved Olympic II) and two-meter Oly 650. The fabulous Aquila (which, with Skip Miller's mods, won the 1979 F3B World Champs in South Africa) really put Airtronics on the international map. Later, they would make headlines again with the standard class Sagitta 900 and then the



Still another excellent entry-level model is Goldberg Models' Gentle Lady, designed by the legendary Carl Goldberg himself. A basic, easy-to-build two-meter floater first introduced in 1966, still a popular subject today.

two-meter Sagitta 600.

Airtronics has never looked back, and to this day produces some of the finest, most competitive sailplanes in the world. Lee passed away a decade ago but his wife Barbara and two sons Bob and Tim have taken over the company, keeping Airtronics the beloved family business it has always been.

When I became interested in controlling where my free flight gliders went, Astro Flight was the company I turned to. My first RC sailplane, built in the summer of 1975, was Astro's 100-inch, rudder/elevator, V-dihedral Monterey. A few models later I was back at Astro for their big 132-inch ASW-17 scale sailplane with its white gelcoated fiberglass fuselage. I absolutely loved both sailplanes and wish I still had them in one piece and flyable. Astro Flight made other sailplanes through the '70s and '80s, including the Malibu, Super Malibu, and an ASW-15 with a rotationally molded polyethylene plastic fuselage. This fuselage was later used in Astro's last sailplane kit, the Californian.

Soarcraft was yet another company that made scale and sport sailplanes in the mid-'70s. There was a 111-inch Libelle, a 120-inch Diamant, and a gorgeous 144-inch Glasflugel 604. I remember thinking the 604 had such tightly spaced ribs that it looked like too much work. I also remember seeing a few Soarcraft Centurion IIs around in those days. It was a standard class competition glider that came with a molded plastic fuselage. It had a big brother called the Magnum 12, which at 148 inches and 1,112 square inches was a real high performance monster of its day!

Larry Jolly Model Products was always there with competitive designs in the late '70s and early '80s. Who could forget the AMA Nationals dominating Icarus, a V-tail two-meter that was flown by John Brown to perfection year after year. There followed a string of great designs from Larry's gifted brain! The most popular were the Pantera, Meteor, SULAbird, Flinger HLG, and the Icarus.

Bob Martin RC Models was the friend of many a beginning thermal and slope flier. His Pussycat was a terrific trainer, his Talon a terrific slope aerobatic plane. When Hobie Alter quit making the phenomenally successful Hobie Hawk, Bob bought the rights and kept this classic alive. Then there came the Katie II with its unbreakable Duralene plastic fuselage, and RC training took on another dimension.

I could go on and on and on about the past, but that just means there would be fewer photos to show. If you are a manufacturer that was omitted, please forgive me, it would take a book to include everybody! I hope you've enjoyed this little journey down memory lane.

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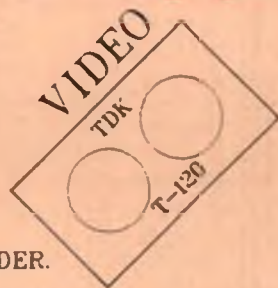
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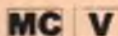
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PLUG SPARKS

BY JOHN POND

The Start of O.T. RC on the West Coast

It was not until the late '60s, when this writer established his Old Timer Plan Service in a section of Russ Barrera's Hobby Shop and Museum in San Marcos, California, that finally I met Howard "Red" Barrows in the rented portion of the shop, as Barrows was looking for a particular O.T. plan.

Unknown to this writer, Red Barrows had been looking for me during my first two years of residence in San Diego. In less time than it takes to talk about it, at the close of the day's business, Red and I adjourned to my home on Avati Drive in San Diego to look over my stock of O.T. models (all FF).

After viewing the various models, Red offered the opinion, "Why don't you fly these models with radio control?" Inasmuch as I was flying modern RC pattern-type models like the Sun Fli, Quik-Fli, Stormer, and others, this would pose no problem. In addition, having joined the Palomar R/C Club in San Marcos, I could use their field, which was near my shop.

Lest one think this is an original idea, I had been using a single-channel system to fly my old Buzzard Bombshell (the best trainer anyone could ask for as it would fly completely hands-off). Armed with this confidence, we decided to select a suitable design and build two of them. Being partial to large Texaco types, Pond prevailed on Barrows to choose Ben Shereshaw's "Champion," which appeared in the April 1937 issue of *Flying Aces*.

Enthusiasm was high with Pond building the fuselages and Barrows making up the wings and tails. A Kraft system was chosen by Pond while Red

used one of the then-new Hobby Shack "Cirrus" sets. Of course, they were glow powered to start with as we had not yet figured out how to shield a spark ignition system from the radio.

We couldn't have made a better choice, as the Champions turned out to be good fliers and very rugged. Pond's model turned out a bit heavy at 7 pounds but has proven excellent for use as an RC trainer. To this date, 25 years later, this model still serves SAM 21 as a trainer for any member wanting to learn how to fly O.T. RC.

Naturally, the Champions were an unqualified success,

but the enthusiasm of Barrows was infectious. We decided that what we really needed was a fast-climbing, limited engine run model (patterned on the FF rules). After some browsing through photos, Red quickly decided that "we" should build a pair of Henry Struck's "New Rulers."

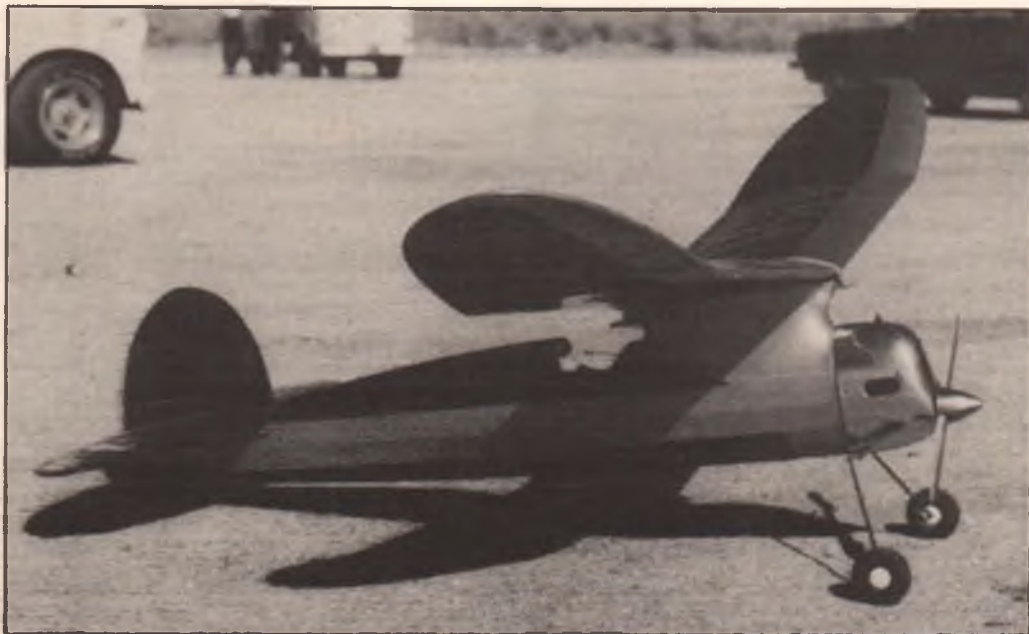
Red was a terrific fast model builder from whom this "old dog" picked up some pointers like using cyanoacrylates, epoxies and other glues, plus the use of MonoKote for covering. Like all free flighters, this writer was hesitant to use MonoKote at first, but after seeing the speed at which one could



Photos taken back in the early '70s show the "Old Man" and his pal Red Barrows with their pair of Shereshaw Champions, built specifically for RC. If memory serves, Barrows' model was beautifully done up in transparent yellow and metallic green MonoKote, while John preferred his traditional overall white with blue trim. John's Champion is still going strong and serves as the official club trainer for the SAM 21 group in California.



O.T. RC as a specific event was just getting started in the early '70s; here's our enthusiastic columnist with his Merco .60 powered New Ruler. Photo was taken at the 1973 Mats, where an unofficial O.T. RC event was hosted by the Old Time Eagles, the group that pioneered RC Old Timers on the East Coast. John thought he had a pretty good chance with his 8-pound 'Ruler, but was shocked by the climb performance of the much lighter ships being flown by the Easterners.



Red Barrows' RC version of Henry Struck's New Ruler. Red had a knack for working with MonoKote; that cow! was finished in chrome MonoKote but you'd have sworn it was polished aluminum, it was so expertly done.

cover, plus the durability of the material, it was just a question of what color to use.

Again, in less than two weeks, two newly constructed New Rulers were ready to go. Trials of Pond's model with its

Merco .60 were something else! The first flight revealed the model had a very smooth climb and was quite easy to fly.

About this time, the New Jersey boys (Old Timer Eagles club), comprised of Woody

Woodman, Joe Beshar, and Art Thoms, staged a meet for RC Old Timers. Demonstration flights at the Nationals led to an application to SAM for approval to run this event at the next SAM Champs. To avoid conflicts with the regular Nationals RC events at Glenview, a field a few miles away was obtained.

