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VOLUME 31

NUMBER 4



This Month's Cover — features a beautiful 1/2 scale Nieuport II built by Ray Clark of Sydney, Australia. With a span of 132", it is powered by a 160cc (9.7 cu. in.) Victa lawn mower engine and weighs 44 lbs. A JR radio handles the controls. Scale from Proctor plans, construction is spruce/ply covered with SolarTex, and has a hand formed aluminum cowl. It has several hundred flights to date. Transparency by Tony Stinson of Brookvale, N.S.W., Australia.

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R/C MODELER (ISSN 0033-6866) USPS 509-190, is published monthly by R/C Modeler Corporation, Don Dewey, President. Editorial and Advertising offices at 144 West Sierra Madre Boulevard, Sierra Madre, California 91024. Telephone: (818) 355-1476; (800) 523-1736; FAX 818-355-6415. Second Class U.S. postage paid at Sierra Madre, California and additional mailing offices. Contents copyright 1994 by R/C Modeler Corporation. All rights reserved. Reproductions in whole or part, without written permission of the publisher, is prohibited. All prices appearing in this magazine are subject to change without notice. All subscriptions will be taken at the prevailing rate. Postmaster: send address changes to R/C Modeler, P.O. Box 487, Sierra Madre, CA 91025.

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ADVERTISING: Send advertising copy and complete instructions to Advertising Department, R/C Modeler, P.O. Box 487, Sierra Madre, California 91025. Telephone: (818) 355-1476; (800) 523-1736; FAX 818-355-6415. The publisher reserves the right to refuse any advertising copy.

Printed in the USA

DICK KIDD



FROM THE SHOP

Recently I received a package from George Steiner, one of our electronic wizards. George is always dreaming up and designing new goodies for the modelers. This latest submission sounds like a real breakthrough and I'm trying to decide if we should have George continue to work on this newest design and see if he can overcome some of the problems that have cropped up or just scrap the whole project. Read on and you'll see what I mean.

High Torque Mods to Your Standard Servo.

Increase the Servo Power for Your 1/4 Scale Model.

To Dick Kidd --

For many years, with modeling, it has been a struggle to determine what size servo to use. With the larger 1/4 and 1/3 size models becoming very popular, it is logical to use the largest servo available. They do have a price tag that goes along with the cost of the large model. With the following information, one could keep the price down for servo installation. If you are a modeler of a few years like I am, you already have some standard servos of the general purpose type as shown in photo. They will have a torque ounce rating of some 40 to 50 ounces.

How about an upgrade modification to that standard size servo that would be able to pull a MAC truck? What has been found is that a larger size servo motor could be installed with a few physical alterations to give the low torque servo a King Kong power that you would not believe. The biggest problem is the adaptation of the output gear with the larger motor size and the servo case having to be altered. Photo shows the different size motors and how, in one case, the standard servo gear was drilled out and installed to the largest one. The servo electronics will have to be beefed up also and this is done by paralleling two sets of servo electronics with a "Y" harness and common the motor wires to the larger motor. Be sure to observe the polarity of all the wiring, otherwise you will have a smoke bomb instead of a super high torque servo. The bottom of the standard servo case will no longer be used as you can see all the modifications that have to be made. I call this the "applied physical rotation force on output modification." Otherwise known as A.P.R.F.O.O. for this month's RCM.



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Ron Thixton of Orlando, Florida, sent this photo and brief information on his G-Shark, early in 1993. Powered by a 4.2 B&B Special with a smoke device, Ron was putting it to good use when not flying it. Read on --

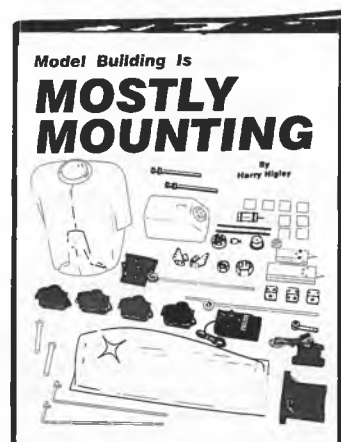


Ron Thixton, who is employed by the Security Department of NationsBank, Orlando, Florida, was very impressed by his bank's relief efforts during the aftermath of Hurricane Andrew. Ron, with many of his fellow employees, volunteered to go to South Florida to assist employees devastated by the Hurricane. He learned that NationsBank spent millions of dollars assisting employees and responding to local and state government needs during this emergency. To show his appreciation, Ron had the bank logo made up and put it on his G-Shark for use in marketing efforts at local branches when he is not flying it on weekends.



The very talented manufacturer and writer, Harry B. Higley, has just completed a new book entitled, *Model Building Is*

Mostly Mounting. RCM has added it to our Anthology Series and it will be available by the time you read this. The following is some pertinent highlights about the book:



Mostly Mounting presents an entirely new approach to installations in R/C aircraft. The accurate, sure-fire "Mostly Mounting System" makes any modeler a better builder. These new methods guarantee that any popular kit, including ARF's, will fly and look its best. It shows new control installations, new treatment of tanks, engine mounts, canopies, cowls, wheel pants, retracts, and many other subjects.

The book contains 96 pages with 750 photographs, and is priced at \$14.95.

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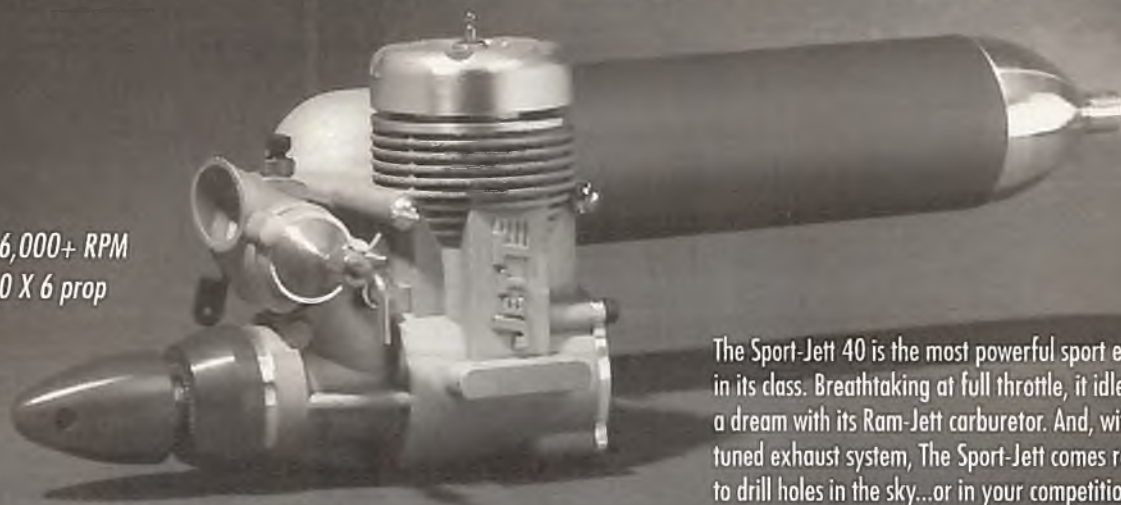
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If you ever find yourself in a situation such as these Texas modelers shown in the following photo, please do as these modelers did. The man with the long fiberglass pole is an employee of the electric power company. By all means, don't try this retrieval by yourself. Let the people who are trained in this type of work save your aircraft.



We are working on another great construction article from the designer of the FA-18, Mike Pastro. The FA-18 appeared in our April 1991 issue in a .40 size (Plan #1090) or .60 size (Plan #1089). G&P Sales, 410 College Ave., Angwin, California 94508, Tel. (707) 965-3866, now has a kit of the .60 size with a beautiful fiberglass fuselage.

Mike's new one is a Canadair CT-114 Tutor Jet. It is also a pusher with a .46

2-stroke mounted in the tail. It has a 60" span and, according to Mike, it is the easiest to build of his designs to date and flies like a dream. Keep your eyes peeled for this one, we're pushing to get it completed and published.



New FAI "Scale Jet" Class

On December 2nd, 1993, three representatives of the "International Jet Model Committee" (Mike Cherry, Philip Avonds, and Paul Ratajczak) presented the case for a new official "Scale Jet" class to the Bureau of the FAI/CIAM in Paris, and were rewarded with almost unanimous approval. "Jets" are now recognized by the FAI, and in the very near future it seems certain that a separate official FAI Class for "Scale Jets," together with its own World Championship, will become a reality at last.

In recognition of their efforts in achieving this big step forward, we would like to congratulate all the members of the "International Jet Model Committee," and next year we propose to combine an F4J competition with the "Deland

Jet-Together."

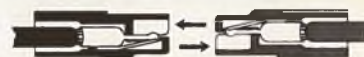
Many of the members of the "Committee" traveled from Europe to attend the 1994 event at Deland, and during the weekend they held a meeting with the JPO to discuss the proposed provisional F4J rules. They also presented a short "update" to any pilots who were interested to let them know exactly what was needed to finalize approval of the new FAI "Scale Jet" class.

That's all for now!

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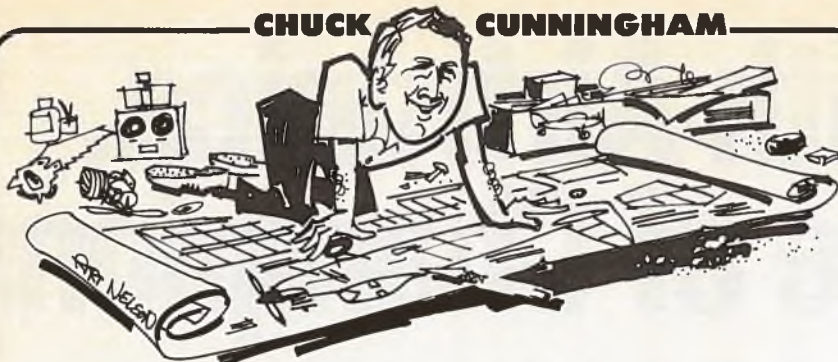
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CUNNINGHAM ON R/C

The other day I was in one of our local hobby shops to buy some hardware items and we got into a discussion about the many ready to fly models on the market. We looked at a couple of the .40 size models and once again I was struck by the thought, "How the heck do they do it?" The ones that we were looking at were beautifully made and covered, and are very good flying aircraft. It kind of boggles the mind to contemplate how little work needs to be done to finish the aircraft and get it into the air. A really perfect entry into the mysteries of radio control flying.

For the past several weeks I have been building a new aircraft in which to put my G-23. I bought this engine well over a year ago and have only run it on the bench one time, then set it aside to design an aircraft for it.

