

A CONTROL LINE AUTOGYRO!

THE KAYABA KA-1

Ready for something *really* different? The author has been having a ball flying his WWII-vintage carrier-based Japanese autogyro in CL Profile Carrier events. Makes a great sport flier, too. You gotta build one!

BY BILL DARKOW

PHOTOS BY AUTHOR, CHRIS WEINREICH AND BILL MAZZONCINI



In fully developed slow flight the Ka-1 has been clocked as slow as 10 mph; here the rotor is operating at about +38 degrees from horizontal. Best of all, an autogyro can fly like this naturally, without resorting to line sliders or any of the other fancy tricks the fixed-wing guys have to use to achieve the same thing.



One of the author's earlier versions of the Ka-1—note the old-style non-adjustable rotor head design. Engine is a Super Tigre .35. Bill's latest Ka-1 uses a Fox .36 with clockwise rotating crankshaft to maintain the tension during slow flight and eliminate the inward "torque roll" when the throttle is opened.

1952

Ray indicates the percentages are also pretty encouraging. Already, without much press coverage, he has 62 fliers who have returned their vouchers. Of these, about 20 percent are newcomers! Can you remember the last time your club had a meeting or a day of flying where 20 percent in attendance were beginners? Yes, 62 is a humble start, but it's growing!

LSF started small too, but it grew. Back in the '70s we were all pretty much beginners. LSF taught us discipline and gave us goals to shoot for. Soaring was more affordable. Sailplanes were comprised of balsa sticks and sheet wood held together by glue and MonoKote. We were excited, and we learned.

LSF is still around, however, not too many people are talking about it anymore. Perhaps something's gone wrong. Maybe the enthusiasm and new blood of WINGS will set an example.

On the flip side, there are those who will say that learning to fly with a sailplane as small and light as a typical 1.5-meter is going to be tough. Small planes are more flitty and sensitive to wind. They are very responsive and therefore easy to overcontrol. If you're trying to learn to fly all by yourself, you'd be better served by a larger, slower handling, steadier aircraft. However, larger means more expensive, and up goes the

continued on page 82

ORGANIZE AND PROTECT YOUR COPIES OF **MODEL BUILDER**

Now there's an easy way to keep copies of your favorite magazine readily available for future reference. Designed exclusively for **MODEL BUILDER** by Jesse Jones Industries, these custom-made, titled cases and binders are sized to hold a year's issues. *Reinforced board covered with durable leather-like material in Blue. *Title is hot-stamped in Silver. Free personalization foil included for indexing year. *Cases are V-notched for easy access. *Binders have special spring mechanism to hold individual rods which easily snap in.



MODEL BUILDER

Jesse Jones Industries, Dept. MB
499 East Erle Avenue, Philadelphia, PA 19134

Please send _____ cases; _____ binders
for **MODEL BUILDER** magazine.

Enclosed is \$ _____
 Charge my: (minimum \$15)
 American Express Visa
 MasterCard Diner's Club

Card # _____ Exp. Date _____

Signature _____
Charge orders: Call TOLL FREE 7 days, 24 hours: **#1-800-825-6690**

PRINT NAME _____

ADDRESS _____
No P.O. Box Numbers Please

CITY/STATE/ZIP _____

PA residents add 7% sales tax.

SATISFACTION GUARANTEED

Quantity	Cases	Binders
One	\$ 7.95	\$ 9.95
Three	\$ 21.95	\$ 27.95
Six	\$ 39.95	\$ 52.95

Add \$1 per case/binder postage and handling. Outside USA \$2.50 per case/binder. U.S. Funds Only.

You and champion fliers have one thing in common. You all use Top Flite MonoKote.



Modelers everywhere have made MonoKote #1—for its light weight, easy application, beautiful lustre and unmatched color selection.

Maybe you don't have equal access to supercharged engines or high-performance fuels. But one product you can use is identical to the pick of the "pros."

That's Top Flite MonoKote covering.

You don't need to be a Tournament of Champions veteran to admire MonoKote's strength, low weight, and huge selection of rich colors. And first-timers aren't the only ones who enjoy its low price and easy application.

For over two decades, MonoKote has supplied the crowning touch equally to trainers, sport planes and elaborate scale masterpieces.

It's not just #1 with people who can have anything they want on their planes. MonoKote is the key to making *your* project a winner, too.

For a free brochure and the location of the dealer nearest you, please call 1-800-682-8948, ext. 034A.

TF TOP FLITE
MONOKOTE®

Distributed Exclusively Through GREAT PLANES MODEL DISTRIBUTORS COMPANY P.O. Box 9021, Champaign, IL 61829-9021

© Copyright 1994-207909



The author with his unusual CL model. We understand Bill's Ka-1 has created something of a stir within the CL Navy Carrier community—not because it's a guaranteed contest winner (it isn't), but because it's "different," and has proven itself capable of giving traditional fixed-wing Carrier models a run for their money in competition.

