RADIO CONTROL AIRCRAFT

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NOVEMBER 1993
DISPLAY UNTIL NOVEMBER 8

MODEL BUILDER

WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

construction:

EEE-Z-FLI
WET 'R DRY
PEANUT SCALE
MONOPREP

contest reports:

SOARING: THE NORTH-SOUTH CHALLENGE

PATTERN: F3A TEAM SELECTION

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reviews:

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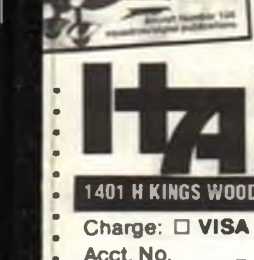

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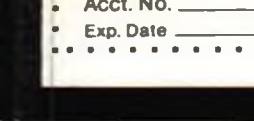

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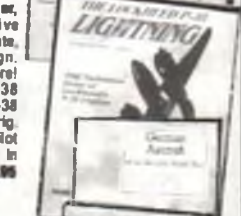

MODEL BUILDER
WORLD'S MOST COMPLETE MODEL AIRCRAFT PUBLICATION

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NOVEMBER 1993 • VOLUME 23 • NUMBER 2

COLUMNS

FEATURES

PRODUCTS IN USE

ON THE COVER

Remember the North-South Challenge? After a 10-year hiatus, this prestigious California RC soaring contest is back and better than ever under the expert management of the Central Valley R/C club. At the first of these revived meets, Steve Condon, seen here launching his RnR Products Genesis, tied for 1st place with world-class competitor Joe Wurts, leading Team South to a decisive victory over the North. Photo (and story—see page 20) by Bill Forrey.

CONSTRUCTION

DEPARTMENTS

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MODEL BUILDER (ISSN 0731-4795) is published monthly by Gallant Models, Inc., P.O. Box 669, Capistrano Beach, CA 92629. Phone (714) 496-5411. Subscriptions $25.00 for one year, $47.00 for two years in U.S. Subscriptions outside U.S. (except APO and FPO): Canada, $35.00 one year, $66 two years; other foreign, $33.00 one year, $63.00 two years. All payments must be in U.S. funds. Change of address notices must be received six weeks before date of issue that new address takes effect. Send old addresses with new . . . old label preferred. Duplicate issues cannot be sent. Postmaster: send address changes to Model Builder, P.O. Box 669, Capistrano Beach, CA 92629. Second class postage paid at Capistrano Beach, California, and additional offices. Editorial contributions are welcomed by Model Builder, but cannot be considered for publication unless guaranteed exclusive. Model Builder assumes no responsibility for loss of or damage to editorial contributions received, including but not limited to text in any form, photographs, drawings, and art work. Editorial material must be accompanied by return postage, unless return is not desired. Any material accepted for publication is subject to possible revision as may be considered necessary, at publisher's discretion, to meet requirements of its magazines. Publisher assumes no responsibility for accuracy of content, and opinions stated in published material are those of the contributing author, and do not necessarily reflect those of the publisher. Upon acceptance, payment will be made at our current rate, which covers all author's rights, title to, and interest in, the editorial contributions received as described above. Unless prior arrangement is made in writing to Model Builder, submission of editorial material to Model Builder expresses a warranty by the author that such material is in no way an infringement upon the rights of others.
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After a long absence, 67-year-old Shimpei Yamamura, of Kyoto, Japan, now has time in his retirement to enjoy building Old Timers. The two planes shown were designed by the late Dr. Kimura, the most famous model aircraft designer in Japan. The C-2 appeared in a 1943 Japanese model magazine, the D-1 in 1944. "I'm making Old Timers which are changed from FF into RC," Shimpei says. "I have about 10 planes of Japanese, American or German design ready to fly at any time. My American models are a Playboy Sr., Albatross and Gulf. In Japan there are no kits of Old Timers, so I always make them myself one by one. It is unfortunate for me that there are very few people who are flying Old Timers in Japan." *Shimpei Yamamura, 39 Nishionoboji Omiya Kitaku, Kyoto 603, Japan.*

Jay Evans of Upper Darby, Pennsylvania has been flying RC for only a year, and this 1/3-scale Sig Spacewalker is already his second scale project. Jay says he spent about 200 hours on the 104-inch wingspan model, which has an Zenoah G-62 engine, B&B smoke system and uses one of the big 6-volt gel cell batteries from MAT. "The finish is Super Shrink Coverite and Ditzler auto paint. The cockpit dashboard has the on-off switch and kill switch built right into it." Jay flies with the Delaware Valley RC Club and wins a *Model Builder* custom T-shirt for sending in his photo. *Jay Evans, 7012 Hazel Ave., Upper Darby, PA 19082.*

An indirect scale-up of a Beancraft Bostonian provided Scott McNickle with lots of fun in 1992. "The flying surfaces are drawn to a slightly larger scale than the fuselage because Bostonian fuselages get absolutely *huge* when blown up to RC size," says Scott. "As it is, the cross-section at the cabin is 4x7-3/8 inches, wing area is 374 square inches, weight is 29 ounces, and the power is a Cox Queen Bee .074. It's covered with Micafilm and the V-tail mixing is by sliding tray. Scott says the model climbs briskly and glides surprisingly well considering the big, boxy fuselage. "It's so much fun I've already starting scaling up a low-wing Bostonian, the Ichiban." *Scott McNickle, Box 163, Mt. Pleasant, OH 43939.*

"Only a few autogiros were built with in-line engines. This is a sort-of-scale Pitcairn PAA-2 with Martin 120-horsepower engine." Builder Pete Van Dore, of Elkins Park, Pennsylvania, notes that the landing gear is not scale. Power is supplied by a Cox Tee Dee .049 with throttle. It has micro servos for the rudder and elevator, and the autogiro is finished with Silver Micafilm and red Black Baron film. *Pete Van Dore, P.O. Box 26794, Elkins Park, PA 19117*

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"SPORT PACK"	05	4	1.43 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	3/4 DEG.	HARD NYLON	$ 55.95
"PRO-PACK"	10	4	1.48 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	1/3 DEG.	IRON/OILITE	$ 66.95
"ELECTRO-GLIDE"	20	3	1.25 x 0.55 x 1.2	0.95	28 oz."	0.22 Sec	1/2 DEG.	SUPER TIGHT	$ 78.95
"GIANT PACK"	15	3	1.97 x 1.14 x 2.3	3.50	130 oz."	0.23 Sec	1/2 DEG.	B.Brg./OILITE	$105.95
includes Sm. Thr.	05	1	1.43 x 0.79 x 1.6	1.55	42 oz."	0.24 Sec	3/4 DEG.	HARD NYLON	
"SUB-MICRO PACK"	24	3	1.14 x 0.55 x 1.1	0.60	32 oz."	0.15 Sec	1/3 DEG.	SUPER FAST	$ 99.95

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PGP	21	AM	7	300	100	150	150	150	100	0.84 x 1.47 x 2.43	1.5	$ 69.95
PGP	31	FM	7	400	–	200	600	500	200	0.84 x 1.47 x 2.43	1.5	$ 74.95
MICRO	535	FM	5	2400	–	2200	2600	2500	2200	0.82 x 1.17 x 1.98	0.8	$ 81.95

*Plus $5.95 shipping and handling per order, & CA sales tax for CA residents. (Allow 2 - 4 weeks for delivery.)

PLANE TALK

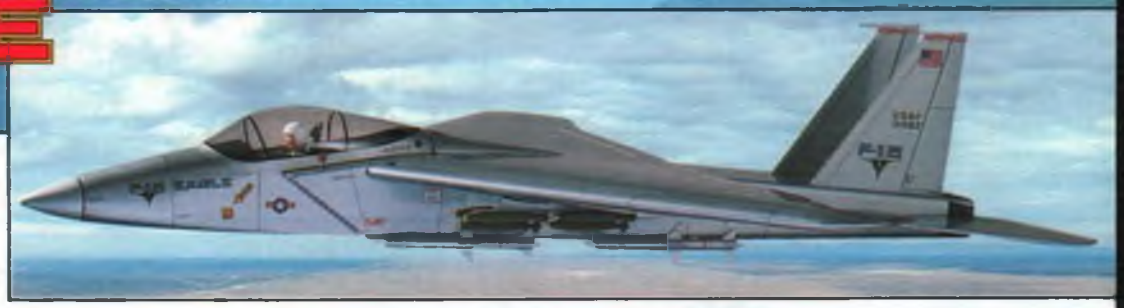
Brian Hewitt noticed no Brits have yet been featured in Plane Talk, and decided to do something about it. The 1950 British Nationals Gold Trophy champion is shown both as a 27-year-old flier with his CL "Stunt Queen" and as a 70-plus-year-old modeler holding a 100 percent outline replica, built as an RC model and powered by an old Veco .19. With a 37-inch wingspan and weight of just over 2 pounds, Brian says it really goes! "I'm now over 70 and dare not risk revolving to fly CL," he notes. "But my original, re-covered 1949 Nats-winning model was flown last year at our Old Warden Vintage event—by someone younger and more competent!" Brian has been modeling since 1930 and flew his first power plane in 1938. Since then, he's been through just about all disciplines, including helicopters. "But to each his own, and I hope our great hobby never descends into cliques of specialists who can't see what the rest of us find to enjoy." Amen! *Brian Hewitt, "The Squirrels," 5 Daresbury Close, Bexhill-On-Sea, East Sussex, England TN39 4DR.*

United Airlines pilot Horrace Cain of Humble, Texas sent in this photo of his Heinkel 100 D-1, bashed from a Midwest Fun Scale P-51 kit. Why? "It's something other than a P-51—*everybody's* got a P-51!" says Horrace, who's been modeling for 50 of his 57 years. "It's a Sunday fun flier with real airplane looks. And not being an ME-109 or FW-190, I get lots of 'What's that?' questions. Purpose served!" Horrace started in RC in 1972 and now belongs to the Jetero RC Club of Humble. He's served three years each as an AMA RC Contest Coordinator and District VI vice-president. "And after I retire in February 1996, I'm going to build *lots* of models!" *Horrace D. Cain, 9838 Canterbury Dr., Humble, TX 77338.*

"Short grass, biplanes, no neighbors—perfect!" That's how George Moberg describes his club's sod farm flying field in Chula Vista, California, near the Mexican border. That's where he flies his Sterling Waco SRE, powered by a Magnum Pro .45 with J-TEC muffler and controlled by an Airtronics PCM six-channel radio. One year in the building, George's Waco is covered with Solartex and finished with Coverite Black Baron paint. "It looks great on slow fly-bys, but is really quite aerobatic." *George Moberg, 1606 Shooting Star Ct., San Ysidro, CA 92173.*

How to hit Mach 1 without ever leaving the ground

F-15 EAGLE



Wingspan: 47 in (1194 mm)
Wing Area: 615 sq in (39.67 sq. dm)
Weight: 6-6.5 lb (2.72-2.95 kg)
Length: 52.5 in (1334 mm)
Requires: 2-cycle .40-.50 cu in (6.5-8.0 cc) engine and 4-channel radio with 4 servos

Shown with optional Armament Package. Propeller and landing gear removed from photo for dramatic effect.

Get behind the controls of a Great Planes F-15 Eagle

Within 23 seconds of brake release, the USAF F-15 Strike Eagle can accelerate through the speed of sound, known as Mach 1. This is just one of the many capabilities that helped F-15s bring home the majority of air-to-air victories during DESERT STORM and has made them the most sophisticated air superiority fighters in the world.

Now Great Planes brings all the excitement and adventure of flying an F-15 Eagle to pilots who prefer to keep their feet on the ground. Its authentic sport-scale design captures the dogfighting spirit of the real F-15 in beautiful detail. An extensive decal sheet lets you copy the look right down to the afterburners.

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With Great Planes' new Auto-Lock™ construction, no advanced skills are necessary to build this jet-like plane. This new interlocking construction lets you simply twist formers inside the fuselage, locking them into place for the most simplified assembly process offered by any R/C kit manufacturer.

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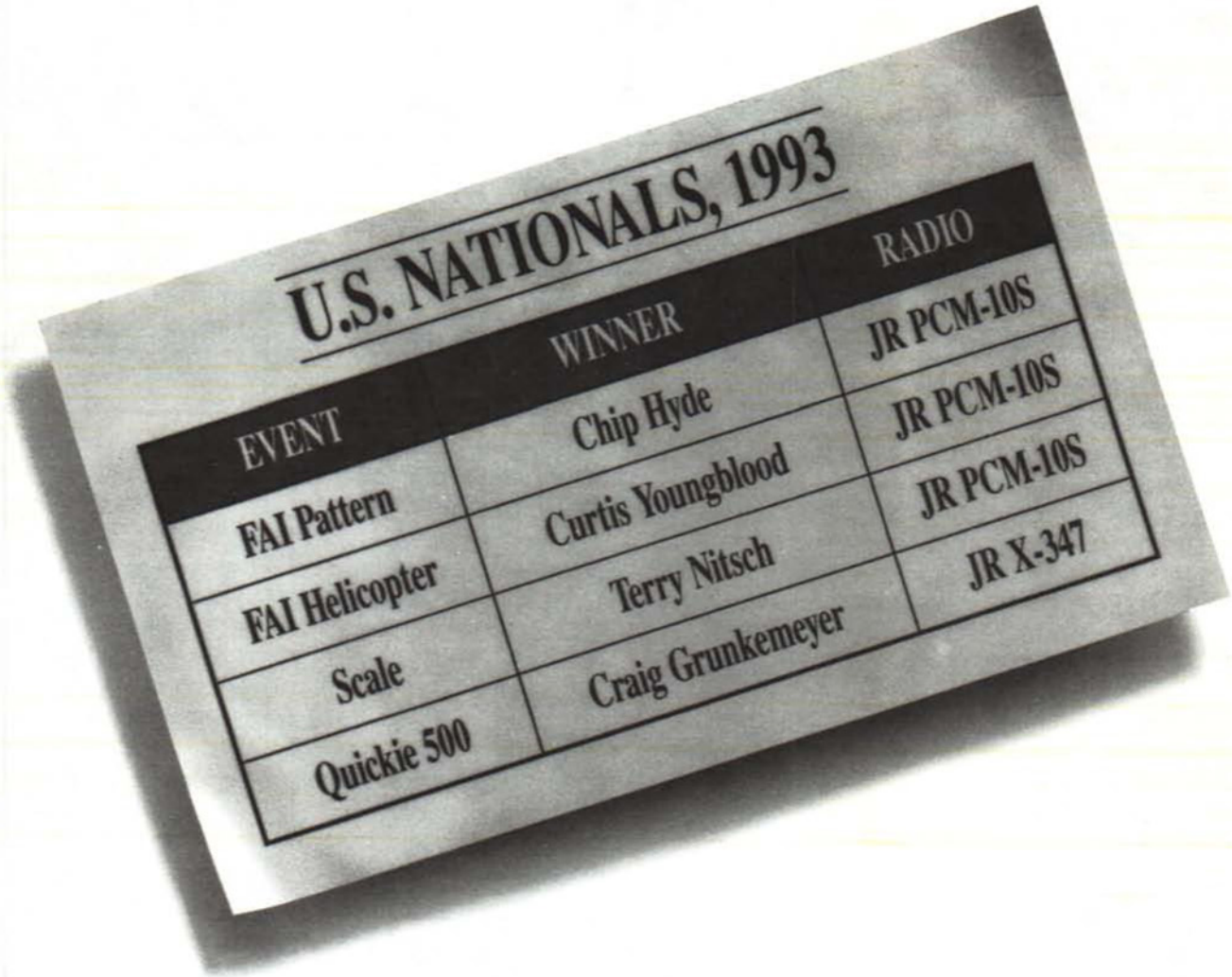

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DEAR JAKE

Advice For The Propworn

DEAR JAKE:

I've had starting problems. They all told me to bounce the prop. I threw it against the wall and off a concrete floor. My wife wouldn't let me use the padded carpet in the living room. Now the engine won t run at all. Should I have taken the prop off the engine? What on earth did I do wrong?

Orlis Howe in Mesa, AZ

Dear Readers:

Poor Orlis here is a perfect example of someone who is having difficulty because he doesn't fully understand the vernacular of our hobby. You would think we all would know the difference between bouncing a prop off compression and bouncing one off the handball court. But Orlis didn't, and sadly, thousands of modelers suffer from a similar misunderstanding of the technical jargon that finds its way into so much of our written and spoken communication.

Help is available, however, in the form of Jake's Glossary of Misunderstood Modeling Terms. I've been remiss in not running this feature for quite some time now, but Orlis's letter and others like it have prompted me to get off my duff and provide this much-needed service. Without further delay then, here is another installment of:

JAKE'S GLOSSARY OF MISUNDERSTOOD MODELING TERMS

Undercarriage—Where a dog looks for teething biscuit crumbs.
Pitot Static—Brakeman for the Irish four-man bobsled team.
Aeroelastic—Material in a stewardess's girdle.
Ferry Flight—Very rare occurrence associated with gale force winds around Staten Island.
Envelope Expansion—Increase in junk mail volume.
Cabane Strut—The way you walk when your cabane is bigger than anybody else's.
Biplane Rigging—Fixing a race between Glenn Curtis and Orville Wright.
Bermuda Triangle—Diaper for an onion.
Stits Playboy—A gentlemen's club and what's on display there.
Rotary Engine Waco—Cult home for Mazda worshipers.
Spruce Goose—Why Fred got his face slapped in the pine forest.
Control Cable—Take the TV remote away from your teenager.
Counterbalance—Evenly distributing the patrons at a diner.
Coordinated Turn—A heading change your mother-in-law in the back seat approves of.
Gravitational Attraction—What Tom Arnold has for Roseanne.
Three-Channel Receiver—British TV set.
Jacobs Chuck—Guinness Record for distance and chunk size, held by "Ralph" Jacobs of East Bronx, NY.
Flight Envelope—Byproduct of dog-meets-mailman event.
Spline Wrench—A dislocation of that bone in the middle of your black.
Former Doubler—Retired amoeba.
Reinforced Joint—Bar with extra bouncers.
Universal Solvent—Road salt and water.
Scotch Adhesives—McGlue Flight of the Bumble Bee, a famous piece of music written by Igor Sikorsky.
Surface Flutter—Spandex phenomenon encountered on Vic Tanny massage machines.
Resin and Hardener—New TV show about two ex-cops that go into the fiberglass business.

(Solution to this month's mystery clue: The brakeman for the Irish bobsled team was Pete O'Static.) ***MB***

over the counter

FUTABA'S BIG ACROSTAR

Futaba's high-performance ARF Acrostar 60, reviewed in the February '93 *Model Builder*, has lately been joined by a bigger version designed specifically for 1.20 four-strokes. Also an ARF, the Acrostar 120 comes 90 percent factory finished and requires no covering or painting. All of the basic hardware is included. The model spans 67-1/2 inches, wing area is 806 square inches, and the flying weight comes in at something less than 10 pounds. We acquired one of these models and turned it over to ace ARF reviewer Art Steinberg—watch for his review in an upcoming issue. In the meantime, if you need more info, contact Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

NEAT GADGET OF THE MONTH

Top Flite's Precision Magnetic Balancer is a truly unique and fascinating new item. In brief, a steel shaft, ground to a point at both ends, has two sliding friction-fit nylon cones that automatically center the prop. The shaft is then placed between the magnets in the plastic frame, but what's interesting is that only one end of the shaft actually touches a magnet; the other is supported in mid-air by the pull of the second magnet, which is spaced about 1/16-inch away from the end of the shaft. With contact at only one point, it's as close to frictionless as possible, and *extremely* accurate. The "Ceramic 8" magnets used are quite powerful and will support props or other items weighing up to 5-1/2 ounces. A thumbscrew at each magnet allows adjustable spacing, and the whole thing quickly disassembles into a compact package that will fit into any field box. Obviously, much thought went into the design of this handy tool, which carries a suggested retail of $26.99. From Top Flite, P.O. Box 9021, Champaign, IL 61826-9021.

WHAT'S NEW, DAD?

DAD stands for Dave Abbe Development, a new company located in Santee, California. Dave Abbe, formerly of RCD, formed DAD in order to provide a line of all American-made RC equipment, and has joined forces with Tom and Donna Runge of Ace R/C to produce his first offering: the "All-Pro" eight-channel, ultra narrow band FM receiver, introductory priced at $79.95. Measurements are 3/4x1-5/8x2-11/16 inches, weight is 1-1/4 ounces, and it's available with Ace, Futaba, Airtronics and JR connectors.

The All-Pro receiver is just the first of several planned items to be available from DAD—in coming months we'll be telling you about others. In the meantime, you can get more information on DAD and the All-Pro receiver by calling 1-800-669-4548.

WHEEL MOUNTING MADE EASY

One of several new products recently announced by Du-Bro Products is the E/Z Adjust Axle, which can be used for either main or nose gear installations. The machined metal fitting locks onto the strut with an 8-32 set screw, and the axle itself mounts with a 10-32 set screw. Four different combinations of axle lengths and diameters are offered, all priced at a suggested retail of $2.95. From Du-Bro Products, 480 Bonner Rd., Wauconda, IL 60084.

WING SERVO MOUNTING MADE EASY

An elegant way to mount servos in thin RC sailplane wings is with Robbe's clever "Servo Locks"—circular molded plastic fittings that get epoxied in place flush with the wing surface. The servo lays down inside and gets covered with the plastic top, which screws in place and even has a pushrod fairing molded in. Two sizes are offered: one to fit Futaba S133, 5102 and 143 servos, the other to fit Futaba S135, 3302, 3501 and 9601. Robbe Model Sport, 170 Township Line Rd., Belle Mead, NJ 08502; (908) 359-2115.

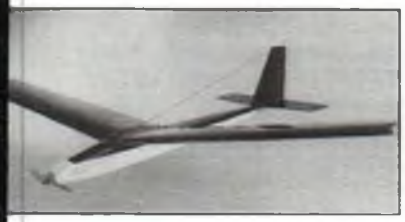
THE LATEST FROM P.A.W.

Carlson Engine Imports now has in stock the new English-made P.A.W. .29 and .35 BR diesels, both in standard and RC versions. With their single ball bearing crankshafts,

these engines are intended to fill the niche between the plain bearing and double ball bearing diesels produced by that venerable company. Mufflers are standard equipment. The engines are priced at right around $100, and a special factory tuning option is available at extra charge. For details, contact Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022-3112, or call (602) 863-1684. A buck will bring you a complete 10-page catalog.

SKY OUT WITH A SKIMMER

Brand new from Hobby Lobby is the "Skimmer" electric motorglider, a 70-inch span all-wood ship designed to perform well on one of HL's low-priced Graupner six-cell motor/prop combos. We've seen a couple of these kits up close—gotta say, it has the beefiest construction we've ever seen in a model of this size and type and should stand up to much abuse in the field. The wing uses the Selig 3021 airfoil and covers 532 squares. This airplane also has a huge space for the battery and radio—enough that it would be no problem at all to get 10 or 12



cells in there, if you wanted to experiment with a larger motor such as a Graupner Speed 700 Turbo. Battery access is from the bottom of the fuselage—no wing removal required. Priced at $48 from Hobby Lobby, 5614 Franklin Pike Circle, Brentwood, TN 37027; (615) 373-1444.

MOUNT 'EM SOFTLY

For you Big Bird fans, J'TEC is now producing its "Snuf-Vibe" engine mounts in sizes for the big gas burners—they can be ordered to fit Quadras, Zenoahs, Sachs-Dolmars and others. Offered in both

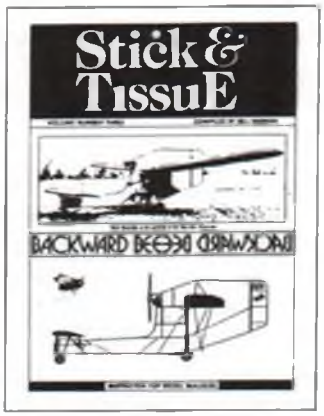
flat plate ($39.95, seen at the left in the photo) and extended plate versions ($49.95, right, which provides clearance for a spring starter), the mounts are complete with cast aluminum plate, rubber bushings and all necessary hardware. Available in hobby shops or direct from J'TEC, 164 School St., Daly City, CA 94014; (415) 756-3400.

JUST FOR HELI FLIERS

Horizon Hobby Distributors is the exclusive distributor of the new line of Revolution helicopter accessories, one of which is the precision blade balancer shown here. Heli blades are fastened to the anodized aluminum plate and then the pivot shaft is laid over the edges of two drinking glasses; a precision glass bubble level indicates uneven blade weights. The pivot shaft slides out for easy storage. Stay tuned to this column for info on other Revolution brand helicopter accessories, from Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

HANNAN'S AT IT AGAIN

Volume 3 of *Stick & Tissue International* is now available from Hannan's Runway, and if you're familiar with Bill Hannan's past work, you don't need us to tell you what a delightful publication it is. Volume 3 includes full-size plans for three Peanuts and a Pistachio, four three-view drawings (including one for the Gee Bee Ascender canard depicted on the cover), plus a wealth of other informative and entertaining features. The issue covers 26 pages in an 8-1/2x11 format and sells for $9.95 plus postage ($2.50 book rate, $3.50 first class). Order your copy from Hannan's Runway, Box 210, Magalia, CA 95954.



A TRULY SIMPLE COMPUTER RADIO

Unlike most of the computer radios currently on the market, Hitec RCD's new Prism seven-channel system is purposely

designed with only those features likely to be used by the average sport flier. The result is a relatively low-cost ($399.95 retail), user-friendly system that anyone can use. Besides the normal functions, the system has memory for three models and is switchable between PCM and PPM. Full particulars can be had by contacting Hitec RCD Inc., 10729 Wheatlands Ave., Suite C, Santee, CA 92071; or call (619) 258-4940.

SUPER SMOKE SYSTEM

Tejera Microsystems Engineering has taken a different approach to

installing a smoke system in your model; their electric "Simple Smoke Pump" plugs into your receiver and pumps smoke fluid from an on-board tank directly into your engine's muffler, producing more smoke than you could ever get from a crankcase pressure setup. A separate receiver pack is needed to operate the pump, which comes with radio connectors (your choice), tubing, flow control valve and instructions. Introductory price is $59.95, direct from Tejera Microsystems Engineering, P.O. Box 340608, Tampa, Florida 33694; (813) 968-9510.

FOR SMALL ELECTRICS ONLY

To complement their 50-watt electric power setup, Dickeybird Models just released their DB120 Electronic Motor Control Unit, a 3/4-ounce, super-small device priced at $24.95, which incorporates an automatic motor cutoff circuit; used with the DB121 BEC harness, you can run your radio from the motor battery, and the motor will automatically shut off at a predetermined point, saving enough juice to power the radio. The complete system—motor, four-cell battery, motor control and BEC harness—runs about $67. Write or call for more details: Dickeybird Models, P.O. Box 1249, Westminster, CA 92684-1249; (714) 775-4153. An illustrated catalog is available for $1.

continued on page 40

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

THE CL COMPETITOR'S BIBLE: REVISED EDITION

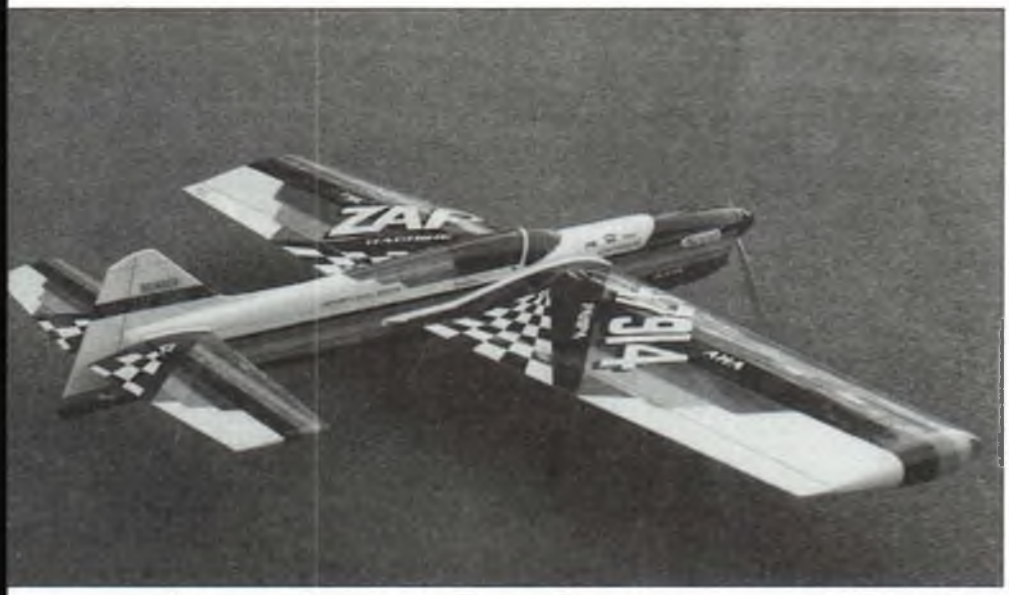
A rundown of the CL competition rules revisions that will appear in the 1994-95 AMA Rulebook.

Every two years the various contest boards of the Academy of Model Aeronautics consider proposals for updating the AMA rulebook, the Bible of miniature aviation competition. (The contest boards are panels of expert modelers in the various categories, one representing each of the 11 AMA districts.)

The cycle starts off with a large number of proposals submitted by board members, AMA officials and general members of the AMA. The proposals are printed in the "Focus on Competition" section of *Model Aviation* magazine, and comment by modelers is invited. After receiving comments, the contest boards take a preliminary vote on each proposal. Those that pass the first round are printed again and there is more time for comment. The boards then take a final vote. The process takes more than a year.

The contest boards have just completed their final votes on the proposals for the 1994-95 rulebook. The rulebook is an absolute "must" for any modeler who plans to enter any AMA sanctioned competition, and should be ordered along with your annual AMA membership renewal. The first rule of competition is: Know the rules!

As always, the Control Line Contest Board faced a large number of proposals in the just-completed cycle. And, true to the usual procedure, many of them were weeded out before the final vote. Fourteen revisions were approved, most of them minor changes, out of 36 proposals.



Steve Buso's beautifully finished Super Kestrel. Wing area is 745 square inches and the ship weighs 70 ounces. Power is a Supertigre .60 swinging a Rev-Up 13x6 prop. Steve uses hardware from Pro-Stunt Products, operated by Windy Urtnowski out of Little Ferry, New Jersey—address in text.

One change, however, is likely to have a major effect on the rat race event over the coming years. Approval was not unanimous, but supporters of the change hope it will result in increased participation in the AMA's top-gun racing event.

This change applies a venturi size restriction to engines above .2135 cubic inch displacement. The purpose is to slow down the .40-powered planes that are now the standard for rat race, and make unrestricted .21-size engines the eventual preference of competitors.

The change to .21 engines, which has been debated in one form or another for more than a decade, is a reflection of the declining participation in rat race that some attribute to the incredible athletic ability required for piloting standard rat racers. With the extreme pull on the lines and speeds in excess of 150 miles per hour, only a few remarkable individuals are able to participate in the event.

While it's likely that the .21-powered airplanes will approach similar speeds, particularly after some development, the weight and pull should be significantly decreased, and piloting should be possible for a much wider range of individuals. It's likely that it will take two or three years for development of the new, smaller planes and for people who have dropped out over the years to return to the event. If things work out, as the supporters of this rule hope, in a few years rat race will again be the premier racing event in the United States. In the meantime, the .40 airplanes and engines will still be allowed, so very little equipment should be made obsolete by the rule change.