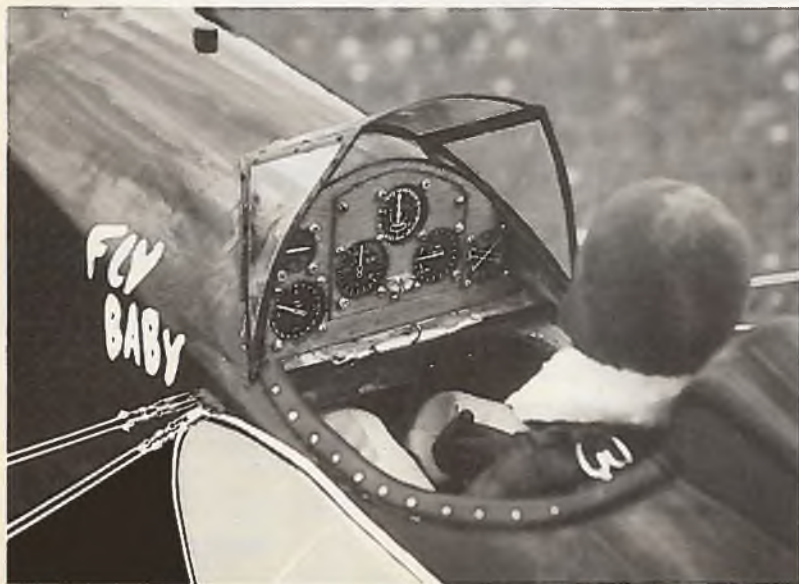
I finally hatched up a design and I am now in the process of building it. The number of hours that I have spent on this 7' model far surpass the total cost of almost any of the ready to fly models. But, for me, the enjoyment is in creating a new design and then building it. The tentative name for this new aircraft is Sky Devil. I drew up the plans based on an 80" wingspan (since stretched out to 84"). After showing the

plans to a number of friends, a couple of my flying pals said that they would like to build one, but really wanted to build a smaller version. I reduced the plans to 75% of the initial size yielding a smaller aircraft with a 60" wingspan, which each of them are now building, and plan to use a .60 engine in the nose. This is a first scratch-building project for both and they are having fun doing it. Let's face it, that's why we are in this hobby/sport, to have fun! The time has come for me to assemble all of the pieces and sand them, which is the part that I do not enjoy . . . but, a necessary evil. Since I only build from scratch, it seems like as good a time as any to dig out some scratch-building tips and ideas which may also be used if you're building a kit model.

I generally use three power tools when building: a hand held electric drill, a drill press, and a band saw. I have a number of other tools, but I find that most of the real work is done on these. For measuring and cutting, I use an X-Acto knife or a utility knife from the hardware store and an aluminum yardstick. Also pins and clothespins by the bunch. Let's take a look at the aluminum yardstick first. I also use this yardstick when drawing plans along with an 8' aluminum flat 1/16" thick x 1" wide. I use this to lay out all of the long lines when drawing plans for larger models. The

aluminum yardsticks can generally be found at a Home Depot store at a reasonable price. I use several of these, and on one I sprayed 3M 77 on the backside to make a nonslip surface, this keeps it from sliding around when cutting plastic covering material. One of the sticks I use just as it is, while the third I cut into two pieces, one 12" long and the other 24" long. Last night I thought I would take the 24" piece and fabricate a small "T" square from it, which would be much more useful than just the 24" ruler. I plan to have the long part of the square to be 12" or 13" long with the top of the "T" about 8" long. The purpose of this square is to make a small, easy to handle tool for use in laying out square ends on balsa, and then cutting them with a knife.

When scratch-building, I find that measuring and cutting goes on all of the time. I cut with both my band saw and with a knife. I have a steel framing square that is reasonably small, but it is heavy and cumbersome to use around balsa. The 3' long yardstick I have is also modified a little. Along the centerline of this stick I have drilled a series of 1/16" holes. One at the 2" mark, one at the 12" mark, and one at the 18" mark, etc. Location of these holes is not critical. When stripping a piece of balsa sheet to make sure that the edges will not have a bow or sweep, I use this stick with plastic topped push pins (purchased from an office supply store) inserted through the holes, through the balsa sheet, and into the building board. These pins keep the yardstick from slipping while I'm doing the cutting. If you have ever stripped out wood, you know how easily the yardstick can slip. I'm also going to drill similar holes in my long drawing aid to keep it from slipping on the drawing. Occasionally, I use the long marker to lay out something on a large piece of construction plywood, and the holes will really be handy.



Matt Campos of Downers, Illinois built this Flybaby from RCM plans (#957), but added all of the extra scale detail. "I don't have to tell you how great it flies, very smooth." ST 90 with smoke.



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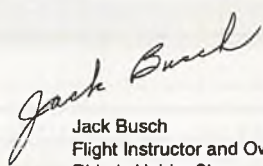
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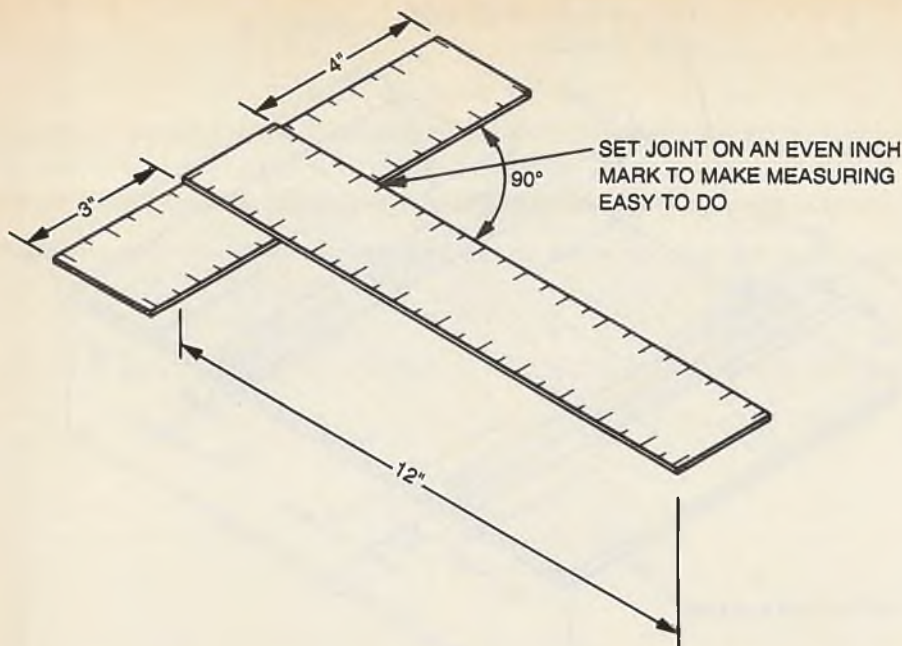

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Model design by Tom Herr





1/16" ALUMINUM YARDSTICK — FABRICATED INTO A WORKING T SQUARE

Based on my old buddy Gene Wallach's advice, I have found that a 1/4" wide metal cutting band saw blade is the best all around blade to keep on the saw. A 1/4" 15-tooth blade is almost as good as the metal cutting blade, but if you suddenly want to saw a piece of aluminum, or brass tubing, the wood cutting blade gets dull in a hurry. The best part of using either of these two blades is that it is very easy to cut a straight line with them. I have found that many of the other blades tend to wander all over the work and making a good straight cut is hard to do. Of course, you can also get band saw blades in 3/8" and 1/2" widths, but it is very hard to cut a small curved line with the wider blades. A square is also used to push pieces through the saw blade. My saw did not come with a square (it has a slot, but no square), so I made one from wood years ago. A rip fence is another item that is needed for your saw. Again, I made one from a strip of pine and a couple of "C" clamps. Then reading *RC Report* one day, I came across an article by Ed Baggett about a

stick cutting adapter to use on your band saw. So building from Ed's ideas of a cutting board, I made a board that I use all of the time. I can cut strips of almost any size from 3/16" on up to 1 1/2". I have now modified the board so that I can cut out webbing materials, both to width and height. All of this is built into one board, but you could easily build several boards for many uses. The drawing should be all that you need to build one. I clamp it to the table with a couple of "C" clamps. With the back side lined up against the table edge it is easy to get it square every time. I used regular 1/4" construction grade plywood for the base of the cutting board and 1/2" square bass wood for the guides. The extra guide for cutting webbing is held to the existing guide with a couple of socket head sheet metal screws. It's simple to make, almost *no cost*, and for a scratch-builder it has a *thousand uses*. Thanks for the good idea, Ed. Actually, Ed uses it on his Dremel Jig Saw, so if you don't have a band saw, but are working with a jig saw, go ahead and



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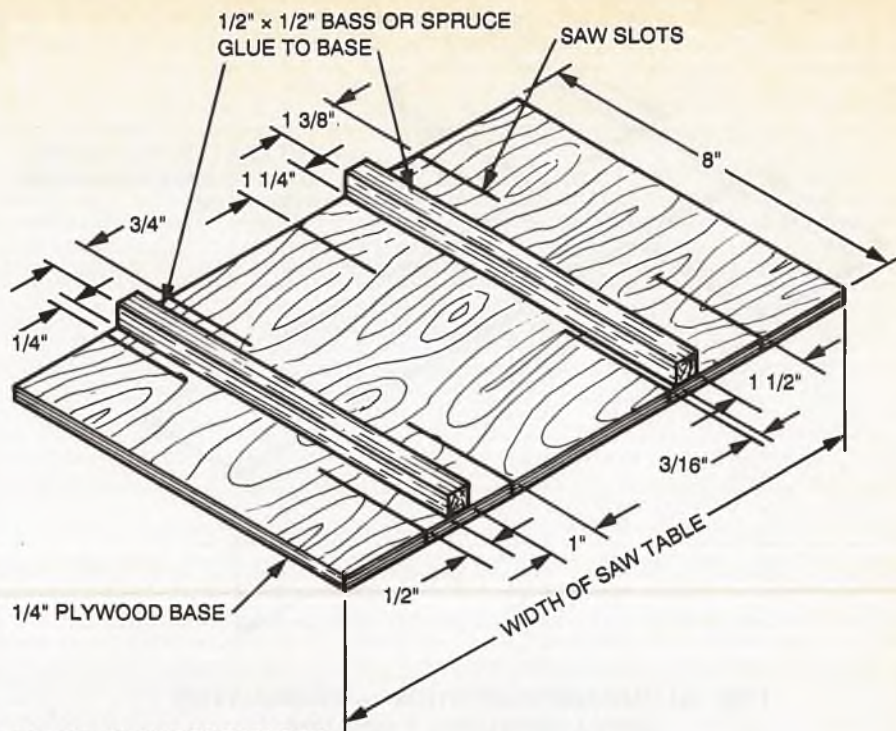
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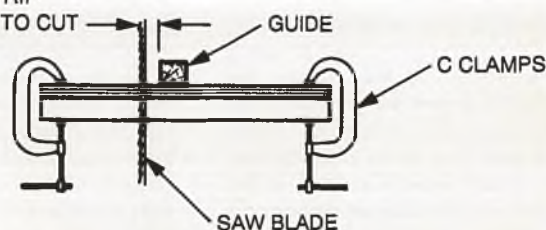
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TO USE - CLAMP TO TABLE OR
SAW WITH BLADE INSERTED
IN SAW CUT SLOT

SIZE OF STRIP
YOU WISH TO CUT



STRIPPING TABLE TO USE ON JIG SAW OR BAND SAW

build a table.

If you need any "C" clamps, I have found a good source for them in the hardware shelves of a large grocery store. The ones I have found have two 1" clamps and one 2" clamp for about \$2.50. Of course, you can buy better ones, at a higher cost, but this is one piece of equipment that doesn't need to be a precision made item. You can add a bit to the grocery bill every now and then, and soon have a good supply to work with. While at the grocery store, pick up a package of plastic, spring loaded clothespins. They have a much stronger grip than the old wood ones, and have small ridges molded into the jaws to give a better bite. They are cheap and work just great.

You should also take a look at the tool collection at any Radio Shack store. You will find a number of small tools that can be used for fabricating balsa stuff just as well as building electronic gear. They have tapered reamers, small screwdrivers, screwdrivers with rubber handles and multiple points, either flat blade or Phillips, a small brazing torch that can be used to solder or braze joints on large landing gears,

and so on. I made a cowl not long ago from an aluminum pot purchased at the grocery store. The hard part was cutting the hole in the bottom of the pan/cowl. Then Ernie Harwood saved the day by loaning me his "Nibbler" . . . a small hand-held tool that kind of eats its way through a piece of aluminum. I found that they have a small Nibbler at Radio Shack for only \$10.99. It will eat its way through aluminum, copper, or plastic; bet that it will also work on a fiberglass cowl. Learning to fly with an ARF kit is a super way to go, but when you have found that model building is as much fun as flying (sure beats spending endless hours in front of the TV set) and then you progress to either building from magazine plans or from your own designs, you will know why we call this the greatest hobby/sport there is. ☐

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CAL ORR



RADIO SPECTRUM

October of every year seems to find me in Las Vegas, Nevada, participating in the QSAA Fun-Fly and the Marathon of Flight. The 1993 event was a good one and I am sure fun was had by all who participated. The weather cooperated very well for the Marathon of Flight, Wednesday, October 13. Thursday the 14th was the indoor static display (nobody really cares about the weather). Friday and Saturday was fun flying out at the dry lake bed. Friday afternoon got breezy and dusty but Saturday was perfect, calm, and perfect flying all day.