In 1943, when Japanese shipping losses were becoming a serious problem, several Kayaba Ka-1 autogyros were armed with depth charges and stationed aboard the escort carrier *Akitsu Maru*. Their performance was impressive. Takeoff runs were less than 50 feet and landing distances were near zero. Their mission was defeated, however, when the *Akitsu Maru* was sunk by an American submarine on November 15, 1944. Still, the Ka-1 remains the only armed autogyro to fly carrier-based combat missions.

Likewise, my profile Ka-1 is the only model autogyro to make an official flight in CL Navy Carrier. It placed 2nd among five entrants in Profile Carrier at the Fourth Annual Great Desert Carrier Bash in Richland, Washington.

Although CL autogyros are fun to fly, a unique design challenge and attract much atten-

tion, they are seldom seen. Except for rare scale or sport models, their development has been neglected. Navy Carrier offers an opportunity to develop competitive CL autogyro designs. The complex "trick" gadgetry currently used to force fixed-wing carrier models into unrealistic slow-speed flight attitudes is unnecessary. Slow-speed autogyro flight is simple and natural.

Bill Bischoff, Chairman of the AMA Control Line Contest Board, has ruled: "I can find no reason that an autogyro should not be legal in any of the Navy Carrier events." With particular reference to the 300 square inch minimum wing area rule in Profile Carrier: "I find no reason to disallow this model due to size constraints." And finally: "To summarize, I feel that the existing Carrier rules do not specifically prohibit autogyros from entering."

Dick Perry, Navy Carrier col-

umnist for *Model Aviation*, has written: "I do not believe that autogyros are prohibited under the existing rules. I, personally, would like to see autogyros fly in Carrier."

DESIGN AND CONSTRUCTION

•Blades

In an autogyro, lift comes from the area swept by the rotor blades—the "rotor disc." The amount of lift generated depends on the disc area, angle of the disc to the thrustline, angle of the blades to the hub, and blade rotation speed.

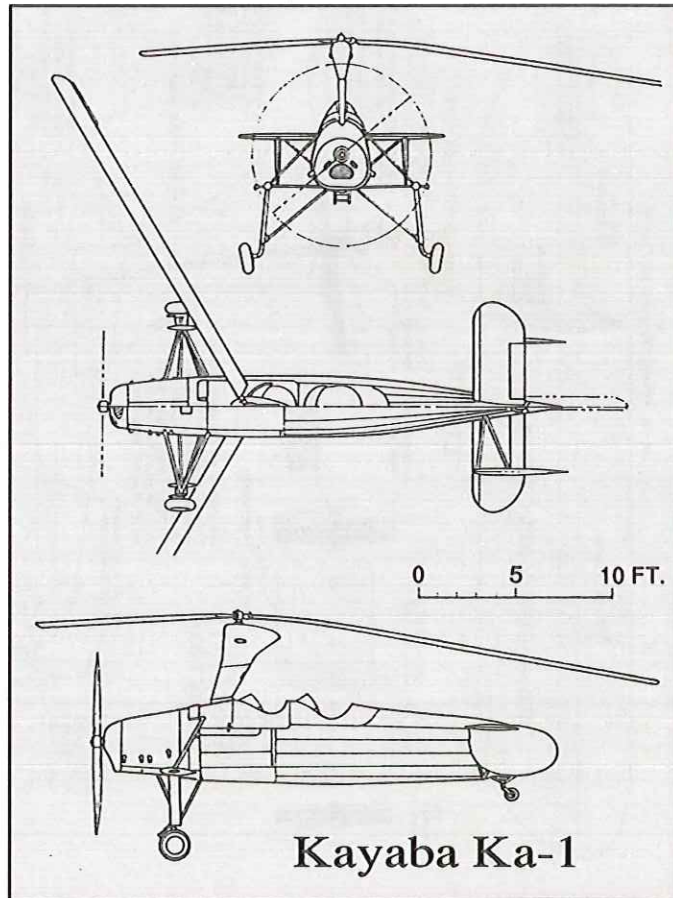
Blade rotation speed depends on the forward speed of the aircraft and the relationship of blade area to disc area—the "solidity factor." A low solidity factor gives less drag, allowing higher rotor and aircraft speeds;