Surprisingly, in spite of the low publicity, at least 10 models showed up. The best performing models on the field were Joe Beshar's Super Tigre .60 powered Sailplane, Woody Woodman's S.T. .60 powered Playboy Senior, Fred Beshar's Torp powered Zipper, and Pond's Merco .60 powered New Ruler.

rupt us, as the armament section had been abandoned by the Navy. Flying was a real pleasure in those days, and we invariably adjourned to Red's home after each Sunday flying session. Red owned a video camera, and footage of the day's activities would be shown at the end of the day! With such fun, it was inevitable that an informal group known as the "No-Name" club would be started; no formal rules, no dues, just plain fun. This was when the small group was seen flying at Lake Elsinore at a free flight contest. You can imagine the ragging "Mr. Free Flight" Pond took when displaying and flying RC models.

Contests, whether for "fun" or competition, are inevitable. Under Red's leadership, an O.T. RC contest was organized to be held at Taft during one of the big U.S. Free Flight Championships. Going strictly by the Contest Coordinator's rules, a sanction was applied for and approved for that very date. There was no intention to upstage the FF boys as the RC models could be flown off to one side with no interference.

The meet was heavily publicized by Pond in his column with the result that the first-ever West Coast O.T. RC Contest drew quite heavily from all over, even as far east as Oklahoma! There was no lack of awards as Red had successfully promoted prizes from Mini-City Hobbies, *Model Builder*, two trophies from Pond, and numerous others this writer fails to remember 15 years later!

But the approval of the RC events at the same time as the U.S. Free Flight Champs brought forth a verbal barrage from District X AMA Vice-President Jim Scarborough, which, as I anticipated, resulted in our banishment to the southeast corner of the field. Caught the AMA officials off base as there were two different types of meets being held. There was nothing left for us to do but get set up and start flying.

On my first spot landing approach (after a 10-minute

Back in San Diego we were flying at the old U.S. Navy weapons test grounds on the east side of Hwy 395. This was simply great as we had plenty of field to fly from, and best of all, there was nobody to inter-

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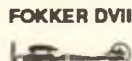
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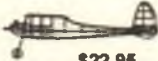
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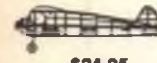
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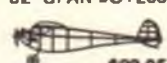
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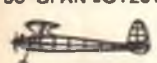
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PLUG SPARKS



Bob Von Konyk (left, with Lanza Record Breaker and Daddy Warbucks hanging onto the tail) was another early proponent of O.T. RC. Flying with the SAM 21 group in California. This photo was taken at the 1973 SCIF Texaco meet at Taft, which allowed RC and FF Texaco ships to compete side-by-side in the same event. Red Barrows' Champion was the highest placing RC model, taking 3rd with a flight of 24:15.

max), I noticed a large crowd around the lines, and got to wondering who they were. Turned out these people were the AMA "top brass"—President Johnny Clemens, Executive Director John Worth, Technical Director Frank Ehling, and a few others. They were visiting the field to assess its possible use for a national meet. They had got tired of watching the FF models zoom up and then glide away. The maneuvering of the RC O.T. models (especially in spot landing) had drawn most of the spectators to the RC flight area.

As it turned out, I think our flight demonstrations did the most to attract AMA to Taft for a possible Nats. At least at that night's Awards Banquet, the proof of the pudding was in the number of people attending and enjoying the hijinks. The

highlight of the evening was Roy Turner, who was then seriously running for Lt. Governor of Arkansas, giving a spoof on his typical vote-getting speech. Absolutely hilarious! Too bad Roy didn't win the election as his speech included many promises to the modeling activity (fields, meets, etc.). We missed the boat on that one!

TEXACO: FF VS. RC

The foregoing was inevitable when the RC O.T. clubs started flying at Taft. Naturally, comparisons were drawn by both sides (FF and RC) as to which would be the best for long Texaco flights. With all the variables in lift at Taft, anyone's guess was as good as the other.

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SCIF member Lenny Curiel was a staunch O.T. free flier when he installed a three-channel Kraft rig in his FF Lanzo Record Breaker in 1973; it flew so well that he did similar conversions on a Conest Clipper, a Goldberg Valkyrie and probably some others too. Lenny later taught MB's editor to fly RC.

Flyers) club was the first to consider such a proposal. In conversations with Bruce Chandler, rules were drawn up as follows:

1. Fuel allotment the same for each type model—1/4 ounce per pound.
2. Retrieving and timing of free flight would remain the same; i.e., chase by motorbike until the model dropped or you did.
3. RC models would be restricted to the field boundaries, requiring landing in same.
4. Trophies would be given for high time RC regardless of place.

With Pond and Chandler hustling up prizes, a pretty impressive list was obtained: trophies by Bob Hunter, two trophies by John Pond, and a special sterling silver champagne chiller perpetual trophy by

Jack Jella.

Bruce Chandler was so enthused over the results of this meet, held in late 1973, that he wrote a piece, "A Touch of Class," on this contest that was incorporated in the Plug Sparks column, January 1974. Of course, with enthusiasm like that, one could figure a free flight model had won the event—and sure enough, Jim Adams took 1st with an Ehling Contest Winner that racked up a flight of 41+ minutes. However, the contest went off so well that future dual meets of this type were planned for the next several years. And the rest, as they say, is history!

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25 YEARS AND COUNTING!

In keeping with this month's 25th Anniversary theme, John presents his list of the top 20 advances in control line model aviation over the last quarter-century.

Let's hop into our time machine and visit the folks at a contest in the summer of '71.

"Hey, that's a pretty jet-looking stunt plane you got there, but it'll soon be out of date. You're going to be flying great big planes with tuned-pipe Schnuerle engines."

"Man, you're still building combat planes out of balsa wood!? Get some foam, because you're gonna be building your wings out of that. Oh, by the way, trash that lousy Italian engine—you'll be able to buy an American-made one that'll haul your new foamie at 130 mph, right out of the box."

"Balsa, basswood, spruce . . . yes, but didn't you use any carbon fiber? What is this, the dark ages?"

"All that nitro just to go 140 mph? Sheesh, before long your rat racer will go 255 mph on 10 percent fuel. Oh, and by the way, your engine is going to be upside down and your fuselage will be made of

fiberglass."

"Could you direct me to the .15 carrier pits? No? Well, how about the .21 Sport Speed circle? No? How about Sport Race? No? Well, OK, just the Classic Stunt circle will be fine. No? 80-mph combat? No? What do you guys do for competition, anyway?"

Yup, it may seem like the dark ages, but it was only 25 years ago that *Model Builder* started publication. Things have changed almost as much in the past 25 years as they did in the previous 25—and mostly for the better.

Building materials are better. Airplane designs are better. Engines are more powerful and more reliable. There's a wider variety of competitive events to participate in, from beginner through expert levels. Each discipline has a strong special interest group. Though the industry has changed, there are now more products available for CL fliers than ever. Things are cheaper. (Whoops, scratch that last one;

progress does have its price.)

Recently, advised that there would be some special notice paid to the magazine's 25th anniversary, we got to thinking about advances in CL model aviation in the past quarter century. We put the word out on modelers' communications networks for some ideas on the top advances in the hobby in that period. Not surprisingly, we got many varied responses.

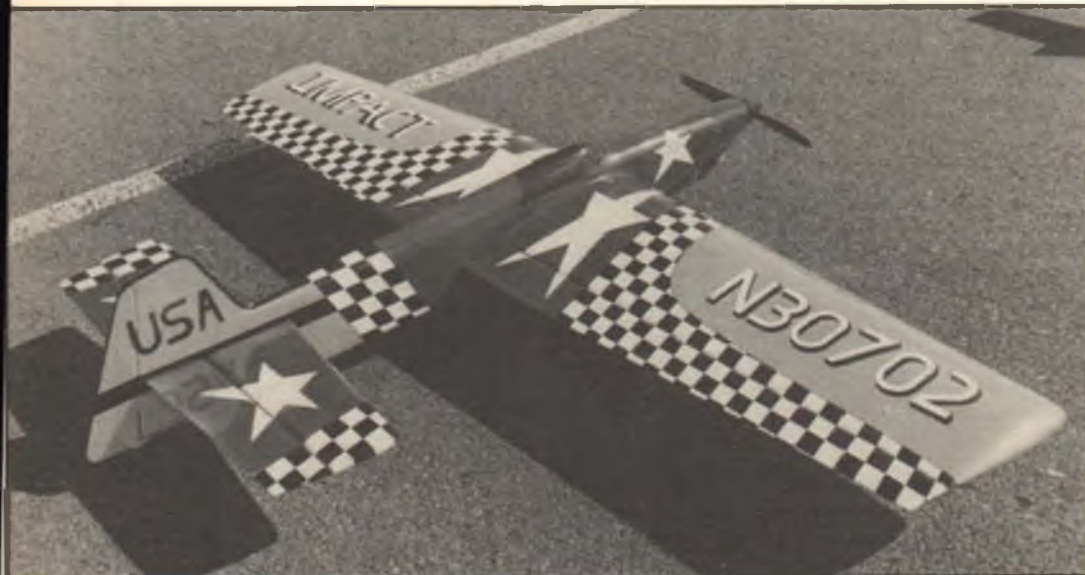
Lumping together generally related items, we came up with a list of 20 top advances in CL model aviation in the past 25 years, plus a list of "honorable mention" advances submitted by various correspondents.

Here's our list of the 20 top advances in CL model aviation, in no particular order. My, how things have changed!

•**Special Interest Groups:** It's hard to imagine a time when there weren't organizations to promote and exchange information about each competition category, but in 1971 fliers were on their own.

Now there are the Miniature Aircraft Combat Association, the Navy Carrier Society, the North American Speed Society, the Precision Aerobatics Model Pilots Association, and the National CL Racing Association, all of which publish informative newsletters, represent their fliers with the Academy of Model Aeronautics and take a leadership role in putting on major competitions.