The QSAA Fun-Fly attracts many scale

models, all of which are flown. The Marathon of Flight is a small portion of the entire fun-fly. I will discuss the events that took place during the Marathon of Flight.

The Marathon of Flight course starts at a dry lake bed in Baker, California. You then head 50 miles down a desert road to your turnaround point and then head back to the dry lake bed. You fly this course as many times as possible on only a half gallon of fuel.

In summary, the 1993 rules for the "Marathon of Flight" are that you must provide a team; a pilot, a co-pilot, a driver, and an observer for another team. The aircraft must meet QSAA and AMA rules

and be able to take off under its own power carrying a half gallon of fuel. The aircraft/team which travels the most miles is the winner.

A complete set of 1994 Marathon of Flight rules and information on the 1994 QSAA Fun-Fly can be obtained directly from the QSAA, P.O. Box 13980, Las Vegas, Nevada 89112.

Keeping a model aloft for hours at a time is challenging and requires lots of team work. In 1993, 12 teams took on this challenge to enter the Marathon of Flight and here is how they did.

The 1993 Marathon of Flight was won by Tom Prothero and his team from Santa Barbara, California. Tom has gotten to be a regular in the Marathon of Flight and usually does quite well. His team does their homework, but I think Tom will even tell you that this event also requires just a little luck. Tom's team flew 381.8 miles in 7½ hours with only a half gallon of fuel on board his aircraft. Photo #1 is Tom Prothero, his Fournier F-4, scratch-built airplane with 118" wingspan. Take-off weight was 14 lbs. The engine used was an O.S. 91 4-stroke swinging a 14 x 14 prop with a Reichmuth ignition system using a 2000 mA ignition battery. Fuel used, gasoline mixed with 4% Klotz and snake oil. The aircraft fuel system is two 1 qt. wing tanks with a pump that transferred the fuel to a small collector tank, with an overflow back to the wing tanks. The radio system used was manufactured by Hitec,



LEFT: Marathon of Flight first place winners Tom Prothero and team from Santa Barbara, California who flew 381.8 non-stop miles on 1/2 gallon of fuel. **Left to right front row:** Sal Arria, Bob Brown, Rog Grigsby, Tom Prothero. **Standing:** Carol Brown, Jamie Vincent, Gordie Azevedo. **RIGHT:** Hobby Club U.S.A. Aeronca C-3. **Left to right:** Greg Berge with daughter, Alan Pounds, Jim White and Monica Wampole.



LEFT: Hobby Club U.S.A. Dave Wampole, Terri Parola, and Steve Parola. **RIGHT:** High Desert Flyers travelling 143.1 miles.

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The Fun Fly Lazer

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The FAZER was designed and carefully engineered with the help of CAD (computer aided drafting) drawn plans. CAD generated tooling ensures a super parts fit. Another example of the quality engineer into SIG kits is the pre-shaped 1/2" balsa profile fuselage. It is routed (not sawn) to the proper shape and requires only final sanding.

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LEFT: Bob Mellen's Team, 5th place. RIGHT: 7th place team, the Coachella Valley R/C Club flying 98.6 miles.



LEFT: The Rebels from Salinas, California, flying 93.2 miles taking 8th place. RIGHT: Back of truck and control panel between pilot and co-pilot.

using 4 servos with a 2000 mA battery.

Tom's O.S. 91 will reach a full throttle rpm of 6400. Full throttle speed is 79 mph. Tom says this was determined with a radar gun, as we know, Tom's team does not travel 79 mph on the California desert roads. After landing, both battery packs were checked and they were found to be just barely in the green. Fuel consumption was calculated to be about 7 minutes per ounce.

Several years ago when the Marathon of Flight was unlimited fuel, Harry Dickinson of Pomona, California, entered a third scale tri-pacer that traveled 435 nonstop miles using 5 gallons of fuel. Tom, you, and your team have almost caught the unlimited fuel course record while you used only a half

gallon. Congratulations on your great fuel economy!

The Channel Island Condors, a club from Camarillo, California, near Santa Barbara, had two entries this year. Second place in this years Marathon of Flight went to Team Condor II. Condor II flew 194.0 miles with a half gallon of fuel. Flown by Hugh O'Connell, co-pilot Jack Ladraik, driver David Lillie, observer Jerry Kroth.

Condor I took 6th place flying 105.0 miles. Their pilot was Gerry Webb, co-pilot Bill Spachhoff, driver Dick Megan, observer Lou Tejeta. These guys were in such a hurry to get underway that I missed the opportunity to take their pictures.

Steve Parola of Hobby Club USA,

Ontario, California, also had two entries this year. Team 5, flown by Alan Pounds, co-pilot Cal Orr, driver Greg Berge, and observer Monica Wampole finished in third place flying 147.7 miles with an Aeronca C-3. The radio used was a JR; a field charger from the truck's 12 volt electrical system kept the transmitter batteries topped off during the flight.

Team 4, flown by Steve Parola, co-pilot David Wampole, driver Terri Parola, and observer Marlyse Berge finished 11th with 23.5 miles. Radio system used in this aircraft was also JR where they intended to swap out transmitter batteries during the flight.

Fourth place this year went to the High



Homeless R/C Flyers flying 75.8 miles taking 9th place.

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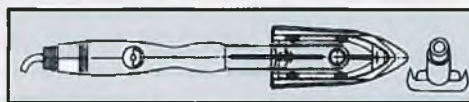
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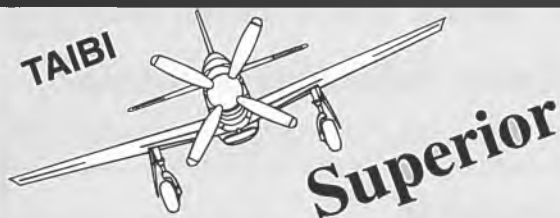
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1/16 x 1/8	.09	.12	3/16 x 3/8	.17	.22
1/16 x 3/16	.10	.14	3/16 x 1/2	.21	.27
1/16 x 1/4	.11	.16	3/16 x 3/4	.30	.41
1/16 x 3/8	.14	.18			
1/16 x 1/2	.17	.21	1/4-INCH	36"	48"
1/16 x 3/4	.22	.30	1/4 x 1/4	.17	.22
			1/4 x 3/8	.19	.27
			1/4 x 1/2	.22	.31
			1/4 x 3/4	.34	.45
			5/16-INCH	36"	48"
			5/16 x 5/16	.23	.29
			5/16 x 3/8	.25	.32
			5/16 x 1/2	.30	.39
			5/16 x 3/4	.42	.56
			3/8-INCH	36"	48"
			3/8 x 3/8	.29	.40
			3/8 x 1/2	.33	.44
			3/8 x 3/4	.47	.64
			1/2-INCH	36"	48"
			1/2 x 1/2	.40	.52
			1/2 x 3/4	.56	.75

BALSA SHEETS

LITE TO MEDIUM DENSITY

1-INCH	36"	48"	3-INCH	36"	48"
1/16 x 1	.29	.39	1/32 x 3	.43	.57
3/32 x 1	.32	.43	1/16 x 3	.46	.62
1/8 x 1	.35	.47	3/32 x 3	.56	.75
3/16 x 1	.39	.52	1/8 x 3	.64	.86
1/4 x 1	.44	.61	3/16 x 3	.77	1.02
3/8 x 1	.57	.77	1/4 x 3	.90	1.20
1/2 x 1	.70	.94	5/16 x 3	1.10	1.43
			3/8 x 3	1.28	1.71
			1/2 x 3	1.61	2.14
			4-INCH	36"	48"
			1/32 x 4	.70	.93
			1/16 x 4	.78	1.08
			3/32 x 4	.80	1.17
			1/8 x 4	1.02	1.35
			3/16 x 4	1.22	1.62
			1/4 x 4	1.40	2.07
			3/8 x 4	1.95	2.90
			1/2 x 4	2.34	3.48

BIRCH PLYWOOD

1/64 x 12 x 12	2.05	1/8 x 6 x 12	1.12
1/64 x 12 x 24	4.08	1/8 x 12 x 12	2.24
1/64 x 12 x 48	8.41	1/8 x 12 x 24	4.46
1/64 x 48 x 48	33.61	1/8 x 12 x 48	8.93
		3/16 x 6 x 12	.83
		3/16 x 12 x 12	1.64
		3/16 x 12 x 24	3.30
		3/16 x 12 x 48	6.57
		1/4 x 6 x 12	.83
		1/4 x 12 x 12	1.64
		1/4 x 12 x 24	3.30
		1/4 x 12 x 48	6.57
		3/8 x 12 x 12	2.03
		3/8 x 12 x 24	4.04
		3/8 x 12 x 48	8.09
1/16 x 6 x 12	.82		
1/16 x 12 x 12	1.64		
1/16 x 12 x 24	3.28		
1/16 x 12 x 48	6.56		
3/32 x 6 x 12	1.02		
3/32 x 12 x 12	2.04		
3/32 x 12 x 24	4.06		
3/32 x 12 x 48	8.13		
		1/2 x 12 x 12	2.27
		1/2 x 12 x 24	4.55
		1/2 x 12 x 48	9.08

LITE PLYWOOD

1/8 x 12 x 12	.82
1/8 x 12 x 24	1.64
1/8 x 12 x 48	3.28

TAPERED TRAILING

EDGE	36"	48"
1/8 x 1/2	.24	.32
3/16 x 3/4	.31	.43
1/4 x 1	.42	.58
5/16 x 1-1/4	.47	.65
3/8 x 1-1/2	.56	.77
1/2 x 2	.83	—
3/4 x 3	1.59	—

TRIANGULAR CUT BALSA

1/4 x 1/4 x 36	.27
3/8 x 3/8 x 36	.31
1/2 x 1/2 x 36	.40
3/4 x 3/4 x 36	.50
1 x 1 x 36	.65

BALSA PLANKS

1 x 3 x 36	2.46
1 x 4 x 36	3.24
2 x 2 x 36	3.50
2 x 3 x 36	4.20
2 x 4 x 36	5.60
3 x 3 x 36	6.30
3 x 4 x 36	8.40

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SUPER-GOLD™	2 oz.	12.64
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SUPER-GOLD™	1/2 oz.	4.28
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GAP FILLER ORDERLESS INSTA-CURE		
SUPER-GOLD™	2 oz.	12.64
GAP FILLER ORDERLESS INSTA-CURE		

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QUICK-CURE™	9 oz.	7.65
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MID-CURE™	4-1/2 oz.	4.87
16 MINUTE EPOXY		
MID-CURE™	9 oz.	7.65
15 MINUTE EPOXY		
SLOW-CURE™	4-1/2 oz.	4.87
36 MINUTE EPOXY		
SLOW-CURE™	9 oz.	7.65
36 MINUTE EPOXY		
EX-SLOW-CURE™	4-1/2 oz.	4.87
2 HOUR EPOXY		
EX-SLOW-CURE™	9 oz.	7.65
2 HOUR EPOXY		
FINISH-CURE™	4-1/2 oz.	4.87
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FINISH-CURE™	9 oz.	9.74
20 MINUTE EPOXY		