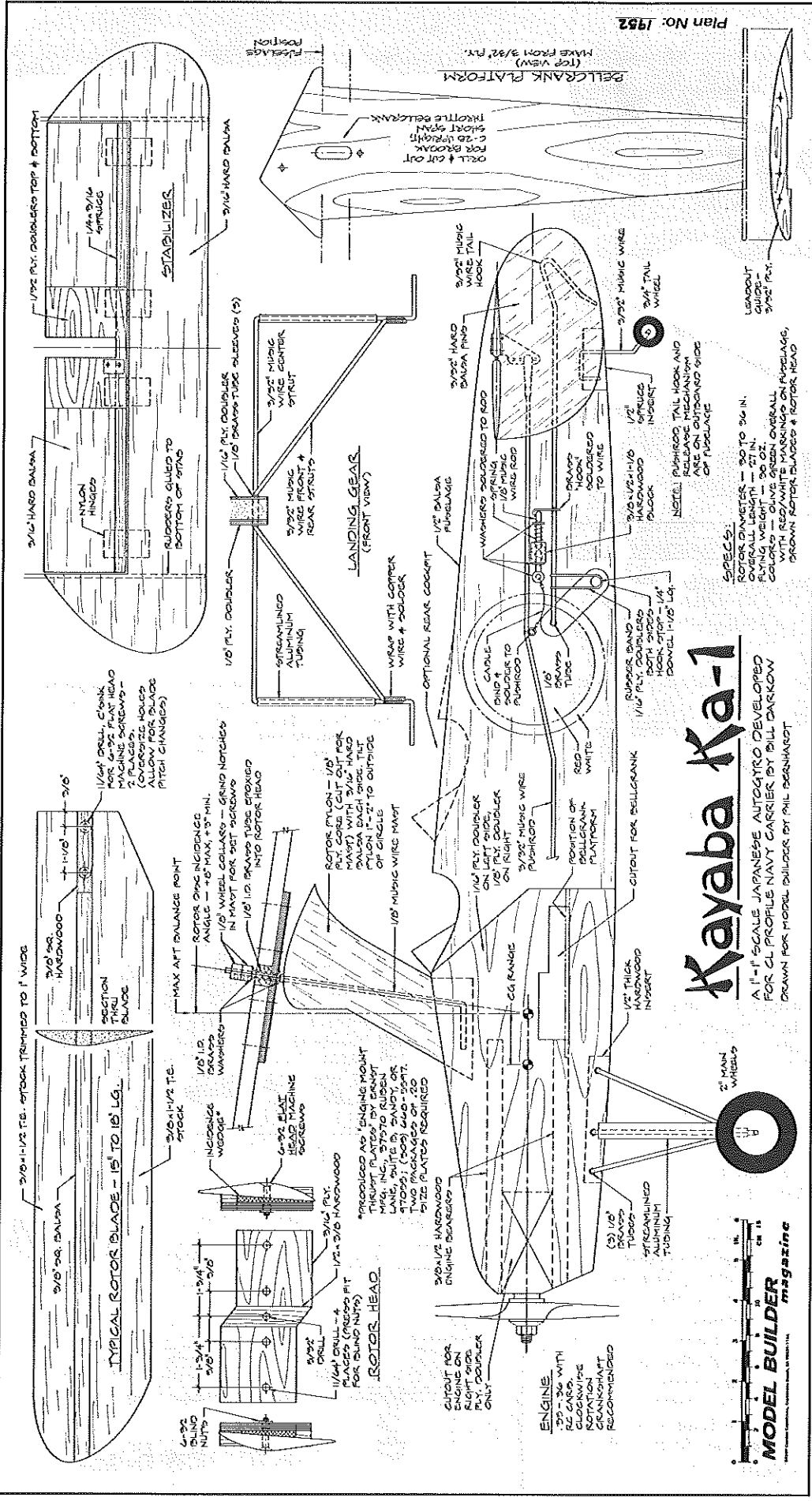
short takeoff and low-speed performance suffers, however. A high solidity factor gives greater lift at low rotor and aircraft speeds, but the increased drag limits top speed. Solidity factors can range from 8 to 15 percent, but 9 to 12.5 percent has proven more practical.

Disc diameters of 24 to 42 inches have been used, but 30 to 36 inches seems to be the optimum range. Generally, larger diameters have smaller solidity factors and vice versa.

To find the blade size for your autogyro, first determine the disc diameter and solidity factor. Then find the area of the rotor disc. Next, multiply the solidity factor times the disc area. That will give you the total area of your blades. Finally, divide that area by total length of all blades to find blade chord.

Three-view courtesy of *Japanese Aircraft of the Pacific War*, by René J. Francillon, Naval Institute Press, 1990. Carrier-based Ka-1s were operated as single-seaters and carried two 132-pound depth charges. They patrolled Japanese coastal waters, particularly the Korean and Tsugara channels. Power was a 240-horsepower Argus As 10c air-cooled V-8, mounted inverted; with a seven-cylinder, 240-horse Jacobs L-4MA-7 radial, the aircraft was designated the Ka-2.





Kayaba Ka-1

A 1" SCALE JAPANESE AUTOGYRO DEVELOPED FOR CL PROFILE NAVY CARRIER BY BILL DARROW
DRAWN FOR MODEL BUILDER BY PHIL DEBENHART

For example, if the disc diameter is 30 inches, the rotor disc area is a little over 700 square inches (3.14x15x15). If the solidity factor is 12 percent, .12x700=84 square inches total blade area. Divide this by the disc diameter to get the blade chord: 84/30=2.8 inches. In practice, that worked out to 2-7/8 inch chord on two 14-3/4 inch blades, due to hub width.

If you use three or four blades, divide the blade area by their total length. The blade chord will get narrower unless you increase the solidity factor and/or disc diameter.

In counterclockwise flight, the blades must rotate clockwise. They should be kept light because they must spin up and slow down quickly. They must also be strong enough to take the stress of high-speed rotation while supporting the weight of your model.

As the plans show, each blade is built up of four pieces. Glue carbon fiber strips between the spar and leading and trailing edges. Round off the leading edge and the top of the spar and you'll have a good flat-bottom airfoil on light, strong blades. Be sure to build all blades alike. Have some spares handy also; you'll break rotor blades just as you break propellers.