•**Adhesives:** Once there was "model cement," most popularly Ambroid with its distinctive odor and reddish color—and its tendency to shrink, get soft when attacked by fuel, and other flaws. But we all built our planes with it, from motor mounts to rib joints. Now there's a different glue for



Paul Walker's World Championship winning Impact represents some of the advancements in CL model aviation over the past 25 years. It features a carbon fiber prop, carbon fiber tuned pipe and an Aero .40 engine; the design itself was nominated by some as one of the era's top planes.



The Martin MO-1 has become by far the most popular carrier plane due to its capability for prop-hanging. This is Pete Mazur's Class II model.

virtually every part of the plane: cyanoacrylates, epoxies, aliphatic resins, hot melt glue, etc. There are several formulas for each, depending on how much working time is needed and how strong the joint should be.

•**Space-Age Materials:** Carbon fiber has revolutionized many aspects of CL building and flying. Not only is it used for reinforcement of key structural elements in virtually all forms of airframes, it is used in the making of propellers, tuned pipes, combat tailbooms, wing spars and a host of other applications. It's light, strong and readily available.

•**The Cottage Industry:** Kits. Engines. Mufflers. Handles. Plans. Parts. Hardware. The range of CL specialty items available now is greater than at any time in history. A great many of the products are manufactured in small numbers to close tolerances by model aviators in their home workshops. Downsizing of the CL portion of the industry to the garage level has made it necessary for fliers to be a bit more savvy in searching for what they need, but it's there. At the same time, several of the big companies have maintained their willingness to manufacture CL products and supply others, and their general quality standards have consistently increased. There even have been some major new suppliers appear on the scene, such as Brodak Manufacturing, which specializes in CL.

•**Engine Developments:** Several noteworthy advances have been made in the power department. The growth of Schnuerle and ABC and AAC engines has resulted in powerplants that are more powerful and more reliable. Rework shops take stock engines and fine-tune them for specific uses. At the top end, manufacturers such as Henry Nelson and Randy Smith are making top-level competition engines available that can be used right out of the

box. Major makers such as Fox, K&B, O.S. and Cox continue to refine and improve their lines. The tuned pipe is part of this advance; tuned-pipe .40s now haul aerobatics planes that once would have required .60s.

•**Foam Wings:** Combat and precision aerobatics have benefited by the ability to produce double-taper wings quickly and cheaply. The building time of an aerobatics plane is greatly reduced. Combat planes can be mass-produced in short order without the builder being confined by rectangular planforms or by 36-inch standard balsa lengths.

•**Safety:** Rules and technological advances have made the hobby safer for fliers and spectators alike. Fuel shutoffs render combat flyaways harmless. Engine safety wires and better officiating standards also have increased combat safety. Nets around speed circles catch wayward dollies. Limits on nitro have slowed down racing and speed events. Safety thongs are now standard in all events.

•**Communication:** Model aviators are going increasingly on-line through computer networks such as CompuServe, America Online, Internet home pages, and e-mail. Added to the magazines, special interest group newsletters and club and independent publications, the communication between modelers is better than ever. Videotape has become a major tool in the spread of technical skill, with several people offering video instructional materials and contest reports.

•**Precision Aerobatics Designs:** Numerous stunt fliers nominated their favorite designs, but the message is clear that designers in the past quarter century have raised aerobatics airframes to a high art. Paul Walker's Impact was most often mentioned, but several others have been prominent during the time period, such as

the USA-1, Genesis, and Patternmaster. A part of this is the development of features that have become standard such as adjustable leadouts and the weight boxes; another aspect is the development of take-apart airplane suitable for long-distance travel.

•**Combat Designs:** Monoboom structures, arrowshaft tailbooms, interchangeable metal motor mounts, and increasing fine-tuning of the correct aspect ratios, airfoils, control systems and wing tapers have made the deceptively simple combat airframe a highly sophisticated and reliable vehicle, in spite of the addition of details such as shutoffs and safety wires. Slow combat airframes are so efficient that 100 mph speeds are common. Half-A combat designs, aided by modern high-horsepower .049s, are nearly as large as the FAI ships of yesteryear.

•**Racing Plane Designs:** The inverted rat racer, most notably Tim Gillott's Shark, and fiberglass structures such as those pioneered by the Fogg-Shahan team have shown the path to superior performance. The swing-weight carburetor combined with the inboard tank took the "slow" out of slow rat.

•**Carrier Plane Designs:** The high-wing MO-1 has taken advantage of current carrier rules and the skill of prop-hanging that has become mandatory for success. Development of line-slider control systems brought this type of flying to a new level.

•**Entry-Level Competitions:** Several different approaches have broadened the entry points into competition for novice fliers. In aerobatics, skill classes have brought fliers rapidly from beginner to advanced flying levels. In other events, separate classes have been created on the local levels: sport races, 80-mph combat, profile scale, .15 carrier, and so forth. Speed has added a sport class to the AMA rulebook. It's easier than ever to begin in competition.

•**New Events:** Each discipline has seen the addition of new competitive events, some, as mentioned above, for beginners, but others simply adding to the interest and variety. Old-Time Stunt, Classic Stunt, .15 carrier, Skyray Carrier, .21 Proto Speed, Flying Clown Race, Quickie Rat, Formula GX combat and other events have added color to the lineup.

•**Contests:** The Vintage Stunt Championships, conceived by current PAMPA president Mike Keville, has become one of the premier events of the year in the aerobatics community, and a link of modern fliers with the past. One local contest that corresponds exactly with the 25-year period under discussion is the Northwest Control Line Regionals, which was held for the 25th time in May, offering 40 events and 124 trophies to competitors from all over the western half of the continent. The AMA Nationals has suffered decline as a true championship in regard

to some events, but in precision aerobatics it continues to grow and develop; the sport has split into advanced and open categories added to that Nats prestige for precision aerobatics.

• **National Flying Site and Museum:** The Academy of Model Aeronautics has developed a premier CL flying site and contest venue in Muncie, Indiana, that is a home for the National Championships as well as regional and international events. AMA also is studying development of regional sites around the country. The aeromodelling museum at the Muncie headquarters site pays homage to CL history.

• **Batteries:** Several fliers nominated advancement in battery technology—rechargeable batteries such as the Glo Bee Fireplug and the palm-sized twist-off batteries, as well as the larger glow-driver setups. These modern, reliable systems have made dealing with engines much easier.

• **Fuels:** In 1971 there were a few common brands of fuel in a limited number of formulas. Now there are numerous manufacturers producing fuels in a wide variety of formulas. Want all-castor? All-synthetic? Castor/synthetic blend? No nitro, or up to 60 percent nitro? It's all available, very likely in your local hobby shop.

• **The Import Market:** The falling of the iron curtain resulted in the opening up of American markets to a wide variety of new products, particularly for competition fliers. Engines now are imported from many former Soviet Union countries, as well as from China and other nations. Names like Stels, Stalker, MVVS, Profi, Moki and other exotic titles are now common, as are unusual airplane designs. Even whole planes can now be purchased for such events as FAI speed, team race and combat.

• **Honorable Mention:** In the category of advances in the past 25 years that may or may not be in the top 20 but are worthy of mention, as nominated by several correspondents:

—Fox combat engines (Mark II, III, IV,

VI and the current VII).

—FAI-style asymmetric sidewinder speed models.

—Multifunction valves in FAI Team Race.

—Flying wing designs in FAI Team Race.

—Better diesel fuel.

—Heavy-duty stunt control systems.

—Laser cutting of wood kit parts.

—Lightweight foam wheels.

—The Super Tigre .46 and .60.

—Synthetic lubricants.

—Clunk tanks.

—O.S. Engines (.40/.46 VF and others).

—High rpm and low-pitch props in aerobatics.

—Large tail volumes in aerobatics.

—APC props, now used in virtually all CL competition categories.

—Cox's Me-109 ready-to-fly stunter, which has sold about 150,000 copies to new CL enthusiasts.

Think that's all the advancement that's been made in CL in the past 25 years? Don't bet on it. Undoubtedly there are many advances we haven't mentioned—and we'll hear about it. Where do you think CL flying is going in the next 25 years? Stay tuned—and check the October 2021 issue for the results.

Thanks for the help in compiling the above goes to these noteworthy fliers, among others: Denny Adamasin, Jim Aron, Brett Buck, Bill Calkins, Don Caron, Robert Compton, Curt Contrata, Alice Cotton-Royer, Lou Crane, Larry Cunningham, Mike Deluca, Steve Fauble, Paul Ferguson, Bob Furr, Tom Hackett, Jim Hoffman, Laird Jackson, Gary James, Tom Kressly, Dick Lambert, Lyman Lew, Bill



Control Line aircraft design has come a long way. The Fogg/Shaban team of Southern California races this style of all-fiberglass fuselage rat racer; the inverted-engine design is an advancement of the era that is now standard among rat racers.

Little, Kerkko Kehravuo, Pete Mazur, Bill Mitchell, Goran Olsson, Buzz Paricka, Randy Powell, Dennis Reardon, Larry Renger, Orlando Rigueira, Randy Smith, Iskandar Taib, and Jess Walls.