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SUPER THIN CYANOACRYLATES		
INSTA-CURE™	1 oz.	3.75
SUPER THIN CYANOACRYLATES		
INSTA-CURE™	2 oz.	6.42
SUPER THIN CYANOACRYLATES		
INSTA-CURE™	8 oz.	18.19
SUPER THIN CA REFILL		
INSTA-CURE™	1/2 oz.	2.14
GAP FILLING CYANOACRYLATES		
INSTA-CURE™	1 oz.	3.75
GAP FILLING CYANOACRYLATES		
INSTA-CURE™	2 oz.	6.42
GAP FILLING CYANOACRYLATES		
INSTA-CURE™	8 oz.	18.19
GAP FILLING CA REFILL		
MAXI-CURE™	1/2 oz.	2.46
EXTRA THICK CYANOACRYLATES		
MAXI-CURE™	1 oz.	4.01
EXTRA THICK CYANOACRYLATES		
MAXI-CURE™	2 oz.	6.96
EXTRA THICK CYANOACRYLATES		
INSTA-CURE™	8 oz.	20.87
EXTRA THICK CA REFILL		

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INSTA-SET™	10 oz.	6.96
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INSTA-SET™	10 oz.	6.96
VANILLA SCENT FREON FREE REFILL		

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36" EXTRA WIDE BALSA SHEETS

	6"	8"
1/16	2.96	4.28
3/32	3.36	4.68
1/8	3.70	5.30
3/16	4.26	6.16
1/4	4.80	6.94
3/8	6.46	9.24
1/2	7.80	10.94

TAPERED AILERON

1/4 x 1 x 36	.65
1/4 x 1-1/4 x 36	.75
1/4 x 1-1/2 x 36	.81
1/4 x 2 x 36	.91
5/16 x 1-1/4 x 36	.75
5/16 x 1-1/2 x 36	.87
5/16 x 2 x 36	.97
3/8 x 1-1/2 x 36	1.00
3/8 x 2 x 36	1.11
3/8 x 2-1/2 x 36	1.26
1/2 x 1-1/2 x 36	1.20
1/2 x 2 x 36	1.35

3" SUPERLITE CONTEST BALSA

	36"	48"
1/32 x 3	.90	1.20
1/16 x 3	.98	1.30
3/32 x 3	1.18	1.57
1/8 x 3	1.35	1.80
3/16 x 3	1.63	2.17
1/4 x 3	1.90	2.53
5/16 x 3	2.33	3.10
3/8 x 3	2.73	3.63
1/2 x 3	3.40	4.52

4" SUPERLITE CONTEST BALSA

	36"	48"
1/32 x 4 x 36	1.48	1.97
1/16 x 4 x 36	1.64	2.18
3/32 x 4 x 36	1.84	2.45
1/8 x 4 x 36	2.15	2.86
3/16 x 4 x 36	2.58	3.43
1/4 x 4 x 36	2.97	3.95
3/8 x 4 x 36	4.12	5.48
1/2 x 4 x 36	4.97	6.61

BARGAIN BALSA *

3" SHEETS x 36" LITE TO MEDIUM DENSITY

	Price Each	Per BDL	BDL Price
1/16 x 3	.28	7	1.96
3/32 x 3	.38	5	1.90
1/8 x 3	.44	5	2.20
3/16 x 3	.55	4	2.20
1/4 x 3	.66	4	2.64
3/8 x 3	.77	3	2.31
1/2 x 3	.88	3	2.64

4" SHEETS x 36" LITE TO MEDIUM DENSITY

	Price Each	Per BDL	BDL Price
1/16 x 4	.44	5	2.20
3/32 x 4	.55	4	2.20
1/8 x 4	.66	4	2.64
3/16 x 4	.77	3	2.31
1/4 x 4	.88	3	2.64
3/8 x 4	1.27	2	2.54
1/2 x 4	1.98	2	3.96

1/8" STICKS x 36" MEDIUM TO HARD DENSITY

	Price Each	Per BDL	BDL Price
1/8 x 1/8	.06	34	2.04
1/8 x 3/16	.08	25	2.00
1/8 x 1/4	.10	20	2.00
1/8 x 3/8	.13	16	2.08
1/8 x 1/2	.15	14	2.10
1/8 x 3/4	.17	12	2.04

3/16" STICKS x 36" MEDIUM TO HARD DENSITY

	Price Each	Per BDL	BDL Price
3/16 x 3/16	.09	23	2.07
3/16 x 1/4	.10	20	2.00
3/16 x 3/8	.11	19	2.09
3/16 x 1/2	.14	15	2.10
3/16 x 3/4	.20	10	2.10

1/4" STICKS x 36" MEDIUM TO HARD DENSITY

	Price Each	Per BDL	BDL Price
1/4 x 1/4	.11	19	2.09
1/4 x 3/8	.13	16	2.08
1/4 x 1/2	.15	14	2.10
1/4 x 3/4	.22	10	2.20

3/8" STICKS x 36" MEDIUM TO HARD DENSITY

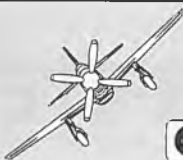
	Price Each	Per BDL	BDL Price
3/8 x 3/8	.19	11	2.09
3/8 x 1/2	.27	8	2.16
3/8 x 3/4	.38	6	2.28

1/2" STICKS x 36"

	Price Each	Per BDL	BDL Price
1/2 x 1/2	.31	7	2.17
1/2 x 3/4	.40	5	2.28

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Fred Ebner's team flying 37.3 miles and taking 10th place.

Desert Flyers of Apple Valley, California. Piloted by Bob Watson, co-pilot Dale Coahlen, driver Jim Slocum, and observer Bob Tyler who flew their aircraft 143.1 miles. Transmitter battery supply consisted of two transmitter batteries, they used one and field charged the other from the truck's 12 volt system. The aircraft battery supply consisted of two 1300 mAh battery packs.

Fifth place went to Bob Mellen and his team from Corona, California. The team flew 140.7 miles. Pilot Jeff Mellen, co-pilot Bob Mellen, drivers Terry Murphy and Earl Sanders, and observer Tom Trowbridge. Transmitter battery supply consisted of two batteries that they swapped between. The airborne battery system consisted of one 1200 mA battery for the receiver and one 1200 mA battery for the ignition system.

In seventh place we had the Coachella Valley R/C Club from Indio, California. Pilot Bob Taylor, co-pilot Nick Maire, pilot/driver Frank Gomez, and observer Ernie Chapin. They flew their Sig

Spacewalker 98.6 miles. For battery supplies they used Radio Shack batteries and made up a 2000 mAh pack for the transmitter and an 1800 mAh pack for the receiver.

Another Spacewalker entered this year was from the Rebels of Salinas, California, flown by Jeff Soares, co-pilot Jeff Bradbury, and drivers Diego Zuniga and Jim Kelly. This team finished in 8th place, completing 93.2 miles. The radio used was Futaba, the airborne battery consisted of one 4000 mAh battery pack, the transmitter's power was supplied by a control panel/field charger off of the truck's electrical system. The control panel monitored the transmitter's battery as well as keeping it topped off.

The Homeless R/C Flyers from Bermuda Dunes, California, took 9th place flying their Cub 75.8 miles. Batteries used were AA alkaline energizers. The team consisted of pilot Dan Metz, co-pilot Foster Edwards, driver Jeff Edwards, and observer Jim

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Closs.

Fred Ebner's team from Santa Barbara, California, took 10th place by flying 37.3 miles. Piloted by Fred Ebner, co-pilot Jim Conley, driver Andy Steiner and observer Frayne Higgason. They carried two transmitter batteries, used one and field charged the other from the truck's 12 volt electrical system. The aircraft used one 1200 mA 6 volt gel cell.

Marjoe Bunney's team of Las Vegas, Nevada, took 12th place. They elected not to fly since Marjoe was the contest director.

The Marathon of Flight is a fun event that takes a lot of team work. Get a Team together and give it a try! The October event (QSAA) is for scale aircraft. Sometime in May is the California R/C Marathon also in Baker, California, that flies on the same course with a half gallon of fuel, this is a nonscale event. For information on the California R/C Marathon contact Monte Salot at (714) 650-5004.

For next month a look at some new electronic goodies.

'Til then have fun!

WIRE BENDER BENDS AND FORMS WIRE AND STRIPS OF METAL (IN ANGLES, CURVES LOOPS, ETC.) No. WB100 - \$4.00 SQUARE PUNCH SET CUTS SQUARES AND SLOTS SET INCLUDES SIZES: 1/8", 3/16", 1/4", 5/16", 3/8" MADE FROM NICKEL PLATED STEEL No. SPS5 - \$12.00 BRUSHES 3 PCS MINIATURE WIRE BRUSH SET ONE EACH - BRASS NYLON, STAINLESS MWB3 - \$3.00 ZONA SAWS 150 42 TEETH 3/4" \$2.30 200 32 TEETH 3/4" 2.30 250 MITRE BOX 2.50 450 SUPER SABRE SAW WITH LONG & SHORT BLADE 2.60 500 1 1/4" WIDE 2.70 600 ZONA HAKA JUNIOR HACKSAW 1.65 DRILL SETS FIRST QUALITY HIGH SPEED STEEL ALL SETS SUPPLIED IN A CASE DS180-1/16 to 1/4" (13 pcs) \$4.00 DS181-1/16 to 1/2" (28 pcs) 18.50 DS182-A TO Z (28 pcs) 23.50 MOST POPULAR DS183-No. 1 to 60 (60 pcs) \$16.50 DS184-No. 81 to 80 (20 pcs) 12.00	NEEDLE FILE SET 5 1/2" - 12 SHAPES PLASTIC HANDLE WITH EACH FILE GREAT ON WOOD, PLASTIC, METAL No. NFS101 - \$5.00 DREMEL 3950 INDUSTRIAL QUALITY X-TRA HEAVY DUTY; 12 SHAPE 4" LONG \$6.50 6" LONG \$8.00 EPOXY BRUSHES MADE IN U.S.A. 12/PACK No. EB12 - \$1.00 Doz. No. EB144 - \$7.00 Gross PIN VISE STAINLESS STEEL - 0 TO 1/8" CAP. PV4 - 4" - LONG - \$4.00 PV6 - 6" - LONG - 6.00 PV10 - 10" - LONG - 8.00 PV15 - 15" - LONG - 10.00 PV614- 0 to 1/4" Capacity-\$6.00	TUBE CUTTER 1/8" TO 5/8" CAPACITY HEAVY DUTY MADE FROM SEMI-STEEL No. TC58 - \$4.00 HOBBY KNIFE BLADES No. 11 MADE IN U.S.A. 100 PACK No. HKB11 - \$6.50 SINGLE EDGE BLADES MADE IN U.S.A. FIRST QUALITY No. 9 100 PACK No. SEB102 \$4.50 HEAVY DUTY NO. 12 FIRST QUALITY 100 PACK No. SEB101 \$8.00 Z PLIERS MAKES PERFECT "Z" BENDS WITH A SQUEEZE No. ZPL \$16.50	CUTTING MATS HEALS ITSELF AFTER EACH CUT AND SURFACE STAYS SMOOTH. NON-GLARE GREEN FINISH CUT ON BOTH SIDES CM8 9" x 12" \$10.00 CM12 12" x 18" \$15.00 HELPING HAND FIRST QUALITY THREE ARMS 2 ARMS WITH ALLIGATOR CLIPS 1 ARM WITH 2X GLASS 2 1/2" MAGNIFIER HH1 - \$7.00 NORTHWESTERN CHOP SAW MAKES PERFECT MITRE CUTS 30°, 45°, 60°, IN WOOD OR PLASTIC. USES SINGLE EDGE BLADE - ADJ. STOP NCS - \$14.50 T-BAR SANDERS ALUMINUM - MADE IN U.S.A. T11 11" LONG \$2.30 T22 22" LONG \$3.50 SANDPAPER - RUFF TUFF ADHESIVE BACK \$1.05 EA (SPECIFY FINE (RFS), MEDIUM (RSM) OR COARSE (RSC))
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21

THE GLITCH RECORDER

HOW DO WE GET THE MOST OUT OF OUR 91 RECEIVERS?