Here's a look at the other revisions for the 1994-95 rulebook:

- National records for speed and carrier competition are allowed to be set in Class A or higher competitions, rather than AA or higher as at present.
- The requirement that the engine be started within one minute—and the possible 5 points—is deleted from the precision aerobatics rules.
- The builder-of-the-model rule is eliminated for racing events.
- The safety thong rule in the "General" CL section is clarified to specify the amount of slack required and the pull test requirements.
- Half-A combat is upgraded from a supplemental to an official event.
- Half-A profile proto speed is upgraded to an official event, and the junior event was combined with senior-open.
- Instructions for making lines are rewritten to require that double loop terminations be used on button-style bellcranks.
- New precision aerobatics rules give the contestant five minutes from the time of call to give the hand signal to begin starting the engine, and three

additional minutes to become airborne.

- In Class I mouse race, the words "currently produced" are eliminated from the engine rule.
- Model weight limit for mouse and 1/2A scale racing is reduced from 4 pounds to 1 pound.
- Half-A combat engine size is increased to .0514 cubic inch to allow the Cox Tee Dee .051 engine.
- The fast combat kill zone length is increased from 12 inches to 84 inches.
- In combat, the engine-restraining cable can now be attached to the engine through a hole drilled in the crankcase webs, an alternate to the cable being wrapped around the cylinder barrel.

Another proposal that had some support but failed the final vote would have added a new 80-mph combat event. Disagreement over the specifics among combat fliers led to the failure on this round, but the event could pass a future round if the Miniature Aircraft Combat Association is able to agree on a set of rules.

ON THE STUNT FRONT

A comment by precision aerobatics World Champion Paul Walker in the January edition of this column, critical of the Patternmaster airplane design series, generated some response in defense of that airplane. We issued an invitation in the June column for fliers familiar with the Patternmaster to offer some comments of their own.

The first person to check in was Steve Buso of Tivoli, New York, who doesn't use the Patternmaster but often flies against it. In addition to sending some pictures of his own Super Kestrel stunter, he offers these remarks about the Patternmaster:

"I have never built or ever flown a Patternmaster. For years now I've had to fly against them. In 1991 I designed and built my Super Kestrel, a Supertigre .60 powered ship whose aerodynamics closely follow those of the Patternmaster. The only real difference is that it's about 7 percent smaller than the classic .60 powered PM. Reason: I felt it might be able to do sharper corners. Does it? Hard to tell.

"I believe that if you can't beat 'em, join 'em. I can't begin to count the number of times that an average advanced level flier, having gotten his hands on a PM, rose through the ranks overnight. A reasonably light, straight and adequately powered PM is a lethal weapon in the stunt wars. They are user-friendly and confidence-building, two characteristics that have helped keep many good people involved and enthusiastic about stunt. With the possible exception of the Nobler, no other individual design that I'm aware of has had as much positive impact (sorry, Paul) as the PM.

"Speaking of Mr. Walker, he is absolutely entitled to his expert opinion about the PM's flying qualities. His track record speaks for itself. Having talked with him about what was published in your column, I know for a fact there was no ill will intended. Knowing Paul, I did not expect any, either. One of the most fascinating aspects of stunt is that just about everybody's opinion is correct. Not just at one time or another; I'm talking about all the time. What's worth arguing about is the degree of correctness. It's kind of like the old joke: 'Who is bigger? Mr. Bigger? Mrs. Bigger? Or Mr. and Mrs. Bigger's Baby? Why, the baby's a little Bigger!'"

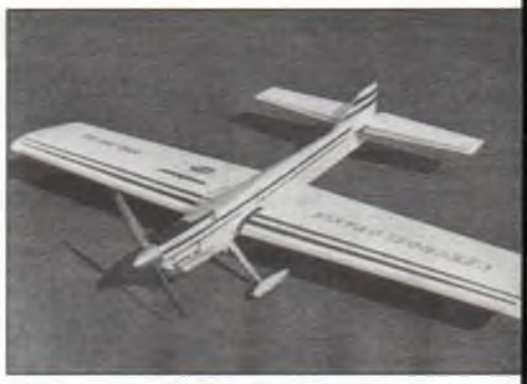
Also on the subject of precision aerobatics, we have a photo of a couple of beautiful Cardinals built from the kit now being produced by Windy Urtnowski's Pro-Stunt Products. These have Supertigre .51 and O.S. .46 powerplants. Windy offers plans and kits in either built-up or foam versions, and video instructions also are available. PSP has a wide range of control line precision aerobatics products. For a catalog, send $2 to Pro-Stunt Products, 9 Union Ave., Little Ferry, NJ 07643.

Tom Dixon, another supplier of precision aerobatics equipment, has released his latest catalog. New items include several old-time stunt plans, a Fox .50 reworked for stunt, and a new kit of Dave Hemstraught's PT-19 design. There are also several new plans for modern stunt planes, along with the usual array of kits, plans, engines and accessories. For the catalog, send $3 to Tom Dixon, P.O. Box 671166, Marietta, GA 30066.

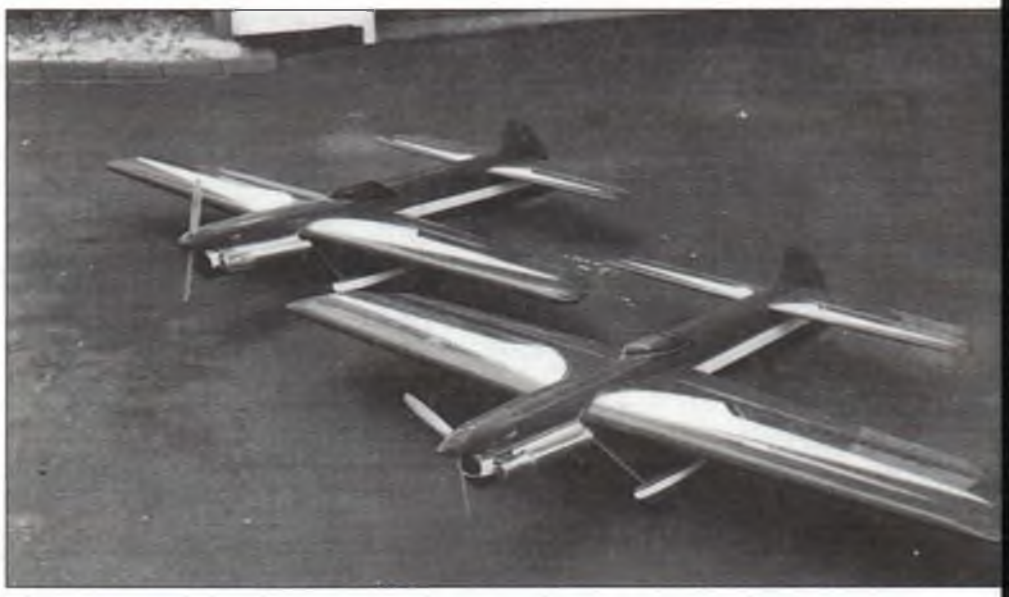
A couple of combat tidbits: Acting president of the Miniature Aircraft Combat Association, Chuck Cline, is doing even more acting! He has taken over as temporary editor of *MACA News*, and the first edition under his direction, June 1993, has a new look and lots of contest and technical information.

One interesting note is the growing number of contests on the 1993 calendar in which automatic flyaway shutoffs are required in fast combat. These safety devices, which are becoming common in fast combat, are required this year in contests in Oregon, Ohio, Canada, and Michigan.

MACA has a committee working on shutoff research and development and several manufacturing projects are in the pipeline. We'll report on new entries as information becomes available.



Slu Richmond forwarded this look at the stunt ship built by Vladaslav Trnka, one of Czechoslovakia's leading precision aerobatics fliers.



Pro-Stunt Products also offers kits for this classic Cardinal stunter in both foam and built-up versions. Photo courtesy of Windy Urtnowski.

Control line fliers in the Salem, Oregon area may want to get involved in the new club being formed there by a group of CL fliers who until now have been associated with other clubs in the area, such as in Portland and Eugene. The club hopes to acquire a flying site and promote CL aviation in the area. Plans were under way for an organizational meeting, swap meet and fun-fly sometime this year. For information, contact Mike Hazel at 1073 Windemere Dr. N.W., Salem, OR 97304.

Club news, contest reports, technical tips, pictures and other CL information is always welcomed. Write John Thompson, 295 W. 38th Ave., Eugene, OR 97405. ***MB***

HANNAN'S HANGAR

BY BILL HANNAN

"If it runs on electricity it's a motor. If it has a piston, connecting rod and crank it's an engine."

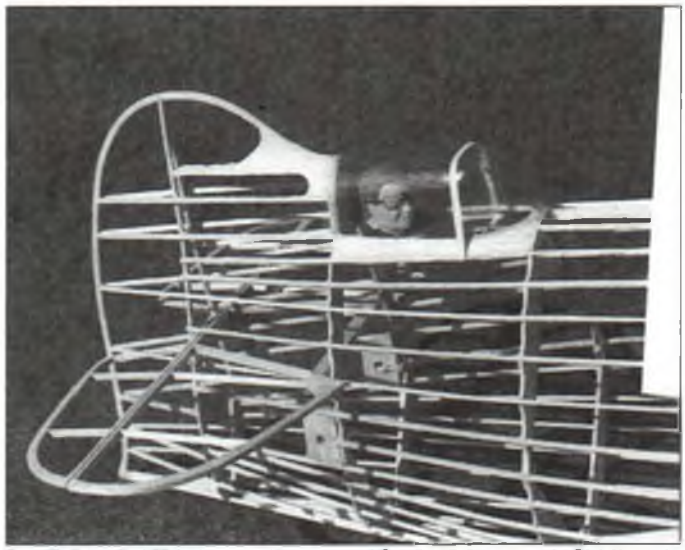
So says Robert B. Meuser, in response to our question of whether the correct designation is CO_2 *engine* or *motor*. Bob, former editor of the National Free Flight Society newsletter and *Scientific American* magazine paper airplane contest winner, among his other claims to fame, points out, however: "One can take a solenoid, connect the plunger to a crankshaft by a conrod, and rig a commutator to connect the solenoid winding to the electricity source at just the right times. Is it an engine or a motor?" A fair question, Bob, but how does rubber power fit into your definitions?

REBORN RACERS

Golden Age racing aircraft continue to proliferate in both model and full-size reproduction form. What seems remarkable is that their appeal has been so out of proportion with their numbers. Many, if not most of them, were one- or two-of-a-kind creations, yet their fascination may be stronger now than when they were brand new. "Good old days" nostalgia may account for some of their popularity, however it is undoubtedly the esthetic charisma which so strongly captivates us.

Is this a model or the real thing? See article. Photo by Bill Hannan.

Jim Clevenger's full-size reproduction of Roscoe Turner's Wedell-Williams racer (pictured here last month) has recently flown successfully, and it's likely that Jim's #92 Wedell-Williams reproduction will be completed eventually. We understand a Gee Bee Z is also underway in that part of the country.



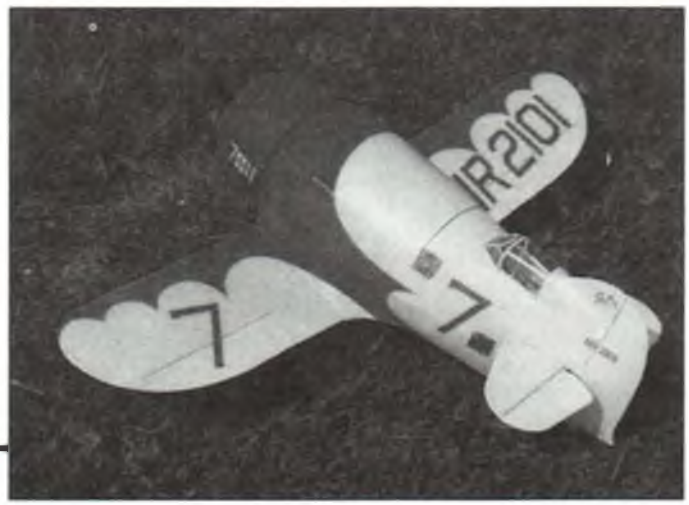
Beautifully crafted 25-inch span rubber-powered Gee Bee R-2 structure by Dick Howard features a carved likeness of Delmar Benjamin in its cockpit.

In June of 1993, the New England Air Museum rolled out their newly completed static display Gee Bee R-1 following nearly nine years of construction time. Interestingly, the Granville brothers and their crew turned out the original R-1 and R-2 in about three months! Our thanks to Tom Nallen for sharing information about the new R-1, which will be displayed near the original Gee Bee biplane in the museum collection.

Gee Bee racers with their exotic compound curves are highly work-intensive. Delmar Benjamin and Steve Wolf invested about a year in research and another year in construction to produce Delmar's R-2. Even a model Gee Bee can consume an incredible amount of fabrication time. We have photos of two such models this month, one from Arizona and the other from Germany. Both started from Vern Clements' scale drawings, however, vastly different techniques were employed.

Dick Howard, from Lake Havasu, built his rubber-powered Gee Bee R-2 in the time-honored traditional built-up balsa manner. Its finished weight is 80 grams,

German modeler Siegfried Glockner based his excellent electric-powered RC Gee Bee R-2 on Vern Clements' scale drawings.



Nope, it's not a Gee Bee! Harvey Mummert's 1932 Mercury S-1 racer, now on display in the Hammondsport, New York Curtiss museum, would make a fine model subject.

which is more than Dick had expected. Interestingly, Delmar Benjamin's full-size Gee Bee also came out heavier than predicted, which prompted him to remark, "It's built like a plow!" But after all, it is stressed for 14 Gs.

From Germany, Siegfried Glockner's electric-powered RC replica employs a balsa inner structure sheeted with styrene foam, and weighs 720 grams. The 1/8-scale model is a slow, stable flier with "normal" control, including an effective rudder. As an experiment, Siegfried made two cowlings for the model, one in the R-2 shape and another in the larger Gee Bee R-1 configuration. Although the performance difference was slight, the R-2 cowling permitted a faster climb, and he feels that different motor gearing to allow a larger diameter propeller would likely increase overall efficiency.

Delmar Benjamin, owner/pilot of the full-size Gee Bee R-2 currently on the airshow circuit, displays a fragment of fabric from the original R-2. Henry Haffke photo.

COMMERCIAL CORNER

Model building continues to thrive, judging by the continuing influx of new products. We recently received a sample of the Russian-made "Junior" CO_2-powered sport model described in an earlier column. Remarkably complete, the kit features molded foam parts, injection-molded accessories, a complete CO_2 power system including charger and propeller plus spare parts, detailed assembly and flying instructions and colorful pressure-sensitive markings. The molded foam shipping container can also serve to safely transport the disassembled model—a neat concept. Although we have not flown ours yet, glowing reports have been received about the model's performance. The very reasonably priced kit is available from D&B Import/Export, Sig Manufacturing Inc., and Peck-Polymers.

VINTAGE PLANS

John C. Fredriksen alerted us to the 10-page catalog of vintage scale, semi-scale and non-scale free flight and control line model plans available from Peter Williams, 13 Southminster Rd., Cardiff, So. Glamorgan, CF2 5AT Wales, England. Many of these designs are from long out-of-production kits, by such companies as Keil Kraft, Skyleada, Frog and others. Included are plans for rubber, diesel, glow and Jetex subjects, as well as a selection of gliders. To obtain a copy of the complete list, send $2 to the above address.

Also from England are the vacuum-molded parts for small flying scale models offered by Lindsey Smith. Among the selections are Golden Age, balloon and modern wheels, pilot busts, dummy radial engines, cockpit canopies and British roundel decals. Three International Reply Coupons (available from post offices) will bring you a size and price list from: Small Scale Custom Services, Spring Meadow, Fyfield, Andover, Hampshire SP11 8EL, England.

ELECTRIC DUCTED FANS

Ferrell Papic, winner of the 1992 Astro electric champs ducted fan free flight scale event, has produced an instruction manual and plans packet for several sizes of MiG-15 models, ranging from Peanut size to 40-inch wingspan. Following "the scientific method, or we learn by doing" approach, the manual is exceptionally thorough and extensively illustrated. In addition to information on building models suitable for 01, 02, 03 and 05 electric motors, there are instructions for building a simplified semi-profile rubber-powered MiG (with a conventional propeller), recommended as an aid in learning how to trim swept-wing models.

Other sections of the manual explain vacuum-forming of canopies, building and balancing ducted fan models, and novel color and marking techniques. The 60-page instruction manual and 14 plan sheets together sell for $24 plus $4 shipping and handling ($6 to Canada, $8 to Europe and Asia), from: Ferrell Papic, 300 W. Lincoln, #82, Orange, CA 92665.

ALZART GLIDERS

Intended for beginners age 12 and older, are a series of three all-balsa hand-launched gliders: the Standard Sky Sailer, Dihedral Glider and X-Wing. The Standard we received included good quality balsa printwood, instruction sheet, two grades of sandpaper, and modeling clay for nose ballast. Spanning 16 inches, the glider is expected to require an estimated 4 to 5 hours building time. The price for each kit is $4.95 plus $1 postage, from: Alzart Originals, 6871 Oakridge Lane N.W., Alexandria, MN 56308.

When contacting any of the above sources, kindly mention *Model Builder* magazine!

FINAL NOTE

Might anyone be interested in what may be the world's simplest flyable Gee Bee R-2? Average building time should be about one hour, after you've gathered the few and inexpensive materials required. If so, let us know.

About that Gee Bee R-2 flying inverted: Yes, it's the real thing, with Delmar Benjamin at the helm. ***MB***

Ricky Cochrun shows his Russian "Junior" molded-foam, CO_2-powered free flight model. More details in text.

CONTROL SYSTEMS

This month the subject is radios, servos, and controlling-our-models kinds of Tech Stuff.

Back in the 1930s, when I was learning about radios (the music and talk kind, not the plane-crashing kind), I was taught that the two wires of many circuits should be twisted together to reduce interference. The wiring acts like antennas and picks up stray radiation on various frequencies. Sometimes this pickup can cause serious interference in the output of the radio or other electronic device. For instance, in old AC radios certain pairs of wires were twisted together to prevent the pickup of 60-cycle radiation, which would appear as a 60-cycle hum from the speaker.

The theory is that when a pair of wires is twisted, the antennas they form are effectively broken up into a lot of short antennas, and each half-turn antenna is out of phase with the preceding half turn or the following half turn, so that whatever interference is picked up is cancelled.

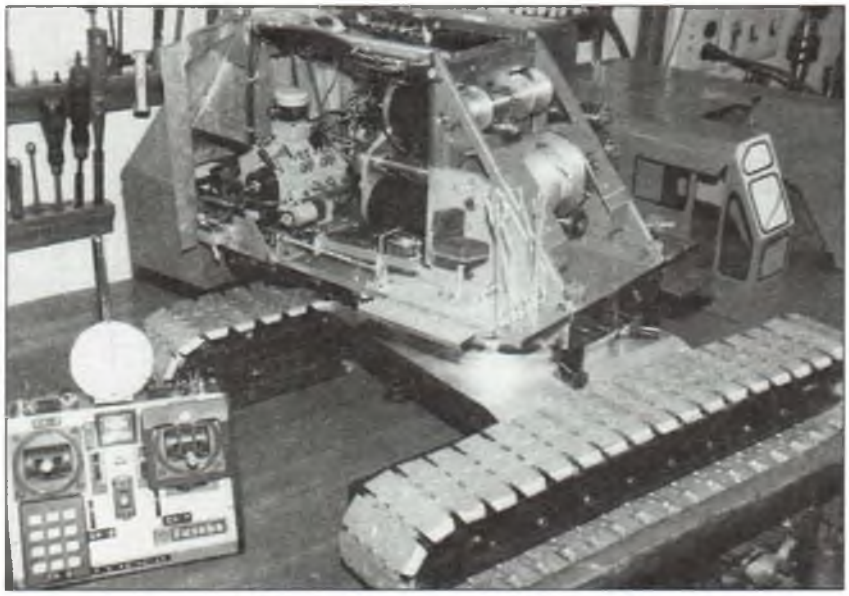
Not only did such twisted pairs reduce interference, but the twisting kept the two wires neatly bundled together. The electric lights I remember as a small boy had a twisted-pair "drop cord" from the ceiling down to a lightbulb hanging just above head height. Twisted-pair cords have long since given way to zip cords and other modern types where the conductors are left straight and insulation is molded around both of them together.

Several years ago our RC servos also had twisted leads (triple wires, in this case). Now they too have insulation which molds them into an integral cable. This flat cable is cheaper to produce with modern equipment, but what has it done to our interference problems?

Recently I chatted about this with John D'Amore, the Service Manager of Futaba Corp. of America. He felt that with today's interference-resistant RC sets, twisted servo leads are unnecessary. John did confirm, however, that under bad local interference conditions, such as the use of excessively long servo leads or spark ignition engines, twisting might help. Keep this in mind if you have interference trouble. Twisting is free, adds no weight, adds no additional components, and is easy to do.

MICRO SERVOS

The first proportional servos we had, back in the early 1960s, were pretty large and rather unreliable. Intermittent pots (potentiometers) and slow motors (dirty commutators) were often the problem. Modern servos are wonderful!



Our columnist's famous 1/10-scale Manitowoc 3900A RC model crane is a masterful example of the machinist's art. A complete write-up appeared in the July 1987 issue of *Model Builder*. Note that the Futaba seven-channel transmitter is fitted with a Vantec "Keykoder" system, expanding the number of available channels to 18. Francis has some good things to say about Vantec in this month's column.

Besides great improvement in reliability, servos have gradually gotten smaller and lighter over the years. We still have some large extra-powerful ones, but the size and weight of the "standard" servo is pretty reasonable.

There are also the mini and micro servos. Some years ago I bought a Cannon Super-Micro radio for use in some very small planes I was experimenting with. After I went back to .40 and .60-size planes, I figured, why carry the weight of a standard servo for throttle control when it is such a light load? I haven't used anything but micro servos on throttle for the last eight years.

Recently I have become even more interested in reducing the weight of my RC models to the minimum, and I've been using micro servos on other controls also. For instance, on one of my .60-powered ships I'm using micro servos on the throttle, flaps and one on each aileron, and standard servos on the rudder and the elevator. It has 135 flights on it and I've never had a problem with the micro servos. Later, on three very light ships (one .60 powered and two with .40s) I have used micro servos on all channels—still no servo failures.

If we follow the herd, we are inclined to feel that standard servos are required on standard-size RC models. My experience proves it ain't always so.

Calculating the theoretical flight loads on servos, or measuring the actual loads, would be very difficult and subject to all kinds of conditions and errors. As I see it, the most practical approach to arriving at the minimum safe servo size is by actually trying smaller ones, step by cautious step. So far I haven't regretted having taken any of those steps. The .60-powered model with five micro servos has 670 square inches and weighs 4.01 pounds. That weight would have been difficult to achieve with standard servos. This obviously is an unlimited-vertical airplane. The thrust was measured at 1.65 times the weight.

Not only have there been no servo failures, I can detect no difference in aerobatic performance (except the improvements due to lower weight). In crashes the micro servos will be more prone to strip gears, but replacement gears are readily available. The gears cost little, and are easy to replace.

USING TWO AILERON SERVOS

Substituting two Futaba S133 micro servos (one for each aileron) for one standard S148 will give you 37 percent more torque with 15 percent less weight. Both the S148 and the S133 are rated at 0.22 second/60 degrees, but considering that you will be

continued on page 80

Small . . .

. . . *but Potent!*

SIG

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Designed by:
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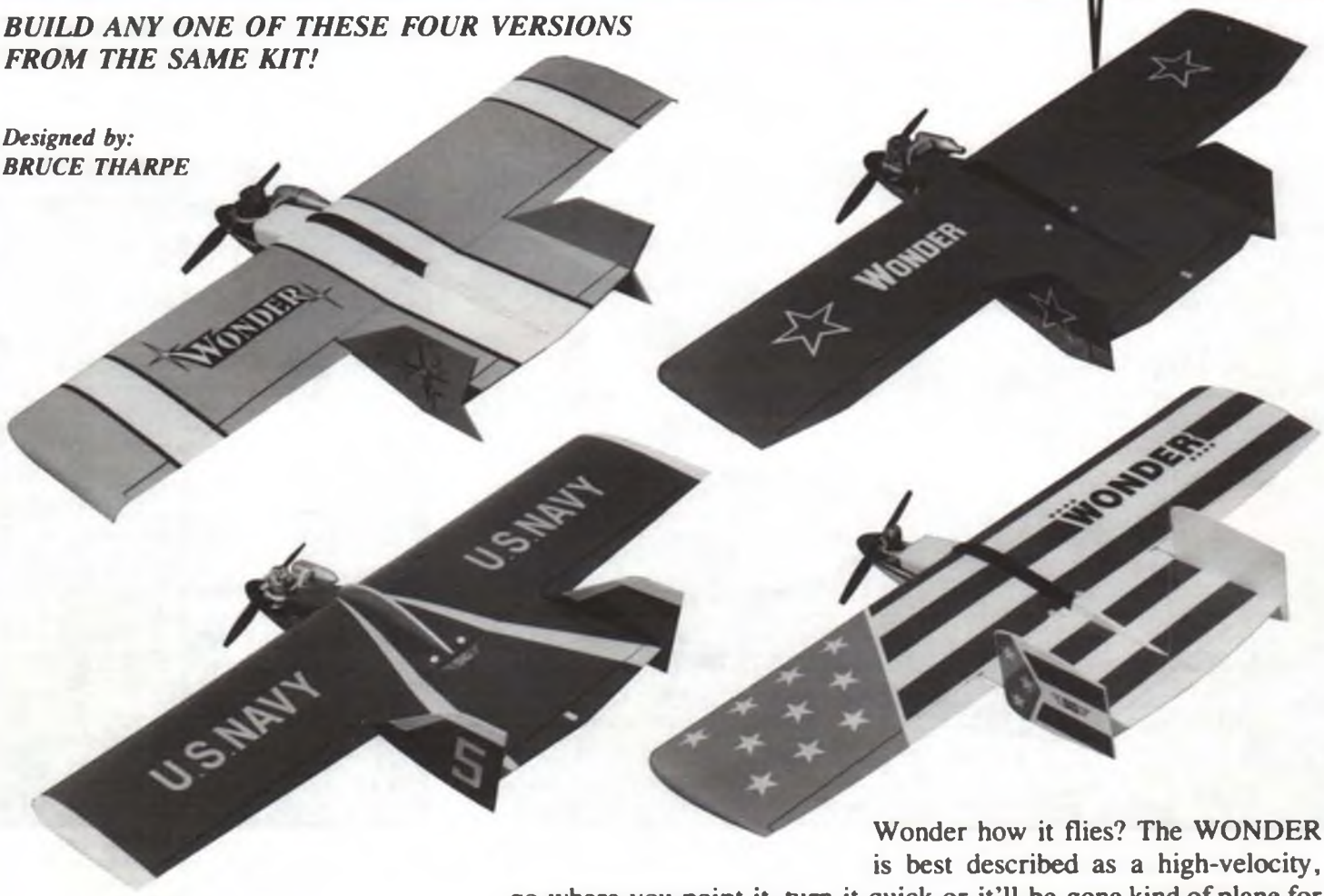

Wonder how it flies? The WONDER is best described as a high-velocity, go-where-you-point-it, turn-it-quick-or-it'll-be-gone kind of plane for hot-thumbed R/C pilots. Hand launches and landings are no sweat thanks to the WONDER's thick airfoil and light wing loading. C'mon and take a walk on the wild side of sport flying -

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REVIVAL! THE NORTH-SOUTH CHALLENGE

Bigger and better than ever, this major California contest returns after a 10-year absence.

June 19 and 20 of this year saw the overwhelmingly successful return of the classic annual soaring event known as the North-South Challenge. Begun in the early '70s as a friendly, fun way to determine "Yank" or "Reb" superiority within the very large and rapidly growing west coast soaring community, the Challenge was suspended a decade later for reasons that are unclear to this writer. Now another decade has passed, whatever problems may have existed are clearly filed under "bygone concerns," and once again, this popular rivalry is alive and well.

Credit for this remarkable resurrection must go to the Central Valley R/C club, the same group who yearly hosts the nation's premiere soaring event, the Fall Soaring Festival, at Visalia, California. Their seemingly tireless and always impressive efforts never fail to result in first-class fun for all who attend, and now the same goes for the North-South Challenge as well.

Total sign-ups for this old/new event came to about 110 pilots. Of these, 94 were on hand to record flights on at least one of the two days. Considering the newness of the event, the time of year (July) and the location (California's hot, arid southern San Joaquin Valley), this turnout is amazing and a credit to the CVRC's reputation.

Temperatures reaching at least 105 degrees on Saturday and the mid 90s on Sunday were not enough to discourage anyone from enjoying the meet or force anyone to leave the contest early. I will admit, however, that I quickly gave up my plan to camp out on the field Friday night when at 10 p.m. the bank thermometer in Tulare read 90 degrees! Gimme air conditioning and a motel room!

The North-South Challenge is a team-concept contest which pits the skills of pilots from the North against those from the South. Club affiliations are not important as there is no club team trophy given. There is only Team North and Team South.

The dividing line between the two teams is the 35th parallel (dubbed the Mason-Dixon Line by the more imaginative contestants). This line runs from Santa Maria, California to Kitty Hawk, North Carolina. In California, this means Santa Maria as well as Bakersfield are within Yankee territory!

According to the event rules, it is the top 12 fliers from each side who will determine who represents the North and the South. A

■ LEFT: Mark Triebes (5th place North, 12th place overall) flew this highly modified T-tail Thermal Eagle. Model features an RG-15 airfoil, triple-taper wing (*a la* F3B Eagle) of 108-inch span and approximately 900 square inches. Proportionately small stab was transplanted from a 2-meter Swift T-2000. All-up weight was a very light 55 ounces, but 6 ounces of ballast was needed to get it to perform at its best. ■ RIGHT: Mike Aguirre (11th South, 17th overall) did very well with his new Ben Clerx Mako. Mike says he likes the Mako better than all of his previously owned models. He claims better tracking in turns; better, slower landing approaches; and increased stability in turbulence. Mike estimates the weight at 75 ounces. Span is 114 inches, airfoil is the SD7037 (RG-15 is also available).

■ LEFT: Seen launching his RnR Products Genesis is event co-winner Steve Condon. Model is all molded, including the wings and stabs! Construction time is very short, as most of the hard work is done for you at the factory. ■ RIGHT: Sue Van Gundy guides her relatively rare 100-inch Duck up the line after a launch by Arthur Markiewicz.

simple aggregate score of each group determines the winning team. This year, six of the scheduled seven rounds of precision duration flying was all that could be squeezed into the 4 p.m. Saturday cutoff time for the beginning of any round. Sunday saw all four scheduled rounds flown, and the meet was over by lunchtime. This allows the majority of folks to travel home

Landings don't get any better than this! U.S. F3B Team member Randy Spencer (4th South, 4th overall) pilots his Greco Technologies Duration Modi into the center of the landing circle under the watchful eye of World Champ Joe Wurts. Randy added a bit more area to the rudder, so the plane is not quite box-stock. It made its first flight the Tuesday preceding the event.

Brad Clasen (11th North, 24th overall) absolutely loves his new Layne/Urwyler Saturn 2.9T. He says he likes everything about it—great launch height, thermals well, Quabeck 2.8/9-2.8/8 airfoils, won't tip stall, no bad habits. Quite an accolade from a very accomplished contest flier!