Static balance is critical. Each blade must be balanced both spanwise and chordwise. When the blades are bolted to the hub, the entire assembly must balance. When you replace a blade or bolt on a different set of blades, the assembly must be rebalanced.

•Hub and Mast

The areas and angle settings of the rotor blades, hub and mast will determine your gyro's flight performance.

The rearward tilt of the mast determines the incidence angle of the disc, which has a direct effect on the model's performance. It all depends on what you want. Low angles (3 to 4 degrees) give less drag and higher speed, but longer take-offs. High angles (7 to 8 degrees) allow shorter takeoffs and near-hovering low-speed flight, but limit top speed. Medium angles (5 to 6 degrees) appear to be the best compromise.

The blades are mounted to the rotor hub at a negative incidence angle, which can be ad-

justed as needed. Ernst Manufacturing produces three sizes (.20, .40, and .60) of what they call "Engine Mount Thrust Plates" in 1, 2, and 3 degree increments. They make perfect rotor blade incidence wedges. Two packages of the .20 size will provide all the variations needed.

The hub is mounted perpendicular to the mast. If the mast has a 6 degree rearward tilt, then the disc will have 6 degrees positive incidence. In that case, each blade must be mounted to the hub at no more than -6 degrees, or the gyro won't fly properly.

Here we meet the true phenomenon of a CL autogyro which, since the blades are fixed to the hub, probably shouldn't fly, but does anyway. It has to do with the "advancing blade," "retreating blade" and airflow relative to the ground.

At a model speed of 60 mph, a 32-inch diameter rotor spins at about 1500 rpm. That gives a tip speed of about 140 mph relative to the model. However, the tip of the advancing blade is doing 200 mph relative to the ground while the tip of the retreating blade is at 80 mph.

When the blades are at 6 degrees negative on the hub, which is at 6 degrees positive to the thrustline of the engine, the advancing blade (moving toward the nose on the inboard side) will be at 0 degrees incidence to the thrustline and relative airflow. Meanwhile, the retreating blade (moving toward the tail on the outboard side) will be at 12 degrees negative incidence to the thrustline and relative airflow. It's my belief that the relative airflow acts against the underside of the retreating blade and provides the energy that keeps the blades spinning.

The optimum range of blade-to-hub angles appears to be -3 to -6 degrees. Experimentation will prove what's best for your model. My model has the mast tilted 6 degrees rearward, which means the hub and disc are at +6 degrees. The blades are mounted at -4 degrees to the hub; this gives +2 degrees on the advancing (inboard) blade for lift/thrust and -10 degrees on the retreating (outboard) blade for power.

Both blades must be at the same angle and in the same plane of rotation. Like a propeller, the rotor blade tips must follow identical "tracks" or dynamic imbalance will create vibration.

Since the blades are rigidly attached to the hub, they cannot "flap" or "lead" and "lag" as they do on a full-scale autogyro. Dynamic imbalance from unequal lift between the blades as they rotate from "advancing" (inboard) to "retreating" (outboard) and back again will create vibration. This will be most noticeable at low speed. Build your model strong and try to ignore it.

•Rotor Pylon

The rotor mast is keyed into the pylon and cannot pull out. When gluing the pylon to the fuselage, be sure to tilt the pylon slightly toward the outboard side of the model (1-2 degrees). Sand the pylon to a

streamlined cross-section after it's glued into the fuselage.

•Fuselage and Tail

Build the fuselage from two sheets of 1/2-inch balsa, 2-1/4 inches wide. Make the cutouts for the engine, motor mounts, rotor pylon, landing gear mount, bellcrank, cockpit(s), hook release block, tailwheel mount and stabilizer before gluing the top and bottom halves together along the center/thrustline.

The rotor pylon and the mounts for the landing gear and engine must be epoxied in place before adding the nose doublers. Note that the inboard doubler is 1/16 ply and is cut out for the throttle bellcrank

opening only; the outboard doubler is 1/8 ply and is cut out for the bellcrank and engine. Be sure to drill the 9/64-inch hole in the hook release block before gluing it through the fuselage. A balsa cheek may be installed over the engine mounting blind nuts if desired.

The holes and elongated slot shown in the plywood bellcrank platform accommodate a Brodak upright, short-span, C-28 throttle bellcrank. Be sure of the fit and alignment before epoxying the platform in place. The leadout guide is epoxied to the inboard end of the platform.

When gluing the stabilizer/elevator and rudders in place, check to be sure all parts



MAT

800 752-1650 (201) 804-0077

MAT ELECTRONICS



MAT Servo Master
LED's Display Pulse width from transmitter. Unit can Trouble Shoot Radio, Receiver, & Servo Problems. Doubles as a building tool!
\$59.95

MAT Servo Driver
Will operate 4 servos at once. Substitutes for Rx & Tx while building. Small, Inexpensive, Easy to Use. **\$24.95**

Servo Master

Precision Turned Aluminum Spinners!