By George Steiner

PART II

(Let's Build a Glitch Recorder)

In the Glitch Recorder, Part I, we talked about why we needed a GR unit in our model, and that it painted a

big bright picture evaluating the receiver installation and performance. Up to now that could only be evaluated by how the model performed through visual indications. The Glitch Recorder is a tool



Photo #1: The test model with the GR-2 unit placed in the cockpit to show how it can be temporarily rubber banded in place for a test flight. The transmitter is the new fabulous JR X-388S that never missed a beat with the many hours of GR testing.

for the modeler and it shows how well his communication control link is during a flight, or how much margin there is between solid control and glitch city. It's a tool that is flown in the model to monitor the R/C systems performance each flight, and is a real time unit to indicate a frame rate error with an adjustment window and visual numerical readout.

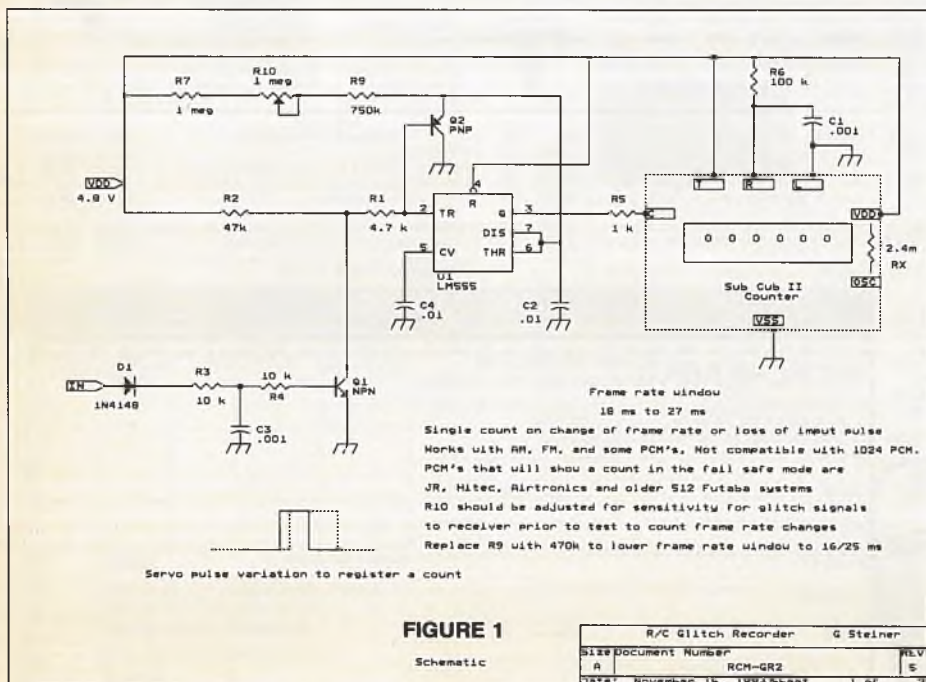
A device like this is nothing new. It has been used by many radio control people in the past in an effort to gain knowledge of what is going on in the model. Most often a device of this type has been referred to as a pulse omission detector. The schematic (Figure 1) shows the basics of the GR-2 for this construction article.

How does it work to catch a count in the display device when we have an error in our ground to model control? Referring to Figure 1, an input signal from the receiver servo connector appears at the "IN" terminal point through D1. This is a positive pulse at a typical frame rate of 20 milliseconds. It is buffered and reshaped through R3, C3, and R4 to drive Q1. This inverts the signal for a negative going pulse to trigger the 555 timer at pin 2. The 555 timer is set up for a monostable operation. As long as the trigger pulse remains at pin 2 and keeps arriving at the received signal frame rate (typical 20ms, the circuit stays triggered), the output at pin 3 remains high. Any change in input pulse error in a positive direction (20ms + 1) allows completion of the timing cycle (2/3 Vdd at pins 6 and 7, discharge and threshold terminals), then pin 3 goes low. Q2 along with control potentiometer R10 and C2 determine the timing for the error pulse frame window of 18 to 27 milliseconds. Each time pin 3 goes low it will give the Sub Cub display a count of one. Any disturbance in the servo pulse timing as tight as 250 microseconds can be captured for a count. Reset of the counter is accomplished by powering down and back up again triggering a negative pulse from C1 at the "R" terminal on the counter.

The circuit can catch lightning fast disturbances and receiver hits that the servo is unable to respond to in time to give a visual glitch in the model. This is the gray area in the model you never knew about.

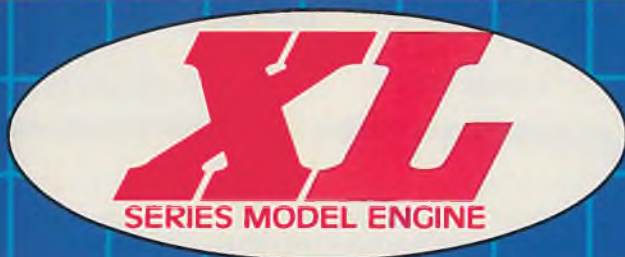
Building a Glitch Recorder can be done very easily by following the instructions, the photos, and captions along with purchasing the parts shown in the parts list. It also helps if you are handy with a low wattage soldering iron with a small tip.

The first step is to become very familiar with what is required to assemble the GR-2 parts list. All the parts can be ordered from Digi-Key Electronics, with the exception of the GSP PC board. The board can be ordered separately as indicated in the material parts list and is shown in Photo #2. The Display PC board that has to be ordered from Digi-Key is shown on the left side in Photo #2. A convenient semi-kit package is being offered at \$23.00. Alternate parts source as shown in parts list and Photo #3 can be ordered from Mouser Electronics. It



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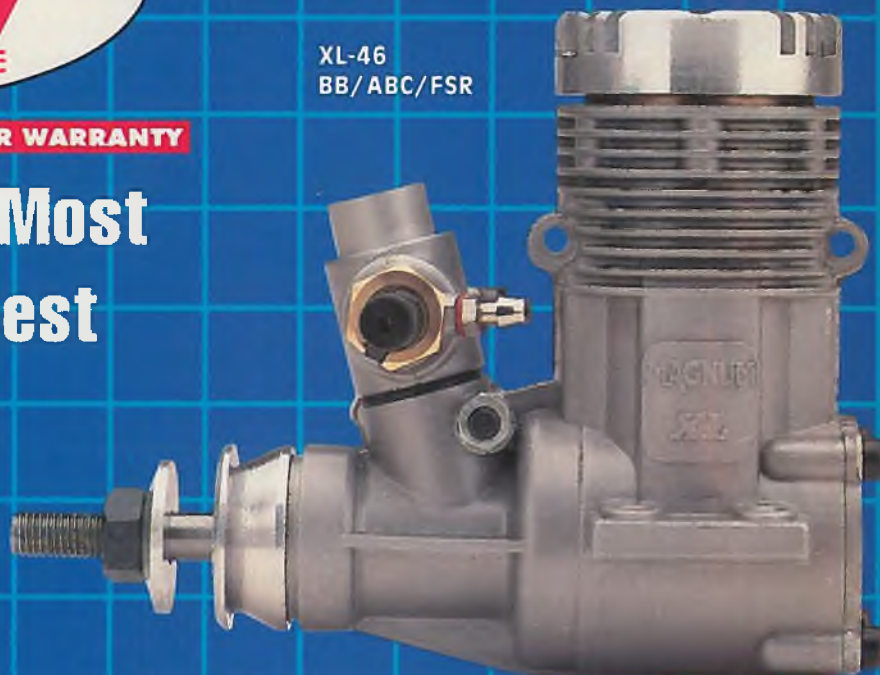


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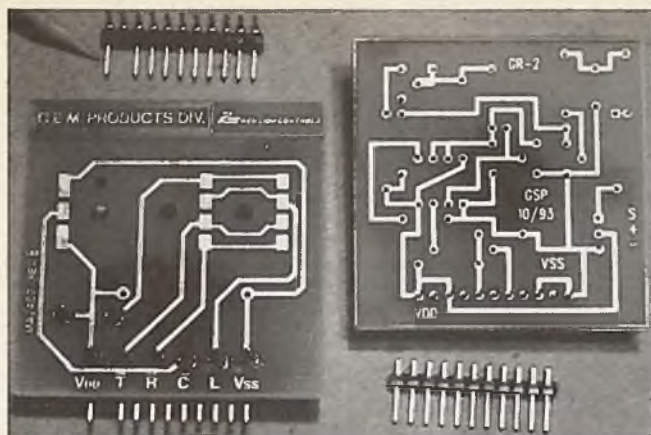
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LEFT: Photo #2: The two major PC boards involved in the construction of the Glitch Recorder. Note the 11 pin circuit header that has to be replaced with a straight pin type with the display board. In the final assembly one board is sandwiched with the other using the 11 pin circuit header. **RIGHT: Photo #3:** Two GR-2 units with all components in place showing options of using R10 (pots) and C2.01 capacitor. Note how C2 on the left PC board is bent down over the 555 IC for a low profile.

also shows the variation between types of parts. A GR-2 unit can be scratch-built by using your own parts, but is not recommended for the novice electronic builder.

Now, for some important steps pertaining to assembling the GR-2. Parts stuffing in the GSP PC board can be followed by using Figure 4 component overlay drawing. No sequence is required. All parts should attain a low profile as noted in Photo #3. Stick them in and solder in place, with the exception of the 11 pin header as shown in Photo #2. Photo #3 shows what the parts on the PC board should look like.

The header must have the pins pushed flushed with the phenolic mounting. This is done in order to have maximum reach for the final assembly of the sandwich between the GSP and display PC boards. After making the pins flush with the phenolic mounting, insert them into the GSP board as shown in Photo #2, and solder all the pins projecting through the PC board. At this point another operation has to be done, and that is the removal of the 11 pin header from the display PC board. This is a right angle unit and becomes useless for the GR-2 unit. This is pointed out in Photo #2. The use of a soldering aid called "Solder Wick" is needed for this operation (Radio Shack #64-2090). After removal of the right angle

header, check the alignment between the two PC boards by making sure the Vdd and the Vss match up between the two PC boards with the 11 pin header. Make a trial fitting, but do not solder them together as yet. Remove the display PC board and mount the display module as shown in Photo #4. It can only go one way so check the plastic mounting pins in the back of the display to be sure they line up with the holes in the display PC board. Lay it to one side. Install the servo connector lead at point J1 (see Figure 4 component overlay) to the GSP board. Photo #3 shows the servo leads coming out of the PC board.

This should complete the basic building of the GR-2 unit and it now can be pretested before the final assembly.