Al Doig (former *RCM* soaring columnist) and his original design "Slippery Hollow" V-tail. "The best flying sailplane I've ever owned. It is a gentle handling model that thermals beautifully." Ship weighs 85 ounces, SD7037 airfoil, 1026 squares, NASA sweep at tips, lots of carbon tow, C/F tailboom, V-tail mixing and electronic flap/elevator coupling.

before dark, a consideration which is well received!

This year a special North-South Challenge perpetual trophy was designed and made. Each year the names of the pilots on the winning team will be added (via engraved metal plaques) to the base of the trophy, and as needed, additional bases will be added, like layers on a cake, to

This fold-up shade canopy belonging to the George brothers of Visalia had an interesting superstructure which allowed above-ground (read: out of the way) storage of sailplanes.

The prototype DCU Windstorm thermal competition sailplane as flown by Jim Parsons. Model will soon be commercially available. Triple-taper wing is 116 inches long, molded hollow core with Rohacell/fiberglass sandwich skins, SD7037 airfoil, slotted flap linkages to prevent ballooning, and vacuum-bagged stabs.

Phil Halford of Pasadena, California grazed the tops of three 12 Kilovolt power lines which parallel the Visalia field on one side, and that's all it took for the C/F reinforced Levoe Design Super-V to go BOOM! The fireball and black cloud rising from the area that the plane struck was like something out of Hollywood. Two of the wires fell at the spot, and one of the two also snapped at two other locations down the line and took out at least one transformer! All servos sustained damage, with some even blowing out their cases. Plane and wires came down in water, extinguishing flames and causing much concern. Assistant CD Larry Taylor works for SC Edison and just happened to have a company walkie-talkie with him. He stopped Edison from sending a check current down the line which could have injured fliers and farmers.

accommodate all winners in the future. The top scoring pilot of the winning team is responsible for the care of the trophy for one year, and is responsible for its safe return to the following year's Challenge. In addition, individual team members receive trophy plaques which are theirs to keep.

As unlikely as it sounds, the top pilots of the winning Team South were Steve Condon and Joe Wurts, who tied with a score of 3331! The tie was allowed to stand, and the winners agreed to take turns caring for the perpetual trophy.

Flite Lite Composites and Airtronics Specialty Division donated a deluxe Thermal Eagle kit to be awarded to the winner of a flyoff between members of the winning team. Prior to launch, each pilot's score was reduced to an even zero to help keep things fair. Joe Wurts once again rose to the occasion and took top honors, not to mention a really nice prize!

The contest format consisted of Rounds 1 through 6 (Saturday): 3, 5, 8, 6, 4 and 3 minute precision duration. Sunday's flights were 2, 7, 7 and 3 minute PD. Landing bonuses were scored within 1.5 and 3 meter concentric circles, with the inner circle being worth a 20 percent bonus (based on target time, not personal) and the outer circle worth 10 percent. If you landed south (the safe side) of a foul line, you got a 5 percent bonus.

To keep the troops fed, morning and

continued on page 30

BY DAVE GARWOOD

Dynaflite's Coyote Slope Glider

The Coyote was ahead of its time when introduced on the eve of the U.S. Bicentennial. It's been on the market for nearly 20 years and remains a standard of comparison for slope soarers today.

The Coyote is a slope soaring hotrod. Other model aircraft can be called the Jaguar, the Ferrari, the BMW or even the Volkswagen of slope soaring, but if the Coyote were a car it would be a four-barrel '57 Chevy, a stroked and bored street rod. Some sailplanes fly faster, roll quicker and loop tighter, but few present as commanding a presence on the slope as the Dynaflite Coyote.

This glider is big, sleek, tough and agile. Designed for intermediate pilots, it's capable of all normal aileron and elevator aerobatics, yet is stable enough to give you a rest when you need one. First introduced in 1975, it is still available and still worth a look.

This review includes the building and flying experiences both of myself and longtime flying buddy, Bob Powers.

THE KIT

Dynaflite gives you a lot for your money. The kit contains a molded plastic fuselage, white foam wing cores, 1/64-inch plywood wing sheeting; machine-cut balsa tail surfaces, basic hardware including Mylar "quick install" type hinges, reduced size plans, and a 16-page instruction manual with one photo and 17 diagrams.

The plywood-over-foam construction makes a strong wing. The fuselage, molded of Duralene, a proprietary plastic material, is incredibly tough—so tough that it's guaranteed against breakage, including crash damage, for a year. . . a real benefit in the rough and tumble world of slope soaring. To complete the model the builder need supply only adhesives, covering, some small hardware and a radio.

CONSTRUCTION

Wing construction is typical for a foam core design. The wing builds quickly with the plywood sheeting because you don't have to make up wing skins from balsa

Dave's completed Coyote features a natural finish on the Duralene plastic fuselage, Goldberg Ultracote covering on the flying surfaces, trim color and canopy markings cut from Sig Super Trim, and wing and tail lettering from AMP Graphics.

sheets. The fin, rudder and elevator are precut 3/16-inch balsa, requiring only sanding and covering with heat-shrink film.

No wash-out is incorporated into the wing, in order to preserve inverted flight stability. Remember that wash-out, when upright, becomes wash-*in* when inverted. Tip stalls are prevented by transitioning to a higher lift airfoil at the tip.

Fuselage preparation is amazingly simple; just carve or grind off the mold seam line, install and tap threads into the plywood wing hold-down plate, install the elevator servo rails, glue on the tailplane assembly, and you're done. We left the fuselage in its stock shiny white finish, but instructions are given for painting for those who want another color.

Control linkage construction is also simple—wire pushrods for the ailerons and a dowel pushrod for the elevator. Precise carving is needed to shape the aileron servo mounts to fit inside the canopy area. We found that DAP Wilhold RC-56 glue works better than epoxy for mounting the servo rails, fin and stab to the Duralene fuselage.

I substituted Du-Bro 181 ball links for nylon clevises at the elevator control horns to accommodate the twisting action produced by the swept elevator hinge line. I also added an antenna tube, but otherwise the kit was built using the materials supplied.

DYNAFLITE COYOTE

WINGSPAN	72 in.
WING AREA	639 sq. in.
FLYING WEIGHT	52 oz. (as built).
WING LOADING	11.7 oz./sq. ft.
OVERALL LENGTH	39 in.
RADIO	Two channels (ailerons and elevator).
AIRFOIL	Modified NACA 2412 (semi-symmetrical).
SUGGESTED RETAIL	$139.95.

Manufactured by Dynaflite, P.O. Box 1001, San Marcos, CA 92079; (602) 885-6900.

COVERING

I've been extremely pleased with the performance of Goldberg Ultracote for covering the wing and the tail surfaces on my models. Ultracote handles great going on and is unusually rugged in service. Canopy and wing markings were made from Sig Super Trim, and the lettering was custom made by my friend Clyde Geist at AMP Graphics (516-363-5205).

RADIO INSTALLATION

The Airtronics receiver and 500-mAH battery pack wrapped in foam slid easily into the nose, along with 4-1/2 ounces of clay to balance the model as shown on the plans. I mounted a standard Airtronics 94102 servo in the wing for ailerons and a mini 94831 for elevator. Standard size servos will fit both places, but just barely.

This review includes the performance assessment of two Coyotes, built by Bob Powers (left) and the author.

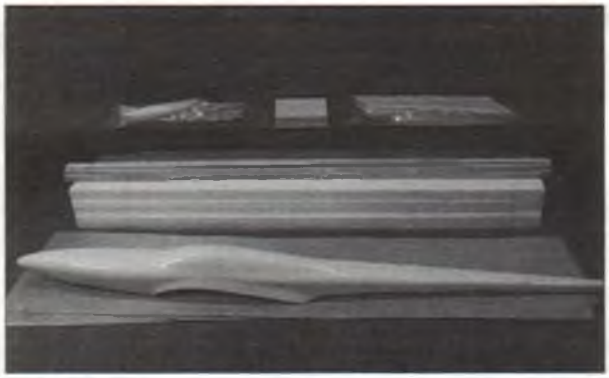
Bob Powers guides his Coyote through a fast turn on the cliff in front of the Seascape Motor Inn on Cape Cod.

FLYING THE COYOTE

Bob and I have both been flying our Coyotes for more than two years. We're happy with the planes and can confidently make the following observations.

The Coyote was made to fly fast. At cruising speed it's exceptionally smooth, yet responsive to control inputs. It is quite stable in level flight and gentle turns. Fast pylon racer type "stand-on-a-wingtip" turns are as snappy as you could want in a sport airplane. As an indication of its inherent level flight stability, the Coyote will fly hands-off for four or five seconds at a time.

The Coyote can be slowed somewhat, but the handling is not as crisp and precise as when it's going fast. Slowing down too



The kit's centerpiece is the unbreakable Duralene fuselage, shown here on the 1/64 inch plywood wing skins. Also included are white foam wing cores, all necessary balsa wing stock, pre-cut fin, stab and elevators, a bag of hardware, and the wing fairing block.

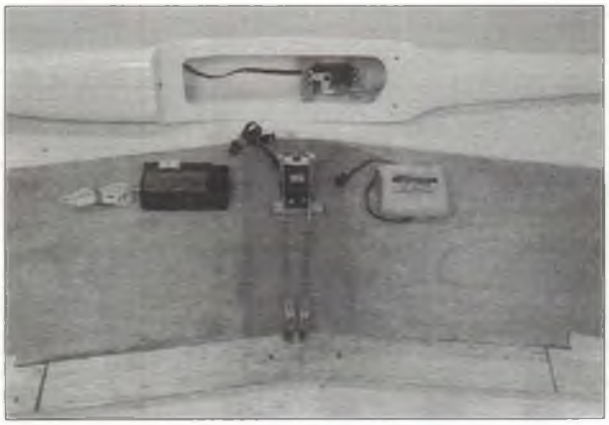
much will cause the model to wallow a bit. Stalls are gentle and straight, and recovery is easy. Tip stalls are not a problem. I don't recall ever stalling a wingtip in any turn at any speed.

The Coyote delivers excellent aerobatic performance within the limits of an aileron/elevator design. Inverted flight is competent and uneventful, but requires considerable forward stick. The roll rate is moderate—about one roll per second. (Bob enlarged his ailerons after a year of flying his Coyote.) Large or small inside loops are easy, requiring little or no roll control input.

Our favorite Coyote maneuver is a stall turn, performed by making a low fast pass, pulling up into a stall and letting the nose fall over away from the slope. The fin is big enough to weathervane easily, and the wind yaws the model. The Coyote falls over sideways into a nose-down attitude and begins to gain speed for another fast low pass. Exhilarating and beautiful!

This is one well-behaved and rugged airplane. I've made some terrible landings with it and the only damage suffered was a wing leading edge nicked by a branch and two nylon wing mounting bolts sheared during hard landings. The Duralene fuselage is the toughest I've ever seen—bar none—and the plywood sheeted wing is extremely resistant against landing and handling damage. I'm happy flying my Coyote at 52 ounces with 1/2-inch up and 3/8-inch down aileron throw and 5/8-inch each way on the elevator, although I know other fliers who prefer flying the Coyote 6 ounces heavier and with twice this control surface deflection.

The Coyote kit provides good value for the cost and returns hairy-chested yet smooth flying performance. Every slope flier should have a chance to fly one. ***MB***



Dave's model uses a standard size aileron servo in the wing and a mini elevator servo in the fuselage. The 500-mAH battery pack and standard size receiver are wrapped in foam and slid into the nose. Note that the aileron control horns are offset to the left and the elevator servo arm points to the right in order to clear each other.

ELECTRONICS CORNER

BY ELOY MAREZ

•Automatic Shutoff Circuits •Build Your Own "Intermittent Detector" •Product News

Although I like to think of EC primarily as a place for those with more than a passing interest in the electronics side of the RC hobby, I also like to think that sooner or later something will be included for everybody. This month is no exception. Our first item is for the. . .

...ABSENT-MINDED!

This is really the result of a conversation with a friend during which we compared the high usage of 9-volt transistor batteries in our tachometers. It seems we both are constantly forgetting to turn the darn things off!

It seemed there must be a simple solution, as there are countless electronic devices (calculators, for example) which turn themselves off after a precalculated period if there is no action taking place. As it turns out, there is more than one way to skin this particular cat! There is the ever-useful 555 timer IC with a relay in the output, and there are SCR circuits that will do the job, but I finally settled on the circuit shown for two important reasons. The first is obvious—it is about as simple as you can get. The second is that the device in use, the MOSFET, has an extremely low resistance and will have the least effect on voltage to the circuit being controlled.

The circuit shown is built around an "N" channel 60-volt, 3-ampere, 0.6-ohm device known as an IRF-510. It is overkill in this application, but was chosen because it will work reliably with the low voltage being applied, is available from Radio Shack and is priced at under $2.00. It can be installed in place of the original switch or can even be placed in parallel with it, so that timed and normal operation can be chosen. To activate, press the pushbutton momentarily; this charges the capacitor and turns the MOSFET on. In time, the capacitor will become discharged, turning off the MOSFET and whatever is connected in series with it.

The time needed for the capacitor to discharge is determined by its capacitance and by the voltage applied. The .22 uF shown, with the circuit being operated by a 9-volt battery, will give a delay of about a minute. A capacitor value of 1.0 uF at the same voltage will give you about an hour's playing time. Anything in between is up to you; don't be afraid to experiment a bit to come up with the time period most useful to you.

HONEY, I'VE SHRUNK THE RECEIVER!

Horizon Hobby Distributors, importers of JR radio systems, recently introduced their new "Credit Card" receivers. They are available in PCM and FM versions, measure .55x2.06x 1.43 inches and weigh 1 ounce. Small, huh?

I haven't seen these receivers, so I can't speak with any authority as to their construction or operation. However, I've had the opportunity to check out a couple of new JR servos lately, and if these receivers are in the same class, they are indeed worthy of your serious consideration. After you have flown them, please write in and let us know how they are working for you!

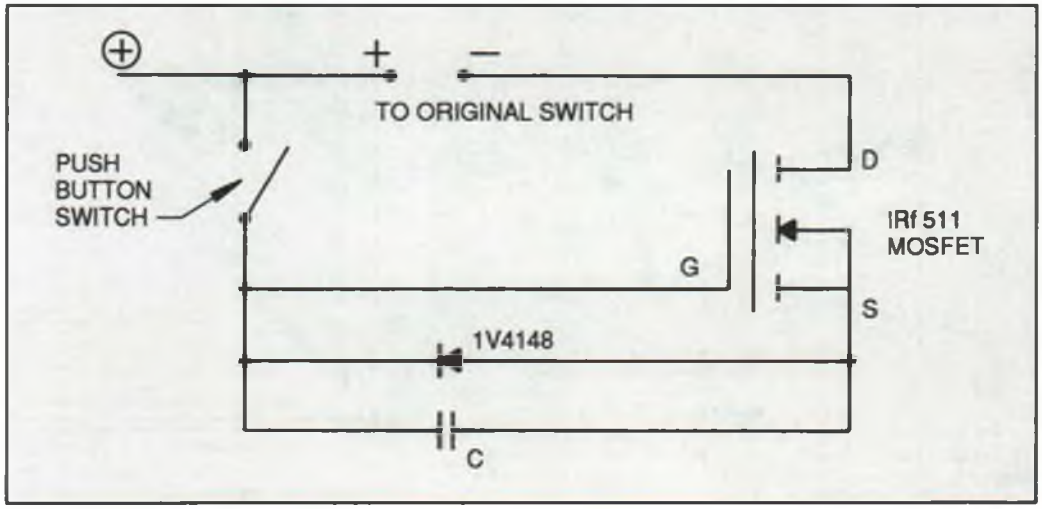
MORE ELECTRONIC GOODIES

From Bob Holman Plans? That's right! Bob has run across some interesting and worthwhile items made in England by a company known as Ibis Designs, and is making them available to American RCers.

First is a series of light systems, specifically designed as anti-collision, navigation, or helicopter lights. They all include four high-visibility bulbs and are arranged in pairs for left and right indicators. Sequential flashing—left, right, right—aids the flier to determine the model's orientation.

Another device is an "Electronic Servo," a MOSFET switching device that can be used to activate anything elec-

A very useful test instrument, this intermittent detector will provide an LED indication of an open condition in any wiring, switch or plug. It can make fast work of the otherwise frustrating job of trying to pinpoint a troublesome—and even dangerous—connection.



trical (spark ignition, lights, etc.) in the model via a normal control channel without any servo-actuated microswitches. It is rated for 2 amperes steady and 30 amperes momentary switching—enough for almost all normal devices including low-current electric motors.

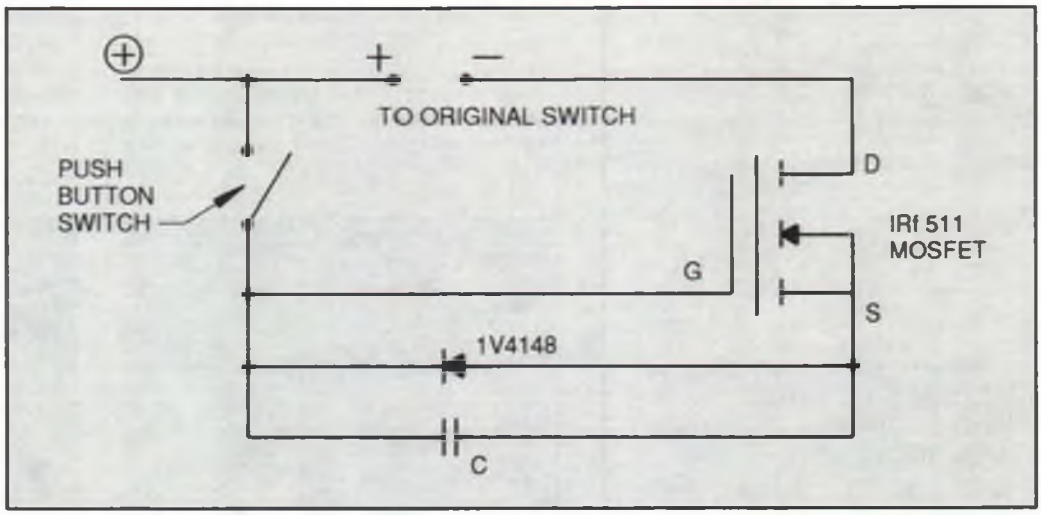
Apparently an adaptation of the Electronic Servo, there is a "Glowdriver," specifically tailored to power the glow plug in flight at low throttle.

There is also a "Machine Gun Simulator," which flashes high-intensity lights to simulate rapid machine gun fire. I remember my much-missed friend Harry Apoian once having a WWI model with audio-simulated machine guns—this would have been a realistic addition had it been available in those days.

And last, but certainly not least, there is the "Active Y-Lead," used to connect two servos to a single receiver channel. These are useful devices to prevent interaction from one servo to another in dual-aileron, dual-elevator, etc. installations. It will also help in certain situations, using the channel singly, when add-on devices are connected to the receiver output. A case in point is the older Futaba PCM receivers, on which the output signal is marginally low. Using non-Futaba accessories will sometimes load the signal down to a level too low for consistent control, requiring the use of a buffer amplifier of some sort.

The Ibis Y-Lead is the most effective one that I have seen. Most receivers have a control signal amplitude close to that of the system battery; at least over 4 volts. The Futaba receiver mentioned has around 3.5. The Ibis device, with an input signal at only 2.9 volts being applied, will develop an output of 4.7 volts. I found that this level did not drop significantly with the addition of any servo, switcher, etc. that I happened to have on hand. It is also a valuable addition in those large airplanes with wing-mounted servos and long extension wires. Bear in mind, however, that while it will compensate for a reduction in control signal strength, it will not do so for any wire loss in the battery voltage to the servos.

Prices? Light systems $60; Electronic Servo $20; Machine Gun Simulator $20; Glowdriver $26; and Active Y-Lead $20. Shipping is $1.50—and do I need to remind you Californians about the exorbitant tax? Write to Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (909) 885-3959, FAX (909) 889-9307.



What do you call it? a turner-offer? A battery saver? Whatever, this is the type of circuit found in calculators and other electronic items that turn the unit off after a predetermined period of time. Applications to modeling include tachometers, glow plug drivers, etc.

THOSE #@!!*# INTERMITTENTS

Intermittents are high on my list of things to hate—I much prefer to work on a completely dead electronic device. I want to share with you a simple circuit I use to trace those insidious on-again off-again temporary opens caused by poor solder connections, broken wire, dirty switch or connection contacts, etc. Just as simple to use as it is to assemble, this device lets you know an intermittent open exists, and also confirms when you have corrected the problem.

Things they are a-shrinking! Seen here is one of the new JR "Credit Card" receivers. Considerably smaller than previous JR receivers, which are comparable in size and weight to many other available brands, these little nine-channel marvels are available in PCM and FM versions.

It uses an SCR (Silicon Control Rectifier), a switching device that can be triggered from an on to an off state by even the shortest possible opening of whatever is connected across the test terminals. The LED will be lighted to indicate a normal solid connection and will go out when it is broken. Restoring the connection in whatever is being tested will not relight the LED; this can only be done by pushing the test switch.

Let's assume you suspect your switch harness. You would connect one wire at a time across the input, then operate the switch and/or wiggle the wires. If everything is operating well, the LED will stay on. If there is the slightest open break anywhere along the way, the LED will go out and not come back on even though contact in the switch or wire has been restored. Neat, huh? Once you have made a permanent fix, the LED will always stay on solidly—though in this case, if any doubt exists, a new switch harness, which is always cheaper than a new airplane, is definitely recommended.

Next month? Drop in and find out. Eloy Marez, 2626 W. Northwood, Santa Ana, CA 92704. ***MB***

RC SOARING *continued from page 23*

afternoon lunch wagons plus a Saturday night, on-the-field catered barbeque of chicken and beef were provided. This was some of the best food I've ever had at Visalia, and it was appreciated.

On the down side, besides being hot, the weather featured a southerly wind which created a downwind launch and landing condition—much to the dismay of those whose planes were either overweight or set up with a towhook too far forward. It was the same weather for all, however, so at least it was fair. . . just a bit unfortunate.

At this point, I'm going to turn over the column to the photographs. I hope the old "a picture's worth a thousand words" cliche will provide ample entertainment and educational value for you!

I welcome communication with all readers who wish it, but due to a heavy work schedule, I am only able to field phone calls (909-245-1702) from 7 p.m. to 9:30 p.m. California time weekdays or pot luck on weekends. ***MB***

Arthur Markiewicz just missed being on Team South (13th South, 22nd overall) with his RnR Synergy III. His impressions: "A great plane. Kinda heavy for precision landings, but such a fun plane to fly that I don't mind. I get my duration times most of the time." Arthur has a Genesis on order from RnR.

CVRC member Dell Henry is very impressed by the performance of his beautiful Airtronics Whisper. "It's a beautiful flying plane. It stays up with the big boys just fine." It weighs 46 ounces and was built stock.

The winning Team South! Top 12 "Rebs" are (front row, from left): 11th, Mike Aguirre; 7th, B.J. Wiseman; 9th, Keith Finkenbiner; tie-1st, Steve Condon; tie-1st, Joe Wurts. Top row, from left: 10th, Joe Rodriguez; 4th, Randy Spencer; 5th, Mike Reagan; 12th, Don McNamee; 6th, Tim Renaud; and 8th, Todd Billman.

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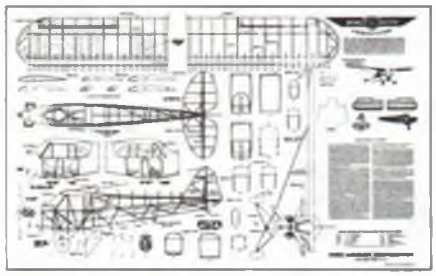

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FREE FLIGHT

BY BOB STALICK

What Constitutes An 'Original Design'?

If you look at the "original designs" you see being flown at contests, you will notice that very little is really original. So the wingtip shape is different or the tail moment is longer than you are used to—does this make it original? The answer is "no." Very little is new in this free flight world.

But each of us is determined to do our bit as a contribution to furthering the sport of free flight. We build a model that is just a bit different from what we usually see. We use different materials, different color schemes and different powerplants. It is our attempt to stand apart from the crowd. Such is the case with this month's featured model. It began life as a Mini-Pearl—a fast climbing, easy building, simple model that is competitive in its original form. How do we improve such a design? Read on.

Free Flight columnist Bob Stalick gets a good launch on his 1/2A Dixie-Pearl at the Willamette Modelers Club Fall Annual. Model is featured as this month's mini-plan. Photo by Chuck O'Donnell.

THE DIXIE-PEARL BY BOB STALICK

Recently, I was searching for a model that would be competitive on the 1/2A scene here in the Northwest. Since we fly Category II events almost exclusively and our wind conditions are typically mild, the model did not have to be large by contemporary standards.

I happened to be at a contest at Harts Lake Prairie in Washington last year, when I noticed a fast-climbing 1/2A ship being flown by Mark Sexton. It was a Mini-Pearl, a model that I recalled from the Chicago Nats years ago. Designer Bill Chennault and his buddies from Texas were flying up a storm with these little ships. Mark's Mini-Pearl reminded me of those ships. His climbed like a homesick angel and got plenty of altitude in the 9 second engine run. It transitioned nicely but glided down in less than 3 minutes. I thought that anything that got that high should take longer to glide down, even in neutral air.

After I returned home, I decided that I would build a Mini-Pearl, but I would make a couple of changes to the design. The objective was to keep the same fast climb, but to improve the glide. To do so, I reasoned, an undercambered wing section would help with the glide, and decreasing the weight would help both the climb and the glide.

I ordered a set of Mini-Pearl plans from NFFS Plans Service (10115 Newbold Dr., St. Louis, MO 63137; $5 for NFFS members). For a better glide, I changed the airfoil to an NACA

Nostalgia Minipower! Steve Welch shows off his 100 square inch RamRod, equipped with one of the early Tee Dee .010 engines. Steve hails from the Seattle area.

6409. To decrease weight and increase strength, I changed the wing and stab spar structure to that used on George Fuller's fabulous free flight, the Dixielander (hence the name of my model). The wing and stab were covered with Japanese tissue and five coats of nitrate dope. Aerogloss Hot Fuel Proofer was applied after the dope had cured.

The fuselage is built flat on the board, with the top and bottom longerons, diagonals, uprights and pylon being added to the right fuselage side. Before adding the left side of the fuselage, the engine mount needs to be installed. It is made from birch plywood in a rough "H" shape to the dimensions called out on the plan.

After the engine mount is glued in place, the left fuselage side can be glued in place. The next step is to glue a piece of 1/16 plywood on the right side of the 1/8 plywood mount; this centers the engine thrustline through the middle of the pylon. The fuselage can now be completed and sanded smooth, doped and prepared for the tissue covering.

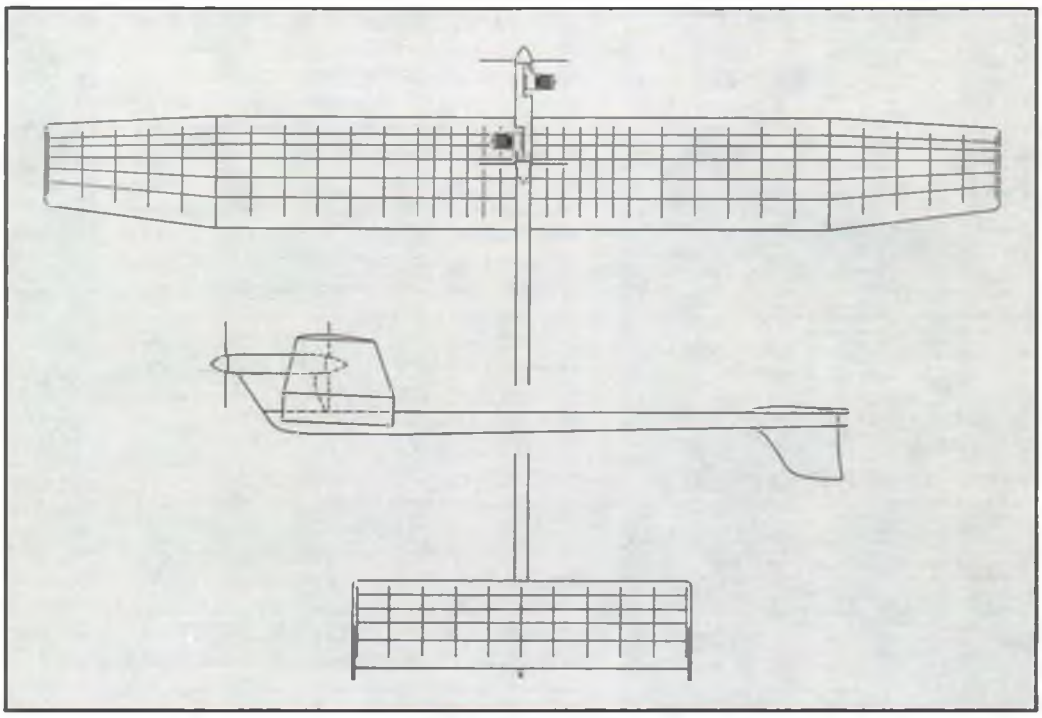
With the model completely assembled, check the balance point; reposition the engine on the mount as needed. When the CG is located correctly, drill holes through the plywood, install blind nuts and fasten the engine in place.

If you selected your wood carefully, the model should weigh in at 6 ounces or less ready to fly. Check to see that the wash-in on the right panel is approximately 3/32-inch and that both tips have equal washout. The model should glide with a very slight nose-up attitude and have a slight right turn. If it doesn't turn to the right, shim up the right side of the stab until it does. Shim up the stab leading or trailing edge until you get a slight nose-up glide. I use 1/64 plywood for shims.

Trim the model for a straight ahead or slight right turn under power. Use thrust adjustment to affect the early part of the climb and rudder trim tab to affect the latter part. The model should make no more than one turn in the climb in the 9-second engine run allowed in AMA Cat. II events. If you fly this model in F1J (and it is a very competitive performer in this event), you will need to adjust it to climb no more than one turn in a 7-second engine run.

My Dixie-Pearl was built in one week. I trimmed it out in four or five flights at the Willamette Modelers Club Fall Annual in 1992. I flew it in both the 1/2A and F1J events. I placed 2nd in F1J with five maxes and 88 seconds in the flyoff, and 3rd in a field of six in 1/2A gas at the same meet. The engine used is a KK Tee Dee .049 which was being broken in at the meet. I started flying with Sig 25 percent fuel and ended up using Magnum 50 percent. I used an APC 5.7x3 prop for all flights.

This model has the same fast power pattern as the original Pearl and the glide is dramatically better. I like this ship immensely, and I think you will as well.



MYSTERY MODEL

NOVEMBER MYSTERY MODEL

Back in the good old days, the designer of this unusual model was a strong FF competitor, as was his wife. Both of them submitted a number of construction articles to the magazines. The model presented here is a high-thrustline design intended to be flown with either one or two .15s or one .35. It was presented in both 500 and 800 square inch sizes.

If you think you know the name of the ship, all you need to do is write it down on a card or letter and send it off to *Model Builder*. The lucky person whose name is drawn from among the correct entries wins a free one-year subscription. Wotta deal! Do it now.

AUGUST MYSTERY MODEL WINNER

None of the 18 readers we heard from had trouble identifying Frank Garcher's 1/2A "Fortastrop," published in the April 1957 *Flying Models* and kitted by Midwest Products Co., of which Frank is the owner and president. Of those 18, quite a few mentioned that they have original kits in their collections and/or are currently flying Fortastrops in Nostalgia competition. Winner of the free *MB* subscription is Ed Turner of Fort Worth, Texas.