2"	\$12.95	2 1/2" ..	\$14.95
2 3/4" ..	\$17.95		
3"	\$21.95		
3 1/2" ..	\$29.99		
4"	\$44.95		

NEW!! MAT ARC Kits! ALL Wood!!

Beautiful Pre-built kits imported from Europe. Kits include: E/Glass cowl, wheel pants, & full Hardware Pack.

Scale 10-300 Ultimate WS:56" 1.20 Engine	\$279.95
Scale Extra 300S WS:61" 1.20 Engine	\$279.95
Mombo Trainer WS:63" .40 Engine	\$99.95
Fitness 40 Sport WS:56" .40 Engine	\$119.95



MAT FUEL!



Blend or Synthetic

0% FAI -	\$7.25
5% -	\$7.75
10% -	\$8.75
10% -	\$8.75
15% -	\$9.50
15% -	\$9.50
20% -	\$12.50
4-Stroke -	\$9.50
Heli-Fuel -	\$9.50

Model Aviation Technology TIME MACHINE

MAT AC/DC Charger
Fast Recharging, Automatically!
AC & DC Adapters Included!
Great for ALL Gell Cells **\$49.95**

MAT ESV
LED's Indicate Condition of Battery
Will Test 4.8, 6.0, & 9.6 Volt Packs
\$24.95

FLIGHT PACK COMBO
AC/DC Charger, ESV, & 1200 mAh Gell Cell Battery.
Only! **\$84.95**



MAT 1200 & 2200 Gell Cells
No Memory, Longer Flight Times
Fast Charging! 1200mAh-**\$24.95**
2200mAh-**\$29.95**

ORDER INFORMATION

Prices Subject to change without notice, S&H \$6.00 Lower 48 States UPS, Oversized Packages additional, COD \$4.75 additional, \$7.00 Haz.Mat additional for Fuel, Fuel shipped by cases only, FL & NJ Residence add 6% Sales Tax, 1 or 2 day service additional, 20% restocking fee for unopened merchandise, Individual manufactures warranties apply.

4 of 6

MODEL BUILDER JANUARY 1995 67

HAVE YOU TRIED FULL-SCALE ?



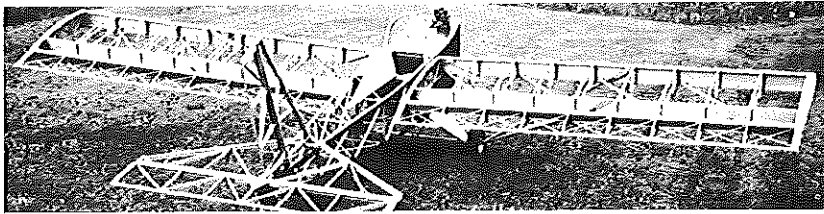
AFTER YOU DID ALL THE WORK, WHY LET YOUR AIRPLANE DO ALL THE FLYING?



INFO \$5.00

BUILD & FLY THE miniMAX YOURSELF!

INFO \$5.00



AWARDED SUN-N-FUN '86 • Computer Designed • Wood Construction • Easy Construction
 "Most Innovative New Design" • Part 103 Ultralight • 3 Axis Control **VIDEO AVAILABLE**

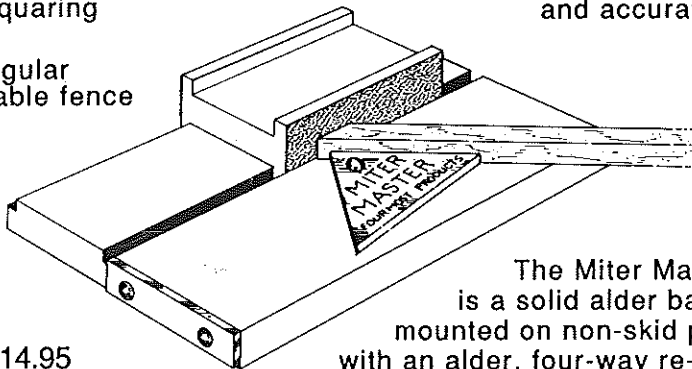
TEAM INC. • 10790-MB IVY BLUFF RD., BRADYVILLE, TN 37026 • (615) 765-5397

Miter Master

- * Perfect for Truss construction
- * 90 squaring fence
- * Triangular adjustable fence

Miter Sander

Sand any angle and its complement quickly and accurately.



Price: \$14.95
 Product No. 122

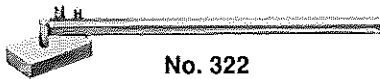
The Miter Master is a solid alder base mounted on non-skid pads with an alder, four-way reversible, sliding block that carries 2 different grits of sand paper.

FOURMOST PRODUCTS

4040 24TH AVE. FOREST GROVE, OR 97116 (503) 357-2732

WIRE BENDERS

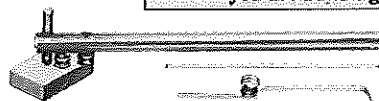
K&S ENGINEERING
 6917 W. 59th St.
 Chicago, IL. 60638
 (312) 586-8503



No. 322



No. 323



No. 324

K&S ENGINEERING has two wire benders that will satisfy any craftsmen and modelers. They will solve most bending problems including music wire, square, and rectangular shaped metal.