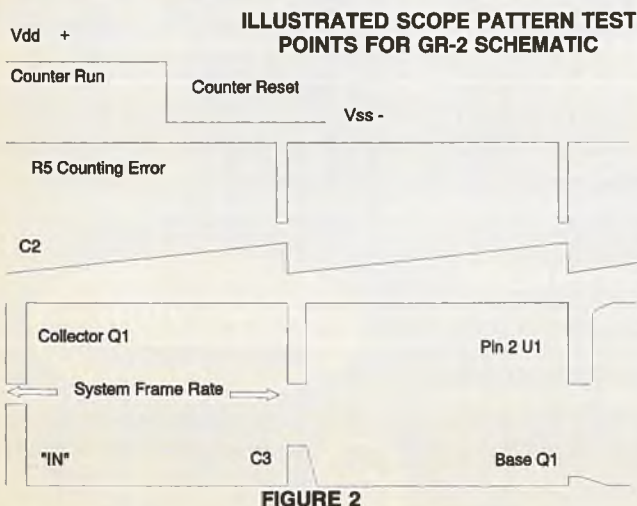
A preliminary smoke test is done by plugging the GSP board into a working R/C system at any unused channel with power on. A voltmeter is connected to negative Vss and + to R5 and should show a reading of +4.5 volts. Adjust R10 from one extreme to the other and a slight variation in voltage ($\pm .2$ volts) indicates the Glitch Recorder is working. Now turn off the R/C transmitter and the R5 voltage should go to zero. Refer to Figure 2 if you have an oscilloscope for troubleshooting. If the GR-2 unit passed this test you are ready for the final assembly. If it gave little or no



Photo #4: The Glitch Recorder displaying a 49 count. This photo shows the display module Sub Cub 2 in place (plugged in) on the mounting PC board from Digi-Key.

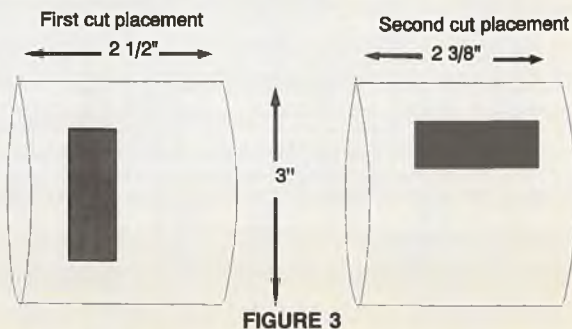
indication with the voltmeter, go back through component placement and soldering and make sure you have all the right parts soldered in the right places. It has to work because of the simplicity of the design.

Final assembly is done by placing the display board on the 11 pin header to the GSP board and matching up the Vss and Vdd indications between the two PC boards, so the two PC boards are parallel to each other. Solder the 11 pins coming



HEAT SHRINK TUBING FOR COVERING THE GLITCH RECORDER CUT SIZE (drawing not to scale)

Cutout for display is made after heat shrink has been installed
Display cutout size, 1 1/2" by 1/2"



THE OUTLOOK IS CRYSTAL CLEAR



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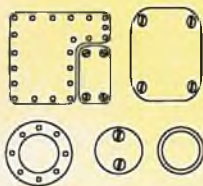
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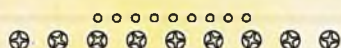
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through the display board with the exposed pins not more than 1/32" above the soldered surface.

Final test is made by following the outlined installation and operation steps 2, 3, 4, and 5 of the Glitch Recorder in the next paragraph before containment covering. After proving the GR-2 works on the bench,

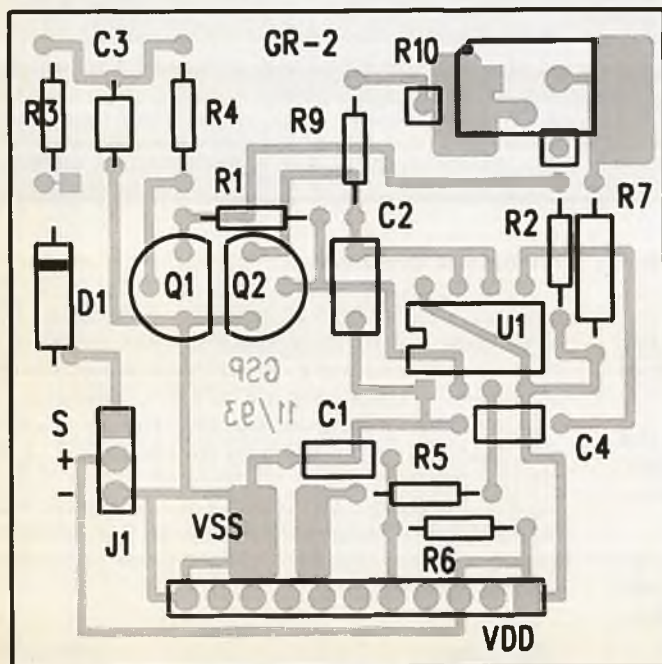
follow Figure 3 to install the heat shrink tubing to make it a finished product as shown in Photo #5.

Installation and Operation of the GR-2

(1) Plug GR-2 into any unused servo channel location. Suggest using retract channel for this if not in use, but a "Y" harness can be used on any channel. Find a

location in your model where the GR-2 device can be viewed for the set-up and after-flight recording readout. Even using a temporary servo extension to rubber band the GR to the outside of the model would be okay for a couple of test flights as shown in Photo #1.

(2) Turn on R/C system transmitter and



GR-2 TOP VIEW PARTS PLACEMENT
FIGURE 4



Photo #5: The GR-2 finished product with the 3" heat shrink covering for the containment fixture. Note comparable size to a standard servo. Weight as shown for the GR-2 unit is 1.2 oz.

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7 X 4	1.59	9.5 X 7.5N	5.39	11.5 X 4	8.29	13.5 X 11.5N	7.95	16 X 16	12.95	22 X 22	31.00
7 X 5	1.59	9.5 X 8.0N	5.39	12.25 X 3.75	8.39	13.5 X 12.5	10.25	9 X 6P	3.95	24 X 10	38.00
7 X 6	1.59	9.5 X 8.5N	5.39	12 X 9	7.95	13.5 X 13.5	10.25	10 X 6P	3.95	24 X 12	38.00
7 X 7	1.59	9 X 6.5	5.39	12 X 10	7.95	13.5 X 14	10.25	10 X 7P	3.95	24 X 14	38.00
7 X 8	1.59	9 X 7.5	5.39	12 X 11	7.95	13.5 X 14W	10.25	11 X 6P	3.95	24 X 16	38.00
7 X 9	1.59	9 X 8.5	5.39	12 X 12	7.95	14 X 5N	12.95	11 X 7P	3.95	24 X 18	38.00
7 X 10	1.59	9.5 X 4.5	11.29	12 X 13	7.95	14 X 6N	12.95	14 X 6P	12.95	24 X 20	38.00
7.8 X 4	3.95	10 X 3	2.29	12 X 14	7.95	14 X 8	12.95			24 X 22	38.00
7.8 X 6	3.95	10 X 4	2.29	12 X 15	7.95	14 X 10	12.95			2 Blade Hub 18 - 19	30.00
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8 X 10	1.79	10 X 9	2.29	12 X 20	7.95	14 X 16	12.95				
9 X 4	1.99	10 X 10	2.29	12 X 21	7.95	14 X 17	12.95				
9 X 5	1.99	10.5 X 4.5	11.39	12 X 22	7.95	14 X 18	12.95				
9 X 6	1.99	11 X 3	2.49	12 X 23	7.95	14 X 19	12.95				
		11 X 4	2.49	12 X 24	7.95	14 X 20	12.95				
		11 X 5	2.49	12 X 25	7.95	14 X 21	12.95				
		11 X 6	2.49	12 X 26	7.95	14 X 22	12.95				
		11 X 7	2.49	12 X 27	7.95	14 X 23	12.95				

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receiver.

(3) Adjust sensitivity control (R10) in the GR-2 unit until the counter starts to count. Further adjust the sensitivity control until display just stops counting.

(4) Operate all servos with a control stick movement and further adjust GR-2 sensitivity control (R10) until no counter indication is being registered. Turn power off and on at the transmitter to see if a single number count is registered. If not, go through steps (1) to (4) again.

(5) Turn the receiver power off and then on for one second and this will reset the GR-2 counter display to '0' or a one count.

After a normal model flight, check the GR-2 counter. A zero count indicates an

excellent R/C system with solid receiver response to your commands. No interruptions! A count of up to 10-15 is average and should be considered very good for general response. A count up to about 50 will be a system usable without any visible glitch problems. A consistent count over 50 would suggest an investigation to what is causing such a high count. The top end of this is about 200 rate hits when visual glitching occurs, and this depends on the length of flight exposure.

To lower the GR count, check the following:

- Transmitter to receiver alignment.
- Antenna location in the model and other wiring dress.

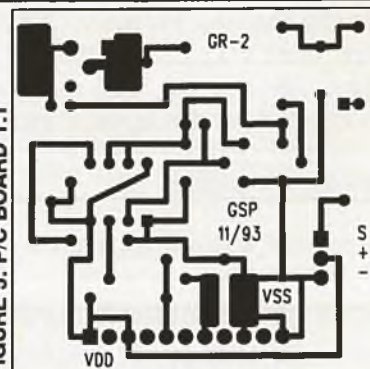


FIGURE 5: P/C BOARD 1:1

(C) Vibration problems, metal to metal contact.

(D) Poor voltage regulation. Low



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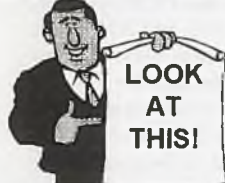
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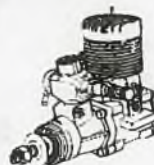
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capacity battery or high resistance wiring connection. Long battery or servo leads.

(E) Servo problems. Old and well worn.

(F) Any one of the above can lead to a visual glitch that most of the time is blamed on outside interference. Any of the following information should also lower the count.

(G) Change frequency of system.

(H) Try receiver replacement.

(I) Replace airborne battery pack with a high capacity type.

Limitations for the GR-2 are that it will not work with Futaba 1024, Airtronics Vanguard, and Infinity 600 PCM systems. All other PCM, PPM, FM, and AM's will give a glitch count when there is any disturbance that comes through the receiver and is decoded as misinformation to the servos. The reason this GR-2 will not work with above R/C systems is because of the way it was designed to register pulses that are in error for the frame rate of a positive direction. (A KISS design.) An illustration of this is shown the Figure 1 schematic.

A Glitch Recorder that can detect error signals for the 1024 PCM, etc., R/C equipment has been designed and tested. It will be presented at a later date as the GRPCM.

Summary

As I stated in Part I of this article, I would report on some of the tests I have made to validate receiver performances when just testing the receiver by itself. This method

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Bomb-Bay Door Module (BBDM) creates over **50 cubic inches of payload bay area** in the TO-Pod. Load action figures with parachutes for para-rescue missions, flour sacks, candy or eggs for precision bombing, fill the sky with confetti or streamers, or tie on a drogue chute for slowing KnightHawk down when landing "hot".



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KnightHawk Specifications

Type - AWSUMM, Wingspan - 64", (752 sq. in.) Length - 43", Training Wt., RTF - 5.75 lbs. Mission Wt. - varies with payload up to 9 lbs. **Radio Required** - 4-channel minimum (rudder, elevator, throttle, ailerons). TO-Pod features require additional dedicated radio channel. ARM and BBDM each require dedicated servo. Flaps require additional dedicated radio channel and 2 additional servos. **Engines** - .40-.50 ball-bearing 2-stroke or .50 4-stroke. Engine, Radio, Camera, 12 oz. aux. tanks for LRTS and wheels are not supplied and must be purchased separately.

Acquisition Data

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for evaluating a system is to isolate the receiver from the flying system with no servos attached. This means to fly the model with one R/C unit and have the other receiver (riding piggyback in the model using its own battery pack) to evaluate.