In his write-up, Bob Stalick mentioned that the "fortastrop" moniker apparently didn't mean anything, so we called Frank Garcher at Midwest to find out. Turns out that in the early 1950s, when he was in the Army and working at the White Sands Proving Grounds in New Mexico, he and another fellow by the name of Paul Marincola both belonged to the base's model club. Paul liked to use the term "fortastrop" to describe a tool or some such thing when he didn't know its proper name; they'd be at their workbenches and Paul would say, "Hand me that fortastrop." Frank was so tickled by the term that he used it to christen his latest FF ship, and of course the rest is history.

NOSTALGIA ENGINES

This article is excerpted from the Florida Modelers Associa-

Chuck Gode, also known as "Lucky Chucky," scaled down Sal Taibi's Spacer for the .010 Minipower event. Chuck is a Spacer fanatic and has built them in every size imaginable, ranging from 100 to over 800 square inches.

tion newsletter and was written by Donald Hockaday and Dave Linstrum.

"Nostalgia is a power loading event. The rules specify 100 ounces per cubic inch of engine, i.e., 15 ounces for a .15 powered model, etc. Nostalgia engines must be plain bearing with the basic design preceding January 1, 1957, although there are certain exceptions to this rule. Actual lists of eligible engines are available from Bob Larsh.

"I spent a lot of time and money buying old engines and put in a lot of bench and tach time. After running literally hundreds of tests, I feel I can comment on the following marques:

"K&B Greenheads: This ambitious series was the '50s leader and you can do a lot worse than staying with them. I particularly like the .19 and the .23, which will run 15,000+. If you can find a .35C, it is also excellent.

"Fox: Duke Fox designed the famous .29-.35 stunt engine in the early '50s and it is still in production. Unfortunately, the stunt engine, though light in weight, is not powerful enough for competition free flight use. The .29X and the .35 Combat Special are excellent. To be legal, these must have plain bearings and rounded venturis. The Fox .15X is a lightweight sleeper and a super engine.

"Veco: A favorite of many is the Series 100. The .29R and .35C are particularly desirable. My .19 will turn a 9x4 at 12,500 and an 8x4 about the same. These engines take a lot of break-in time.

"Johnson: The three-bolt case and four-bolt head models are not too good, but the .35CS and .19R are hard to beat. A good

Along with his August Mystery Model entry, Brian Malin of Florida sent this photo of his young daughter holding his 1/2A "Fortastrop," built from a set of original kit plans. Brian says he built his first Fortastrop in the late 1950s, and although his current model has yet to win in Nostalgia competition, they've been having a lot of fun with it.

.35CS will turn 16,500 on a 9x4 prop.

"O.S. Max III: This engine earned the Japanese their first #1 rating in FAI FF. It's available in .15, .19, .29 and .35 sizes. The performance is top of the line in each size. All in all, I think the Max is my best Nostalgia engine.

"McCoy: The red or blue head models are typically stunt engines. Some will surprise you. I have a .29 that will run 14,000 on a 9x4. They are cheap and easy to find.

"Holland Hornet: The best 1/2A engine you can get. The Mark II will turn Tee Dee numbers—20,000 with a 5.5x3 Cox gray prop and 50 percent nitro. If you can't find a Hornet, the next best bet is a Cox Black Widow. I have seen these turn over 17,000 with a 6x3 prop.

"Other Notes:

"1. Many of these engines' needle valves do not like pacifier tanks. The threads are not fine enough and the needle does not stop leaking. You can replace them with a Kustom Kraftsmanship universal needle valve.

"2. Take carburetor restrictors out of the venturi.

"3. Most engines will tolerate 25 percent nitro. If you go any higher, you may want to add a shim under the head.

"4. Do not fiddle with the piston/cylinder fit or timing unless you really know what you are doing. If you find a new engine, plan on at least an hour of run time before you have it broken in.

"5. Use lots of castor oil (20% or more) in these old guys and do not run them lean unless you have lots of spare liners and pistons.

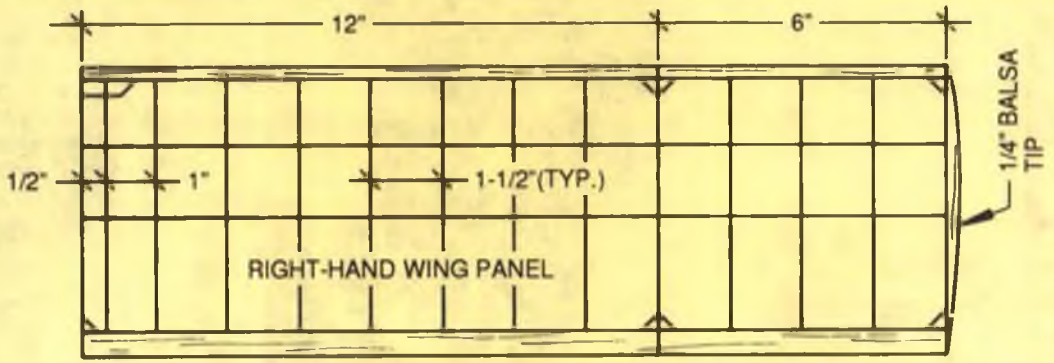
"6. Buy a good analog tach and use it. Remember, 1,000 rpm is a lot!" ***MB***

BOB STALICK'S

"DIXIE-PEARL"

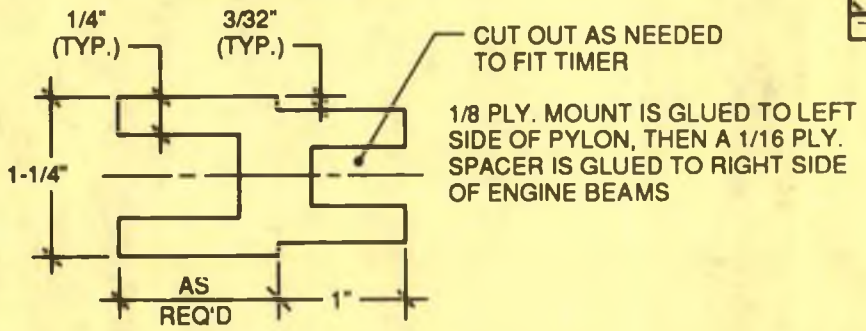
FOR 1/2A OR F1J COMPETITION

TRIM: 3/32" WASH-IN RIGHT INBOARD PANEL; 3/32" WASH-OUT BOTH TIPS. RIGHT-RIGHT FLIGHT PATTERN.

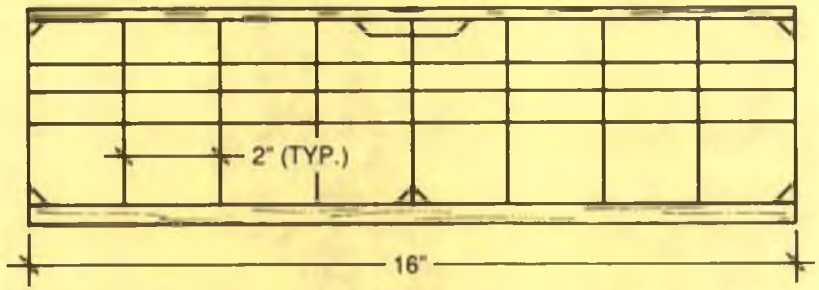


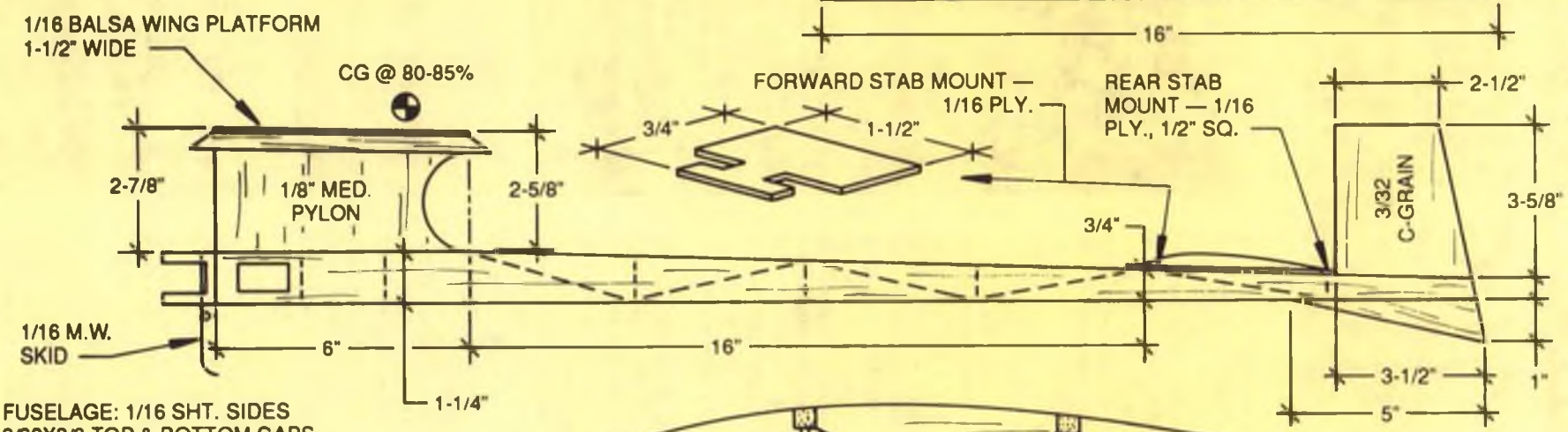
DIHEDRAL: 2" EACH TIP WITH INBOARD PANELS FLAT ON BOARD; 1" AT EACH POLYHEDRAL BREAK

ENGINE MOUNT DETAIL

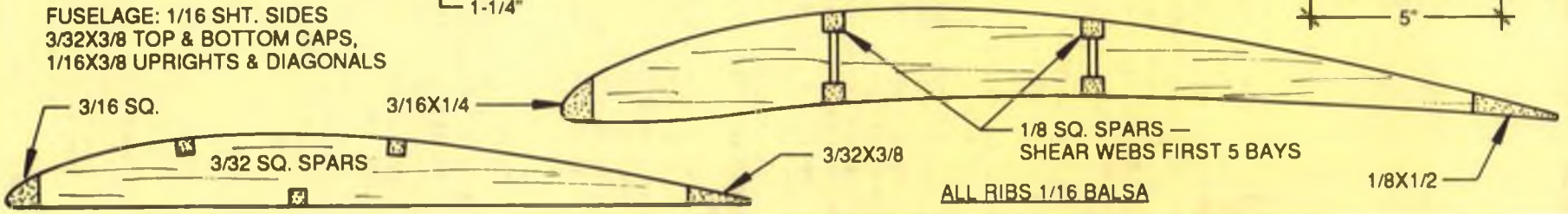


1/8 PLY. MOUNT IS GLUED TO LEFT SIDE OF PYLON, THEN A 1/16 PLY. SPACER IS GLUED TO RIGHT SIDE OF ENGINE BEAMS





FUSELAGE: 1/16 SHT. SIDES 3/32X3/8 TOP & BOTTOM CAPS, 1/16X3/8 UPRIGHTS & DIAGONALS



ALL RIBS 1/16 BALSA

THE NORTHWEST SUMMER FLY-INS

In June, my wife Eileen and I journeyed to Chewalah, Washington to attend the Second Annual Giants of Summer I.M.A.A. Fly-In, sponsored by the Bald Eagles of Eastern Washington.

The Bald Eagles are I.M.A.A. Chapter 399. They have two fly-ins each year at the sod farm at Quartzite Mountain Sod and Nursery Stock, Inc.—a beautiful flat grass field that looks like a million acres. I flew my Spacewalker II through so many touch-and-go's that the grass was starting to wear the paint off the bottom of the wheel pants!

I am having a great time flying the Spacewalker II. It is proving to be a very agile performer and I am close to perfecting the "Lomcevak" tumble maneuver. Roll rate is slower than that of a hot sport plane but very good for a scale model with generous dihedral. I have a lot of differential in the ailerons—three times more up than down—and I sealed the aileron gap. Good, straight consecutive rolls take work and coordination that only practice will perfect.

Even at its maximum recommended weight, the Spacewalker II is still rather lightly loaded and has to be flown onto the runway. My first few attempts at landing saw the plane floating past me a few feet off the ground for what seemed like forever, but I soon got the hang of it. After flying the model at three fly-ins I am still using the same Graupner 15x8 composite propeller, and there's not a mark on it.

Until the Spacewalker, I never had a plane that used wheel pants. Most fliers are usually left with some scarred-up pieces of glass or plastic after a few landing attempts, but Sig's wheel pant mount is a very good one and remains unscathed despite many landings.

My good friend Chuck Willcox also attended with his new Lanier Stinger. Chuck had an S.T. 3000 for power, equipped with a C.H. spark ignition setup and a Walbro gas carb. I was glad to see Chuck get in some flying time because he had spent the entire previous week getting the Stinger

■ **ABOVE RIGHT: Carl Jade flew his Quadra-powered Great Lakes Special through some impressive aerobatics at Chewalah. *Model Builder* has plans for a couple of different 1/4-scale Great Lakes models.**
■ **RIGHT: Dick Carson, proprietor of Anything R/C, a hobby shop up in Spokane, flew his Senior Telemaster at the Bald Eagles fly-in at Chewalah, Washington. The 96-inch wingspan plane is powered by an O.S. .91 and also flies great with floats.**

into flying shape.

The Bald Eagles' fly-in was not a big one. It attracted 35 planes and 25 pilots, however, the fun factor was 100 percent! Even Contest Director Dan Rood was able to relax and enjoy the flying. I hope to fly with the Bald Eagles again in the future, as they are a good group and good company. It's just too bad they're based 400 miles away from my home!

For representing Big Bird flying and participation at its best, Carl Jude received a *Model Builder* T-shirt and chose a set of Lynn Lockrow's Monocoupe plans from the plan collection. Carl flew a Quadra 50 powered Great Lakes Special through some very nice aerobatics. Carl also flew a 1/3-scale, 30-pound Bob Nelitz designed J-3 Cub, powered by a Quadra 35.

The following Saturday, June 19, Chuck Willcox and I went to Snohomish, Washington to fly with the Snohomish RC club. It was the SNOR/C's first Big Bird fly-in.

My Spacewalker II gave me another day of excellent flying, handling the gusty conditions very well. Eileen could tell I had a good time with the SNOR/Cs; she said I didn't quit smiling for a week!

Dave Grip received a *Model Builder* T-shirt and chose a set of plans for a Dalotel from the plan collection. Dave flew a Nick Ziroli P-40 and a scratch-built 1/4-scale Spacewalker.

Contest Director Greg Roth did a fine job of keeping the flying going smoothly. About 40 planes and 35 pilots were present. The SNOR/C field is an 800x75-foot field on the edge of a farm—a great place to fly!

The following weekend, Eileen and I drove to Vancouver, British Columbia two days before the Radio Control Flying Club of British Columbia's fly-in. If you ever have the opportunity to visit Vancouver, plan on visiting Queen Elizabeth Park and the Van Dusen Botanical Gardens for some spectacular flower viewing. We sniffed the roses and had a real English afternoon tea at Van Dusen Garden's restaurant. Gentlemen, the ladies can put up with a lot of balsa dust when treated to such pleasures frequently.

At the R.C.F.C.B.C's Fry's Corner flying site, 71 planes turned out to face very strong winds whistling through the Fraser Valley that runs along the Canada/U.S. border. I only flew the Spacewalker II once that day.

Len Bosman and Contest Director Ron Leavitt each received a *Model Builder* T-shirt for their Big Bird flying and participation. Len chose a set of "Hog and a Half" plans and Ron chose a Nick Ziroli Zero from the plan collection.

For the last several years, the Society of Automotive Engineers has sponsored an RC model aircraft weightlifting contest at Wichita, Kansas. The 1993 winning team was from the University of British Columbia, and they were present at the fly-in. Their plane is called the "U.B.C. Heavy Lift." It spans 98 inches, weighs 6.5 pounds and, according to the contest rules, uses a K&B .61 running on Omega 10 percent

Emil Neely's 8-foot Fairchild 22 has an excellent finish and flies well on an O.S. 1.20 four-stroke. Emil heads up Ikon N'west, which produces the kit.

Carl Martin modified his Lanier Stinger by adding wingtips and his own turtledeck and wing cover. A superb aerobatic hotdogger with a Quadra 50 supplying the pull.

From left, Kevin Wilder, Joeleff Fitzsimmons and Rob Prior are part of the team that brought the 1993 Society of Automotive Engineers' RC Model Weightlifting 1st place trophy home to Canada. The University of British Columbia students lifted 21.65 pounds with their entry, dubbed "U.B.C. Heavy Lift." More in text.

nitro fuel. The plane lifted 21.65 pounds at Wichita.

• • •

July arrived and there was a break in the fly-ins for a while, which suited me fine because I needed to finish the Lanier Stinger review I've been working on. I took five days off over the July Fourth weekend and hoped to finish the airplane, but I ran into a few technical difficulties, not the least of which was hooking up the throttle mechanism on the Saito 300 twin. The single carburetor version of this engine has the throttle lever at the center of the engine—an awkward location, unless you like running the throttle cable through the center of your fuel tank.

Columnist Bruce Edwards solved a difficult throttle hookup on his Saito 300 twin with some common off-the-shelf hardware. See text for explanation.

I studied the problem and finally came up with a solution. First I drilled a clearance hole for the shaft in each motor mount half, in line with the center of the carburetor barrel. Then I soldered 7/8-inch long steel control arms to two 3/32-inch wheel collars, and assembled the parts such that one of the collar/arm pieces was located between the engine mounts and the other was outside, on the left-hand side. Other standard collars were used to limit side-to-side shaft play. They do not fit flat against the angled sides of the motor mount, but this does not seem to affect smooth operation.

The inner collar/arm was connected to the carburetor throttle lever with two 2-56 ball sockets and a short piece of 2-56 threaded stock. The throttle cable connects directly to the outside arm—well out of the way of the fuel tank. Neat, huh?

I would love to hear about your latest project or problem. I have been able to assist quite a few people over the past two years and to share some of your ideas with the rest of the Big Bird builders and fliers. Bruce Edwards, 8304 53rd St. Ct. W., Tacoma, WA 98467; (206) 564-4416. ***MB***

"Could All Top Pilots At the '93 USA FC-3 Team Trials Be Wrong?"

The top five positions, as well as over 50% of all the entries, were filled by X-Cell helicopters.
The results are clear . . .

1st -	Curtis Youngblood	X-Cell .60 Custom Pod & Boom
2nd -	Wayne Mann	XL-Pro/Optima
3rd -	Wendall Adkins	X-Cell .60 Custom/Triumph
4th -	Cliff Hiatt	XL-Pro/Optima (Team Alternate)
5th -	Dan Chapman	XL-Pro/Optima

Other Notable '93 events thus far . . . .

Tangerine Champs
FAI

1st -	Wayne Mann	XL-Pro/Optima
2nd -	Dan Chapman	XL-Pro/Optima
3rd -	Wendall Adkins	X-Cell 60 Custom Triumph

Class II

1st -	James Griffith	X-Cell .60 Custom

British FC-3 Team Trials

2nd -	Alistar Newman	XL-Pro
4th -	Dave Wilshire	XL-Pro (Team Alternate)

Scotland - Carlisle FAI

2nd -	Dave Wilshire	XL-Pro

Brazilian Champs/FC-3

1st -	Jefferson Elias	XL-Pro
2nd -	Richard Pinmo	XL-Pro
3rd -	Lucifer Brendler	XL-Pro

Australian Nationals
FAI

1st -	Ian McDonald	X-Cell .60 Custom

Columbian Nationals
FAI

1st -		X-Cell .60

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ADULTS: $5.00
CHILDREN (6-12): $3.00 w/adult
SENIOR CITIZENS: $3.00

Sponsored by the Mt. Rainier R/C Society

THE COUNTER continued from page 13

SCALE BUFFS, TAKE NOTE

Aeroloft Designs, known for its extensive line of dry transfer markings for scale models, has announced the availability of photo documentation packs and three-views, samples of which are pictured here. For complete particulars and to find out what's presently available, write to Aeroloft Designs, 2940 W. Gregg Dr., Chandler, AZ 85224; or call (602) 838-0447.

LEISURE'S STILL AT IT

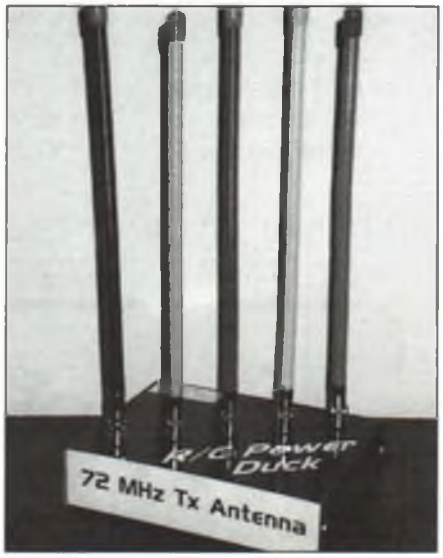
Leisure Electronics has been out of the electric kit manufacturing business for the past couple of years, but owner Roland Boucher recently wrote to say he's still producing his seven-cell electric power systems and components. Roland offers three different ball bearing gearbox configurations (one of which is the extra-long glider setup shown) in three different gear ratios and with your choice of two different motors. Motors and gearboxes are available both separately and as packaged units, along with battery packs, props and a whole line of accessories. An SASE will bring you a full price sheet from Leisure Electronics, 2950 Airway Ave. #A4, Costa Mesa, CA 92626, or call (714) 435-9218.

UPDATED AERO-COMP SOFTWARE

Back in the February '93 *Model Builder*, reviewer Roger Jaffe had some good things to say about the Aero-Comp computer software program put out by USR&D, used for predicting the performance of electric powered model aircraft. We've just learned that Aero-Comp Version 2.0 is now available, this being an updated version that has greatly expanded menus, allowing you to input much more data than before. The expanded output info includes motor horsepower, average climb angle, optimum glide angle of attack, glide time, maximum flight time in still air, and more—this in addition to the original program's extensive output. There are now 36 working files, metric units can be used if desired, the help screen information has been updated and improved—and the list goes on. For full particulars, contact USR&D Corp., P.O. Box 753, Hackettstown, NJ 07840-0753.

R/C POWER DUCKS

The latest of the so-called "rubber ducky" transmitter antennas to come on the market are the R/C Power Ducks from TauCom, a new company owned and operated by Manny Tau, who has gained notoriety as a top competition RC soaring pilot in Southern California. What sets these apart from others is that each Power Duck is individually hand-tuned to 72 mhz for the closest SWR match and highest RF output. About 12 inches in height, they're available in red, blue, black, pink and yellow, for $23. 95 plus $3 S&H and 7-3/4 percent California sales tax if applicable. Currently, only mounts for Airtronics transmitters are offered, but JR and Futaba adapters are coming. From TauCom, 2490 S. Ola Vista, #28, San Clemente, CA 92672; (714) 492-9553. **MB**



1935 LAMBERT MONOPREP

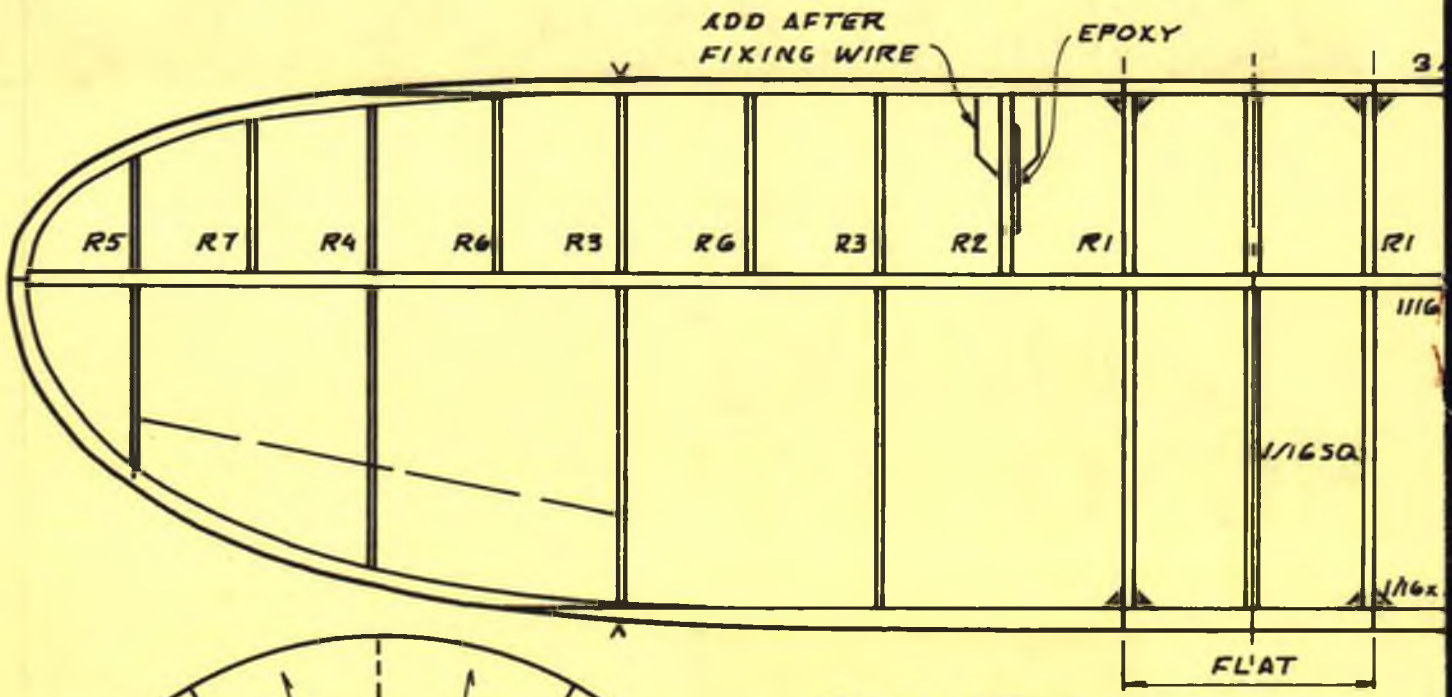
BY W.L. KINCHELOE • PHOTOS BY BILL HANNAN

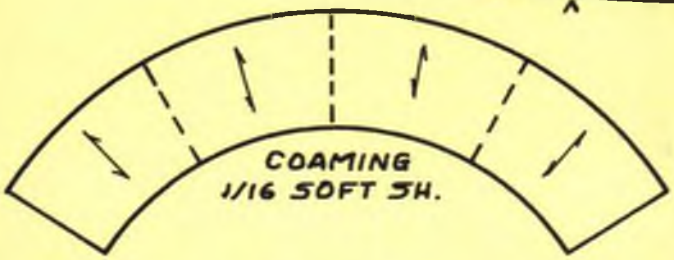
The Monoprep was designed in 1935 by Al Mooney for the Lambert Aircraft Corporation of Robertson, Missouri. During one of my weekly visits to the St. Louis airport in 1936 I saw a yellow and blue low-wing open two-seater with a radial engine, oversized tires and the wing number X11791—the prototype Lambert Monoprep. In 1937 the design was modified by raising the turtledeck and adding a sliding cockpit enclosure. The name was changed to Monosport, but the number X11791 remained.

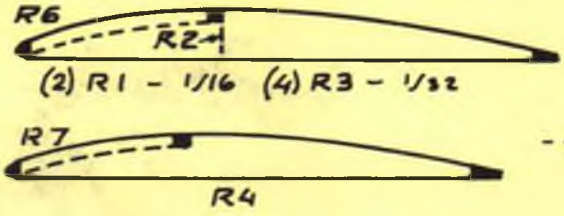
Lambert started building three Monosport airframes when Knight Culver bought the design, parts and tooling and moved production to the Dart Boat Works in Ohio. The whole complicated story is covered well in John Underwood's book *Of Monocoupes and Men* and by Jim Alaback in his write-ups of the history of the Dart GW.

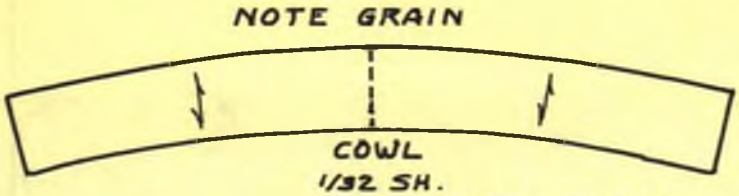
I fell in love with a black and red Dart that provided my first dual flight instruction in 1938. The Dart had a personality that was forever engaging. In 1943, now a student at Parks Air College where two Darts (of an original five) were used in the flight training operations, my association with the Dart continued. In the school library, in *The Aircraft Yearbook for 1937*, I found a three-view that looked remarkably like the Dart but was identified as the Lambert Monosport. There, also, was a three-view of the Lambert Monoprep. I started to make a layout for a CL model of the Monosport/Dart in the summer of 1943, but my local draft board had other plans for my spare time despite my student deferment.