Send contest flyers, contest results, club news, photos, questions suitable for answers in the column, technical tips and other items of interest to CL fliers to John Thompson, 2456 Quince St., Eugene, OR 97404. E-mail at JohnT4051@aol.com. **MB**

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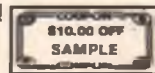
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HELICOPTER WORLD

BY JAMES WANG



RC HELICOPTERS — THE LAST 25 YEARS

James takes us back to the beginnings of RC helicopter development and talks about a few of the significant machines that have led to the current state of the art. To be continued next month.

I am really thrilled to be writing this and the next two months' columns. In celebration of *Model Builder's* 25th Anniversary, the editor asked me to go back and talk about the most significant developments in RC helicopters over the past 25 years. Next month I'll share with you what I feel are today's best after 25 years. Finally, in December, I'll reveal what I see in RC helicopters in the next 25 years (that's a tough one!).

Compared to RC airplanes, helicopters have had a short history. The first commercially available RC helicopter has only been in existence for 25 years. We credit Mr. Dieter Schluter of Germany as the father of RC helicopters. He successfully flew an RC helicopter in 1970 and sold the design to the Hegi Company of Japan. The resulting kit, the very first of its kind, was powered by a .60-size engine, had a 52-inch diameter fixed pitch main rotor, and had a scale-looking Bell Huey Cobra fiberglass

fuselage. There are still a few Hegi Cobras in flying condition today. In 1974, Schluter founded his own company. The fixed-pitch Heli-Baby was his first commercial kit.

Mr. Schluter was successful with RC helicopters because he realized that some kind of mechanical stability augmentation system was required to make models flyable. Schluter borrowed the Bell-Hiller flybar design from full-size Hiller helicopters and made his model a success.

Once it had been proven that an RC helicopter can be controllable, the last 25 years have simply been used to refine the details. Amazingly, after 25 years, the basic layout of the typical RC helicopter hasn't changed much; rather, the efficiency of each component has been optimized. Modern RC helicopters have very precise handling characteristics. They are more stable and also more agile. They can do anti-gravity 3-D aerobatics that have to be seen to be believed. RC helicopters have reached such a sophisticated level that it's difficult to make a quantum leap into the future. Let's look at the milestones in RC helicopter



LEFT: *Model Builder's* first Chopper Chatter columnist, John Tucher, with his Kavan Jet Ranger, a popular model during the '70s. Introduced in 1973, the Jet Ranger was the first kit chopper to have collective pitch. RIGHT: Dieter Schluter's first heli kit was the Heli-Baby, a fixed-pitch machine for .60-size engines. Featured a Bell-Hiller rotor head design and a heli-drive tail rotor. It was on one of these models that MB columnist James Wang learned to fly in 1976.

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Graupner was one of the major players in the early days of RC helicopter development, turning out several impressive (and very expensive) models such as this Bell 212.



No discussion of RC helicopter history would be complete without mentioning the diminutive .25-powered GMP Cricket, the most-sold fixed-pitch helicopter in the world. Over 10,000 were sold between 1980 and 1990. At \$199 it helped many people get started in RC helicopters.



Mr. Ewald Helm of Germany with two of his own design Lockheed 286H scale models. Helm pioneered the leading axle main rotor head, and used semi-monocoque fuselages on his helicopters to keep weight down.

technology.

Franz Kavan in Germany introduced the world's first successful collective-pitch helicopter kit in 1973: the Kavan Jet Ranger. It was also the first RC helicopter to perform loops and rolls. The .60-powered Jet Ranger was a large model; the fiberglass fuselage was nearly 5 feet long and the main rotor diameter was over 5 feet. This model is a collector's item now.

Kavan introduced the world's first RC helicopter rate gyro in 1975. I think this is one of most significant milestones in RC helicopters. The Kavan gyro was very simple; it had an electric motor mounted on a gimbal, with a flywheel mounted on each side of the motor shaft. The motor assembly tilt angle was measured by a potentiometer. It worked! It wasn't very popular, though;

people thought it was just a gimmick, and besides, *real* pilots didn't need gyros. The Kavan gyro died away, but it left a seed.

By 1976, Ernie Huber of Massachusetts became the first to fly an RC helicopter inverted. He wired his own invert switch on a five-channel airplane radio. By flipping a switch, the direction for the elevator, tail rotor and collective servos were reversed. Ernie flew demos all over the country, hovering his Kavan Jet Ranger inverted an inch above the ground.

Prior to 1976, there was no such thing as a dedicated heli radio. When I was flying my Schluter Heli-Baby in 1976, I was using a five-channel Kraft airplane radio, and no gyro. From 1976 to 1978, a few radio manufacturers in Japan started to offer some rudimentary heli radios. All they had were revolution mix and dual rates. At that time, JR was not as popular as Futaba, MRC, or Kraft in the U.S., but JR did offer an invert switch on their heli radios.

When JR's Unlimited 8 heli radio was introduced in 1982, they were way ahead of the others. My father drove me to the JR importer in Las Vegas and we bought an Unlimited 8 for \$500. It had servo reversing, high and low end pitch adjustment, throttle hold, idle-up, invert switch, low end pitch adjustment for invert, travel end point adjustment for tail rotor, revolution mix, tail rotor acceleration compensation, gyro sensitivity select, and dual rates. This was the first true heli radio. Cliff Hiatt won the 1983 Nationals with this radio and a Schluter Superior.

The hot engine from 1976 to 1984 was the O.S. FSR series. The O.S. FSR .25, .28, .40, .50 and .60 dominated the helicopter market. The Japanese had the most popular heli radios and engines during this period, but the Germans dominated helicopter design.

Graupner introduced a very sophisticated scale-looking Bell 212 in 1975. The reliability of this model was proven by flying one across the English Channel. Kavan again demonstrated its advances by introducing the world's first flybarless RC helicopter: a scale Lockheed 286, which had retractable landing skids. This was a model I just had to have, and picked one up before they discontinued it in 1986.

Amazingly, after 25 years, the basic layout of the typical RC helicopter hasn't changed much; rather, the efficiency of each component has been optimized. Modern RC helicopters have very precise handling characteristics. They can do anti-gravity 3-D aerobatics that have to be seen to be believed.

HELICOPTER WORLD

These German models were sophisticated but expensive (\$500 for a Bell 212 kit in 1975). Very few Graupner helis were sold in the U.S. The Schluter Heli-Baby was the first helicopter that became universally popular because it was simple and affordable. The Heli-Baby was introduced in 1975 for \$190. It used a .40-size airplane engine and a four-channel airplane radio. Yours truly learned to hover on this helicopter. A collective conversion was introduced in 1978. John Simone formed a company in California in 1977 and made a successful clone of the fixed-pitch Heli-Baby, calling it the Revolution 40. Hundreds of Revolution 40s were sold.

Realizing the need for a small, affordable entry-level heli, John Gorham introduced the fixed-pitch .25-size GMP Cricket in 1980. Over 10,000 Crickets were produced between 1980 and 1990.

By 1980 the public was ready for higher performance collective-pitch machines, and they found it in the Schluter Heliboy, the world's first truly aerobatic pod-and-boom helicopter. The main structure was made up of two aluminum sideframes with the engine mounted in the middle. Servos were mounted on a wood tray in the front, and a plastic "fish head" canopy was used. The rotor head was a teetering design utilizing Bell-Hiller stabilator and control methodology. The Heliboy was the first helicopter with a cone start system on the clutch shaft. The cooling fan was surrounded by a shroud. All of these traits are found on modern helicopters.

By 1982 it had become accepted in the modeling community that RC helicopters had arrived, that they didn't just beat themselves to death, and that they were very aerobatic. Manufacturers began refining the concept of aerobatic pod-and-boom helis. The GMP Competitor, designed by John Gorham in 1983, became the pacesetter in high-performance RC helicopters. In the early '80s, GMP Competitors won almost every contest in the country. Robert Gorham demonstrated the precision of the Competitor by doing a nose-in hover and kissing the nose of the helicopter. The Competitor was the world's first precision acrobatic helicopter kit. The kit price was \$400.

By 1983, electronic rate gyros had finally become popular. The Kraft gyro, made by KO in Japan, was the first popular gyro. It used a magnetic Hall effect sensor to precisely detect gimbal tilt—all mechanical gyros on the market now use the same setup. The Kraft gyro sold for \$69. I learned how to fly without a rate gyro, but now I cannot control a helicop-



The .60-size GMP Competitor was the first of the really high-performance pod-and-boom aerobatic RC helis, winning almost every contest in the country during the early '80s.



The Helim Star Ranger. Ewald Helm flew one to 2nd place at the first World RC Helicopter Championships in 1985. This was the most advanced and best selling .60-size helicopter in Europe from 1984 to 1988.



The Miniature Aircraft USA X-Cell 60, introduced in 1987, borrowed the best attributes from the Helim Star Ranger and Schluter Champion. One potent machine!

ter without one.

John Gorham's .40-.50 size Cobra was a scaled-down version of the Competitor. In the mid-'80s the Competitor and Cobra dominated more than half of the entire helicopter market in U.S. The Cobra was stable, nimble, and inexpensive.

Mr. Schluter became very prolific after the Heliboy; he introduced a new

helicopter just about every year. In 1981 he introduced the SX-81; in 1982, the Helistar; in 1983, the Superior; in 1984, the Miniboy; in 1985, the Champion; in 1988, the Junior and Scout; and in 1990, the Magic. They were all pod-and-boom helicopters. However, the machined metal parts and molded plastic parts became more refined, as did the control

setup.