What I have found is that most all receivers have a definite footprint using the GR-2. By that I mean some receivers will never register a zero count. That does not mean they are of inferior operation and will crash a model. It shows that some have less margin and are closer to a visual glitch. This type of receiver might never give a problem so you can't condemn it. Older single conversion AM receivers will always have a count of 20 or more. The newer AM receivers earmarked as 91 approved will have counts of less than 10. This is an indication that the AM design R/C with AGC is really working. Take an older FM single conversion receiver and no matter how you tune it or what environment you fly it in, it will have a very high Glitch Recorder count. A lot of the newer FM and PPM receivers will end up with a 1, 2, or 3 count after a five minute flight and that is very good. Most all PCMs tested gave less than a 5 count with the GR-2. A consistent zero count is the best, and that is what I look for. On one rare occasion I found a new R/C receiver giving a very high glitch count of over 200 right out of the box. A bench test investigation showed the receiver was really not what it should have been and was sent back to the vendor for an exchange. In my test model I try them all and stick with the receivers that give me the lowest count, flying or otherwise.

Every model flight is an exciting experience for me now when using the Glitch Recorder. I hope you will find it a helpful new tool with a rewarding education. The GR-2 is not a device to reinvent the wheel. It just shows that it is still round.

A GSP PC board is available for \$13.00 p.p. as shown on the left of Photo #2 from GSP Products, 2238 Rogue River Dr., Sacramento, California 95826.

A parts kit is also available that includes all resistors, capacitors, transistors, and 555 IC with the exception of the Sub Cub II counter display and PCB/Display board from Digi-Key as a semi kit for \$23.00 p.p. from GSP Products. □

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for The Giant Scale Modeler

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FLYING LOWE

Feedback

In my January '94 column I talked about the "missing link." I defined the term as the lack of a national structured program for the flight training of newcomers to R/C. I pointed out that most clubs have programs to provide instruction of new members when needed. Some of these programs are very good and some are . . . I did mention also that there are a few commercial enterprises around the country that instruct new fliers for a fee. That is undoubtedly a good way to go if one can afford to do it.

Since the column was published I have received a number of responses to it. I will share some of these letters with you.

Robert Barnes of the JTL Miniature Flight Training Center, 210 N. Goldenrod Rd., Suite #10, Orlando, Florida 32807, writes that they have been in business now for several years and are very busy. The cost of the basic flight training course is about \$400.00. Robert indicates that they emphasize positive reinforcement rather than criticism. Everything is furnished for the flight training.

A letter from Dave Kiesling, owner of the StarFlight Aircraft Factory, 405 Sunset Ave., Alamogordo, New Mexico 88310, writes:

"Today I received my copy of the January 1994 issue of RCM and as is my habit, I briefly scanned the magazine to see which articles I would want to read completely and in-depth. That is, until I came upon your article which stopped me dead in my tracks.

"When I started in the R/C aircraft hobby some 23 years ago, I had the good fortune to come in contact with two or three individuals who were very much dedicated to ensuring that the new guy got off to a good start in the hobby. Their dedication kept me from making many of the mistakes common to the novice RC'er and now I'm in a position to return that favor and use my knowledge and experience to help the beginning RC'er of today.

"For the past 18 months, I have been gathering information, formulating and consolidating ideas, taking a business course and writing a business plan. The end

result of all this effort is the StarFlight Aircraft Factory. The subjects that you covered in your article are exactly the same ones that gave me the motivation to pursue the one thing I had found to be most lacking in the R/C hobby and you have also given credence to my original idea. The original idea was that the novice RC'er needs the help and assistance of an experienced professional in order to make a successful entry into the R/C hobby; the kind of help that will lead to an enjoyable lifetime experience.

"The main goal of the StarFlight Aircraft Factory is to offer the new RC'er courses in building R/C aircraft and flight instruction that will give them a foundation of fundamentals that they can use as they become more involved in the hobby. It is my personal goal to give the kind of help to those thinking about R/C that I received when I first started, so they, too, can get as much enjoyment from the hobby as I have received. I have enclosed a brochure that briefly outlines the objectives of the StarFlight Aircraft Factory.

"With your permission and that of the R/C Modeler Corporation, I would like to use your article to reinforce what I have been telling the new RC'ers for many years and to promote the concept of the StarFlight Aircraft Factory.

"Thank you Mr. Lowe for writing such an outstanding, on target, article."

Evidently, Dave is as confident as I am that structured help for fledgling fliers is needed.

Another letter came from Howell Gwin, 1375 Rikisha Lane, Beaumont, Texas 77706. Howell has been involved for some time training new pilots, and takes some exception to my statement that the use of stabilizers (autopilots) would help ease the process. He writes in part: ". . . at least half the students I know who've trained on a stabilizer equipped airplane never learn to fly an aircraft without one. I have helped several of these people, and you would not believe the reluctance they have to switch off the stabilizer, even two mistakes high with a buddy-cord and a qualified pilot standing by. Having flown several autopiloted planes, I know how much

difference there is -- we've even tried making the AP less sensitive -- that doesn't work well, either.

"Over the past two years, I've trained (to competence) probably a dozen folks, usually father-and-son combinations on a buddy-box equipped taildragging O.S. 20 powered Seniorita which now has almost 1000 flights on it. My method is to explain what the sticks do, emphasize that they cannot crash, and let them have at it. The first few minutes (or flights, sometimes) are hairy. I demonstrate, they try, I save, and tell them what they're doing wrong. Mostly I let them make mistakes and learn from them. After all, with the box, they're not fatal. Sooner or later, they catch on enough to steer the plane around reliably. At that point, we moved on to precision turns (squares, rectangles, Figure 8's, etc.), until they can put the plane where they want it -- coming and going. By the time we start landing patterns, they're usually finished building their own airplane and we finish training on their ship. (Most of my students who don't begin building their own, seldom stay around enough to complete the program. They pay me between \$10.00 and \$20.00 (whatever they feel is right) for gas, wear and tear, no matter how long it takes. Throughout, I promote smooth, accurate flying and emphasize the need to have a specific goal every time they fly.

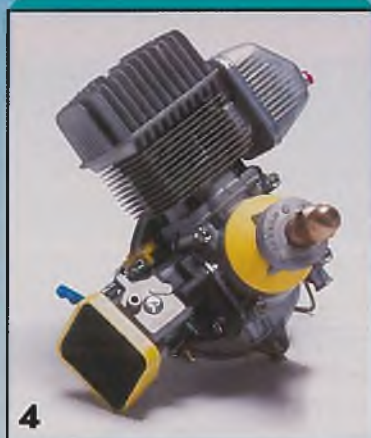
"Yes, we need affordable flight schools -- lots of them -- located all over the country. Yes, simulators and maybe autopilots will speed up the process, especially in areas where they have real winters. These things are expensive but there are a lot of people whose appreciation is in direct proportion to the money spent. I really hope that we don't lose the willingness to help beginners that was so common when you and I started. I wish more people would at least try to help beginners."

A third response that came from Clarence Ragland, 546 Niagara St., Lockport, New York 14094, reveals a little different approach to flight instruction. He writes: "I've been flying R/C aircraft for over 20 years and training beginners for about 17. I agree with everything in your recent article, 'The Weak Link,' in January '94 RCM.

"My main goal now is promoting the R/C flying hobby/sport, I've developed a technique of flight instruction that is easy, quick, and safe. This method doesn't require a buddy-box. I can guarantee that my student can take off and land within one to four lessons, without crashing. I've been practicing this highly successful training technique for the past 10 years, with only one or two minor mishaps.

"If you, like most of the club's members I've told of my success, find it difficult to believe, I can easily provide proof. Of course, I would have to show you in person,

continued on page 40



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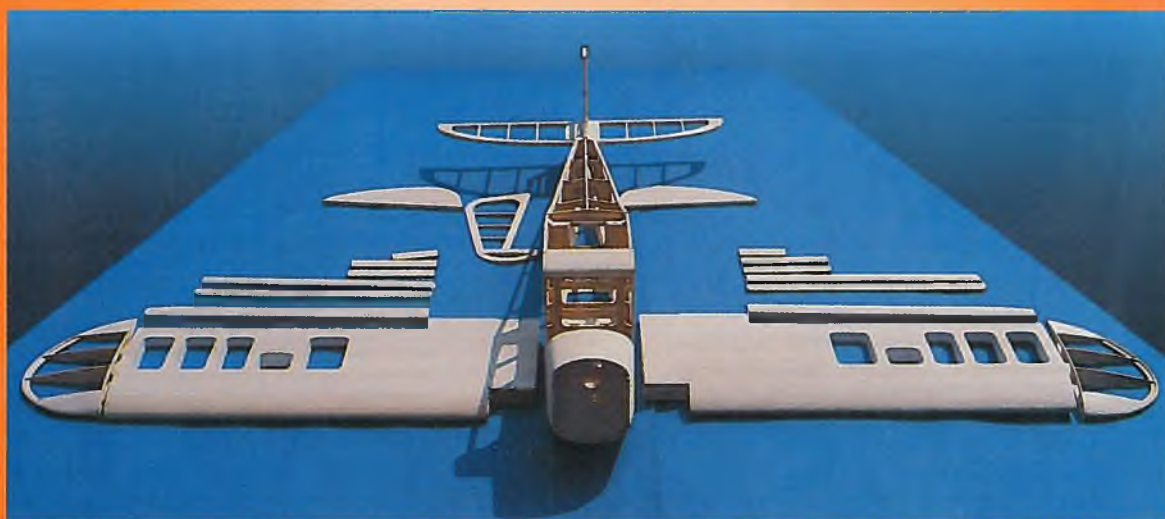
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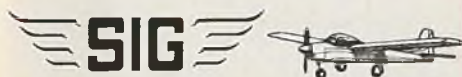
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33530	UNC:THREAD REPAIR KIT (3-48)DS #37.....	\$25.20
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10339	50mm (2").....	\$6.75
10340	55mm (2.25").....	\$7.75
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10318	45mm (1-3/4") White.....	\$2.75
10322	52mm (2") Red.....	\$3.50
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10324	52mm (2") White.....	\$3.50
10327	57mm (2-1/4") Red.....	\$3.75
10328	57mm (2-1/4") Yellow.....	\$3.75
10329	57mm (2-1/4") White.....	\$3.75
10330	62mm (2-1/2") Red.....	\$3.95
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as this is the only way to let people understand the potential of what I call the Ragland Technique (R.T.) of R/C flight instruction.

"Teaching R/C flying is apparently not a pleasant experience for most instructors or their students. Like you've said, it is difficult for the instructor and student to match schedules. When the instructor and student get together, the quality and quantity of flying time is usually limited. The result is a lack of growth of our R/C hobby.

"The R.T. is relatively easy. Here is how it works: The student holds the transmitter and the instructor is on his right side.

"The instructor holds his thumb and forefinger on the elevator/aileron lever, while the student learns the feel of the control with his/her thumb on top of the stick. There is a little more to it than that . . . like the instructor maintaining composure and confidence . . . but the technique essentially allows the student to learn to make corrections with the help of his instructor. Anyone can learn how to instruct as well as I can using the R.T. (others have done it). There is very little stress and strain with the R.T.

"The lack of quality flight instruction has been a noticeable, serious problem for years. I've been unable to get anyone else to acknowledge the obvious. After reading your article, I felt compelled to respond. Like I said before, my only goal is to share the joy of R/C flying with everyone."

Personally I would like to see an industry-wide program which includes a certain amount of flight training with the purchase of a complete model package (airplane, radio, and engine). With enough commercial flight schools around the country this should work. It is interesting to note that the schools that do exist seem to stay very busy.

A Tragic Experience

If you read my column which included a photo of the beautiful 38%, Precision Built Aviation, Extra 300S you can understand my sorrow when it met its demise the other day from battery failure.