The Coil Winder gives you the freedom to customize landing gears, steering, arms, springs, or any wire project you are building.

Stock No.

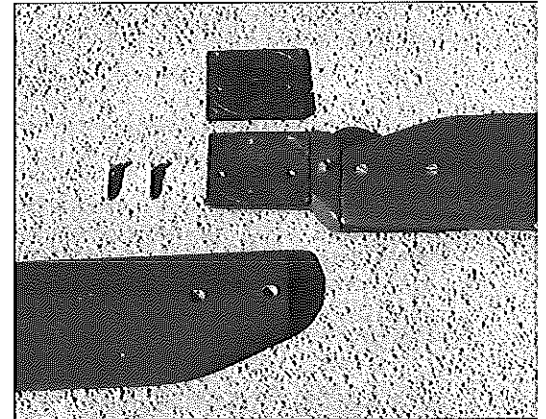
- 322 Mighty Wire Bender
- 323 Mini Wire Bender
- 324 Coil Winder

SEND 50¢ FOR PRICE LIST AND CATALOG



are aligned correctly, both horizontally and vertically. The rudders may be offset 1/4-inch to help keep the nose pointed outward if desired.

Sand and paint the entire model before installing the engine, fuel tank, landing



The current rotor head design uses a fixed hub and separate, replaceable blades, with angled shims in between to establish the blades' negative incidence angle.

gear, control system and tailhook mechanism. Be sure to mount the engine with 2 degrees of outthrust, or, better yet, use an engine with a clockwise-rotating crankshaft.

•Balancing

Proper balance is vital for optimum performance. Install the complete rotor and fasten it so the blades are lengthwise relative to the fuselage. Suspend the model from the rotor mast. When the model is correctly balanced, it will hang with the blades level or at slight (1-2 degrees) nose-down angle. Don't even think about flying it tail-heavy! Keep it slightly nose-heavy for the first flight or when flying in wind.

FLYING

Adjust the engine for a slightly fast idle and take off downwind. Hold some up elevator as you open the throttle. On a calm day, the model should take off within half a lap. When it heads into the wind, your gyro may literally jump vertically. Control this with down elevator. Don't close the throttle!

Fly several laps at full throttle to become familiar with the model. If it "hunts" and won't "groove" or maintain level flight, it is slightly tail-heavy. Land and correct this immediately!

If the engine should quit at any time, hold down elevator to within about 2 feet of the ground, then level the model and land. Don't try to stretch a glide with up elevator! A CL autogyro with power off has no glide. If you hold neutral or up elevator, the action of the rotor will bring the gyro to a stop in mid-air and the model will drop vertically with the fuselage nearly level. Any landing from that position will be a hard one.

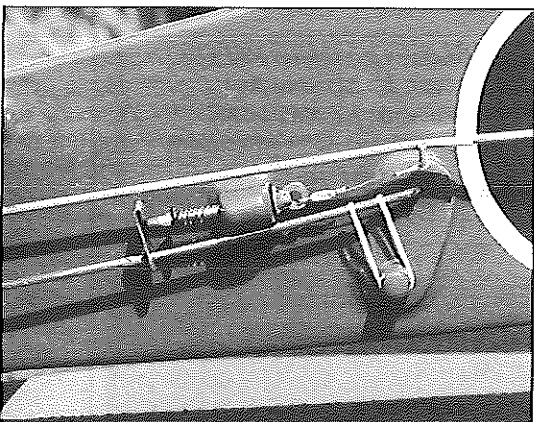
For slow-speed flight, gradually close the throttle while applying up elevator to

50Fl6

maintain altitude. When more up elevator won't do the job, gradually open the throttle until the model's flight path stabilizes. The model will now be flying in a nose-high attitude with the rotor spinning rapidly. Close the throttle slightly and the model will settle. Open the throttle a little to regain lost altitude. Exciting, isn't it? With plenty of power, a good rotor setup and a little practice, the Kayaba slow-flies realistically at 10 to 15 mph.

When slow-flying into the wind, the model will slow even further and settle as it approaches a near-hover condition. To counter this, first add some throttle, then stop any excessive climb with down elevator. *Do not* apply down elevator first as this will slam the model into the ground!

The model will also tend to drift into the circle during upwind slow flight. This characteristic convinced me that an



Arresting hook details. Hook is released when full down elevator is given; a rubber band holds it down at 45 degrees relative to the fuselage centerline.

engine with a clockwise-rotating crankshaft is better than all built-in offsets. Torque reaction will tend to roll the model to the outside of the circle.

On the downwind side of the circle, the model will settle just like a fixed-wing aircraft. Again, add throttle first, then down elevator if necessary.

Maximum nose-high slow-flight attitude for the full-scale Kayaba was 15 degrees. However, according to an article in the February 1935 *Aero Digest*, wind tunnel tests made at New York University showed that a rotor angle of 30 degrees to the horizontal is the optimum angle for maximum lift, with 42 degrees being the point where the lift and drag of the rotor are equal.

The tailhook hangs at 45 degrees to the fuselage for slow-flight reference.