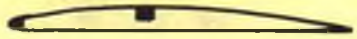
Walt Mooney's Peanut model of the Dart appeared in *Model Builder* in 1975, and later, I saw a beautiful 1/4-scale RC model of the Dart at a fly-in in California. It had been done; and at both ends of scale. Then it struck me: no one had built a model of the Monoprep. During discussions with Bill Hannan it came

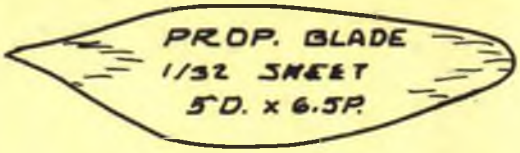




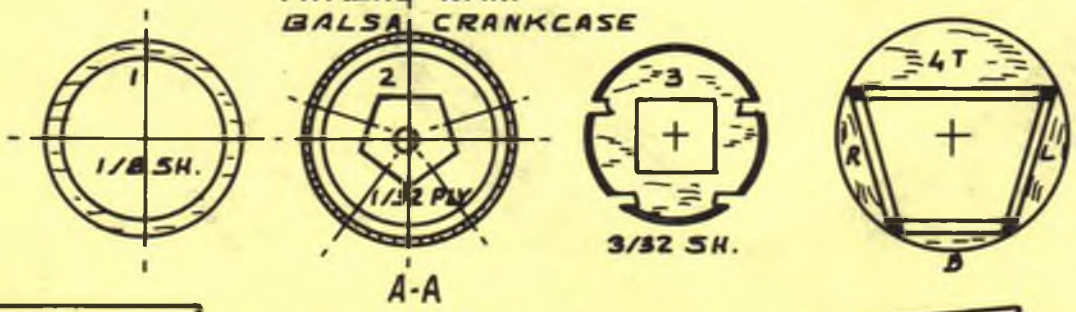


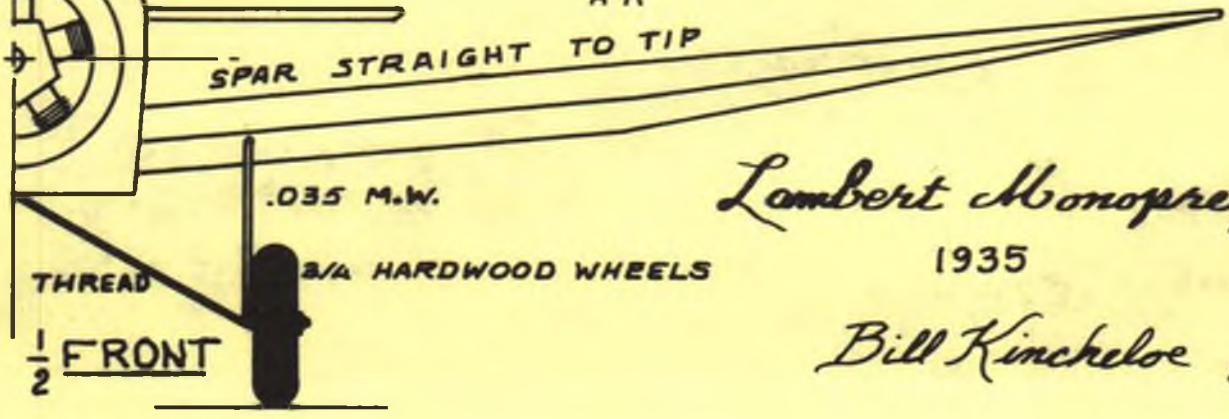






ENGINE: 5 CYLS
PAPER TUBES
THREAD WRAP
BALSA CRANKCASE

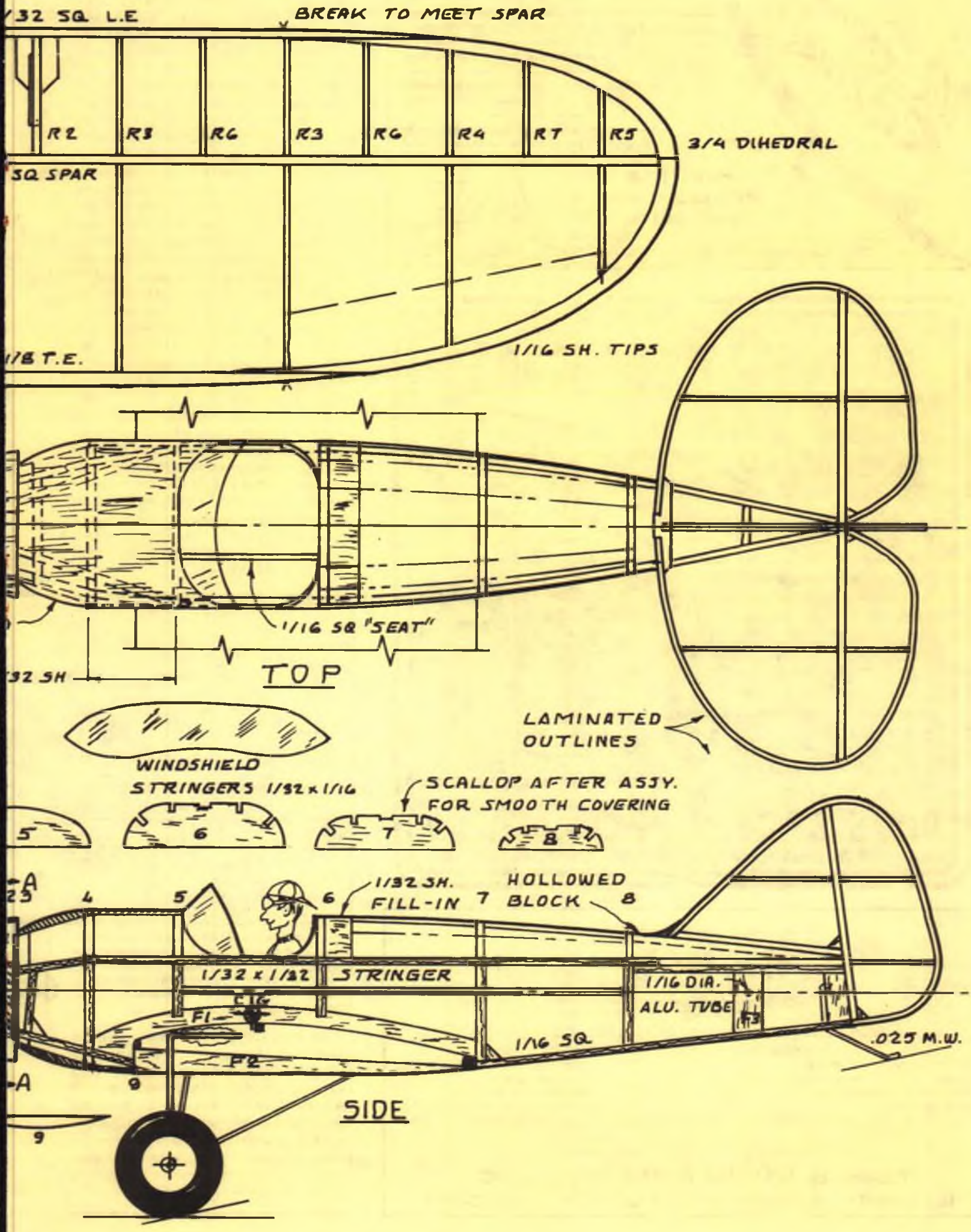




Lambert Monoprep

1935

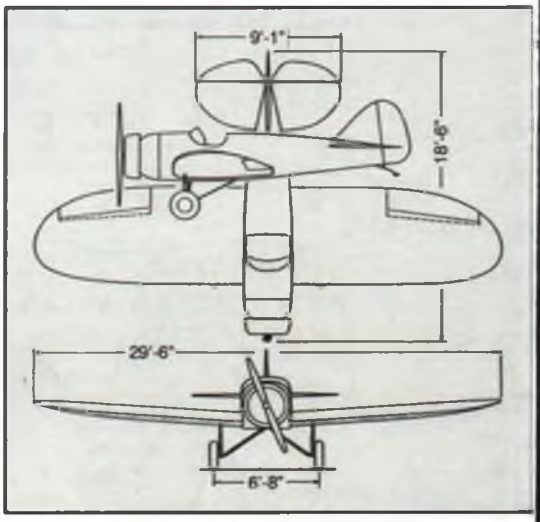
Bill Kincheloe 2/93


/32 SQ L.E
BREAK TO MEET SPAR
R2
R3
R6
R3
R6
R4
R7
R5
3/4 DIHEDRAL
SQ SPAR
1/8 T.E.
1/16 SH. TIPS
1/16 SQ "SEAT"
32 SH
TOP
LAMINATED OUTLINES
WINDSHIELD
STRINGERS 1/32 x 1/16
SCALLOP AFTER ASSY. FOR SMOOTH COVERING
5
6
7
8
A
25
4
5
6
1/32 SH. FILL-IN
7
HOLLOWED BLOCK
8
1/32 x 1/32 STRINGER
1/16 DIA. ALU. TUBE
C.G.
F1
1/16 SQ
.025 M.W.
F2
A
9
9
SIDE

out that he had the original ink-on-linen drawings by Harry Pack that had been used in *Aero Digest* and the *Aircraft Yearbooks*. My proof-of-scale rests on the yearbook illustrations, one of which is included with this article.

The model presented here is the result of nearly a year of spare time design and test activities. First, using the original drawings, a Peanut-sized layout was completed. Next, areas and weight estimates were calculated and the airfoil selected (Clark-Y). Next I built a proof-of-principle all-balsa profile model with a flat plate airfoil as a pleasant and inexpensive way to learn about the design's stability and performance potential without the time, expense and aggravation of building the complete model. After the POP model flew, the working plans for the final Peanut were drawn up and the structure detailed.

The prototype model shown here came in at a trifle over 21 grams—a bit heavy. Despite my best efforts, the model was nose heavy. Therefore, I've replaced the carved basswood propeller shown in the photographs with a Larrabee-profile bent wood prop, and have included a blade pattern on the plan. It should enhance performance and does reduce the overall weight. One important point: do not yield to the temptation to replace the hardwood wheels with balsa or some other lighter alternative! The center of gravity on the plans is shown in the highest, most rearward position for stable flight with the angular setup shown.



Copy of page 295 from *The Aircraft Yearbook for 1937*, a publication of the Aeronautical Chamber of Commerce of America, Inc., New York. The original of this three-view by Harry Pack is presently owned by Bill Hannan and was used to provide the outline for the plans of the Monoprop Peanut.

The most difficult part of the work is maintaining alignment of the front frame of the fuselage, so I made a cone out of postcard stock and doped it well to provide a base to form the coaming that extends from the firewall back one station. The cutting pattern for the segmented soft balsa is given on the plans along with the pattern for the cowl. Don't use CA glue on the joints of the conic patterns, as it doesn't bend well.

The author's Monoprep "in the bones." The landing gear is scale length and wheel diameter, there being no hope of making a presentable extension for R.O.G. takeoffs with a flying propeller. This model used cut sheet balsa wingtips and bent basswood laminated tail surface outlines.

I carved a block to the contour of the windshield and heat-molded the windshield from thin clear plastic taken from a bubble-pack. This eliminated the frustrating experience of trying to hold a springy plastic part in place while the glue dries. The wing and tail outlines can be made either from laminated basswood around a form or cut from sheet balsa. Mount the landing gear to the stub ribs R2 with epoxy before covering the wing. The Lambert R-266 engine is modeled using paper tubes formed on a dowel and wrapped with thread to simulate fins. The pentagonal crankcase is a piece of hard balsa.

License numbers were printed on a CAD setup and then transferred to tissue in a copy machine. This method has minimum weight penalty and reproduces fine details well. Be sure that the tissue is taped carefully to a sheet of plain paper to carry it through the machine. The numbers won't run when doped if the dope is sparingly applied with an airbrush, or if pre-doped tissue is run through the copier.

Every part of the model is covered before assembly except for the wing mount area of the fuselage. A sub-structure of three pieces of F2 can be built and covered after the wing is installed in the fuselage. The model should have a noticeable wash-out in the wings as a result of lifting the leading and trailing edges to meet the straight spar. Be sure that both wings have the same wash-out.

The thread representing the central landing gear struts is added after all covering is complete. When all this is done, add the hardwood wheels with brass washers and a drop of solder to retain them. This will help keep the center of gravity low. I used four strands of .037-inch square rubber, barely slack, for my first trial motor. You might want to try two strands of .045 with noticeable slack.

If the model balances as shown on the plan, the indicated angular alignment hasn't been changed, and there aren't any serious warps, it should fly reasonably well on the first low-power attempt. A short-coupled low-wing airplane *can* be made to fly! **MB**

EEE-Z-FLI WET 'R DRY

The "Ol' Man" comes up with a neat scale-like amphibian, utilizing his unique EEE-Z-FLI construction.

BY AL WHEELER

An amphibian may not be the most desired project for desert dwellers, but for those with access to patches of wet stuff, water flying can be a lot of fun. The Wet 'r Dry is an all-around fun airplane and one that is surprisingly agile for a non-aerobatic type. Both ground and water handling are good, with more than adequate rudder control in both configurations.

The O.S. .35 FP has adequate power with enough left over for a roll or loop now and then. The entire flight envelope is best described as docile with no departures from normal flight. The only difference from an engine-in-the-nose airplane is a tendency for the nose to come up if rapid power reductions are made; with power on, the high thrustline will pull the nose down, a characteristic that is compensated for in the rigging and is entirely within the normal trim range. Flare and landing are normal, with wheel landings three-pointed and water landings flown on in a level attitude using a touch of power. (Tail-low water landings tend to start a porpoising action.)

In keeping with the EEE-Z-FLI philosophy, Wet 'r Dry is not a difficult building project. The plans leave little to the imagination, and the materials needed are all readily available.

So, why not build something that will let you get your feet wet, learn a new landing technique and widen your choice of flying sites? Roll it or dip it with the EEE-Z-FLI Wet 'r Dry!

Ain't she pretty? Model's generic design lends itself to all sorts of attractive color schemes, from WWII military to contemporary civilian as seen here. With the exception of the painted engine nacelle, the prototype Wet 'r Dry was covered entirely with Top Flite Super MonoKote, the author's preferred material for all of his EEE-Z-FLI projects.

CONSTRUCTION

Begin by splicing the fuselage sides out of 4-inch wide sheets of 1/8-inch balsa. Install doublers D1, D2 and D3 as shown (be sure to make a left and right side), leaving spaces for bulkheads B1, B2 and B3. Glue bulkheads B2, B3 and B4 to one fuselage side; when dry, glue the remaining side in place, using a square to keep everything aligned. Fit B1 into the groove at the front edge of the fuselage sides, align and cement in place. Fit and install the 1/8x1/2 doublers between B3 and B4 at the top of the fuselage and down the inside of the windshield slant.

Install BA and the 1/4 square stringer between it and B1. Skin the top with 1/16 balsa (wet it if needed). Invert the fuselage on a level surface and fit and install the forward and aft keels. Install B5, gluing it to the fuselage sides and the keel. The fuselage sides will have to be pulled in to install B5; be sure the curves are even. When the joint is dry, pull the rear edges of the sides together. Be sure the bend is the same on both sides. Don't build a banana!

Fit and install the rear fuselage filler block and the triangular strips from B4 back past B5. The fuselage bottom from B5 aft can now be sheeted with cross grain balsa. Run an extra bead of cement along the inner joint.

Install the three 3/16 balsa doublers that support the tail wheel assembly. When dry, install the tail wheel assembly and the pushrod to the rudder servo. The fuselage top may now be sheeted with 1/16 cross grain balsa.

Sheet the hull bottom from the step aft; use 1/16 medium balsa with the grain running lengthwise. Be sure to sand the keel, the chine line and B4 and B5 to the proper angle first. Follow up with an extra bead of cement on the inside of all joints.

I laminated the nose block from eight pieces of 1/2-inch soft balsa (sawn to provide a hollow interior) with 1/4-inch balsa side pieces. The block is carved and sanded to shape and then glued to the front of B1. Sand the keel, bulkheads and chine line with a block first to provide a good seat for the bottom sheeting, then sheet the bottom with the grain running lengthwise. Allow the extra width for the splash rails outboard of the chine line—an additional 3/4 inch will provide sufficient material for final trimming. The rails extend back to the step and taper into the hull side at B1. The forward ends of the bottom sheeting may extend past B1 and feather into the bottom of the nose block. Using Dap spackle and a wet finger, form a fillet between the fuselage side and the top of the splash rail.

Using epoxy, install the 1/8 plywood landing gear support doublers (D4, D5 and D6) on the inside of each fuselage side, as well as the 3/16 plywood wing bolt plates—don't forget the triangular supports underneath. The wing bolt holes will be drilled later, after the wing is framed up.

Drill the landing gear strut holes;

■ **TOP: Engine nacelle is made mostly of plywood and hardwood; cowl and rear fairing are from soda pop bottles. Nacelle holds the engine (in this case, an O.S. .35 FP), fuel tank and throttle servo.** ■ **ABOVE: For land operations, the author recommends removing the tip floats (each is held on with two screws). Landing gear can be retracted manually for water flying; the front strut leg pivots in a tube, and the rear drag link fits into one of two holes in each side—the lower hole for gear down, the upper hole for gear up. Tail wheel also gets replaced with a water rudder for water flying.**

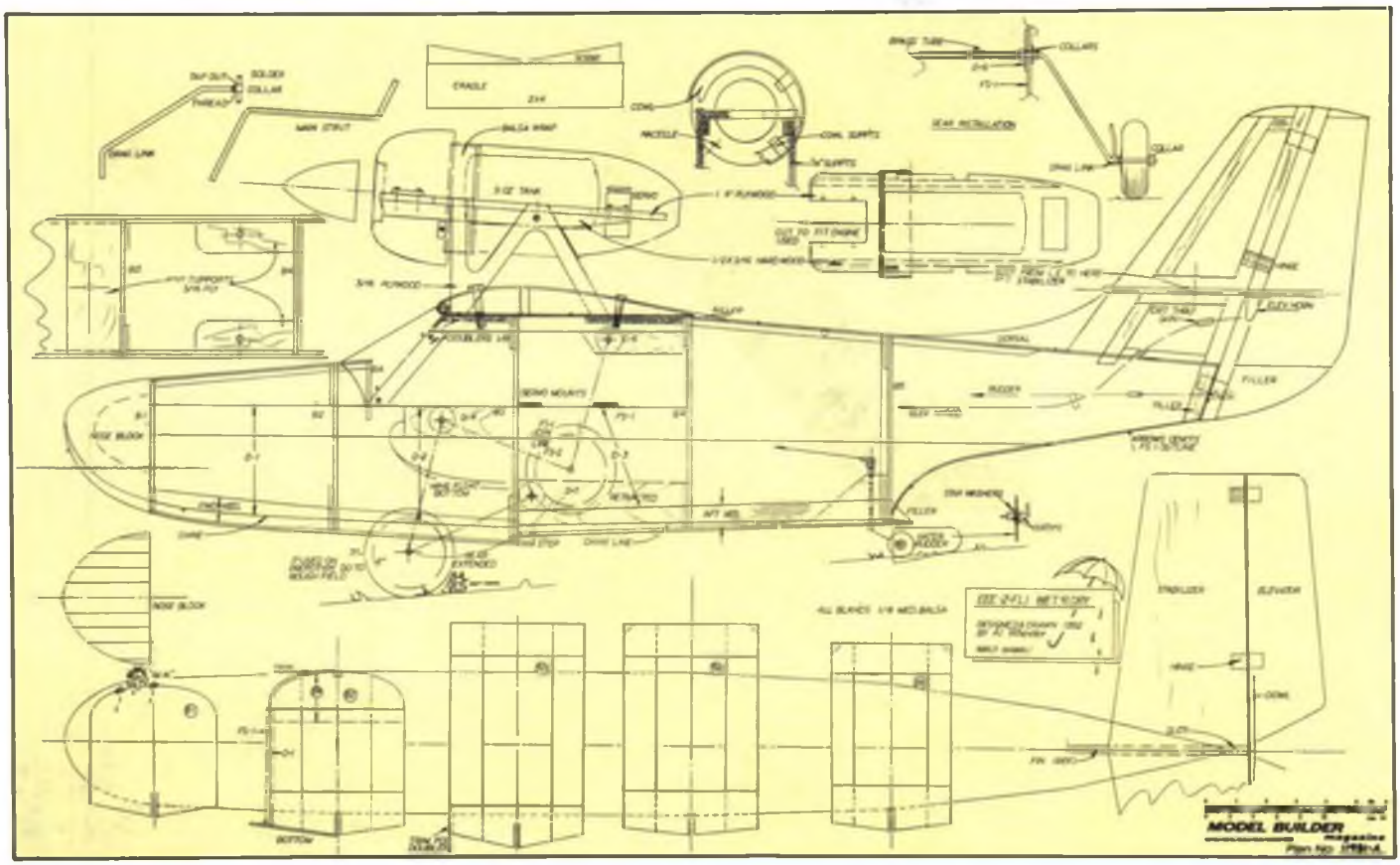
also the upper hole for the drag link in the retract position. Using a rod to center them over the holes in the fuselage, epoxy the six outer 7/8-inch diameter discs in place. You now have inner and outer plywood doublers for all gear entrance points. Round the top corners from the wing trailing edge back to the aft end, sand, fill and resand as needed, then put the fuselage aside.

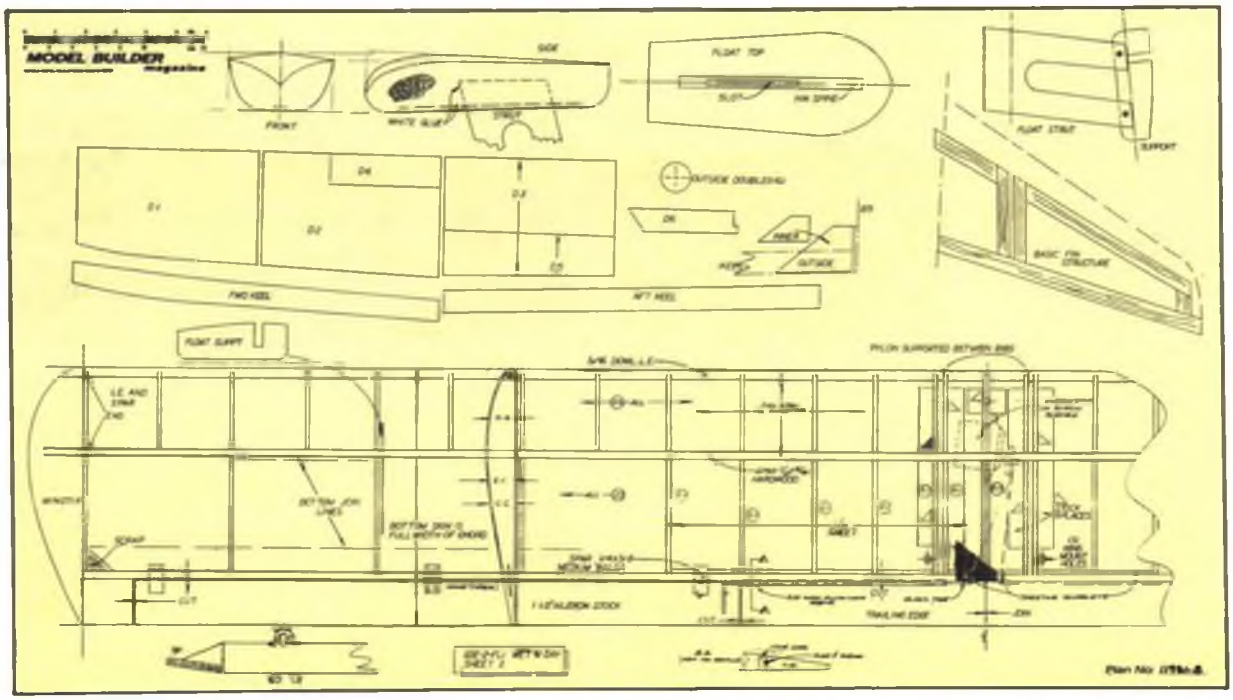
The stabilizer and elevator are of conventional 3/16 sheet balsa construction. The fin is made of 3/16x1/2 medium hard balsa and skinned with 1/16 sheet. The leading edge is formed by pulling the skins together and cementing them. The rudder is built in the same manner, with the skins cemented together at the trailing edge. Mark and cut the stabilizer slot in the fin, being careful to assure a snug fit.

Trial fit the fin to the fuselage top. Mark and cut the slot in the top skin to fit the forward fin spar and the Nyrod. Install and trim the dorsal as required for a good fit.

Hold the elevator Nyrod under hot tap water and form it the approximate bend required to exit the side of the fin. A little fishing and some re-heating and bending may be required to get it to work. Once installed, cement it firmly to the fin skin and up through the bottom rib to the fin interior as far as possible.

With the fin permanently installed on the fuselage, slide the inner control rod through the Nyrod; if it seems stiff at the exit





■ LEFT: Wet 'r Dry's wing construction is typical EEE-Z-FLI—fully sheeted bottom, sheeted leading edge and center section on top. Right-hand wing panel (top) shows the two closely spaced ribs one bay out from the center; the nacelle N-struts fit between them. Left-hand panel (bottom) has been finished and the openings for the N-struts made. This type of wing construction is very stiff and resists any corrective warping, so make sure you build 'em flat! ■ CENTER: Here's a view of the engine nacelle under construction. Main plate is 1/4-inch plywood, cut out as needed to fit the engine and fuel tank. N-struts are 3/16 plywood. Before being installed in the wing, the entire nacelle assembly gets treated to a fuelproof finish such as K&B Super Poxy. ■ RIGHT: All framed up and ready for cover. It would be a good idea to mount the radio gear as far forward as possible, to offset the fact that the engine is located fairly close to the CG. Prototype model needed 4 ounces of lead in the nose to balance.

bend, heat it at the area of the curve. The fore and aft movement of the rod is less than 1/2 inch, so the bends will remain in the same general proximity and will operate quite freely. Trial fit the stabilizer, correcting the slots as required to make it level, and trial fit the rudder and elevators.

Wing construction is typical EEE-Z-FLI with minor variations in the center section to accommodate the engine pylon. Begin by edge-gluing sheets of 1/16 balsa as required to form the bottom wing skins. Working on the plan, mark the spar and rib locations on the bottom skin. With the skin on a flat surface, cement the spars in place, making sure they are vertical to the bottom skin.

Install all of the ribs, assuring a good fit between the spars; take extra care in locating the two R1s that support the engine pylon. Glue the 1-1/2 inch wide trailing edge stock to the top surface of the bottom skin; be sure it is up against the rear face of the rear spar but *not* cemented to it. Now cut the aileron section loose from inboard of the outer rib to the wing centerline; also, cut the aileron portion loose from what will be the fixed trailing edge section at the center.

Cut a slot in the inboard trailing edge section to accommodate the aileron torque rod and tube. After cementing the rod and tube assembly in place, glue the center trailing edge section back to the wing, cutting away wood as needed to allow the torque rod to move freely.

Using a 5/16-inch diameter round file, make circular notches in the ribs to accept the leading edge dowel. It's easy to file parallel to the leading edge of the bottom sheet, doing several ribs at a time. Make the notches so that the dowel will rest on the bottom skin when installed. When satisfied, cement the dowel in place. Glue all of the various reinforcement pieces into the wing center section as shown on the plans and sheet the top with 1/16 balsa, from the center rib to the outboard R1 rib, and from the forward face of the rear spar to the *centerline* of the front spar. Assure good glue joints at all ribs. Be sure to measure and mark the location of

continued on page 54

BY JOHN LUPPERGER

Hobby Lobby's 'Telesport'

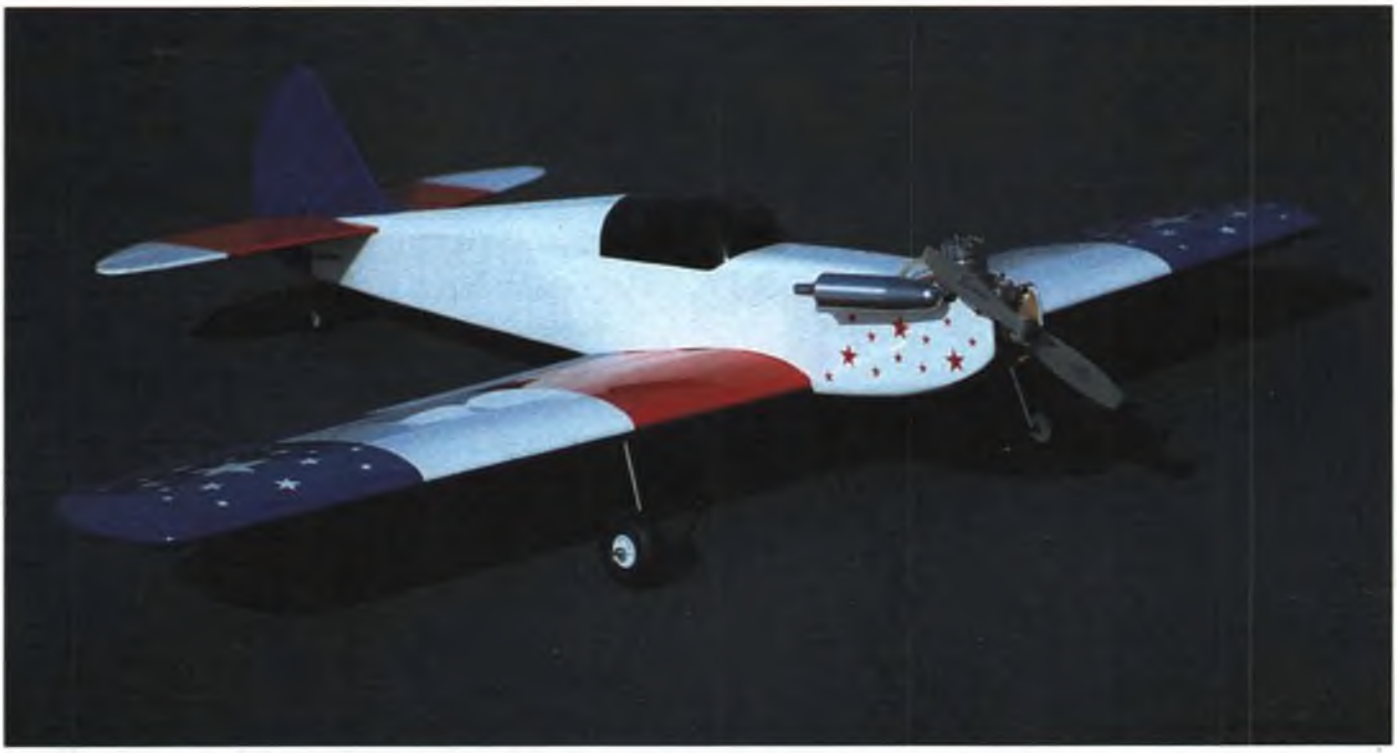
A classic-looking sport model with hotdoggin' aerobatic ability!

The Telesport was designed by Ted Davey for Hobby Lobby International. It's a low-wing sport model capable of outstanding aerobatic performance in the hands of any moderately capable pilot, yet is actually easy enough to fly that it could be used as a secondary trainer. The design is quite simple and easy to build. The full-size plans and instructions are well thought out and should present no problems for anyone with previous building experience.

The Telesport's lines are similar to some of the homebuilts of the '30s. If you wanted to, you could cut the canopy to create a windscreen, add a pilot, and cover it in a scale color scheme complete with N numbers to produce a semi-scale look. Not only would you have a great looking model, you'd also have one capable of some real barnstorming performance.

THE KIT

All parts come bagged or rubber banded together. The canopy is wrapped with tissue. The full-size plan sheets are rolled and there is an illustrated instruction sheet with a complete parts list. The wood quality in



The Telesport makes up into one handsome looking ship—all she needs now is a set of wheel pants to *really* look sexy. Patriotic covering job was done with Solarkote.

Low-time pilots need not write off the Telesport just because it's a taildragger—with that wide-track landing gear, ground handling is a cinch. See text for the author's comments.

my kit was average, and the die-cut parts were easily removed from the sheets. Parts fit for the most part was pretty good (more on this later).

CONSTRUCTION

The wing is of standard D-tube construction which results in a very strong and stiff structure. All of the ribs have building tabs at each end, which allow the wing to be built on a flat building board without the need for a wing jig. The left and right panels are both framed up and permanently joined prior to adding the sheeting.

Before sheeting, make sure the ribs have a smooth taper from the root to the tip. As stated earlier, the parts fit was pretty good, but the wing ribs were off just enough that there surely would have been some waviness in the finished wing if not corrected. This was easily accomplished using a 36-inch aluminum T-bar with sticky-backed sandpaper, which was laid on the root and tip ribs and the ribs in between sanded as needed.

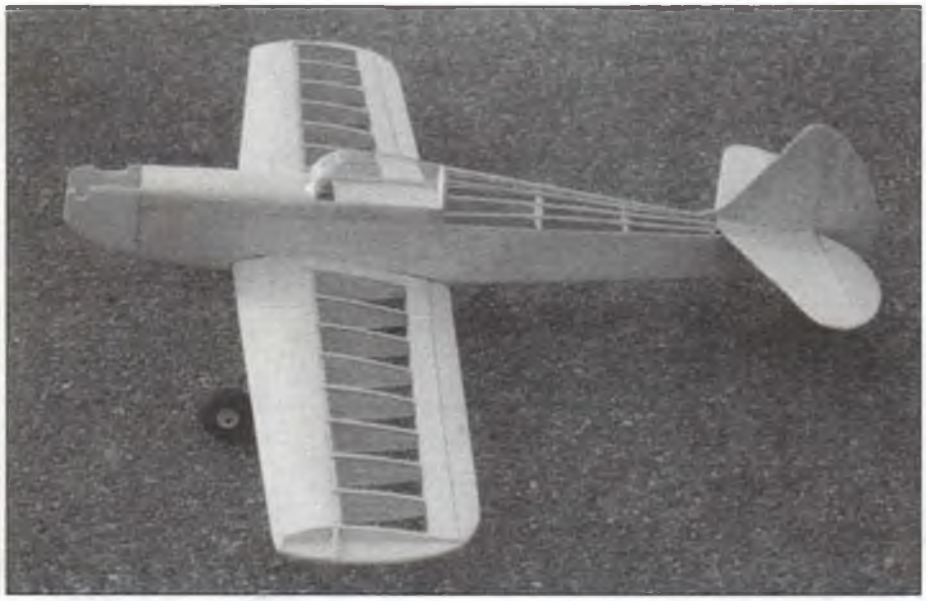
Be sure to use plenty of epoxy when gluing the hardwood landing gear blocks into the notched ribs, as there is no additional bracing in this area other than a doubled rib section. This is not meant to imply that the area is weak, as the ribs are all 3/32 balsa, as is the wing sheeting. The blocks protrude beyond the ribs so that they are flush with the outside of the lower wing sheeting. There are no specific instructions as to how the area around the gear blocks should be sheeted, and most modelers will probably opt to do it in sections. I took a bit of extra time and made a cut-out in the sheeting to fit exactly around the gear blocks. This was slow work, but the payoff was a finished wing devoid of splices in the sheeting.