In the decade of 1980-1990, we saw a boom in helicopter kits, radios, and engines. This gave birth to the first RC Helicopter World Championships, which was held in London, Ontario, Canada in 1985. Helicopter aficionados at last had a chance to see what was the state-of-the-art in model helicopter technology and pilots' competency. The Japanese and Europeans dominated the contest. Shigetada Taya from Japan captured 1st place with an original Agusta 109 look-alike fuselage and TSK mechanics. Ewald Heim from Germany took 2nd with his original design, the Heim Star Ranger. Robert Gorham placed 5th with a GMP Competitor.

After the 1985 World Champs, the Heim Star Ranger became the hottest machine in Europe. To date, Heim helicopters are still flown by a quarter of the European fliers. The Star Ranger had many innovative features, including the floating axle teetering main rotor head design. The entire rotor head was made from molded glass-filled nylon parts. The design is simple and works great. This rotor head has been copied and used on most modern helicopters, such as the X-Cell, Shuttle, Futura, and Intrepid.

Heim helicopters had a very low parts count. The mechanics could be finished in one evening, however, the fiberglass fuselage and its wood bulkheads required some effort to build. Helicopter modelers tend to be mechanically oriented and like to assemble things rather than sculpt things like airplane modelers. Heim helicopters were no more expensive than other kits—in 1985 a Star Ranger kit was under \$500—but Heim helicopters never became popular in the U.S. because Americans prefer the user-friendliness and workability of pod-and-boom helicopters.

Schluter helicopters, on the other hand, became very popular in the U.S. in the mid '80s. They were all of rugged pod-and-boom design with nearly everything machined from aluminum or steel. Schluter machines were heavy but were built like Panzer tanks.

Then came Walt Schoonard's X-Cell 60 in 1987. Walt was the U.S. importer of the German Heim and Schluter helicopters from 1984 to 1988. He combined the best ideas from the Heim Star Ranger and Schluter Champion and made the X-Cell 60. To me, the X-Cell 60 marks the beginning of modern high-performance RC helicopters.

Next month we'll continue this discussion with the new breed of machines such as the X-Cell, Legend, Concept, Shuttle, and beyond. We will also discuss the breakthrough in hi-tech programmable radios, modified engines, and piezo gyros. Stay tuned!

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HELICOPTER WORLD

BY JAMES WANG



THE NEW JR "ERGO" FROM HORIZON HOBBY DISTRIBUTORS

In Part One of a two-part review, James looks at the newest .30-size heli to hit the market; next month he'll talk about the upgrades needed to convert it into a .46-powered 3-D hotdogging machine.

JR has been at the leading edge of programmable helicopter radios since their invention in 1980. However, it was a pleasant surprise to learn that JR has now also begun offering complete helicopter kits. JR collected a handful of helicopter experts in Japan, including Mr. Kazuyuki Sensui (many-times Japanese National Champion and winner of the 1991 World Championships) to brainstorm some new

helicopter designs. The result is that by the end of the year we will see not one but three new JR helicopters: a .30-.46 size Ergo, an Ergo 60, and an all-out, competition caliber, nothing-held-back Superior 60. This month we'll take a look at the new Ergo 30; next month we'll examine the upgrades for converting it to an Ergo 46, and also review JR's 783 radio. In the December issue we will review the Ergo 60.

My Ergo 30 finishes at 6-3/4 pounds. This is few ounces heavier than other .30-size machines, but the large rotor diameter (55cm blades) gives it a light disk loading. The model is very stable in hover, predictable in forward flight, and docile in autorotations.

The Ergo uses modern stacked frame structure design. Main frame assembly is made up of four black anodized aluminum sideframe plates. The plates are thin and light, but once the structure is put together it is torsionally rigid. Modern helicopters have all gone to the stacked frame design because it allows the plates to remain flat, making it easier to check whether or not the assembled structure is straight and true. This is also important when doing a post-crash evaluation. Older helicopters often used bent aluminum sideframes which are difficult to align. For those who



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In this great photo sequence taken by Matt Gilmore, Dave Storey shows off the Ergo's agility with a low-altitude roll to inverted.

want to add an extra touch of class, Horizon offers optional graphite sideframe plates for the Ergo (JRP960159, \$299.95).

The plastic servo tray and tailboom assembly feels very solid. The tailboom is mounted in a strong plastic grip sandwiched by the sideframes. The tail rotor and throttle servos are mounted directly on the sideframes—this seems to be the vogue for modern helicopter designs. For an enhanced look, KSJ makes a graphite servo tray (KSJ365, \$36.95) to replace the plastic one supplied.

All of the bearing blocks are made from CNC-machined aluminum instead of plastic. I think aluminum bearing blocks are the way to go because they won't distort when the bolts are tightened. I especially like the steel clutch and metal clutch bell. The metal bell is a very nicely machined unit that won't get hot or distort. The clutch lining is glued in at the factory. The entire clutch system runs in a single ball bearing. The clutch shaft is supported by a bronze bushing. There is no bearing inside the clutch bell, either. Only one bearing is used to support the steel pinion gear on the clutch bell. Make sure the clutch shaft is greased and lubricated frequently. A 6mm hex socket is attached on top of the clutch shaft for starting. JR makes a starter extension (must be purchased separately) with a 6mm hex-shaped ball at the tip.

The tail rotor system is a quiet, low-friction belt drive unit. The toothed belt has Kevlar strands imbedded inside for strength. Each tail rotor blade grip is supported by two bearings for precise control. An optional aluminum tail rotor pitch control lever (KSJ396, \$36.95) is also available. The vertical fin is very large and has a intriguing looking ring around the tail rotor gearbox; I can't figure out what kind of aerodynamic benefit (if any) the ring provides. The horizontal fin sits on a super beefy plastic clamp which is also used to attach the tailboom support brace. For those who want to dress up their helicopter, KSJ makes a fiberglass support brace with purple anodized aluminum fittings

(KSJ394, \$28.95).

Most .30-size helicopters use an 8mm main rotor shaft, but the Ergo uses a heavy-duty 10mm hollowed shaft. This is important when using the optional longer tailboom and optional 62cm rotor blades. When the rotor gets bigger, we definitely don't want a wimpy 8mm main shaft!

The main rotor head is a floating axle design. The axle is supported by two rubber O-rings. The injection molded blade grip and head block are very strong. The blade grip is supported by two radial bearings, but KSJ offers optional thrust bearings (KSJ389, \$28.95) for 3D hotdogging. The Ergo is the only helicopter on the market that has markings molded into the blade grip and head block to help you set the blade pitch angle—a great idea! The center hub is machined from aluminum. The quality and performance of this rotor head gets an A. JR then went a step further and offers the all-metal MC-30 rotor head (JRP984002, \$279.95).

The washout unit is pre-assembled by the factory. The arms move very freely and precisely. The sliding washout hub is metal with a brass insert. Two steel pins coming down from the rotor head prevent the washout unit from rotating. There is an interesting cyclic/collective mixing system on top of the servo tray. The whole control system is extremely smooth. All control bellcranks run on bushings, not ball bearings, but there is no free play at all. I'm impressed!

If you really must have the ultimate in precision control inputs, KSJ offers a machined aluminum washout assembly (KSJ362, \$84.95) with dual ball bearings on each mixing arm, and it offers two selectable mixing ratios. The three plastic cyclic/collective mixing levers can be replaced with aluminum levers (KSJ361, \$59.95), each of which has dual ball bearings. My stock Ergo is already flying very nicely, hence I did not install these upgrade items.

The plastic swashplate on the Ergo is very precise, and there

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is very little play between the inner and outer plates. Of course, there's an optional metal swashplate available (JRP960202, \$79.95). KSJ also offers a CNC-machined clutch bell (KSJ393, \$56.95), dual ball bearing supported seesaw mixing arms (KSJ363, \$56.95), and dual ball bearing supported aluminum aileron bellcranks (KSJ392, \$42.95). Two KSJ parts that I would like to get are an aluminum bearing block for the clutch shaft with two ball bearings (KSJ364, \$29.95) and an aluminum cooling fan (KSJ366, \$52.95), which generates more air and is better balanced than the plastic fan. All of these optional aluminum parts are anodized purple. Isn't it nice to know that if you like, you have the option to make your Ergo stand out from the rest? A graphite Ergo with all purple metal parts must look sharp and fly superbly!

For a .30-.40 size helicopter, the Ergo consists of a lot of parts. All are packed in numbered plastic bags according to the assembly steps outlined in the manual. The items inside each bag are clearly itemized at the end of the manual. It took me a week of evenings (about 22 hours total) to build the Ergo and set up the radio. Despite the high parts count, it goes together fast because the 63-page illustrated instruction manual is very clear. The manual explains what accessories are needed, how to program the throttle and pitch curves, how to adjust the pushrod lengths, and even provides radio programs for the JR XF622, 783 and PCM-10SX radios. This manual gets an A+.

The Ergo's canopy is a blow molded, one-piece unit. The material used makes the canopy almost indestructible. A clear window and a colorful decal sheet are provided.

I'm using the new Webra .33H in my Ergo. With the optional JR muffler, the Webra is relatively quiet. Forward flight is very smooth and groovy. The model easily does 50 mph in straight and level flight. The Webra .33H is a brand new design just released this year, and is even more powerful than the Webra Red-head .32H. It uses an aluminum piston with Dykes ring, running in a steel liner. The polished hard steel liner has no chrome or nickel to chip or wear off, so it should give excellent durability and long life. I like the Dykes ring design because it gives a good seal and makes for easier starting than ABC engines. My .33H runs great on 10-15 percent nitro fuel. I tried 30 percent, but the engine doesn't need the extra nitro for power or consistency.