Deck landings are relatively easy. Approach fairly high, reduce power and the Kayaba will settle in smoothly at a steep angle, slightly nose-high. Pretty!

There's no thrill quite like slow-flying an autogyro or setting one gently on the deck. May you have many slow flights and soft landings. **MB**

SCALE PLANS FOR R/C

For Astro Cobalt Grid, 05, to 40. Full cowls, Cable controls, 4 Ch., Easy copy to Glow

SUPERB / ELECTRICS

Incredible realism in flight or display. Strong classic built

Sopwith Swallow 2" scale, 60" span, 720 sq. Astro 40, 4 Ch. - \$44

1 1/2" in Scale KRC '92

Full AMA scale or "Stand-Off," up to you!

Fokker D.VIII 2" scale, 55" span, 500 sq. Astro 40, 4 Ch. - \$43
 Pfalz D.IIIa 2" scale, 63" span, 952 sq. Astro 40, 4 Ch. - \$44
 Zeppelin C.H. 1 1/2" scale, 59" span, 756 sq. Astro 40, 4 Ch. - \$44
 Albatros D.II 2" scale, 54" span, 1032 sq. Astro 40, 4 Ch. - \$44
 Junkers J.2 1 1/2" scale, 58" span, 522 sq. Astro 15, 4 Ch. - \$32
 Aviatik (Berg) 1 1/2" scale, 38" span, 275 sq. 1516sq. 4 Ch. - \$32
 Fokker D.VIII 1 3/8" scale, 38" span, 237 sq. 09 glow, 3 Ch. - \$15
 Albatros D.III 1" scale, 29" or 34" sport, 3 Ch. 09 glow - \$15
 Albatros D.III 1" scale, 27" span, 258 sq. 02 Elec. 3 Ch. - \$15
 Fw55 Stösser 1 1/2" scale, 55" span, 456 sq. Astro 15, 4 Ch. - \$40
 RWD-8 1 1/2" scale, 55" span, 480 sq. Astro 25, 4 Ch. - \$44

1 1/2" in Scale KRC '92

Dornier Zep. D.I, 2" scale, 56" span, 980 sq. Astro 40, 4 Ch. - \$44

ALBUM Data-107 3-story photos, specs, plans, great documentary \$10.00 plus \$2.00 post. (for orders over \$15 deduct \$1.50)

ADD \$4 for rolled plans, \$2 for flat folded plans

AIRDROME
 Box 1425, F.D.R. Station, New York 10150

IT'S HERE...

Gyro-Kite™ is a revolutionary new concept in kites. "The little wind-powered gyroplane you can fly like a kite." Takes off and lands vertically, hovers and flies sideways and backwards. No batteries, motor, rubberbands or springs. Inexpensive, replaceable wood or plastic rotor blades. Rotor dia. 19 3/4". Nylon Body, Steel Landing Gear, Oilite Bearing. One String Control.

Only \$19.95
 Check or money order. S&H \$4.50.
 Allow up to four weeks delivery. Dealer Inquiries Invited.

1-800-99-ROTOR
 Gyro-Kite™ International
 4606 Milton St. Box MB
 Shoreview, MN 55126
 PAT. PENDING © 1993 ALL RIGHTS RESERVED

GYRO-KITE™
 "The Little Wind-powered Gyroplane You Can Fly Like A Kite"

SPECIALIST

CUSTOM AM 'SUPER' SYSTEMS

SINGLE AND TWO STICKS

THREE, FOUR, SIX, AND EIGHT CHANNELS
 DUAL AND EXPO RATES, MANEUVER CONTROLS,
 CHANNEL MIXING, END POINT ADJUST,
 SERVO REVERSE, Rx MONITOR

STILL THE BEST • MADE IN THE U.S.A.

MILLCOTT
 MILLCOTT CORPORATION
 5595 HEATH LAKE ROAD, SAGLE, IDAHO 83860 • (208) 263-2566

Simply the Best!

Deluxe Kits

Kit No.	Model	Price
101	81" Super Chipmunk	\$269
102	82" Chipmunk Trainer	\$259
103	81" Pepsi Chipmunk	\$279
111	62" Ultimate 10-300s	\$339
120	84" Extra 260	\$359
122	84" Extra 300S	\$369
125	87" Extra 300	\$359
130	84" Sukhoi SU-26mx	\$369
140	69" Sukhoi SU-26mx	\$249
210	101" AT-6 Texan	\$499

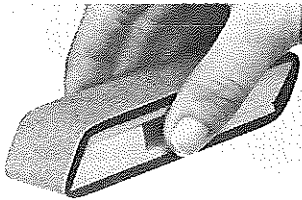
All Wood Airframes only from... Send \$1 for catalog (outside USA \$2) Dealer Inquiries Invited

Ohio R/C Models Phone (513) 859 1660 FAX (513) 859 7202
 4251 Lutheran Church Rd. Germantown, Oh, 45327

MODEL MARKETPLACE

Lots of Good Stuff

Feature of the Month



#111 Mini Sander \$2.95 retail • Adjustable tension • Padded flat and curved surfaces • Handy to hold and use • #115 Gamet and #117 mixed belts available



Applied Design Corp.
(310) 375-4120

P.O. Box 3384, Torrance, CA 90510

CS FLIGHT SYSTEMS

EXPERT
ADVICE WHY
PAY MORE?
FASTEST
DELIVERY

THE BEST IN ELECTRIC FLIGHT
specializing in
ASTRO FLIGHT SYSTEMS
sales & distribution

WE CATER TO THE ELECTRIC FLYER

35 years of R/C Experience, 15 years of Electronic Flight experience to assist you with your needs. Discount prices on all items, not just specials. UPS, Priority Mail, or Federal Express.