The ailerons are of the strip type and only require double-beveling the leading edge, rounding the tips to follow the wing contour, and drilling holes for the torque rods. The torque rods do not have hinge bearings at their root and therefore it is important that a hinge be placed right at the root of the aileron to help support them.

The fuselage is simple to build and goes together very quickly. The entire front of the fuselage from the firewall to the rear of the wing opening is doubled, and the rear section gets stringers all the way back to the rudder post. The area below the stab mount is also doubled for strength.

One point I didn't really like is that the fuel tank is built permanently into its compartment (as opposed to being inserted through the wing opening) with no access. If it ever becomes necessary to work on the tank at a later date, it will require cutting the fuselage open.

The two plywood blocks for the wing trailing edge bolts are glued into notches in the fuselage wing saddle area and are further backed up with pieces of hardwood. After drilling the wing and blocks, you are supposed to seat the supplied 1/4-20 blind nuts into the hardwood, but when I did this the hardwood pieces split and the blind nuts never did become secure. I knocked out the blind nuts, filled the holes with micro balloons and epoxy, added additional wood behind the hold-down blocks,



Telesport's construction is completely conventional in all respects and goes together in short order. For those who would rather buy than build, this airplane is also available in pre-covered ARF form, for about twice the price of the kit.

HOBBY LOBBY'S TELESPORT

WINGSPAN	60 in.
WING AREA	639 sq. in.
WEIGHT RTF	96 oz.
WING LOADING	21.6 oz./sq. ft.
AIRFOIL	Full symmetrical.
POWER	.40-.61.
RADIO	Four channels (aileron, elevator, rudder, throttle).
HOBBY LOBBY CATALOG PRICE	$88.90.

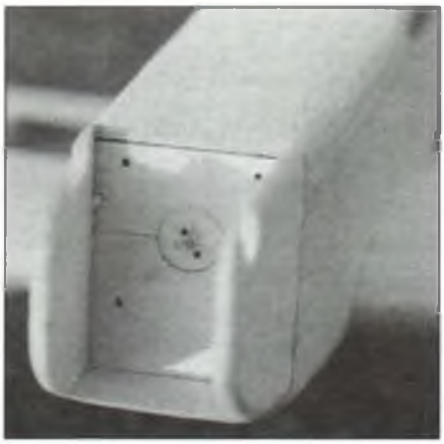
Distributed by Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37207; (615) 373-1444.

MERCO .61 RC

The English-made Merco .61 used in the Telesport review is also available from Hobby Lobby. It's priced in their latest catalog at only $119 (suggested retail is $145.95), which is very reasonable for any .60 size engine—especially one with such rugged construction. The engine has a one-piece crankcase, front and rear ball bearings, and a ringed piston. The engine comes complete with a muffler that proved to be surprisingly effective; using it and a Graupner 12x6 prop, I had one of the quietest two-strokes on the field.

Break-in consisted of running several tanks of fuel through the engine on the ground prior to the initial flight. Revs seemed a bit modest for the first flight at about 8,000, but the pulling power of the engine was really impressive. When the nose of the model was pointed up the Merco just kept chugging away as if no undue strain had been put on it. After a few more flights the power started to pick up a bit. Resetting the needle valve after a couple more flights started to show the engine's real potential. As the rpm approached 9,000 the Merco really started to perform. This engine has real pulling power and is also fairly economical on fuel: the Telesport has a 10-ounce tank, and there was usually about 1 ounce of fuel left in the tank after 10-12 minutes in the air.

If you want an economical engine that should last a very long time, the Merco .61 is an excellent choice. **MB**



Fuel tank is built permanently into the fuselage and exits the firewall through the center of the engine mount. There's supposed to be balsa triangle stock between the cowl cheeks and the firewall, but the use of a .60 size engine mount doesn't leave enough room.

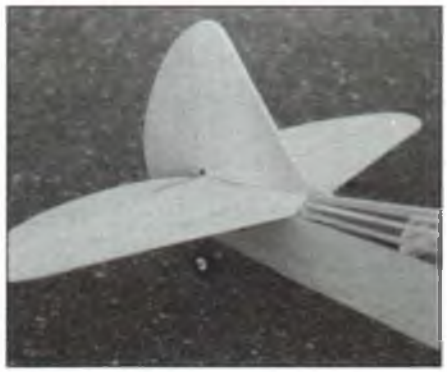
The Telesport's wing is held on with a single dowel at the leading edge and two 1/4-20 nylon bolts at the trailing edge. Rather than use the large blind nuts supplied in the kit, John tapped directly into the hardwood blocks on either side of the fuselage.

redrilled and then tapped the holes for the bolts. I feel this is a much better way to secure the wing and would recommend it to anyone building the Telesport.

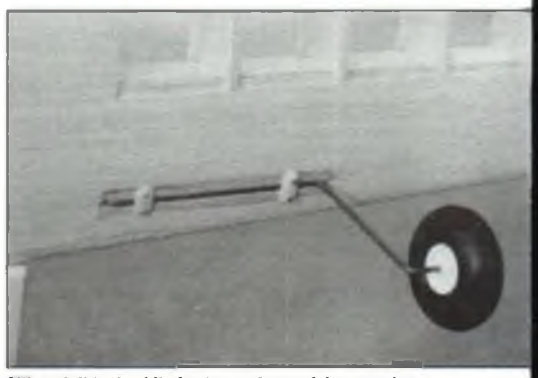
The tail surfaces are sheet balsa and only require gluing together and sanding. I replaced the stock wire elevator joiner with a 1/4-inch dowel, which I feel is less likely to flex. I also used a Du-Bro tail wheel bracket instead of the hinge-type bearing supplied. This way, the rear of the fuselage carries the weight of the model instead of the single hinge bearing and the rudder hinges.

COVERING

The covering I used was Solarkote from Global Hobby Distributors. The bottom of the wing and horizontal stab were covered in dark blue and the rest of the model in the patriotic red/white/blue scheme seen in the pictures. This color arrangement has proven to be highly visible during aerobatics. The clear canopy was painted on the inside with black paint and glued to the fuselage with Wilhold RC-56 glue. (If you don't have a bottle of this glue in your supplies, get one quick, as I understand it has been discontinued.) The entire engine compartment was generously coated with 5-minute epoxy for fuelproofing.



Pre-cut sheet balsa tail surfaces—what could be simpler?



Although it took a bit of extra work, careful measuring and cutting produced a landing gear block cutout in the lower wing sheeting without the need for splicing.

FLYING

Here's the part you've been waiting for! Test flights were carried out in the early afternoon in about a 15 to 20 mph wind. I procured the talents of my flying buddy Steve Shofro to carry out the initial test flight while I got pictures. Even though there was about a 45 degree crosswind, the first takeoff run was straight down the runway. This first flight was spent checking out the general flight characteristics and listening to the engine to determine tuning requirements. It was decided that the only change needed was to add some rudder travel.

After a couple more sedate flights to allow the engine to get additional run time, it was time to start seeing what the Telesport could do! Well, let me tell you, there's not much the Telesport *won't* do. In the hands of a capable pilot (someone more qualified than I), the Telesport should be able to do just about any aerobatic maneuver in the book. Personally, I found the Telesport to be very easy to fly, yet capable of all the aerobatic maneuvers I can do. Loops were big and round (with a .60 in the nose there is more than enough power to make them as big as you want), rolls were smooth (at the rate of about one per second), split-S's were clean and

The tail wheel wire with hinge bearing supplied in the kit was replaced with a Du-Bro tail wheel assembly so that the load is carried by the fuselage, instead of the rudder hinges.

Fuselage is wide enough to take three standard servos abreast with room to spare. Radio used is a Futaba 7UAPS PCM. Aileron servo is mounted on hardwood rails in the wing center section.

straight, Immelmans were easy, and snaps were crisp.

The best part of all is that the Telesport slows down so nicely that you feel like you're landing a trainer. Three-point landings are a cinch, or if you want to bring it in with a little speed, you can make beautiful wheel landings. The Telesport is one of the best-mannered aerobatic sport models I've ever had the pleasure to fly.

Since it was obvious that the Telesport was more capable than I, it was time to again enlist the aid of my buddy Steve Shofro. I few years back I helped Steve learn to fly; now he can fly circles around me! Steve took the Telesport up and proceeded to really wring it out. Additional maneuvers that Steve was able to pull off were spins (upright and inverted), double snaps, and knife-edge. One of the nice things about the Telesport's light weight and its ability to handle a .60 size engine is that Steve was able to string maneuvers together continuously without losing momentum. This really makes aerobatics *fun!* After several flights, Steve's comments were that the Telesport is a very nicely mannered model capable of providing its owner with some exciting aerobatic performance.

One of the things that impressed both of us was the Telesport's excellent ground handling. Even during high-speed taxis, the model handled like an RC car. The wide stance gear makes it very stable when turning, and crosswind conditions are no problem.

If you want a sport aerobatic model that can handle a wide variety of engine sizes (including four-strokes), is easy to build and doesn't cost a ton of money, the Telesport is it! It's a very rugged model that can withstand the abuse of sport flying from any type of field. It's really nice to find a model that actually lives up to its advertising claims! ***MB***

WET 'R DRY *continued from page 49*

the gap between the two pylon supporting ribs on the outside of the sheeting, as a portion of this will be cut out later.

Sheet the upper leading edge from the rear face of the main spar to just past the top of the leading edge dowel, notching the inboard end to clear the section already sheeted to the spar centerline. Assure a good joint with the spar, all ribs and the top of the leading edge dowel. Tape the sheeting in place until the cement sets.

Trim and sand the top and bottom skin to blend with the leading edge dowel in a smooth curve. Inboard of the third rib from the tip, cut a slot and install the 1/8 plywood float attachment fitting; use adequate cement next to the rib and around the bottom skin. Make the wingtip and wingtip brace of 3/16 balsa and glue in place. When dry, sand the tip to fair into the leading and trailing edges.

Prior to joining the wing halves, sand each root rib to mate flat with each tip elevated 3/4 inch at the outboard rib. Using a pointed tool (a compass point is good), punch a series of holes through each root rib to allow better epoxy penetration. Join the halves with an ample amount of epoxy. Sand the joint line smooth and apply fiberglass tape and epoxy. Sand the entire wing in preparation for covering.

Cut the tip floats from foam. Groove the top to accept the 3/8x1/4 spine and slot the spine and the foam to accept the 1/8 plywood strut. The spine and strut are both installed on the float with any adhesive compatible with foam.

The completed float may be sealed with your choice of material—Dap spackle thinned to a brushable consistency with enamel thinner works well. Finish by painting with enamel spray paint. Installation is made with two #3 self-tapping screws. This installation is satisfactory for all water operations, however, the floats should be removed for hard surface flying, as they are not stressed for the side loads encountered in groundloops and other unthinkable ground handling surprises.

The engine pylon assembly may appear difficult at first, but it's actually quite simple. Make the N-shaped supports carefully, as they determine the upthrust angle of 4 degrees. The notches in the 1/4-inch plywood nacelle plate must space the N-supports at the same width as the openings between the R1 ribs. With this dimension correct, the N-supports may be epoxied to the plate.

Install the engine bolt blind nuts, the nacelle bulkhead, the 1/16 skin wrap, the throttle servo and the fuel tank. With the engine mounted, route the Nyrod from the throttle servo. The engine cowl is made from a two-liter soda bottle bottom; the nacelle covering is from a small pop bottle with the neck section facing aft.

Place the nacelle N-supports on the top of the wing with the front legs just behind the leading edge dowel and lined up with the gap between the support ribs, which you should have previously marked. Mark and cut the openings so that the nacelle legs fit between the ribs and seat squarely on the bottom wing skin. Remove the engine pylon until after the wing is covered.

The entire model can now be covered using your choice of material. All of my EEE-Z-FLI efforts have been covered with Super MonoKote, due to its consistency in adhesion and shrinking, and also the ease with which trim cut from MonoKote can be ironed on. Cut the covering from areas to be cemented. The pylon struts and engine plate were painted on the prototype.

Once covered and trimmed to your liking, go ahead and do the final assembly—install the radio, drill and tap the wing bolt holes, hinge the control surfaces, etc. Pay particular attention when you install the stabilizer; make sure it is level and square fore and aft. Use ample cement here, as this is a critical joint.

To install the main gear, first put on a wheel collar, slide it on as far as possible and insert the gear through the hole in the hull. On the inside, install another wheel collar and the section of 5/32-inch brass tube. Install the opposite leg with the collars and slip it into the brass tubing. The legs will almost meet inside the tubing; this stiffens the joint. Center the legs and tighten the collars so there is no side play. Slide the drag links over the axles on the main legs and install them in the holes provided, also with a collar on the outside and another on the

inside. Tighten these collars to eliminate all side play.

To retract the gear for water operation, take off the inner drag link collars, move the links to the upper "retract" position holes and reinstall the inner collars. You now have an operating landing gear, one that has worked well on the prototype. For water operation, remove the tail wheel, install a wheel collar, a washer, the water rudder, another washer and the outside wheel collar, and you will find you have positive water steering.

The windshield is installed with two #3 self-tapping screws on each side. The top edge is retained by the wing leading edge. Ease of windshield removal is required for access to the inner main landing gear collars.

FLYING

Full elevator travel should produce 1/2 inch up and 1/2 inch down. Rudder, 3/4 inch right and 3/4 inch left. Ailerons, 3/8 inch up and 1/4 inch down. Recheck the balance; with the battery as far forward as possible, the prototype required 4 ounces of lead in the nose. *Never attempt to fly this or any other model in a tail heavy condition!*

With the rudder at neutral, roll the aircraft on the ground to assure that it tracks straight, and adjust the tail wheel if required. Taxi the aircraft around to determine how it handles and tracks and, if it seems normal, line up into the wind and go for it! The prototype tracks well and lifts off with a bit of up elevator. Trim the aircraft for level flight and you will find the control response is good in all respects.

Prior to landing, experiment with the power; remember that the high thrustline will tend to pull the nose down a little, and reducing power will let the nose come up a bit. Glide is normal, as are the flare and landing. Ground roll is straight without much of a rudder dance. As you get acquainted with your Wet 'r Dry, you will find that loops, rolls and their combinations are easily accomplished. You may want to increase control throws to suit your own taste.

Before flying off water, plug the drag link holes with a silicone-dipped screw or piece of dowel. Also check the bottom of the hull for damage—cracks, holes, loose covering, etc. It might also be wise to apply a bead of silicone around the windshield.

Water takeoffs are no problem. Add throttle with the stick back, use aileron and rudder to keep the tip floats out of the water and, as the aircraft comes up on the step (starts to level off in the water), ease off on the back pressure and find the attitude at which she accelerates best, let 'er run, add a little back stick and she'll come unstuck and fly.

Water landings are not the flared three-point variety. Use some power and ease the aircraft down to the water in a level attitude. Ease off on the power just prior to splashdown, rotating slightly so the hull touches down on the step.

Good flying, and whether it be circuits and bumps or patterns and dunks, enjoy your new EEE-Z-FLI Wet 'r Dry! **MB**

THE MOTOR POWER CONTROVERSY

For those who like a technical approach to electric power, Roger presents a handful of different methods of determining input and output power.

In response to my first gas-to-electric conversion article (May '93), Bernard Cawley of Auburn, Washington, and a member of the Puget Sound Electric Model Flyers, wrote objecting to my apparent interchangeable use of input and output power. Bernard—and others too!—noted that I used the Astro Flight motor specifications (output power) for their motors, yet for the HiLiner I used the manufacturer's quoted *input* power of 30 watts. Throughout the text, it was my intention that power is the wattage stated in the manufacturer's specifications.

Since Bernard doesn't really care whether we use input or output power as long as we are consistent, we need to find a method to measure these power levels. To find an answer, let's walk down memory lane and review some other electric modeler's methods for determining power. I want to thank Ken Myers, Mitch Poling, Ed Westbrook, Bob Kopski, Steve Neu, Ted Davey and Jim Martin for their input on the subject.

INPUT POWER

Measuring input power is the easiest of all methods. The procedure uses a minimum of test equipment, and the input power computation is very simple: voltage (volts) times current (amps) equals power (watts).

To measure the input power to the motor, connect a voltmeter across the motor terminals and read the voltage while the motor is running at full steam with the propeller you intend to use. Next connect an ammeter capable of reading up to 30 amps in series in the circuit and run the motor again to measure current. Now multiply the voltage across the motor by the current and you get the input power in watts.

Some of the power we just measured is going to be lost between the motor terminals and the prop shaft. No motor is 100 percent efficient. Most of the motors we use are between 60 and 80 percent efficient, meaning that between 20 and 40 percent of the power is lost. Many things will change motor output power and efficiency, including cell count, propeller size and speed and even propeller type. Therefore, a best guesstimate of output power can be found by multiplying the input power by an estimated average efficiency factor.

OUTPUT POWER

Although using output power furnishes a more accurate indication of an electric aircraft's performance, it is a much harder to measure. To understand the following discussion, let's briefly look at Ohm's law: E=Ir. In other words, the voltage across a circuit or component (E) is equal to the current in the circuit (I) times the resistance (r) of the circuit or component.

With that understood, here are some methods that electric experts have devised:

MOTOR CONSTANTS

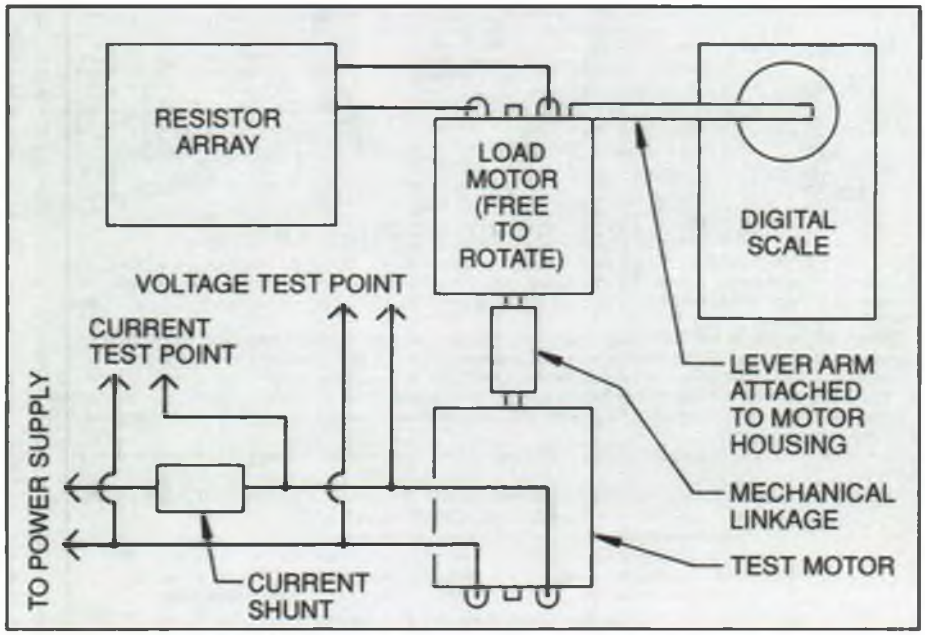
This theory invents two constants that will completely describe the characteristics of any motor. The first—we'll call it r—is the internal resistance of the motor when it is turning. The second constant is called k (dynamo constant) and tells how many volts the motor generates when it turns. Remember that all electric motors are really small electric generators; if their shafts are rotated at some rpm, they will generate a certain voltage. With that in mind, the units of k are volts per rpm. The formula that relates current, voltage, speed, k and r is:

$$E = Ir + Sk$$

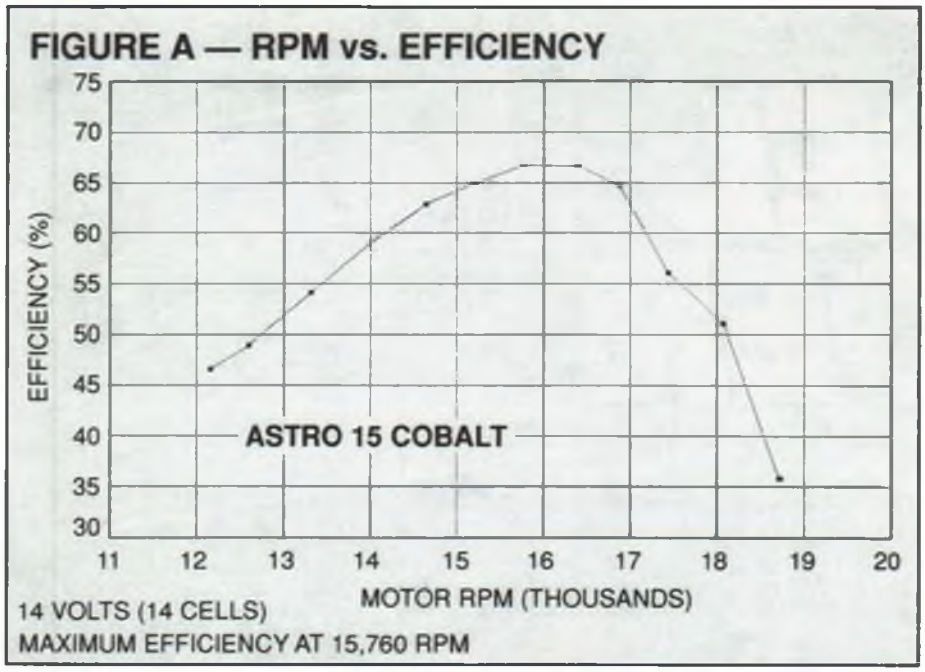
where:
E = voltage across the motor terminals (V);
I = current through the motor (A);
S = speed of the motor (rpm);
r = motor resistance (ohms);
k = motor dynamo constant (V/rpm).

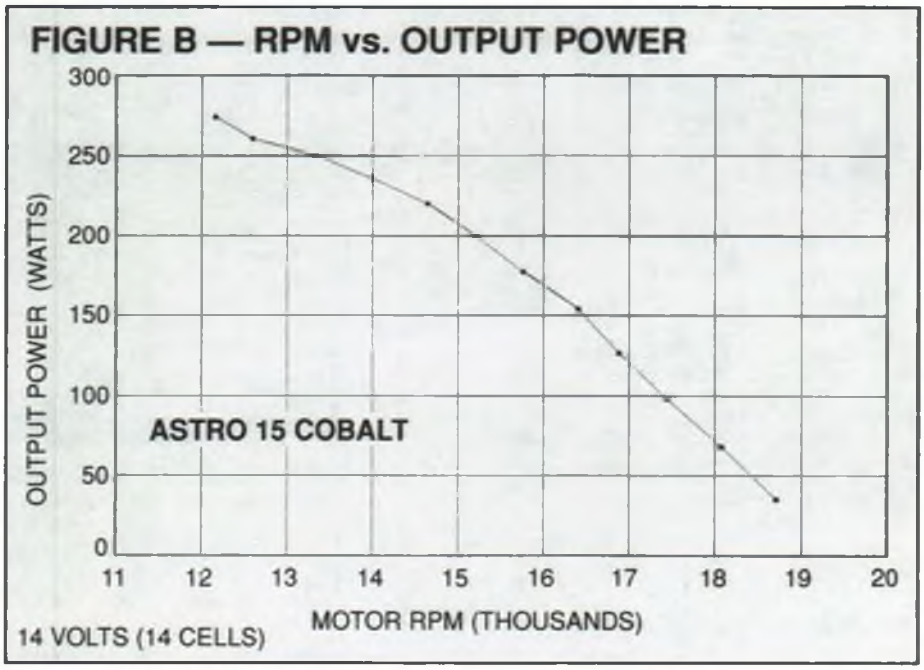
The first term (Ir) is a restatement of Ohm's law; the second term (Sk) adds the voltage generated by the motor when it turns. We add these two terms to get the total voltage across the motor.

As before, we can measure E, I and S, but we need to compute r and k. First measure the current, voltage and speed with two different motor configurations. For instance, the first measurement for an 05 size motor can be with 6 cells and the second one can be with 9 cells. The first may be with a small prop and the second with a big prop. For more accurate results, try to make the load on the motor as light as possible with one measurement and as heavy



Diagramatic sketch of a simple dynamometer you can make to measure a motor's output power. Using such a device is the most accurate way of determining motor power and can be used to plot graphs like those shown in Figures A and B.





as possible with the other.

After taking the two measurements, use these formulas to compute r and k:

$$r = \frac{E_1 - \frac{S_1 E_0}{S_0}}{I_1 - \frac{S_1 I_0}{S_0}}$$

$$k = \frac{E_0 - I_0 r}{S_0} \quad \text{or} \quad k = \frac{E_1 - I_1 r}{S_1}$$

where:
E_0, I_0, S_0 = voltage, current and speed for trial 1;
E_1, I_1, S_1 = voltage, current and speed for trial 2;
r = motor internal resistance;
k = motor dynamo constant.

We can now compute the output power and the efficiency of the motor. Output power is the input power less the power lost in the motor due to its internal resistance. We already know that the input power is the voltage times the current (EI). The power lost in the motor is derived from Ohm's law and equals the current squared times the internal resistance, which we just computed. Therefore the output power is:

$$P_{out} = EI - I^2 r$$

Now that we know the output power, we can also find the efficiency. This is the output power divided by the input power, then multiplied by 100 (to get a percentage):

$$\text{Efficiency (\%)} = \frac{(100)\,E - Ir}{E}$$

Sounds great, right? Unfortunately there are a few problems with this method. Theoretically it all makes perfect electrical sense,

but one very obvious thing I've noticed in gathering information for this discussion is that the k and r values for motors of the same type are not the same. Let's check k and r for the Astro Flight 05 motor. According to Mitch Poling in his May 1991 *Model Builder* column, the internal resistance is 0.097 ohm and the dynamo constant is 0.000468 V/rpm. The Aero-Comp program I reviewed in the February 1993 *Model Builder* fixes the r at 0.055 ohm and the k at 0.000430 V/rpm. Finally, Ken Myers from Walled Lake, Michigan, and editor of the much-respected *Ampeer* newsletter, says that r is 0.071 ohm and k is 0.00099 V/rpm.

To illustrate the disparity these different k and r values create, let's say that we have an 05 motor that will turn an 8x4 prop at 9,800 rpm on 7 cells and drawing 22.0 amps. Now let's chart the estimated output power using the performance parameters stated above:

	r	k	In Pwr	Out Pwr	Efficiency
Poling	0.097	0.000468	154	107	69%
Aero Comp	0.055	0.000430	154	127	82%
Myers	0.071	0.000990	154	120	78%

You can see that the motor performances represented by this comparison are not consistent, and that for the same motor type there is a wide variety of r and k values. I believe that every motor is unique and that motors need to be tested individually to determine their unique constants.

DYNAMOMETER MEASUREMENT

Dynanometers measure motor torque and therefore motor output power for a range of motor loads. Included here is a diagram of a simple dynamometer patterned after one I saw at a recent club meeting by Steve Neu. A variable voltage power supply is used to run the motor under test. The test motor turns the load motor—a motor hooked up to a varying resistive load. The load motor itself is also free to turn, having a small lever attached to its case which applies a force to a digital scale. For each load resistance, the current, speed and force are measured. (The voltage is held constant throughout the test.) Input power, output power and efficiency can be computed.

This testing process results in a graph which shows efficiency and output power versus motor speed. With such a graph you can easily determine the speed at which the motor is most efficient, and can prop the motor to achieve that motor rpm.

Steve Neu ran a dynamometer test on an Astro Flight 15 motor running on 14 volts—approximately equivalent to a 14-cell pack. Gradually increasing the load on the motor results in higher current draw and therefore lower motor speed. Figure A is a graph plotting motor speed versus motor efficiency; the graph shows that maximum efficiency occurs at about 16,000 rpm.

However, propping a motor to achieve maximum efficiency is different from prop-

continued on page 70

The winners and new Team USA with callers, from left: Greg Frohreich and 3rd place finisher Tony Frackowiak; Winner Dave von Linsowe and wife Janell; and 2nd place finisher Bill Cunningham with caller (and 5th place finisher) Chris Lakin.

Steve Helms' Mystery II was absolutely immaculate inside and out.

Defending F3A World Champion Chip Hyde fires up his Dr. Jekyll 1.20 for a demonstration flight. Chip's flights set the tone for the event.

To get to the Masters, you must first enter the Team Selection program and qualify. This time around, the standards were more stringent than in the past.

Dean Koger's entry had the double distinction of being the only bipe and the only one of the 27 entries powered with a two-stroke. The Ultimate look-alike is called the Dazzle-U-II and was designed by Wayne Ulery.

The *real* pros leave nothing to chance in the finals. Primary and backup models are fueled and waiting in the ready boxes. Front to rear: Dave von Linsowe and his USA Stars, Chris Lakin's pair of Fascinations, and Tony Frackowiak's set of Typhoons.

Gene Rodgers and his Mystic design combined for a strong 6th place finish.

'THE MASTERS'

Based on his observations at the recent FAI F3A Team Selection Tournament, Rick talks about the latest trends in pattern design and flying and the importance of flying style as applied to World Champs competition.

For years, the premier Pattern Aerobatics event in this country has been a little biennial do that pattern people call "The Masters." The real name of the affair is the FAI F3A Team Selection Tournament, and its purpose is to gather the most accomplished pattern pilots in the country in one spot, expose them to the best judges that can be gathered from around the nation, and pick the three very best fliers to represent the U.S. at the World Championships.

The Masters isn't a high-profile media event like the T.O.C. or Top

RC PRECISION AEROBATICS BY RICK ALLISON

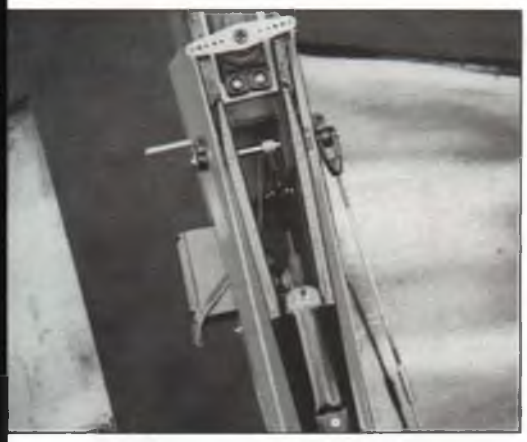
Third place finisher Tony Frackowiak gets a sound check on his Typhoon 1000 while mechanic and caller Greg Frohreich holds.

Mike Klein ended up in 10th place with his Nemesis. In the hands of Chip Hyde, this design won the '92 N-PAC contest.