The .33H features Webra's proven TNII carburetor design. Once the needles are set, it locks on the rpm during hover and during forward flight aerobatics. The Ergo has 9.78:1 gear ratio for the main rotor and 5.18:1 for the tail rotor. This is considered high for a tail rotor, hence, the tail rotor response is excellent. And 9.78:1 is ideal for a .30-size helicopter's main rotor. When the rotor is spinning at 1,800 rpm in forward flight, the engine is revving at 17,600 rpm, which is at the peak of the horsepower curve.

I set my Ergo to hover at 1,500-1,600 rpm, and use 1,700-1,800 in forward flight. The Webra .33H's power curve matches the Ergo's need very well. At 6-3/4 pounds, the Ergo 30 will loop and roll all day long. However, for 3-D hotdogging, a .46 size engine gives more power reserve. I enjoy flying the Ergo with



James finds the new Austrian-made Webra .33H puts out even more power than the Webra Red-head .32H. Features a Dykes ringed piston (easier to crank over than an ABC or AAC engine), Webra's well-liked TNII carb and a large heat-sink head.

a .30 engine because it feels smooth, is quiet, and there is very little engine-induced vibration. It's just a more pleasant machine. Unless you want to burn holes in the sky, I suggest you try the Ergo 30 first—it only costs \$99 to upgrade it to an Ergo 46 later.

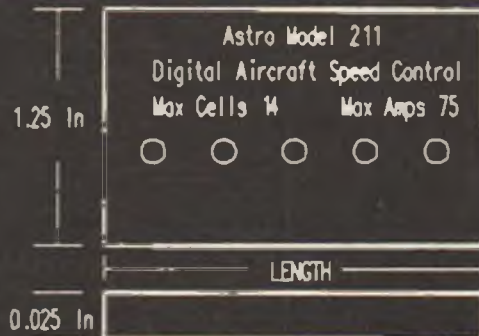
Next month we will discuss the Ergo 46 and my control setup for the JR 783 radio. Meanwhile, I highly recommend getting the action-packed video of Dave Storey demonstrating the aerobatic capabilities of the Ergo. Send \$5 to Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821 and request the "Ergobatics" video. Don't forget to tell them you read about it in *Model Builder* first!

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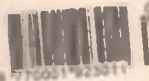
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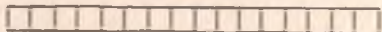
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Simpson Middle School Honors MB101

Getting a standing ovation can be unsettling. You're never quite sure, as they rise from their seats, if they're applauding or coming after you.

This happened to us during an "appreciation luncheon" honoring teachers, faculty and volunteers for their work during the Spring Quarter of Simpson Middle School. Marvin Malicki and I were asked to come forward. Representing MB101, we received a plaque which read "... in grateful appreciation for your time and devotion to the students of Simpson Middle School, June, 1996."

It's been two years, almost to the day, that I've been involved with the exceptional crew at Simpson. For this entire period, MB101 has donated all materials, labor and funding while acquainting teachers with our curriculum. In excess of a thousand models have been successfully built and flown by the sixth, seventh and eighth graders. However, money for this program was unavailable from the county or school administration despite the popularity of the course, the practical education benefits and our need for financing.

Therefore it came as quite a shock to Marvin and me when the Simpson PTSA came forward during the ceremony and presented MB101 with a check for \$1,000 and the promise that financial arrangements for the balance of '96/'97 were being worked on.

.....
In November of '95, Thomas Hill of Santa Fe, New Mexico contacted us about our Middle School courses. We of

course supplied him with our package. In May of this year, Tom was good enough to send us the results of his and his club's efforts. The newspaper clippings, "thank you" signatures from students and the "lessons learned" seminar with teachers are all in keeping with MB101's highest traditions.

However, Tom mentions that "there are many unanswered questions for next year, most of which center around staff and paying for the Tennysons. The sixth grade teachers seem willing to take over the bulk of the Year I effort next year, allowing club members to focus on Year II with the graduated sixth graders."

Tom, you're absolutely right. The Step-1 Delta is only the beginning, and those programs that begin and end with this basic model have really accomplished very little.

The building of our Step-2 Tennyson and understanding the related aerodynamics are critical in finalizing the confidence and enthusiasm of the student. The final eighth grade project, that of designing their own plane, proves to them the value of what was learned in the previous two grades.

We were amazed, Tom, to learn after two active years that very few of the parents knew that MB101 received no money from any educational source or group. My wife and I have invested a considerable sum of our own money and receive no salaries or other compensation. Only expenses directly related to the promotion and operation of MB101 are reimbursed to us and any associate, such as Marvin, who participates.

I have found that basically only three groups are vitally interested in the mission of MB101.

First and foremost, the parents. It is imperative that they be made aware of the opportunities you are offering their child to learn and acquire what could be a lifetime constructive avocation. The burden of accomplishing this,

as we discovered, is yours. Through necessity, we have developed a program that seems to work.

Second, the students. Their excitement and eagerness to learn, build and progress is contagious. Time and again, parents approach us with gratitude for giving their child a chance to discover the wonders of model building and flight. As teacher Donna Miller wrote on a donation she gave us, "You've changed lives forever!"

Finally, and perhaps most important, the entire school staff.

Teaching is a difficult and draining experience. In every class, for these past years, I have worked with the teachers as we formulated a curriculum that was effective and productive. Many days, at the end of a four- or five-hour session with various classes attending, I literally crawled out of the school. The only reason I understand why a teacher continues day after day, year after year, working against inadequate equipment, finances and at times public apathy is because of their dedication. I think that prior to any government official deciding on the monetary compensation these professionals deserve, it should be mandatory for those making the decisions to spend one week in class, working with these educators.

The future of our world is sitting at their desks, in schools throughout our country. We shall inherit the results of what they are taught.

Please note that MB101 derives its operating cash from donations and the sale of proprietary items. Any purchase made of an MB101 product goes directly to the operation and training of Middle School teachers and students.

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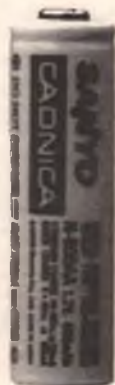
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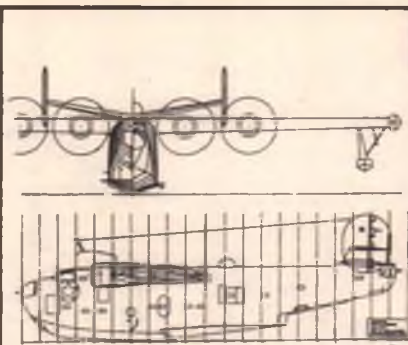
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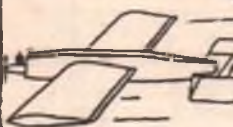
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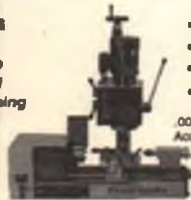
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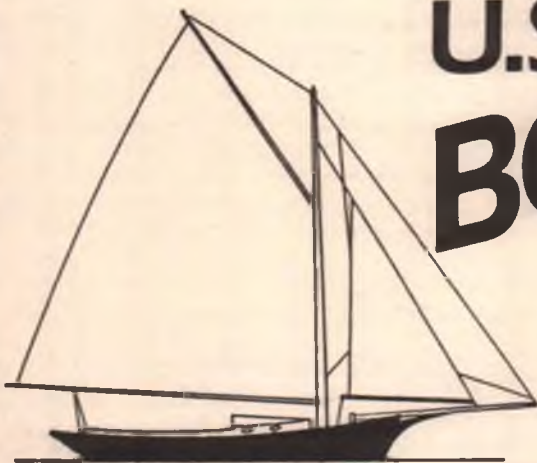
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PRODUCTS IN USE

■ By Jason Eib / Photography by Joe McBride

THE AIRPLANE FACTORY'S "KOMBAT 40 BASIC TRAINER"

What this airplane lacks in aesthetics, it more than makes up in durability and ease of maintenance. Those qualities, plus its exceptionally docile performance in the air, make the Kombat 40 Basic Trainer an ideal entry-level RC model.

I picked up a recent copy of *Model Builder* and came across an ad that made some pretty bold claims: "Fly in an hour! No Gluing, No Covering, No Sanding and No tears when you CRASH!" A small photo accompanied these claims and from what I could see . . . well, it looked to me that the design was based more on function than looks. But appearance aside, I was intrigued by the idea of having an airplane ready to fly in as little as an hour, so I decided to give it a try.

I've built many models in my time but I've never been able to get one out of the box and into the air in only one hour. Even the most complete ARFs that I've built have taken at least eight to twelve hours before

they were actually ready for takeoff, and in my opinion even that much time is nothing when you compare it to the time and effort it takes to assemble a kit that has nothing pre-built for you. And how about the claims that no covering, no sanding, not even gluing are necessary? Not even a little bit of glue? Now I'm really anxious to see how this model is constructed because I've yet to see one that can be fully assembled without any glue at all.

But most importantly, the manufacturer claims this plane is a good trainer. That would have to mean that it's a stable flier that can withstand some real punishment. If all of these things are true, I reasoned, then this is one product that our industry could really use. Many new people coming into this hobby could use a

plane that's cheap, goes together quickly, flies well, and can take a beating. So, without further ado, let's find out how this kit lives up to the demanding expectations mentioned above.