LARGEST STOCK OF ELECTRIC FLIGHT EQUIPMENT IN THE NORTHEAST

Catalog & Compiled Electric Flight Information Packet
USA \$6.00 • Foreign \$7.50 • VISA & MasterCard

CS FLIGHT SYSTEMS

31 Perry Street, Middleboro, MA 02346
Phone 508-947-2805

- + - ELECTRICS ARE NOW - + -

IMPORTED DIESEL ENGINES WORLD'S BEST SELECTION

AE, AM, Aurora, Ceccarelli, Cipolla, FIT, KMD, MARS, MK, MDS, MP Jets, MVVS, PAW, Pfeffer, and Silver Swallow diesels. Also replica Mills, MOVO and Letmo diesels as well as many rare imported glow engines. Ten page catalog \$1.00.

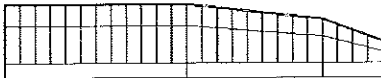
CARLSON ENGINE IMPORTS

814 E. Marconi Ave.
Phoenix, AZ 85022-3112
Phone 602-863-1684 Afternoons

NEW RELEASE

Model Design program \$50

Version 4.0 of the Model Design program adds screen graphics, multiple panel wings and automatic foam core template generation to this program's long list of features.

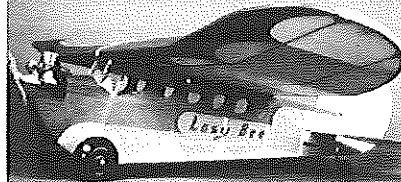


Send SSAE for information and upgrade prices
Chuck Anderson
P.O. Box 305
Tullahoma, TN 37388
(615) 455-6430

Runs on XT.
286, 386 or 486
with MS-DOS
3.2 or later.

The Amazing Lazy Bee

This backyard barnstormer is the slowest, most maneuverable, easiest to fly R/C plane EVER!



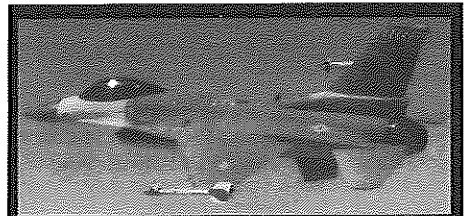
- 049 to .15 or .26 4-Cycle
- Makes Excellent Electric
- Wingloading 4 - 8 oz/sq ft
- Makes great float plane
- Delightful to Fly
- Ideal for Small Fields
- Sprung Landing Gear
- 40" Wingspan

NEW! Full Kit featuring balsa parts precision cut on a band saw, complete plans (3 pages rolled), all required wood, windows, 36 page instruction book.

35 Min. Video
Rent or buy?
\$18 (\$10 refundable)
Catalogs \$2

CLANCY AVIATION
219 W. 2ND AVE.
MESA, AZ 85210
(602) 649-1534

FULL KIT - \$54
FLOAT KIT - \$24
(Installs in 5 min!)
Prices include S & H



WANTED TOP GUN PILOTS

Pre-order Combat Models new 1/8th scale F-16N today and save \$50-off the intro price of \$149. Good this month to M.B. readers only. Call for details. 800 / 336-JETS

R/C - Model - Hobby Show & Swap Meet

January 7 & 8

Indiana's Largest
Over 50,000 sq ft
Memorial Coliseum
Fort Wayne, Ind.

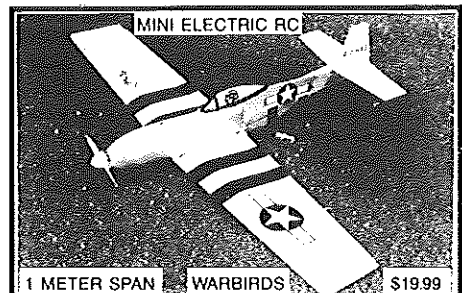
For Booth & Table Information call:
CPI Inc
219-483-6144

Dave's Wood Products

OBECHI? YA BETCHA!
OBECHI AVAILABLE IN
LARGE SHEETS
WIDTHS TO 22"

Please call (509) 548-5201
or send SASE to:
12306 Bergstrasse
Leavenworth, WA 98826

VISA & MC Accepted



1 METER SPAN WARBIRDS \$19.99

send \$1.00 for illustrated catalogue of:



- "Gadfly" electric gliders
- 50 watt motors
- (BEC) wiring harness
- motor control units

Telephone (714) 775-4153

POST OFFICE BOX 1249 • WESTMINSTER, CALIFORNIA 92684