1993 MASTERS STANDINGS

PILOT	MODEL	A/C WT. (LBS.)	ENGINE	RADIO	PROP	CONST.	FINISH	PIPE/HDR.
1. Dave von Linsowe	USA Star	10.5	YS 1.20	Futaba	APC 15x12	Foam/balsa	MonoKote	AAP
2. Bill Cunningham	Malibu	9.8	YS 1.20	Futaba	APC 14.5x14.5	Foam/balsa	S poxy/M kote/FG	Hatori
3. Tony Frackowiak	Typhoon 1000	9.9	YS 1.20	Futaba	APC 15x12	Balsa	Pnt/M kote	Hatori
4. Jason Shulman	Desire	10.5	YS 1.20	Futaba	APC 14.5x14N	Foam/FG	Pnt/M kote	Hatori
5. Chris Lakin	Fascination	9.7	O.S. 1.20	JR	APC 13.5x13.5	Foam/balsa	Pnt/M kote	Hatori
6. Gene Rodgers	Mystic	9.6	YS 1.20	Futaba	APC 14x13.5	Foam/balsa	Paint	AAP
7. Geoff Coombs	SL-1A	10.4	YS 1.20	Futaba	APC 14.5x14.5N	Foam/FG	Pnt/M kote	Hatori
8. Steve Helms	Mystery II	8.7	YS 1.20	Futaba	APC 14.5x14.5	Bal/Car/Kev	Paint	Hatori
9. Mike McConville	Desire 1.20	10.2	YS 1.20	Futaba	APC 14.5x14	Foam/bal/FG	Pnt/M kote	Hatori
10. Mike Klein	Nemesis	9.8	O.S. 1.20	JR	APC13.5x13.3	Foam bal/FG	Pnt/M kote/FG	Hatori

Gun. It isn't a huge social affair like the Nats, nor is it a pure open contest for all the classes like N-PAC. There is very little hype and usually few spectators; it isn't a destination event. Coverage in the modeling press in usually light, which is a shame, because



The trick elevator servo arrangement on Chris Lakin's Fascination. Idler shaft and takeoffs are all ball bearing supported.

this is a bellwether event. Future trends, styles and influences in pattern tend to be spotted here first. If you win this Masters, the TV cameras don't roll while they put a green jacket on you and hand you a check like they do at that other event with the same name down in Augusta, Georgia. No money, no green jacket, no film at eleven.

You do get a ticket to the World Championships and a chance to represent your country. This seems to be enough to motivate most of us.

To get to the Masters, you must first enter the Team Selection program and qualify. This time around, the standards were more stringent than in the past. Of those who entered the program, only 36 pilots qualified. Of the 36 who qualified, 27 actually flew. The '93 contest was a small Masters, but a very prestigious one, and overall, the flying was of high quality.

The event was held June 7-11 in Corvallis, Oregon. Rain and shine, for the better part of a week, 27 of the best FAI pilots in the country cranked it up while the judges watched. The location and the early June date made for some interesting weather. In Scotland, I believe the term is "a fair test of Golf."

Three different fronts moved through the area during the week, producing a wide variety of temperatures and flying conditions. We saw everything from bright sun and light winds to gray overcast and stiff crosswinds, all interspersed with brief rain showers. When the puddles dried up and the smoke cleared (literally; 26 of the 27 competitors flew four-strokes!), the new Team USA members, in order of finish, were Dave von Linsowe, Bill Cunningham and Tony Frackowiak. Chip Hyde, of course, returns on his own as defending World Champion.

There were no surprises. These were the three pilots with the best credentials going in, and these were the three pilots who had the best performances at the event. This is a very strong and capable team. I think it's the best team that could possibly have been picked from the field we had, and the most experienced one. All are previous team members, and all have finished well at previous World Championships. Can they return the team title (now in possession of the Canadians) to the U.S.? Can Chip repeat as F3A World Champion?

I think the answer to both questions is a qualified "probably." To explain, we need to look not only at the '93 Masters contest, but make a little historical digression as well.

The history has to come first. Specifically, history as it relates to the World Champs.

"Style" is a funny thing. Neither the word nor the concept appears in the rulebook, and precise maneuver descriptions are written to minimize its importance. Nevertheless, this is the real world, not the ideal one, and in the real world, the importance of style is great. Flying the proper style at the World Champs has in the past been just as important as flying the proper geometry.

In Europe, competitors routinely cross national borders to fly in each other's contests, much as we travel to another state. A natural result of this has been a pan-European style in pattern flying, just as a North American style has come about. The current European vogue is to fly smaller, tighter maneuvers closer to the judges than is routinely done in this country. The maneuvers tend to vary more in size within the flight, the aircraft on the whole are slower, and the aim is a very constant speed. In contrast, most flying in this country has been routinely done at a greater distance—175 meters rather than the European 150—and the tendency has been to fill the box not only horizontally, but vertically as well. The norm has been a fast airplane flying large, graceful, open maneuvers.

Representation at the Worlds is based on the "one country (of whatever size) = three team members" concept, and judges are required to be apportioned by "the approximate geographical distribution, by continent, of teams participating in the previous World Championships." The net result is that, at any World Champs, regardless of site location, there will be many more European competitors and judges than North American ones. Short of dissolving the U.S. and Canada into their constituent states and provinces and fielding teams from each (which is roughly analogous to the situation in Europe), this fact of FAI modeling life is not going to change.

Naturally, with the preponderance of European judges and competitors at the World Championships, the type of presentation currently "in" on the continent has historically been the favored style at the event.

Back to analyzing the '93 Masters. There was a variety of flying styles to watch, more so than in the past. There were people flying out and up, people flying tight and close, and people flying in every possible slot between the two extremes, at every possible speed. The demonstration flights for the judges were done by the current World Champion, Chip Hyde, and they were moderately paced flights placed dead over the poles at 150 meters, very smoothly done, with low bottoms and few if any maneuvers of very great height. These flights were meant to provide the judges with a standard, and they certainly seemed to do just that.

Ron Chidgey, our AMA representative to the FAI F3A subcommittee, conducted an

excellent and comprehensive judging school prior to the contest. I was not able to attend, although pilots were welcome, and some did take advantage of the opportunity. The judges were brought up to date on the changes in language in the new FAI Sporting Code, including one very important change in the Judge's Guide. The deduction (supposedly to be taken on the previous "out of position" maneuver but in practice seldom applied there) for making an altitude correction on the turnaround has been removed. The net effect of this change is that it legitimizes the practice of sizing the maneuvers differently during the flight and placing maneuver bottoms at differing altitudes. This does make the pattern easier to fly, and especially easier to fly close without pushing the 60 degree upper box limit—and it squares with current European practice.

During the contest, it quickly became apparent that, for most people, moderately paced flights placed at or near the 150 meter mark were scoring best, given similar maneuver quality. A large variation in maneuver sizes seemed to be acceptable during a flight with no penalty. On the other hand, lack of straight flight between maneuvers was heavily penalized, and for a pleasant surprise, proper geometry and good wind corrections seemed to be as important as smoothness. I personally view most of these as positive changes, which means little. What does mean something is that they were definite changes, and changes that may finally mean that we are properly preparing our pilots to fly in front of the rest of the world and actually score as well as they fly.

The team as picked reflected the wide variation in presentation styles at the contest. Dave von Linsowe flies slow, small and close; Bill Cunningham flies large, fast and open; and Tony Frackowiak is almost perfectly positioned between the two in terms of speed and distance. All three are smooth, precise pilots who together have a good chance to bring home the team title flying exactly as they did at the Masters. That chance moves up the scale to excellent if they can make the adjustments to show the judges in Austria what history says they will surely want to see.

Based on the form he showed with a brand new airplane while doing the demo flights, Chip Hyde has a very good chance to repeat as World Champion. His locked-in, solid, no-correction style and over-the-poles presentation combined with the consistency of a metronome make him the guy to beat, and he has a history of figuring out what is working and making quick adjustments during the course of a contest. Make his chance "very probably."

Whatever the outcome in Austria, we wish only the best of luck to Chip, Dave, Bill and Tony, and newly named team manager Tony Stillman. And speaking of history, it says that they'll do just fine over there!

It is a tradition to spot up-and-coming pilots at these contests. Jason Shulman, grandson of modeling great Leon Shulman, finished in 4th place, and would have to be one to watch. Chris Lakin in 5th spot and Gene Rodgers in 6th also flew well and finished high, as did Geoff Coombs in the 7th position.

The 8th and final spot in the finals went to Steve Helms, who has to get this year's "most inspirational" award. Steve was dead last in 27th spot after a poor first flight and a flameout in the second round. Some guys would have quit, but Steve came back and put up strong numbers on the second day of prelims, making the finals by 6/100ths of a point over Mike McConville.

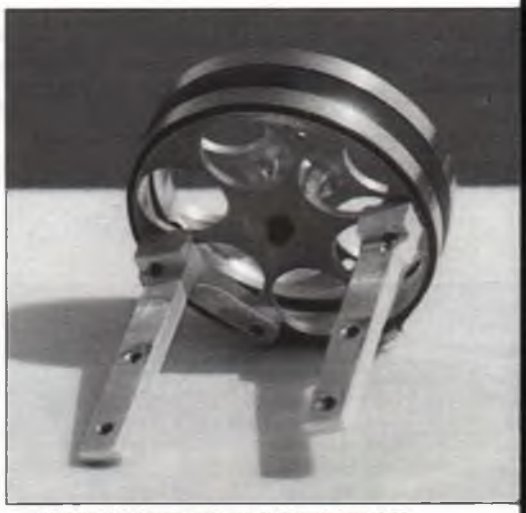
Trend spotting is another tradition. This one was easy; four-strokes have now become the only option in F3A. There was one two-stroke engine at the contest, and it was Dean Koger's geared YS, which, coincidentally, was installed in the only biplane, Dean's Ulery-designed Dazzle-U-II.

To complete the picture of the perfect composite '93 Masters F3A airplane, most wing areas on the ships finishing well up in the order were largish, averaging 950 squares, and either the YS 1.20AC or the O.S. 1.20SP were installed on nearly all of them, with the YS dominating by about 3/1. The radios of choice were either the Futaba 9ZAP or the JR PCM-10s, with Futaba in the driver's seat by a 21/8 margin. Both types of engines and both brands of radios performed beautifully. Average fuel nitro content was about 25 percent.

The trick hardware award goes to Geoff Coombs, who showed up with sequencing retract gear doors *a la* P-51, narrowly edging out Chris Lakin' s stab-mounted single elevator servo with ball bearing supported idler bar driving twin ball bearing elevator pushrods. My own suitcase Python with the demountable fuselage halves was third. On the other hand, my Python fuselage was the only innovation that actually worked during the contest! Greg Frohreich showed a light and beautifully made prototype 1.20 engine mount that will be available this fall from Lite Flite.

No contest report would be complete without a word or two on the officiating. The judges this time came mostly from the ranks of the pilots themselves, as per vote of the Team Selection Committee from a list that included not only pilots but many senior members of the judging fraternity as well. This was a major departure from tradition. The consensus verdict was that it worked well, but no method discovered to date works perfectly! The 10 judges did a fine job overall; certainly a good team was picked, which was the major point of the exercise. Some new faces appeared higher in the finish order, and the points stressed in the judging school seemed to have more effect than in the past. Thanks are due to Bob Crump, Nat Penton, Mike Barbee, Earl Haury, Al Glenn, Charlie Reed, Mike McGowan, Dave Lockhart, Tony Stillman and Darlene Fredricks.

The event director was Mike Dunphy of Medford, Oregon, and the scorekeeping was handled with blazing efficiency by his dynamo other half, Maureen Dunphy. Due to the weather and various other factors only partially under his control, Mike set a new American record for being second-guessed during the week. He handled it all without a cross word, without raising his voice, and always in the best interest of the majority of the fliers. The phrase "grace under pressure" comes to mind with both of these people. It was a fine job turned in under difficult circumstances, and I hope the circumstances weren't so difficult that it was their last major event. Pattern needs all the Mike and Maureen Dunphys it can get! ***MB***



Greg Frohreich's lovely and very light prototype 1.20 soft mount, to be available from Lite Flite this fall.

BY ART STEINBERG

Lanier's Stinger 10

Lanier's popular Stinger series now has a baby brother, in the form of this .10-powered four-channel aerobat. For small-field, small-budget fun, this one is hard to beat!

In all the years I've been flying models from Lanier R/C, it never occurred to me that one day they would add conventional kits to their line of ARFs. However, Lanier recently entered the built-up kit field with a large model called the Stinger, followed shortly by a slightly smaller version called the Stinger 120. Both of them caught on quickly, because they are easy to build, attractive and fly extremely well.

The folks at Lanier must have been very happy with the success of their Stingers, because they recently introduced yet another, but in a much smaller size.

The new model is called the Stinger 10, and is as cute as a button. The wingspan is 36 inches, fuselage length is 23-5/8 inches, wing area is 270 square inches, and the specified ready-to-fly weight ranges from 29 to 38 ounces, depending on the engine and radio used. The airplane was expressly designed to use the O.S. .10 FSR engine.

A great consideration in building an airplane intended for unrestrained aerobatics is that it have an exceptionally strong wing structure, and in this respect the Stinger 10 certainly stands out from the crowd. The wing is a foam core with leading and trailing edges sheeted with 1/16 balsa, joined by 1/4-inch wide capstrip "ribs." The rest of the construction is of balsa and lite-ply, except for the ABS turtledeck, wheel pants and cowl. One nice aspect of the plastic turtledeck is that it need not be glued in place until after the pushrods have been installed, which allows complete access to the entire fuselage cavity during this critical phase of construction.

LANIER'S STINGER 10

WINGSPAN	36 in.
WING AREA	270 sq. in.
FLYING WEIGHT	29-38 oz.
WING LOADING	15.5-20.3 oz./sq. ft.
POWER	10-.15
RADIO	Four channels required
SUGGESTED RETAIL	$59.95

Manufactured by Lanier R/C, P.O. Box 458, Oakwood, GA 30566; (404-532-6401)

The tail surfaces are of built-up construction, which helps keep the tail on the light side. The ABS cowl comes in two sections, as do the handsome wheel pants, and when completed, these are a very dressy addition

The Stinger 10 is one snappy looking little ship, and delivers performance to match. Small wheels and wheel pants are best suited to paved or otherwise exceptionally smooth runways.

to the model. Ailerons are full span, and of solid 3/16-inch balsa.

While Lanier's Stinger 10 is a beautifully engineered kit, the sheet aluminum main landing gear is the only hardware furnished. All other hardware must be supplied by the builder, including a motor mount, fuel tank, tail gear, wheels, aileron torque rods, throttle cable, hinges and control horns, plus assorted screws, washers, piano wire, etc.

Shopping for all these items in your local hobby shop might add around $20 to the cost of building the Stinger 10, but many long-time builders will already have most of these parts lying around the workshop.

The cowl is very roomy and projects out both sides of the fuselage, allowing plenty of space for the engine installation. However, when using the O.S. .10 FSR mounted inverted as per the directions, the muffler does not extend out far enough to clear the cowl, so it is necessary to use a muffler extension. Actually, there is so much room inside the cowl that it might have been more advisable to mount the engine sideways with the muffler on the bottom. I would suggest that anyone building the Stinger 10 give this option some serious consideration.

The fuselage, wing and tail surfaces were covered with white MonoKote with red trim. The turtledecks and the top half of the wheel pants and cowl were painted a deep red, using a fuelproof glossy enamel. Control surfaces were hinged with Du-Bro #537 Kwik-Hinges, each of which was cut in half. The clear canopy was glued in place using RC-56 clear-drying cement.

At this point the moment of truth is reached—the radio installation. This is not normally a problem with conventional airplanes, but when dealing with mini-sized models, space is always at a premium, and installing components can be quite a challenge even for the most experienced builders.

Wide-track landing gear makes for excellent ground handling. Engine is fitted with a 1-1/2 inch Goldberg plastic spinner (later changed to a Cermark aluminum spinner to add nose weight) and an APC 7x4 prop. Also, an extension was needed to get the muffler to clear the cowl. Art recommends mounting the engine on its side so as to put the muffler on the bottom, which should do away with the need for an extension.

Only the smallest servos will fit into the Stinger 10's fuselage, so I used four Futaba S133 micro servos. Recommended location for the receiver is underneath the fuel tank, and I was relieved to find that my standard Futaba R127DF FM seven-channel receiver easily slipped under the fuel tank just as the plans called for. Receiver battery is a 250-mAH pack, which helps keep the weight down. With the exhaust located on the left side of the fuselage, the on/off switch was mounted on the right side, immediately beneath the wing.

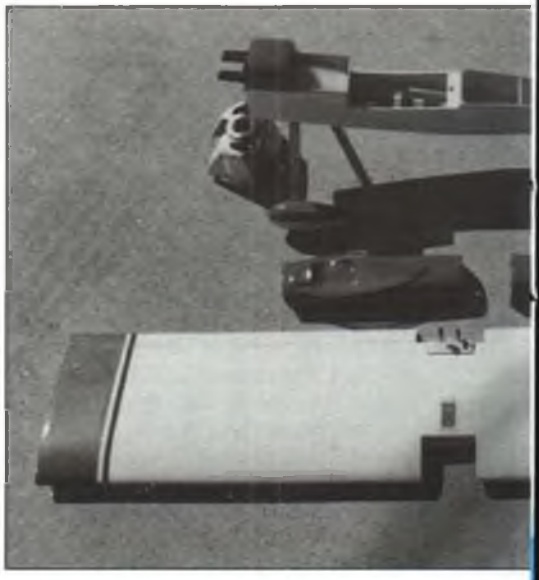
Once completely assembled, out came the scales to determine how closely the Stinger 10 had come to finished weight as specified by the manufacturer. Our version tipped the scales at exactly 32 ounces—well within the lower limits, and 6 ounces under the upper limits. Using this weight, the wing loading computed out to be a very modest 17 ounces per square foot, which made me feel highly optimistic about what to expect in the way of performance. As the instructions did not specify the amount of control surface throw, I guesstimated that 1/2-inch up and down would be right for the ailerons, 3/8-inch should do for the

The Stinger 10's fuselage is a simple all-sheet-balsa box with molded ABS plastic turtledecks fore and aft. Wheel pants and cowl are also ABS plastic.

elevator, and the usual maximum throw would be fine for the rudder.

Although the O.S. .10 FSR ran fine on the bench, I put a few tanks through it while mounted in the airplane, just to avoid surprises at the field. As little engines run best on higher nitro fuels, I filled the tank with Powermaster 15 percent and started her up. Starting was difficult because I ran into a carburetor flooding problem; the tank was mounted too high, well above the needle valve. The fix for this was to put the tank under the receiver, rather than above it as shown on the plans.

I knew that the little wheels and wheel pants really needed a paved runway, but all that was available that day was our local dirt field, so that would have to do. The little



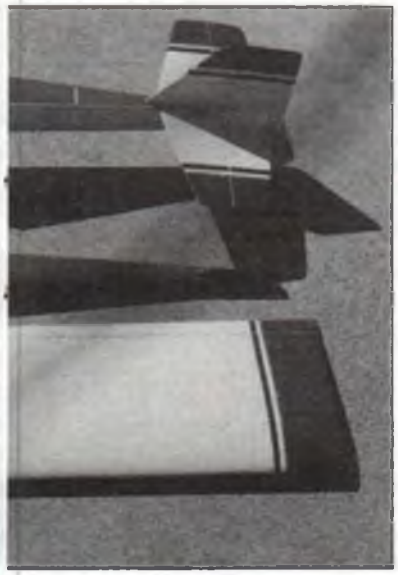
wheels were hampered by the soft dirt, but after a rather long takeoff run she was airborne and climbing at a shallow angle. Only two clicks of right aileron and one click of up elevator were needed to trim the model, but I determined that both aileron and elevator response were too quick and overly sensitive, and the airplane behaved as though it was just a bit tail heavy.

Back in the pits, the aileron throw was reduced to about 3/8-inch and the elevator throw was decreased to 1/4-inch. In addition, 1/2-ounce of weight was added to the nose. The noseweight was later removed and the light plastic Goldberg spinner replaced with a handsome 1-1/2 inch aluminum Spin Right spinner from Cermark Electronics and Model Supplies Co. Substituting this high quality barstock spinner really dressed up the model and added just enough weight in the nose to solve the slightly tail heavy condition.

One other minor problem was a tendency for the wheel pants to drop off. The stock pan-head screws were changed to 4-40 machine screws with locknuts, and the problem disappeared.

With the CG and the control surface throws properly set, the Stinger 10 now behaves like a lady, doing all of the aerobatic maneuvers asked of her. Though the O.S. .10 FSR does provide adequate power, it won't allow the Stinger 10 to realize its full potential, in that sustained knife-edge flight is not attainable, and vertical performance is severely limited. Otherwise, rolls, loops, spins and snaps are spirited enough to satisfy most average pilots. However, I wouldn't hesitate to install a .15 size engine in this lovable little airplane, and yes, I'd certainly mount it sideways. Flying this airplane has proved to be pure, unadulterated fun, and I recommend it wholeheartedly.

Your dealer will be happy to fix you up with your own little Stinger 10, but if he doesn't have one in stock, he can get it for you from Lanier R/C, P.O. Box 458, Oakwood, GA 30566. ***MB***



One nice thing about the Stinger 10 design is that the turtledecks can be left off until after the radio is installed, making it a little easier to work in the confined space.

BY ELOY MAREZ

The Ace R/C Abacus

Measuring your battery's capacity is the only way to be *sure* you have enough juice left to make "one more flight." Ace's Abacus belongs in every RCer's field box.

In this age of calculators and computers, I have to wonder just how many readers, especially the younger ones, will have the slightest idea what an abacus is? Webster describes it as: "A counting board, a frame with beads or balls sliding back and forth on wires or in slots, for doing or teaching arithmetic." Ace R/C's Abacus is definitely a counting device, used to "count" the capacity of your charged nickel-cadmium batteries. And, with its long row of Light Emitting Diodes (LEDs) for indicators, it does in fact bear some semblance to an old-time abacus.

Before we delve into the wonders of this latest battery tester, let's take a look at why we would want to measure battery capacity in the first place, and the techniques involved. First off, all NiCd batteries are rated by the manufacturer as to their capacity, at a given discharge rate for a given time period. This capacity is expressed in milliampere/hours (mAH), i.e., so much rate/time. For example, Sanyo rates its "Cadnica" cells at a 5-hour rate at 0.2C discharge current. That means that a 500-mAH battery, in good condition and properly charged, discharged at a constant 100 milliamp rate (500 x 0.2) will deliver that amount of current for five hours—for a total of 500 mils.

That holds true for Sanyo batteries; it must be noted that NiCds from other makers also come rated at 1- and 10-hour rates. This information is important and must be considered at all times when capacity measurements are being made. Generally, a higher discharge rate than the one specified will result in a lower capacity, a lower rate in a higher one.

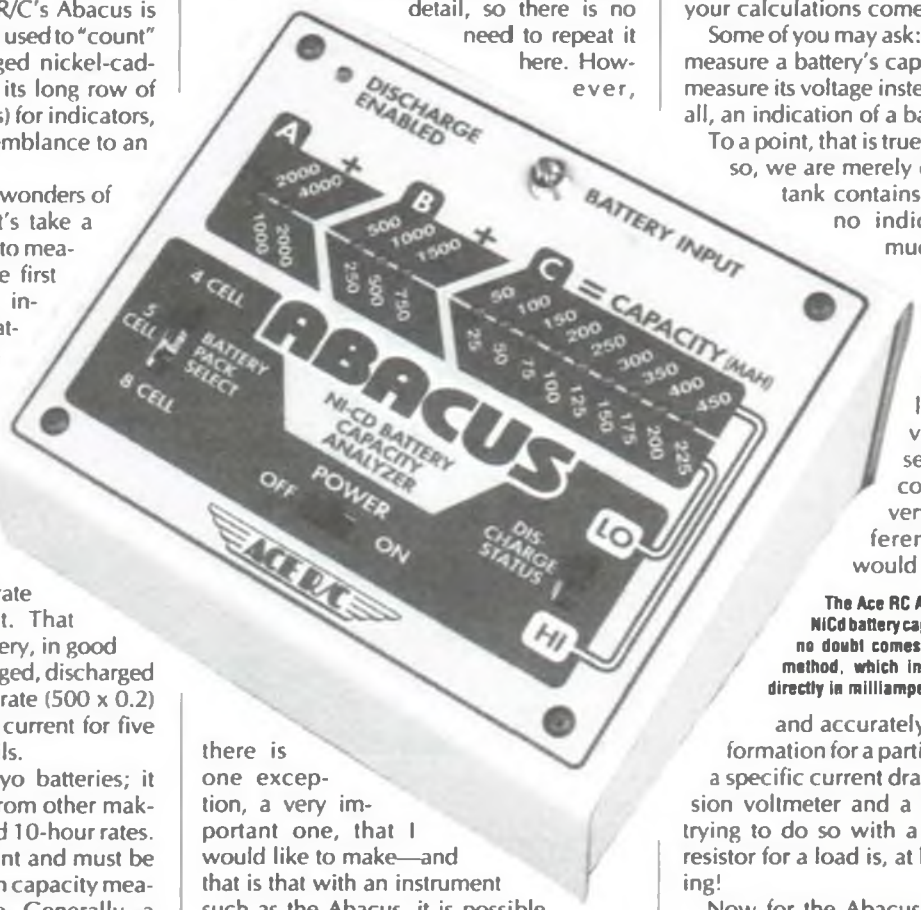
End-of-discharge cell voltage will obviously have a bearing on the measured capacity, as will cell temperature. For our purpose, there's no need to make laboratory type battery tests and compensate for these factors. We can test our batteries at approximately the rates we use them in our RC equipment, and establish accurate parameters for their performance. Any lowering of the calculated and/or measured capacity of a battery pack is a definite indication that it is no longer capable of delivering its normal amount of power.

This whole subject is discussed in the Abacus instructions in greater detail, so there is no need to repeat it here. However, there is one exception, a very important one, that I would like to make—and that is that with an instrument such as the Abacus, it is possible not only to measure the capacity of a given NiCd battery, but also to determine the exact amount of operating (flying) time said battery will be good for in a given airplane. How so?

First, you measure the battery's capacity in the normal Abacus manner. Then you go flying, for a carefully timed period. Then, without recharging the battery, you use the Abacus to measure the amount of charge remaining. Obviously, the battery's normal capacity, less what you have left, will give you what you took out—and since you already know the time it took to consume that amount, you should not even have to resort to a calculator to determine the total amount of flying you can do per charge. (A friendly hint: Land short of the *exact* amount your calculations come out to!)

Some of you may ask: Why do we need to measure a battery's capacity? Why not just measure its voltage instead? Voltage is, after all, an indication of a battery's condition.

To a point, that is true, however, in doing so, we are merely confirming that the tank contains gasoline—there is no indication as to how much! You can in fact determine the amount of charge in a NiCd battery by measuring its voltage, but one look at the shallow voltage curve presented here should convince you of the very minor voltage differences involved. It would be possible to plot and accurately determine this information for a particular battery under a specific current drain by using a precision voltmeter and a constant load, but trying to do so with a $20 meter with a resistor for a load is, at best, wishful thinking!

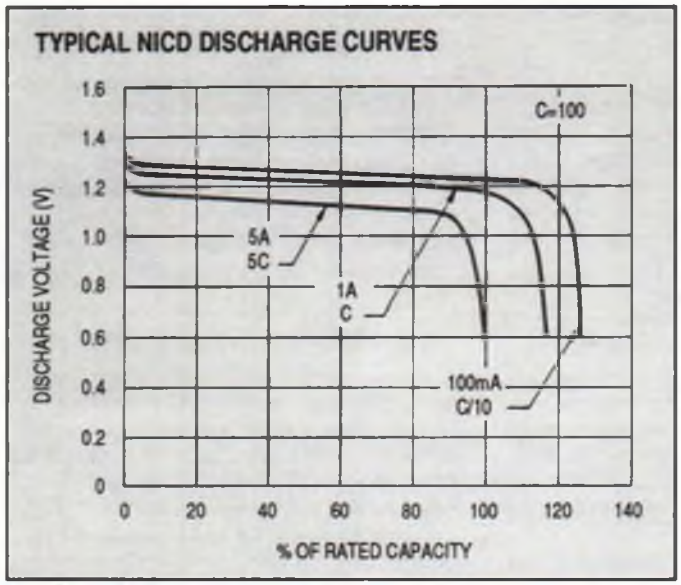


The Ace RC Abacus, a new generation NiCd battery capacity analyzer. The name no doubt comes from its unique display method, which indicates battery capacity directly in milliampere/hours.

Now for the Abacus. It is designed for testing the following battery packs, at the stated cut-off voltages:

- 4-Cell (4.8V) @ 4.0—4.4V
- 5-Cell (6.0V) @ 5.0—5.5V
- 8-Cell (9.6V) @ 8.0—8.8V

These are the most common NiCd batteries in use in today's RC equipment; the 4-cell receiver and 8-cell transmitter battery, and the increasingly popular 5-cell receiver NiCd. Note that the cutoff voltage stated is in all cases at or lower than the battery



A NiCd's voltage discharge curve, shown here for a 1000-mAH cell, is extremely shallow until the discharge point is reached, therefore it is not considered dependable as a charge indicator.

manufacturer's value for discharged cells, at 1.1V.

The Abacus provides a choice of discharge rates: 300 mA (LO), recommended for batteries of 1700 mAH or less; and 600 mA (HI), for batteries up to 4000 mAH (4.0 AH). There is a plainly marked switch to select this option.

An important point in the operation of the Abacus is that it displays battery capacity directly in mAH, not simply in time as did all of its predecessors. Using a series of Light Emitting Diodes (LEDs), the Abacus reads capacity by lighting them sequentially as the battery is discharged. A moment's study of the sketch of the display will answer any questions. In the LO function, the right (C) row of LEDs indicates capacity in steps of 25 mA. After 225 mA has been reached, the first LED in the second (B) row, indicating 250 mA, is lighted. Whatever subsequently shows on the C section is added to the 250 reading. After 750 mA, the right (A) row comes into play, indicating 1000 or 2000 mA, to which whatever the other two sections indicate is added.

For the HI test, the same LEDs are used, only now indicating higher values, starting with steps of 50 mAH.

In addition to the display, there is yet another important difference between the Abacus and other modern NiCd capacity testers. All the others include a charger, with automatic switching at the point of cutoff. While this is a convenience, it also adds to the cost of the device, and since you already own a charger—the one that came with your RC system—it doesn't make sense to buy another which does exactly the same thing. This does place the burden on you to remember to unplug the battery from the Abacus and reconnect it to the system charger in plenty of time to allow proper charging before heading out to the field.

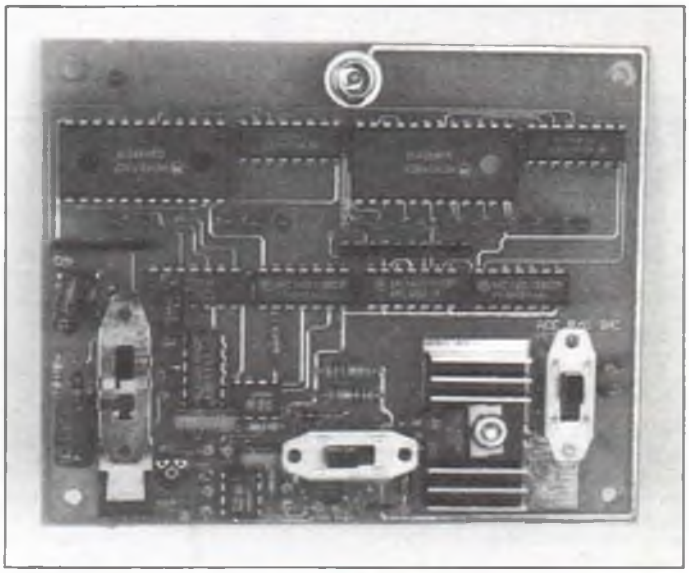
Even if you are not planning to go flying right away, the battery should be charged soon, as NiCds left for long periods in a discharged state can develop problems of reversed cells and loss of capacity. It won't hurt to let them sit for a day or two, but don't capacity test your batteries before putting things away for the winter and forget to charge them!