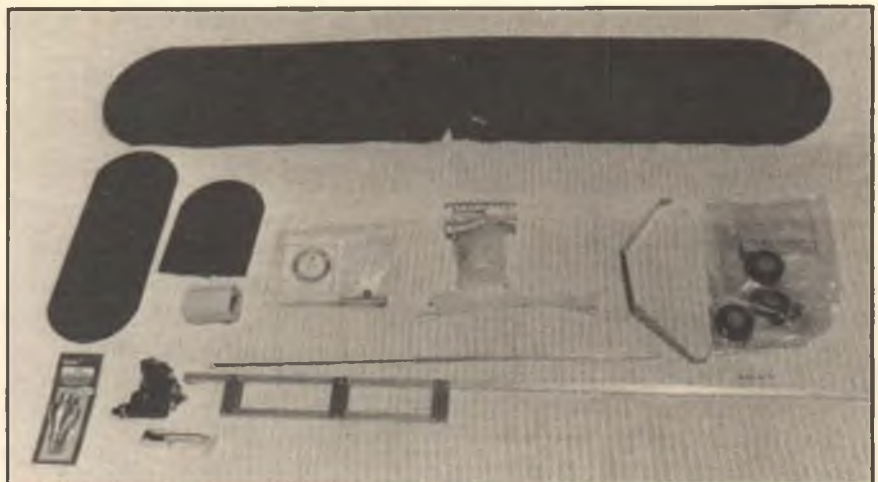
THE MAJOR COMPONENTS

"What is it?" my wife asked as I pulled the wing out of the plain white box. "That looks like a TV antenna," a friend quipped as I removed the fuselage. The wing and tail surfaces are constructed of what the manufacturer calls "rubberized plastic" (actually corrugated polypropylene), and although they appear a bit unconventional at first, it's obvious when you pick them up and start handling them that these things are tough and designed to take some punishment. The fuselage is made up of

THE KOMBAT 40 BASIC TRAINER

WINGSPAN 60 in.
WING AREA Approx. 600 sq. in.
FLYING WEIGHT 5-1/2 lbs.
WING LOADING 21 oz./sq. ft.
ENGINE40-.46 two-stroke.
RADIO Four channels required.
CONSTRUCTION . Pre-built wing and tail of corrugated polypropylene (your choice of red, orange, yellow or blue), pre-assembled fuselage of square aluminum tubing.
SUGGESTED RETAIL \$84.95.

Produced by The Airplane Factory,
1135 Florida, Mandeville, LA 70448;
(504) 626-7840.



The Kombat 40 Basic Trainer's wing and tail surfaces are made of corrugated polypropylene and come pre-built in either yellow, red, blue or orange. Ailerons, elevator and rudder are pre-binged. The fuselage is a couple pieces of square aluminum tubing with aluminum vertical spacers, all riveted together for you at the factory.



By far not the prettiest model on the market, but strong and easy to work on — perfect for beginners. Assembly is all done with bolts and nylon tie-wraps, no glue required. It took our author just four hours to get his model completely assembled and ready to fly, including radio and engine installation.



Right and left side views of the nose showing the simple engine and radio installation. The four standard-size servos are mounted out in the open, between the upper and lower fuselage members, and are held in place with tie-wraps. The receiver and radio battery are contained within the modified fuel tank strapped in place just under the wing leading edge.

pieces of square aluminum tubing riveted together at the factory and reinforced with oak, and most of the necessary holes are drilled for you at the factory.

The Kombat 40 Basic Trainer can be built as a taildragger or with conventional tricycle gear; the kit includes all the necessary hardware to build whichever version you choose. I built mine with the tricycle gear and found that takeoffs were as simple as could be, even in a cross-wind. The directions show that you can build the plane with both the tricycle gear and tailwheel at the same time so that later, if you choose to change from tricycle gear to taildragger, the process will only take a couple of minutes.

The manufacturer claims that this is a complete kit with all the necessary hardware included and "no extras to buy." Well, with the exception of a plastic spinner so that I could use an electric starter, I didn't need a single item. My kit was missing no pieces and everything was packaged nicely so that I had no trouble finding what I needed. With a few hours and some tough "beginner" landings under its belt, my model looks virtually the same today as when I first flew it.

CONSTRUCTION

How about that claim of being able to fly within an hour? Perhaps if I built several of these kits I could get the building time down to around an hour. As it was, I needed about four hours of uninterrupted work before I had before me a model airplane that I judged ready for flight. If you have little or no building experience you should honestly expect to spend at least this much time to do the job right. Still, the Kombat 40 Basic Trainer is one of the fastest building kits out there and more importantly, it's very easy to construct.

I found the instructions clear and easy to follow. A couple of areas came up where I needed to reread a step or two to get a clearer understanding on something, but other than that I had no problems. I tried to examine the plans and instructions a little closer than I normally would to see if there was anything that a person with absolutely no model building experience would find confusing. Items such as "control horns," "clevises," "pushrods," etc. can be confusing to first-timers who have never seen these things before, but the plans are successful at describing each item by providing separate pictures and descriptions of each of the parts, pieces, nuts and bolts used in the construction.

The one thing that amazed me was that, true to their claim, *I never used a drop of glue to build the model.* This may be neither good nor bad to most modelers, but by using machine screws and tie-wraps, the designer did away with the added cost of

CA and epoxy, which also saves you some mess. Aside from your engine, props, spinner and radio equipment, you will need a drill (with 9/64 and 5/32 bits), a pair of wire cutters capable of cutting 1/16 music wire, a flat-head screwdriver, a Phillips head screwdriver, a crescent wrench and a pair of pliers. Add your starting equipment and you're ready to go.

FLYING

The most important question of all is, how well does it fly? It's a winner! Our flight testing showed that with a competent instructor and a buddy box setup, novices with little or no flying experience were soon able to successfully fly the Kombat 40 Basic Trainer from takeoff to final approach! Landings were not difficult but it usually takes a little while for new pilots to master the landing process regardless of the airplane they're flying. Experienced pilots were spot landing the plane without much thought.

One thing that everyone agreed on was how stable the plane flew even in moderate gusts and crosswinds. We tested the model in stronger winds and found that, even though it was getting kicked around a bit on final approach, we could still set it down pretty close to the same spot on our airstrip.

Control response was mild and perfectly suited for beginners, but more experienced fliers may want to increase the throw of the surfaces for mild aerobatics. Sustained inverted flight requires some down elevator but that's to be expected. Stalls were performed repeatedly at altitude and we found that our model tended to drop the right wing slightly before quickly recovering.

As mentioned above, takeoffs and landings were as easy as it gets. With no crosswind, takeoffs required no rudder input even though I powered the airplane with a .50 four-stroke instead of the recommended .40 two-stroke. Just point the nose in the right direction, apply full throttle, and pull gently back on the elevator after you've built up enough speed.

THE SAITO FA-50 GOLDEN KNIGHT

We were pleased when we found out that the engine supplied for this project was the Saito FA-50GK. I've personally found that Saito engines are of the highest quality; the ones that I've owned have never given me any trouble. This particular engine was no different.

If you haven't yet flown your plane with a four-stroke engine, you'll be pleasantly surprised at how quiet these engines are and how long your flights will be on a tank of fuel. And of course, there's the extra torque. Your airplane will have improved vertical performance, and learning to do torque rolls will keep you busy for a while (I can't seem to master them the way other people can).

The throttle response on our .50GK is crisp and responsive. After several break-in runs we leaned the mixture setting out a bit and got respectable power and minimal vibration. As is the case with most four-stroke engines, the muffler on the .50GK extends precariously out the side of the cylinder head and is therefore more susceptible to damage than the mufflers on most two-stroke engines. We found this out when a student ran into an embankment during a botched landing. The airplane itself suffered no damage but the muffler broke off and destroyed the needle valve in the process. The repairs cost about \$40. All in all, however, I have to say that the Saito FA-50GK is one fine engine that starts easily, runs smoothly and develops as much power as any other similar size four-stroke on the market.



As you can see, we enjoyed building and flying this model. If your time is limited or you simply don't want to do much building, consider the Kombat 40 Basic Trainer—you'll be in the air with a stable flying machine in no time. RC fliers who progress past its docile flying characteristics can very quickly convert their airplanes into spirited aerobatic aircraft by installing the standard 48-inch Kombat 40 wing that The Airplane Factory offers. The wing itself costs around \$20 and the conversion only takes a few minutes.

Another development that the folks at The Airplane Factory are working on is sure to turn some heads. Soon we'll be able to bolt an *autogyro head* onto our Kombat 40



The author got in low and close for photographer Joe McBride. In spite of its crude appearance, the author found the Kombat 40 Basic Trainer to be durable and very well behaved in the air, an excellent subject for a first-time RC trainer.

fuselage and experience what it's like to fly our model with a free-spinning rotary wing! Hopefully we'll be able to get hold of one of these things and will let you know all about it in a future write-up. Until next time, keep flying and we'll see you at the field. *MB*

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Jet Models: The first air-breathing jet engines used in model airplanes were "pulse jets." These came along soon after WW II, and were probably an outgrowth of the German pulse jet engines used in the V-1 unmanned flying missile. However, the V-1 engine made a low-frequency putting sound, while our model pulse jet engines **ROAR!** You don't know what noise is until you've heard a model pulse jet engine in full voice. Doubtless that, plus fire hazard, hard starting, short valve life, high fuel consumption, etc., explains their limited popularity in the modeling world.