Connections to the Abacus are made through readily available coaxial power plugs of the type used to connect outside transformers to many electronic devices. These connectors come in various sizes; the proper one is 2.5mm I.D. A couple are furnished with the Abacus. Included also are instructions as to how they should be wired; a critical point, as reversed connections here are sure to damage something. Just as critical are the connections at the other end (plus to plus, etc.). To make it easy and foolproof, Ace can also provide you with ready-made adapter cables for Ace, Airtronics, Futaba and JR equipment. Should you doubt your connections to be 100 percent correct, you are advised to get help from someone a bit more experienced in these matters.

Transmitter charger circuit diodes—ugh! You won't be able to test all transmitters, as some of them have a blocking diode installed internally in their charging circuit that prevents the battery from being discharged through the charge connector. Those diodes will prevent reverse charging of the battery should you cross the charger input wires, however, since your system came with a pre-wired charger, this is almost an impossibility.

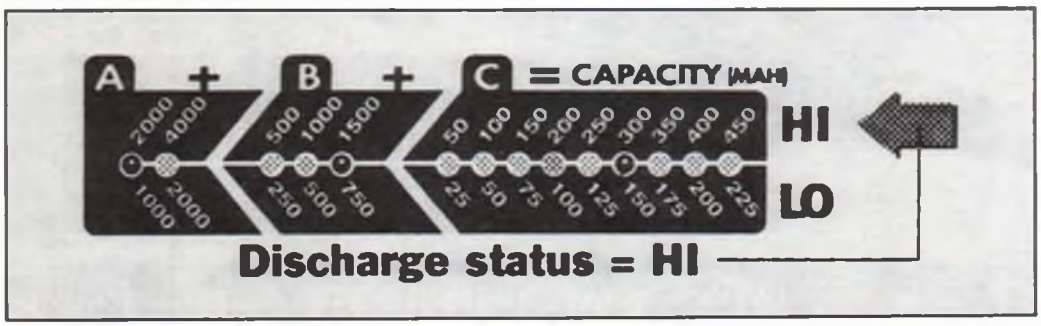
Senseless, yes, but nonetheless something to be dealt with. You will know that your transmitter has such a diode if your Abacus will not go into the charge function when the proper connections are made. You have two options: to bypass or remove the diode if you can locate it, or to remove the battery, prepare the proper connectors and test it externally. It is definitely worth the extra trouble to do so, this being an extremely worthwhile test.

The Abacus carries Ace R/C's normal warranty for 90 days against defects in parts and workmanship—with the usual disclaimer about misuse or abuse. It is available directly from Ace R/C and many dealers throughout the country. It's listed in the catalog as Ace No. 34K65C, assembled. Price? $69.95, and worth every penny in insurance and peace of mind! ***MB***



Though extremely accurate and simple to use, the Abacus is quite complicated circuitwise, using 11 ICs and a multitude of discrete components, mounted on a rugged epoxyglass board.

The Abacus' LED readout, though probably confusing at first, is easily understood once you've used it. The values indicated by the lighted LEDs in each section are added together, in true abacus fashion.



ELECTRIC POWER cont. from page 59

ping it for maximum power. Figure B plots motor speed against output power. Here we see that power increases as the rpm decreases (i.e., as the load increases) and that the motor will run while drawing 275 watts (but not for very long!).

The bottom line is that if you want to run the motor to get the most power with the greatest run time, prop it to achieve maximum efficiency. If you want raw power and are not too concerned with efficiency (like in F3E and pylon flying), prop it for the most power. Your run times will be short, but you'll fly fast!

PROPELLER POWER FORMULA

George Abbott, in the July 1988 issue of *Model Aviation*, published a formula that relates prop diameter, pitch and speed to propeller input power:

$$P_{(prop\ in)} = \frac{HD^4S^3}{188{,}000}$$

where:
$P_{(prop\ in)}$ = propeller input power;
H = prop pitch (inches);
D = prop diameter (inches);
S = prop speed in thousands rpm.

Since propeller input power is also motor output power, this should tell us the output power of the motor.

Ed's formula is easy and straightforward, but it only tells us about propeller *input* power, not the *output* power. Knowing the output power of the motor is not enough to determine the output power of the complete system. Just like the motors, the propellers we use are not 100 percent efficient, and some power is lost between the motor shaft and what is generated by the prop. Anyone who experiments with different types of props of the same "size" can attest to this.

According to my test data, an Astro 25 turns a Robbe 9x6 prop at 10,700 rpm and produces 50 ounces of static thrust. However, a Windsor 9x6 turning at the same speed produces only 43 ounces of static thrust. Obviously, prop design makes a big difference in the power output.

A few years ago some props were supplied with calibration charts with information that stated the load the prop placed on the motor at any given rpm. If we knew this with today's propellers, we could compute the true output power of the complete motor system. If propeller manufacturers could supply this data for their props, it would be a simple matter to convert the propeller load to a torque, then to output power.

THRUST MEASUREMENT

There has been quite a bit of talk about static thrust measurements with electric motors. There are some things you should know about this. First, static thrust gives a good indication of *static* power, i.e. how much power you get while standing still on the ground. Unfortunately, you can't fly your plane while it's standing on the ground, and propeller characteristics change considerably when the plane is flying.

Second, in my testing I've found that for each type and size of propeller, the relationship between speed and static thrust over the prop's normal operating range can

be described by a linear equation:

$$T=mS+n$$

where:
T = static thrust in ounces;
S = prop speed (rpm);
m = prop thrust constant 1;
n = prop thrust constant 2.

To complete this equation, you need to find m and n. First, take two measurements of rpm and thrust using two battery packs of differing cell counts, then use the following equations to compute m and n:

$$m=\frac{T_2-T_1}{S_2-S_1}$$

$$n=T_1-mS_1 \quad \text{or} \quad n=T_2-mS_2$$

where:
S1 and T1 are the speed and thrust for the first trial;
S2 and T2 are the speed and thrust for the second trial;
m is the first propeller constant;
n is the second propeller constant.

Let's try an example. An Astro 25 with a gearbox spins a Top Flite 12x6 prop on 10 cells at 5,400 rpm and produces 32 ounces of static thrust. On 16 cells it will spin the same prop at 7,600 rpm and puts out 63 ounces of static thrust. m = (63-32)/(7600-5400) = 0.0141; n = -44.14. Therefore, given a speed (rpm), the thrust from this prop can be determined by this formula:

$$T=(0.0141)S-44.14$$

Note that if our formula was valid for all possible values of rpm and thrust, at 0 rpm the prop would generate 44 ounces of thrust backwards! This is of course impossible, so the formula is only true for the normal operating speed of the motor.

THE BOTTOM LINE

After reading this overview of the different theories and applications of the workings of electric motors, you're probably wondering which is the best method to use to determine the output power of your motors. Each method has advantages and disadvantages and it really is up to you to decide how deep you want to go in your motor experiments.

In practice, it is accepted by the manufacturers of electric motors and gurus of electric flight that motor efficiency ranges between 65 and 80 percent. With this knowledge, here's how I've decided to jump the motor power hurdle: I measure the motor input power during a motor run test with the battery pack and propeller I am going to use in the plane. Multiply the input power by 70 percent and use this as the output power. This method is quick, easy and achieves the desired goal—to determine an acceptable motor/prop/battery pack/aircraft mix. It's not an elegant, theoretical solution, but it works 95 percent of the time!

Keep those letters and photos coming—I read and answer every one. If you write, let me know what kind of electric models you fly (sport, motorgliders, scale, F3E, old timers, etc.) and please send some pictures. Roger Jaffe, 6462 Sunny Brae Dr., San Diego, CA 92119; (619) 463-4453 between 8 a.m. and 5 p.m. weekdays, Pacific time. ***MB***

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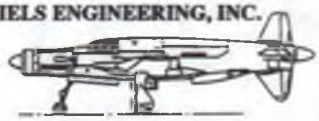

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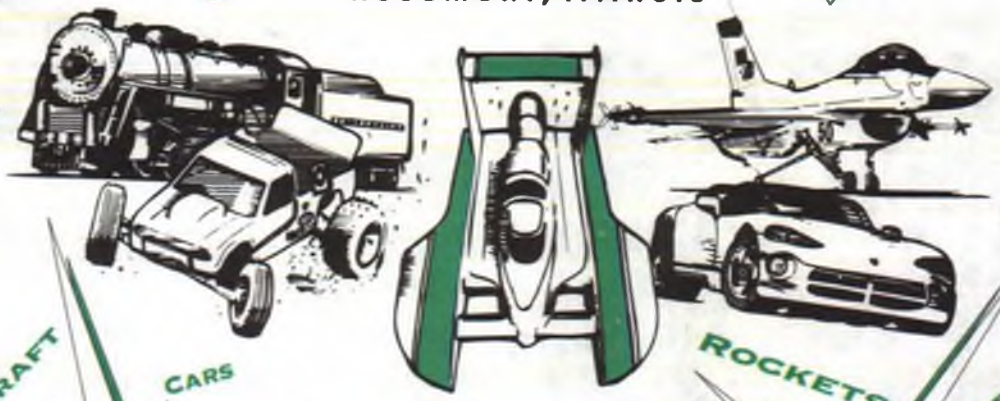

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PLUG SPARKS

BY JOHN POND

SAM 34: How They Acquired A First-Class Flying Field

Every so often, we like to report on a new SAM activity—in this case, the SAM 34 Annual held at Carson City, Nevada, under the leadership of the club spark plug and contest director, Robert Brogan. This was the second such meet held by SAM 34; their initial contest was met with very discouraging weather (in June of all months!).

Bob Brogan reports they initially rented their club field—40 acres—from the Bureau of Land Management, beginning in the early '80s, for about $100 per year. It was not until the BLM was directed to adjust the market value of its rentals that the cost was upped to $800 per year. This is above the average model club's treasury!

Brogan went into a huddle with the local head of the BLM, who pointed out that the BLM can turn over land to local governments for parks and recreation purposes. In short order, the land was turned over to the Carson City Parks and Recreation Commission, which in turn gave care of the land to the High Sierra R/C Club.

In Nevada, the law allows cities and counties to charge a percentage of new housing sales to be used for park development. To top this off, SAM 34 was able to request funds for a runway and paved areas for control line and helicopters. Despite the local newspaper's objections to spending money on "toys," everything went forward with a paved 500x75-foot runway and a 200x40-foot ramp adjacent to the strip. Included in all this was the control line and helipad flying areas for the remarkably low cost of $16,000.

With such a good deal going for SAM 34, the boys have already put up prominent safety signs, have built permanent work tables on the apron and have erected a dividing fence between the pits and the flying area. Further planned improvements consist of stabilizing the loose dirt, putting up sun shields for the tables and improving the equipment shack and registration area.

Photo No. 1. Columnist Pond, a dyed-in-the-wool RC filer, had to get O.T. free flighter George Greenwood (right) to show him how to get a good run out of the Black Widow in his 1/2A Bay Ridge Mike. Scene is the SAM 34 Annual at Carson City, Nevada. Photo by Bob Munn.

Photo No. 2. Hal MacRae with his hot flying but ill-fated Weathers Westerner at Carson City. Schnuerle power and a lightly built structure often don't mix.

Photo No. 3. Nice example of a Junior Brown Junior, the featured Engine of the Month, as turned out by Bill Hofstetter from one of Roger Schroeder's casting kits.

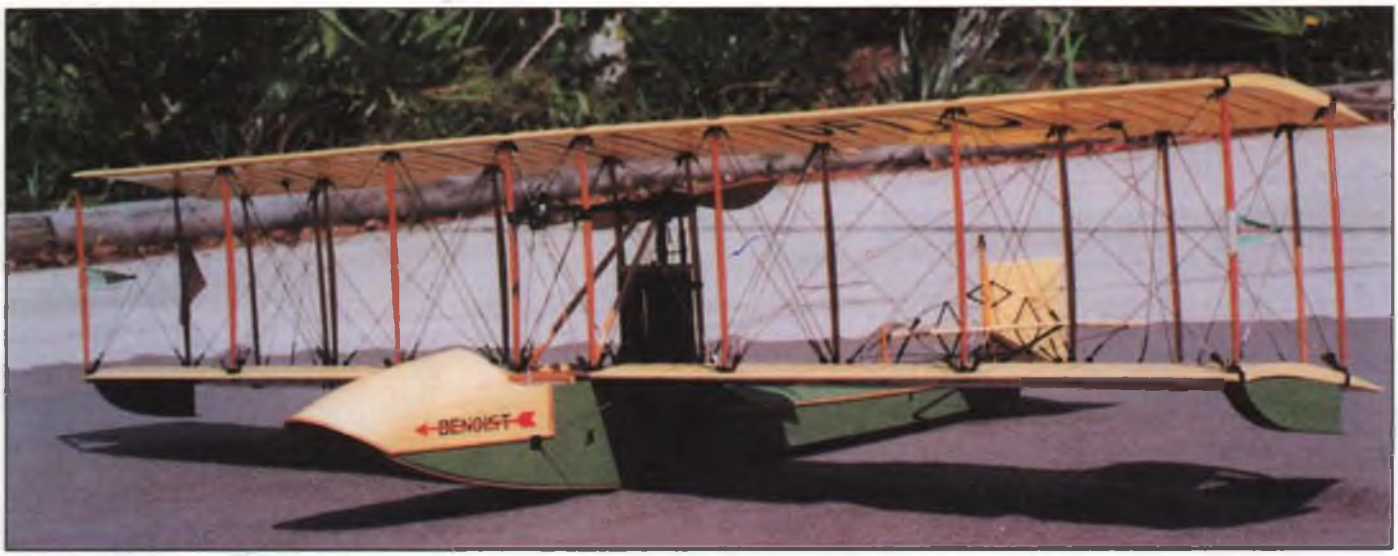


Photo No. 4. To commemorate the first scheduled airline of 1914, Florida O.T. enthusiast Fred Mulholland built this beautiful Benoist Airboat static display model for the St. Petersburg Historical Museum.

Brogan and his club members have paid careful attention to their public relations, making sure the field is used to its maximum. This has allowed them to stage numerous fly-ins and invite out-of-towners to enjoy the facility. Of course, their annual meet can only improve over time.

Photo No. 1 shows John Pond with George Greenwood, an O.T. FF modeler, test running the engine in Pond's 1/2A Mike at the SAM 34 field. I've found the best and easiest way to get newcomers involved in O.T. RC is to introduce them to 1/2A Texaco. This is the simplest event to get started in, as most of the items (engines, kits, etc.) are readily available.

Probably the most spectacular flight occurred when Hal MacRae's hot climbing Weathers Westerner (Photo No. 2) folded a wing under power. The fuselage plunged to a terrific crash, but the broken wing panel, as usual, floated around for another five minutes before being recovered. Hal says he will put the Westerner back together again.

MODEL OF THE MONTH

Quite a few years ago, when this columnist was the SAM Historian, I received literature from Dick Tanis of New Jersey in the form of documents and confirmation letters on an early design done by Dick's dad. Inasmuch as there was plenty of confirming data, the design was approved as an Antique of 1936 origin.

The "Yankee Clipper," selected this month as one of the model designs one rarely sees, is a very simple model to build. The fuselage is a built-up rectangular box with the sides running parallel past the wing mounts. Wing and tail are sim-

MODEL OF THE MONTH

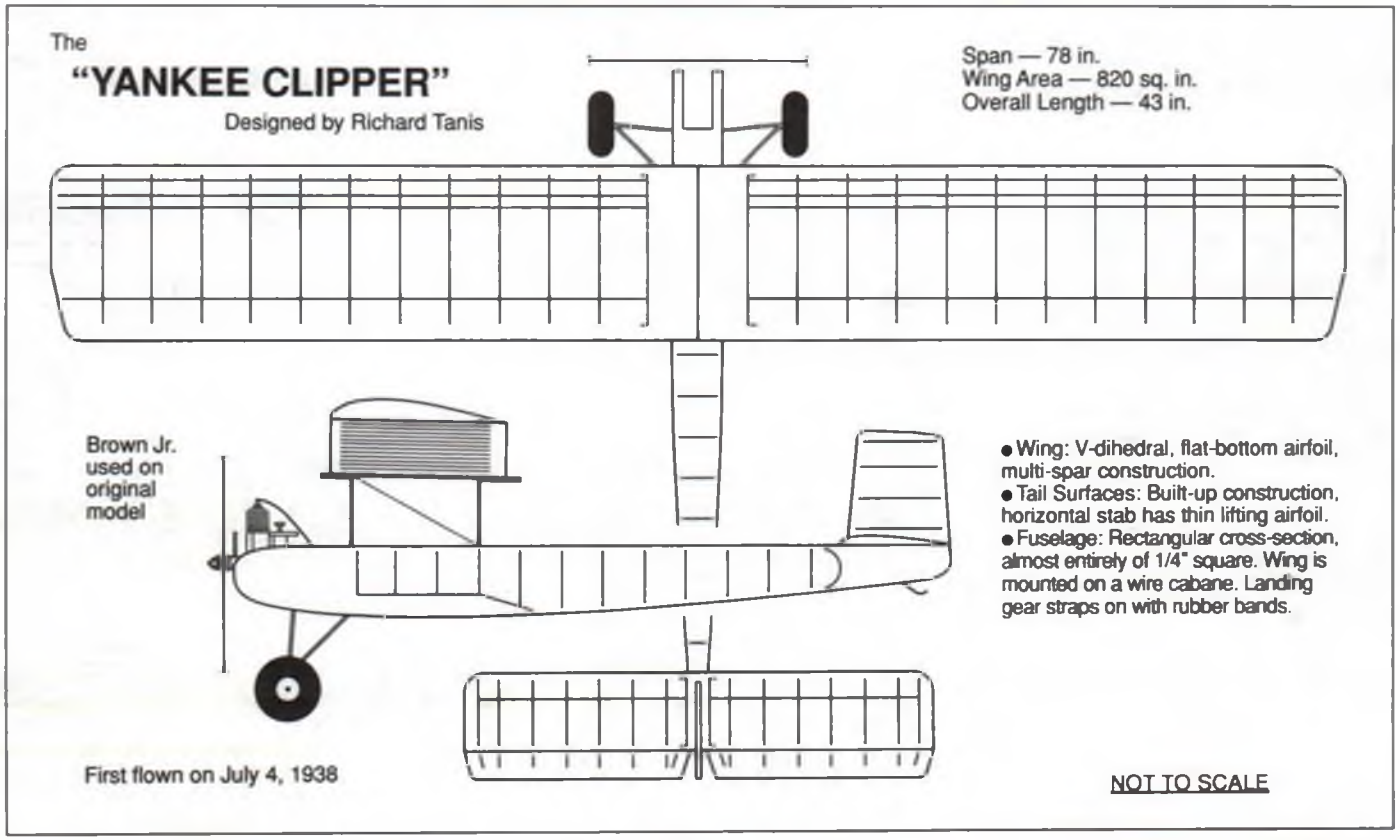


Photo No. 5. Dick Monahan goes for unusual subjects; for the O.T. RC Towline event, he built this graceful sailplane, a French-German R-40. A real floater!

Photo No. 6. SAM 26 Stalwart, Ron Doig, displays his "All-Balsa Soarer," a Hank Struck design. Drawings for the original 4-foot model can be found in the 1935-36 Zaic Yearbook.

plicity themselves, as only one rib section is employed in each. The flying surfaces feature multi-spar construction with sheeted center section. Tanis reports his dad's model was first flown successfully at Murchor Airport on July 4, 1938 using a Brown Jr. Model D for power.

MODEL OF THE MONTH FOLLOW-UP

When we broke tradition and featured a control line model, Bob Palmer's "Smoothie," as the M.O.M. (August '93), we were greatly surprised by the response received. The letter and drawings from Tom Dixon were especially gratifying. For those who are not aware of his activities, Dixon runs a control line plan and engine service, specializing in CL hardware and custom-prepared stunt and combat engines. Tom can be reached at P.O. Box 671166,

Marietta, GA 30066.

Depending on reader response, we would be delighted to feature other nostalgic control line designs; the first coming to mind (as suggested by Dixon) would be Bob Elliott's "Black Tiger," featured in *Air Trails*, February 1952. This model, patterned somewhat after the Curtiss P-40 Warhawk, is an excellent flier and well worth reviewing. Let's hear from you!

ENGINE OF THE MONTH

The Junior Brown Junior was originally the brainchild of Bill Schmidt, a very active member of SAM 56 in Kansas. Bill used a Lindberg A crankcase casting and the basic Hornet A design (drawings of which appeared in *Popular Aviation*), revising the design to resemble a small Brown Junior. The result was a .199 cubic inch engine with a bore of .625 inch and a stroke of .650 inch.

The engine in Photo No. 3 was built by Bill Hofstetter, from castings produced and marketed by Roger Schroeder. Like all homebuilt engines, each one is unique. Hofstetter's shows several changes from the original Schroeder design. Because of machining difficulties, Bill was unable to cut the cylinder fins as they are designed. Bill's engine has fewer fins, but this does not seem to affect the cooling. Also, rather than use the upright type timer as seen in the late Brown Model B engines, a timer design similar to the Hurleman was used and has proved to be quite reliable.

SAM 77 1994 WINTER FLY

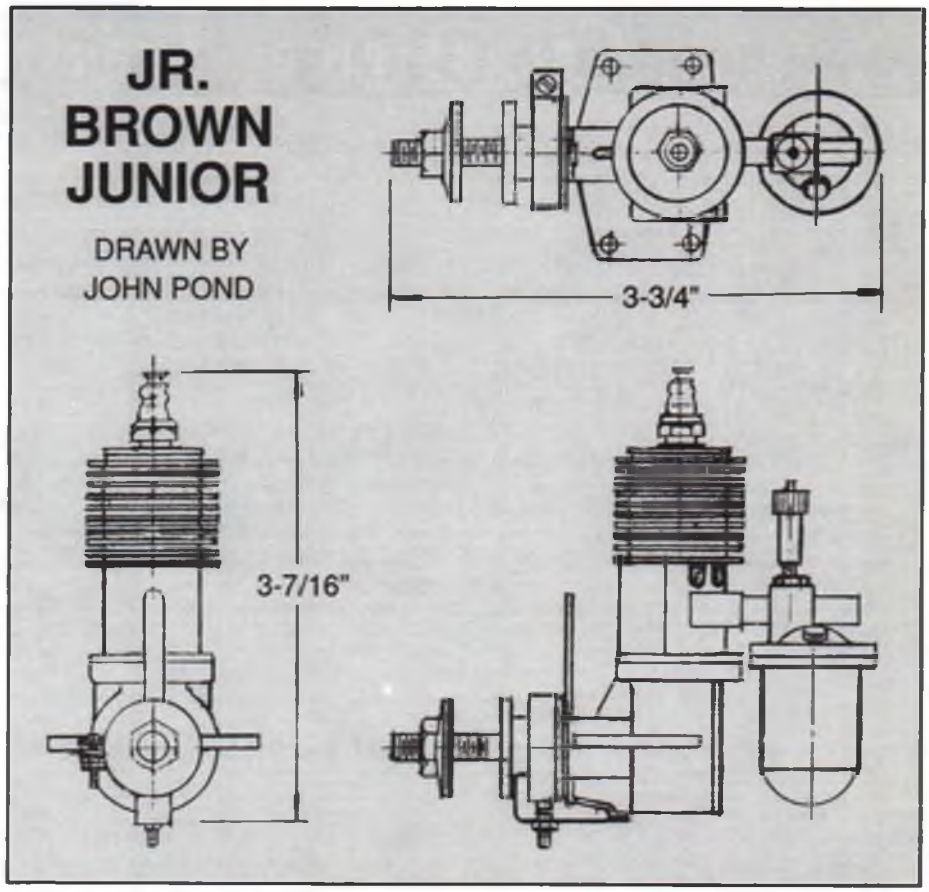
We missed publicizing this one last time, but Fred Mulholland is making sure the word gets out for the 1994 SAM 77, West Pasco Model Pilots Association RC Annual. This meet will be held at the WPMPA field in Odessa, Florida. Three days of flying, January 7-9. Six events each day—more than enough for any red-hot competitor or sport flier. For details write Fred Mulholland, 15410 Stonecreek Lane, Tampa, FL 33613.

Not known to many people is Mulholland's dedication to full-size aircraft as featured in the St. Petersburg Historical Museum. Seen in Photo No. 4 is Fred's recently completed static scale model of the Benoist "Airboat," which was used to start the world's first scheduled airline in 1914.

O.T. TOWLINE

At the SAM 49 Spring Annual staged at Taft, Dick Monahan came up with one of the best-looking RC O.T. towline gliders we have seen in a long time. Photo No. 5 is of his French/German R-40 sailplane, designed

continued on page 82



ENGINE OF THE MONTH

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MODEL DESIGN *cont. from page 18*

loading the two micros less than the previous single servo, you may also end up with better speed with the micros.

I have, over the years, used strip ailerons with a single servo, barn door ailerons controlled through NyRods by a single servo, and barn doors controlled through straight pushrods and bellcranks by a single servo. After using a servo in each wing to directly control its aileron, I will never go back to any of the above.

With a single aileron servo, I frequently had to put aileron balance weights on my hotter airplanes to prevent aileron flutter. In my last half dozen or so airplanes, all with a servo for each aileron, there has been no sign of flutter in vertical power dives even without balance weights. The reason is that the very short pushrods from the servos to the center of the ailerons are much stiffer than NyRod or bellcranks and pushrods to a central aileron servo. In the case of strip ailerons controlled from the center of the wing, the pushrods are short and stiff, but the ailerons themselves, and the torque rod or tube to the ailerons, are frequently quite flexible in torsion. Flexibility and backlash invite control surface flutter at high speed. Unbalanced ailerons can usually be tolerated if the system is tight and stiff.

In addition, the friction drag of the aileron control system will usually be less without NyRods, bellcranks, and torque

ADVERTISER INDEX

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rod bearings, which means less hysteresis and better control.

When we consider the weight of direct short pushrods to each aileron as compared to torque rods, pushrods and bellcranks, or NyRods, and perhaps aileron balance weights, the stiffer, better and easier-to-build two-micro-servo aileron system saves even more airplane weight.

That's the good news on using micro servos. The bad news is that micro servos cost about half again as much as standard servos. If your modeling budget is tight, there may be other things you need more than micro servos.

VANTEC ELECTRONICS

Vantec, a regular advertiser in *Model Builder,* is an interesting company, and its founder and owner, Mr. Dail (pronounced Dale) de Villeneuve, is quite an electronics engineer. I first became aware of Vantec through one of their ads some 10 years ago, when I was designing the 1/10-scale RC crane shown in the photo (see also *MB,* July 1987).

As it turned out, Vantec's "Keykoder" system was exactly what I needed to get the 18 channels required for the crane. It has been operating flawlessly in that model ever since, including demonstrations which resulted in overall Best of Show at the Northwest Model Exposition in 1987.

The Keykoder system adds a miniature 12-key keypad to the face of a standard RC transmitter (see photo). The Keykoder system also adds a "receptor" (decoder) to the airplane, boat, robot, crane, or whatever, to add 12 more channels to the system. One of the original channels on the transmitter (in most cases the gear retract channel) is multiplexed by the Keykoder system into the 12 new channels. All of the remaining proportional channels in the original RC system are unaffected.

The added channels are not proportional; they are of the on/off type. Six of them are dedicated momentary switches, which means that when we push a button, something starts and continues until we release the button, like a doorbell.

The other six added channels may be all of this type, or factory programmed for "latching," or any combination of momentary or latching, at the option of the customer. When a latching channel button is pushed, something starts (like lights turning on) and continues after the button is released. To turn that function off, the same button is pushed a second time.

The Vantec Receptor, as currently packaged, is rather large and heavy, but it fit my crane with no problems. The cost of the Vantec Keykoder system is roughly equal to the cost of a medium-quality RC set, and they can be purchased either separately or already installed on the transmitter.

The Keykoder system is only one Vantec product, however. Most of Vantec's recent ads in *MB* have offered a proportional reverse and proportional forward electronic throttle or speed controller for electric motors. Many types of speed controllers are offered, but that is by no means all. Vantec's current price list shows 70 electronic items.

Of special interest to me was a list of the projects that de Villeneuve has designed or been closely associated with. It includes submarine control systems for the movie "The Abyss" and for the TV production "The Winds of War," pay TV converters, a pulse code RC system for police robots, security and nuclear robot controls, movie robots, stepper motors for industrial systems, electronic automotive steering controllers, wheelchair controllers, a servo system for a centrifugal casting machine, and many others.

I admire capable and ambitious people. Vantec's number is (805) 929-5055 or 1-800-8-VANTEC.

PARTING WORDS

"Risks must be taken, because the greatest risk in life is to risk nothing. The people who risk nothing do nothing, have nothing, are nothing."—Abigail VanBuren. (Fortunately for us, flying model airplanes involves risk.)

Francis Reynolds, 3802 127th Ave. N.E., Bellevue, WA 98005-1346. SASE please. (206) 885-2647. ***MB***

PLUG SPARKS *continued from page 79*

during the early 1940s.

Although the fuselage cross-section is quite large, this model is a superlative performer. There are no minimum weight requirements in this event, so the models can be built very light to fly on the lightest thermals.

Photo No. 7. One of the most popular and prolific Australian O.T. fliers is Colin Borthwick of Queensland. You'll see him at the '93 SAM Champs at Taft later this year.

Interest in the towline event is gradually increasing, with some little-known designs being unearthed. Photo No. 6 is exactly what we are talking about: a scaled-up version of the all-balsa towline glider designed by Henry Struck. Ron Doig has been having fairly good luck with this very streamlined model.

AUSTRALIA

A significant number of contributors to this column reside in Australia. Among those is Colin Borthwick, of Chapel Hill, Queensland. Borthwick is getting to be well known as he has attended over five U.S. SAM Champs in recent years.

Seen in Photo No. 7 is Colin along with his latest model, a Fred Lehmberg "Feather Merchant" finished in pink and white. The model is powered by a Super Tigre .29 which in Colin's estimation seems to provide adequate power.

THE WRAP-UP

What better way to close out this month's column than to run Photo No. 8, showing Bill Cooksey and Lonnie Turner with their versions of this columnist's 10-foot Super Clipper. Cooksey will be remembered for his long stint in New Zealand; photos of him with his big Super Buccaneer appeared in several modeling magazines. Now living in Georgia, Bill has begun to stir up interest in the big Texaco type models, the result being the two huge Clippers.

Photo No. 8. These guys must have to rent a U-Haul truck every time they go flying! Bill Cooksey (right), recently returned to the U.S. from New Zealand, built one of John Pond's Super Clippers, as did his buddy Lonnie Turner.

Bill reports that both models are very graceful and are a pleasure to fly. Being very sensitive to thermals, the models fly quite similarly to the Goldberg Valkyrie. Matter of fact, when scaled up, the Clipper wing is identical to the Valkyrie wing in size and shape. A project well worth considering! ***MB***

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