Pulse jet engines are normally used only in CL speed models, where the record is around 200 mph or more, but my friend Ole Recio put one in an RC model many years ago, and I saw a motion picture of it in flight. The speed of the model was most impressive—and the landing was even more impressive! For some reason it hit the concrete runway too hard, bounced, caught fire, and kept going for several hundred feet, trailing a huge tail of flames. Not recommended. The Dynajet pulse jet model engine is still being produced today, by the way.

The models of jet airplanes that have appeared and become most popular in recent years are internal combustion engine-powered ducted fans. Whether these are true "jet engines" or not depends upon definitions. They are not turbo-jet engines, but they are a type of fan-jet.

True turbo-jet engines for models, of course, are only a few years old, and roughly a half dozen brands are now on the market. I've seen a turbo-jet powered model fly. WOW! As my grandson would say, "It was way cool!" The performance is much like a ducted fan model, but the sound is sweet and realistic—"swoosh"—very much like the sound of a full-scale jet

O'Hine also invented and developed the turbo-jet engine in Germany over the same time period. The first turbo-jet to fly was the He-178, in 1939. Britain demonstrated its first jet to Churchill in 1941.

Meanwhile, in the United States, was anything happening? Yes, I'm happy to report, we also had an early inventor of the gas turbine and the turbo-jet engine. In 1904, Robert Lasley conceived the gas turbine, and made a turbine wheel and housing, then had to postpone further development. Returning to it in 1929, he patented it and incorporated the Lasley Turbine Motor Company. Within a few years he was running tests on a gas turbine driving a Hamilton Standard propeller—the first turbo-prop. The turbine for that test was built by Allison Engineering before it became part of General Motors. Between 1920 and 1942, Lesley was awarded three Canadian, three English, two Australian and eight U.S. patents on gas turbines and jet propulsion. (The information contained here is from several sources, including an article by Peyton Autry in the PNW AIAA newsletter for March 1996.)

Model Cement: If you ask a modeler under the age of 40 what "model cement" is, they will probably say "CA," "cyanoacrylate" or "super glue." It wasn't always that way. One of the first model airplanes I built (a rubber-powered twin pusher, in 1930) was stuck together with the most common adhesive of those days, LePages "animal glue." And the covering was held on with LePages "mucilage," which seemed much like the animal glue, but thinner. These stuck things fine, but took forever to dry. And they had another disadvantage which came to light when I flew my model on a morning when there was dew on the grass. Animal glue and mucilage were water soluble, and my model started coming apart. (Crashing wasn't the only way to "re-kit" some airplanes in those days!)

The adhesive which most of us old-time modelers remember as "model cement"

If you ask a modeler under the age of 40 what "model cement" is, they will probably say "CA," "cyanoacrylate" or "super glue." It wasn't always that way.

airplane, but milder. In my opinion the number of turbo-jet models will increase modestly and will continue to be demonstrated at meets, but I don't think they will ever compete in numbers with the ducted fans. Turbo-jet model engines are, and probably always will be, much more costly and more difficult to maintain and operate.

While we're talking turbo-jet history, let's go full-scale for a moment. It's true that Sir Frank Whittle invented and developed the turbo-jet engine in England, starting in 1929, but lesser known is the fact that Hans

was a big improvement over LePages glue, and the dope we soon used to stick down the tissue paper covering was much better than mucilage. "Model cement" was basically a thermoplastic, such as celluloid dissolved in a solvent. In fact, the poorer of us used to make our own model cement by dissolving scrap celluloid in acetone. The celluloid took a long time to dissolve, and the glue wasn't as good as the commercial model cements, but it was cheap. I remember making the stuff a quart at a time, in a fruit jar. The hard part was looking through garbage cans for broken toys and other

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Engine.....15-25

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Length.....62"

Wing Area.....533 Sq. In.
Engine (2).....20-25

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objects made of celluloid. Sometimes the cement was white, sometimes red, or whatever the color of the celluloid we found. We used our homemade model cement directly out of the jar by means of a "glue stick."

When I was richer (earning 20¢ to 40¢ a week selling Sunday papers) I bought my model cement. Duco cement was good, but it cost 25¢ a tube; Collins cement was only 10¢ a tube. There was also Ambroid, the same basic type of cement, but amber in color instead of clear. Ambroid is still on the market.

The introduction of cyanoacrylate adhesives into modeling occurred just at the time *Model Builder* magazine started, but the invention of CAs occurred some years earlier. It was originally marketed by Eastman Kodak as "Eastman 9-10," for difficult technical bonding jobs. It was not used for models at first because it was originally very expensive—and also little known. Father-and-son free flight modelers Bob and Bill Hunter and their "Satellite City" company introduced CA to the modeling world in 1971, under their "Hot Stuff" brand. Now there are many brands and types of CA for modeling.

Epoxy glue was on the market before 1970, so it can't be listed as a development within the life of *Model Builder*, but it held an important interim place between the old "model cement" and the advent of CAs. Epoxy was so much stronger than model cement that it was always specified for firewall bonding and other high-stress joints. The CAs weren't trusted by everyone for high-strength joints at first, and many construction articles continued to specify epoxy for certain joints. However, in my opinion, modern CAs are fully as strong as epoxy for almost everything, and I haven't mixed a batch of epoxy in years. Cyanoacrylate is much easier to use and cures so much faster. Thank you, Bob and Bill Hunter!

MonoKote: This famous covering film was on the market in the late 1960s, so it doesn't quite fit into the *Model Builder* magazine era. But it was close, and its importance deserves attention here. For the development of MonoKote (the father of all the later integral-pigment integral-adhesive heat-bonding and heat-shrinking plastic film coverings) we are indebted to modeler Sid Axelrod and his Top Flite Models Inc. You will find Sid's name in the AMA Hall of Fame, and I'm sure that his MonoKote was a major factor leading to his selection for that honor.

I know of no better way to impress the youngsters among you with the importance of MonoKote and later similar products than to quote part of a 1970 Top Flite advertisement: "MonoKote is actually less expensive than silk and dope. And, when you consider its ease of application; the tremendous amount of time you save . . . allowing you more time for flying . . . that there are no penetrating, offensive odors; no mess

to clean up; that even if you're a novice, you get a professional-looking finish the first time and every time you use MonoKote; its puncture resistance and high tensile strength; we leave it to you . . . how can you afford not to use MonoKote?" Thanks Sid.

RC Systems: Improvements in radio control systems have been continuous since the first vacuum-tube (and RK61 "gas" tube) single-channel attempts at RC in the 1930s and '40s. The capability and reliability of RC systems have taken huge steps forward since then. And the price for a basic RC system has nowhere near kept up with inflation over the years! It's true that RC in 1971 was a long way ahead of where it was in 1941, but some great steps have been made since *Model Builder* started publication.

In 1971 there wasn't much single-channel or multi-function escapement flying still going on, nor much "galloping ghost," nor even much multi-channel reed-relay flying. Most of us had already gone to the early "proportional" sets. Very early proportional sets? Try the names Orbit, Kraft, EK Logitrol, Heathkit, Micro Avionics, and Controlair. We take proportional control for granted these days, but be assured, youngsters, the development of proportional control for models was a major advancement in the hobby, and it led to a huge increase in the number of RC modelers in the late 1960s and early 1970s. Before then, RC flying was very limited in performance, as well as difficult and frustrating. It was mostly engaged in by dedicated experimenters. Crashes and lost airplanes due to loss of control were frequent. With the advent of proportional, RC also became a sportsman's hobby.

The servos with the reed radios were huge. The servos with the first proportional sets were semi-huge. Today servos are available in a number of sizes, including itsy bitsy. Modern micro servos wouldn't have been possible at MB's birth because we didn't have much in the way of ICs (integrated circuits) or miniature motors and miniature pots at that time.

In the early *Model Builder* era, the thing I had the most trouble with was servos. A periodic chore for RC modelers using the early proportional sets was to service balky servos. The biggest problem was servo feedback pots which had become intermittent so the servo didn't go to where it had been directed. We often had to clean the pot elements and sometimes increase the contact force of the pot wipers. We also opened up servo motors to clean the commutators, resoldered broken solder joints in receivers, and did all kinds of things which RC modelers today wouldn't think of doing for themselves.

Foam-Core Wings: These came along at roughly the birth of *Model Builder*. Foam-core wings were a real fad for quite a few years; a high percentage of the designs featured as magazine construction articles had

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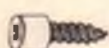
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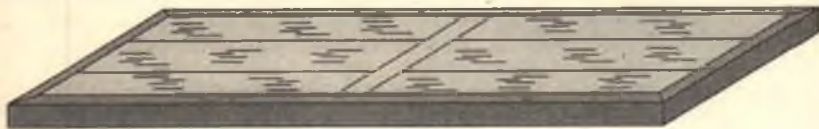
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foam-core wings. I built a lot of them in those days, but like many modelers, I have drifted away from them. They definitely have their place, especially on pattern ships and high-performance sailplanes, where wing strength and maintaining an accurate airfoil are paramount. But without lightening of the core, they usually end up heavier than built-up wings, and for me, they take more time to build.

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KNIGHTHAWK Specifications

Wingspan: 64 in (1625mm)
 Wing Area: 752 sq in (48.5 sq in)
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 Mission Weight: Varies with payload up to 9 lb
 Requires: 2-stroke .40-.51 cu in (6.5-8.0cc) or
 4-stroke .48-.53 cu in (8.0cc) engine
 & 4-6 channel radio

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