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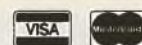
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Nitro	1 Gal.	5 Gal.	Nitro	1 Gal.	5 Gal.	Nitro	1 Gal.	5 Gal.	Nitro	1 Gal.	5 Gal.
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6%	10.50	45.00	26%	18.50	85.00	16%	16.00	72.50	11%	12.00	52.50
11%	12.00	52.50	36%	21.50	100.00	21%	18.00	82.50	16%	13.50	59.50
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Unfortunately, battery failure is not all that unusual, but I feel compelled to share my experience: I have used NiCds since they were first introduced for modeling. They have stood me in good stead. I charge them faithfully and normally do a voltage check (under load) before flight. The 300S incorporated one of the fairly new lead acid gel batteries. I had flown the model probably 20 flights (usually one or two flights on an outing) and on the fatal day I had one five-minute flight, and was two minutes into a second flight when it quit. A post-flight check revealed a **dead battery!** It had been properly charged overnight the night before, and a voltage check prior to the flight showed no problem. I have since learned that one should **not** solder to the battery tabs! Others have related mysterious failures from these batteries. I've learned a very hard lesson: Stick with something you know! I will never fly another large, valuable model without two NiCd packs on board, using separate switching harnesses and a "battery backer."

Lead acid batteries **do not** have the amp-hour capacity of a NiCd (for equal weight and volume), especially under load. The amp-hours advertised is at a very light load (60 mils). Under the in-flight loads typical of most models (several hundred mils) they **will not** deliver the stated capacity. A NiCd battery holds up much better under load. I conducted a discharge test of a fully charged lead acid battery at about 500 mils drain; the result: less than 60% of the advertised amp-hour capacity. This is no secret: It has been known by the battery industry for years. Let's remember that the current drain under load and in-flight can be very high. Vibration also will cause dither of the servos which adds significantly to the drain. A good practice would be: Fly one or two timed flights and run a battery discharge test to get a handle on discharge rates in-flight. I would love to have an on-board recorder to record average and peak discharge during flight.

I use a sealed lead acid battery all the time in my flight box. Why? Because it won't spill and does not self-discharge like a NiCd over a period of time. It does a good job and I rarely charge it. That's where a lead acid battery belongs, **on the ground**, and in a non-critical application. □

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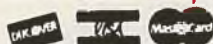


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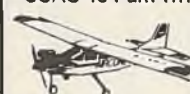
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N-110AA	110	14.5 x 17.9	8	1.80
N-270AA	270	14.5 x 30.0	14	1.80
N-600AA	600	14.2 x 50.0	24	1.75
N-700AAE	700	14.2 x 50.0	27	2.15
KR-800AAE	800	14.2 x 50.0	23	3.00
KR-1100AAE	1100	14.2 x 65.0	30	4.00
N-225AE NEW	225	17.0 x 17.0	12	3.00
N-500A	500	17.0 x 28.0	20	2.00
KR-600AE	600	17.0 x 28.0	21	2.25
N-800AR	800	17.0 x 50.0	34	3.25
KR-1000AE	1000	17.0 x 43.0	31	3.25
KR-1200AUL	1200	17.0 x 43.0	27	3.75
KR-1200AE	1200	17.0 x 50.0	34	3.50
KR-1400AU	1400	17.0 x 50.0	31	4.00
KR-1800AE	1800	17.0 x 67.0	45	5.50
N-600SCR	600	23.0 x 26.0	29	3.75
N-650SC	650	23.0 x 26.0	29	3.25
N-1000SCR	1000	23.0 x 34.0	42	4.25
N-1200SC	1200	23.0 x 43.0	50	2.50
KR-1300SC	1300	23.0 x 43.0	46	2.50
N-1400SCR	1400	23.0 x 43.0	53	4.25
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N-1700SCRC	1700	23.0 x 43.0	53	5.50
N-1500SCR	1500	23.0 x 50.0	61	5.00
KR-2300SCE	2300	23.0 x 50.0	58	7.00
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N-1800CR	1800	26.0 x 50.0	80	7.00
KR-2000C	2000	26.0 x 50.0	75	4.75
KR-2400CE	2400	26.0 x 50.0	76	5.50
N-4000DRL	4000	34.0 x 59.0	160	11.50
KR-4400D	4400	34.0 x 61.0	150	10.00
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7N-800AR	8.4V/800	68 x 48 x 32	25.00
6KR-1200AE	7.2V/1200	102 x 48 x 18	26.00
7KR-1200AE	8.4V/1200	68 x 48 x 32	30.00
6N-600SCR	7.2V/600	87 x 46 x 23	24.00
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7N-1000SCR	8.4V/1000	125 x 46 x 23	28.00
8N-1000SCR-F	9.6V/1000	136 x 46 x 23	32.00
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7KR-1300SC	8.4V/1300	150 x 46 x 23	22.50
8N-1400SCR	7.2V/1400	135 x 46 x 23	24.00
7N-1400SCR-F	8.4V/1400	150 x 46 x 23	28.00
8N-1400SCR	9.6V/1400	180 x 46 x 23	32.00
6N-1700SCRC	7.2V/1700	135 x 46 x 23	37.00
7N-1700SCR	8.4V/1700	150 x 46 x 23	42.50
8N-1700SCRC	9.6V/1700	180 x 46 x 23	48.00
6KR-1800SCE	7.2V/1800	135 x 46 x 23	34.00
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4N-200AAA	4.8V/200	42 x 44 x 11	10.00
4N-270AA	4.8V/270	57 x 30 x 14	10.00
4N-600AA	4.8V/600	57 x 50 x 14	10.00
4N-700AAE	4.8V/700	57 x 50 x 14	11.00
4N-800AAE	4.8V/800	57 x 50 x 14	15.00
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4KR-600AE	4.8V/600	68 x 28 x 17	12.00
4N-800AR	4.8V/800	68 x 50 x 17	15.00
4KR-1000AE	4.8V/1000	68 x 43 x 17	15.00
4KR-1200AUL	4.8V/1200	68 x 43 x 17	17.00
4KR-1200AE	4.8V/1200	68 x 50 x 17	16.00
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5N-270AA	6.0V/270	73 x 30 x 15	12.00
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5N-700AAE	6.0V/700	73 x 50 x 15	13.00
5N-800AAE	6.0V/800	73 x 50 x 15	18.00
5N-500A	6.0V/500	84 x 28 x 18	12.00
5KR-600AE	6.0V/600	84 x 28 x 18	14.00
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5KR-1200AE	6.0V/1200	85 x 50 x 17	19.50
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5N-1000SCR	6.0V/1000	115 x 34 x 23	23.00
5KR-1300SC	6.0V/1300	115 x 43 x 23	14.50
5KR-1800SCE	6.0V/1800	115 x 43 x 23	29.00
5KR-2000C	6.0V/2000	130 x 50 x 26	26.50
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8N-800AAE-3	9.6V/800	116 x 50 x 15	27.00
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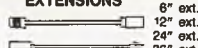
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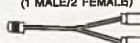
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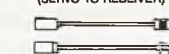
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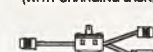
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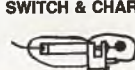
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Sale Price: call

JAVELIN

The Javelin is an elegant F3A sport/pattern ARF flyer that belongs in everyone's collection. This highly treasured ARF is a high performance, fully acrobatic plane with bold and beautiful colors and schemes. There is no plastic, mylar or foam covering on this aircraft. It features balsa sheeted foam wings, complete balsa and light plywood construction, and 100% Ultracote covering, making the Javelin easy to repair.

Length 51in
Wing Area 612 sq in
Radio 4 channel
Wing Span 58in
Weight 70-78oz
Engine .45 - .60

List: ARF \$265.00

Sale Price: call



FREEDOM

Freedom is a high quality all balsa built, precolored and pretrimmed UltraCote constructed electric sailplane. With a fly weight of 2 lb and 13oz, it allows you the freedom to fly and enjoy the many pleasures of a high quality sailplane or an electric sailplane.

Length 39in
Wing Area 617sq in
Radio 2-3 channel
Wing Span 85in (2150mm)
Weight 48-51oz
Engine 05 electric

List: ARF \$165.00

Sale Price: call



EXTRA-300S

Same high quality features as SUKHOI-26M. Much improved building manual. Excellent low speed capabilities

Available in ARC "Almost Ready to Cover",

Available in ARF with all white ultracote,

Available in ARF with all red ultracote trimmed in white

\$325.00

\$365.00

\$395.00



TIGER-SHARK TS-40 ENGINES

This is the best ball bearing engine for your money. FSR ABC engines. Parts available in USA. For a meager \$75.00 we guarantee a high RPM of 13,000 and low RPM of 2,700 with a 10x6 prop.*

\$75.00

*Please call for guarantee features and requirements



GAM-05 COBALT ELECTRIC MOTOR

Must see, must have, top of the line cobalt motor in the world.

GAM-05 is the best performing engine for your money.

Uses the highest grade samarium cobalt magnet.

Streamline and opened end bell to enhance performance, simplify installation, enhance cooling, and reduce weight.

Low profile brush holders and caps.

Large air inlets and opened brush holders to allow maximum cooling.

\$99.95



RCM PRODUCT REVIEW

Cutting Edge Aero INVERSION 40



The Inversion 40 is a forward swept wing Sport model. This configuration has very stable stall characteristics allowing high angle of attack level flight while still providing for fast, smooth aerobatics and gentle landings. The kit is available with symmetrical or semi-symmetrical wings. It may be purchased as a basic kit with wing cores and balsa sheeting supplied, with wing panels presheeted, or as an "almost ready to cover" model with the fuselage prebuilt. We selected the kit with the symmetrical wing presheeted, to save time and work. (We're lazy!) Complete wing sheeting instructions were included in the instruction booklet if you choose to sheet the wings yourself. The version selected should be determined by the level of experience of the builder/flier.

The 48" x 18" x 6" box was neatly packed, with the presheeted (1/16" balsa) foam wing cores securely taped in the blocks they were cut from. All large balsa parts were banded together, with small wood parts in one plastic bag and hardware in another. Pushrods for controls were not included, so you can select your own favorites. The sturdy 12" canopy was wrapped in paper to prevent scratches. A list in the instruction booklet made parts identification easy.

Construction:

A full-size 34" x 54" plan sheet was accompanied by a 15-page instruction booklet with lots of photos to illustrate the construction steps, as well as a list of items necessary to complete the model.

All the fuselage parts were machine-cut to shape except for the rear top and bottom balsa sheeting. Since the fuselage was of simple box construction, it was easily assembled. The fuselage was quite



SPECIFICATIONS

Name	INVERSION 40
Aircraft Type	Sport
Mfg. By:	Cutting Edge Aero
	10929 E. Firestone Blvd., Suite 147
	Norwalk, California 90650
Mfg. Sug. Retail Price	\$89.00 Basic,
	\$119.00 Pre-sheeted Wing, \$149.00 A.R.C.
	plus S&H, Calif. res. add appropriate sales tax.
Available From	Direct from Mfg.
Wingspan	60 Inches
Wing Chord	10 Inches (Avg.)
Total Wing Area	600 Sq. In.
Fuselage Length	48 Inches
Stabilizer Span	21 Inches
Total Stab Area	126 Sq. In.
Mfg. Rec. Engine Range32-.40 2-stroke; .40-.60 4-stroke
Rec. Fuel Tank Size	10-14 Oz.
Recommended No. of Channels	4
Rec. Cont. Func.	Rud., Elev., Throt., All.
Basic Materials Used In Construction:	
Fuselage	Balsa, Lite Ply, Ply, Hardwood
Wing	Foam & Balsa
Tail Surfaces	Sheet Balsa
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (15 pages + 2-page parts list)
Construction Photos	Yes

RCM PROTOTYPE

Radio Used	Futaba FP-4NBF w/5 S-134 servos
Engine Make & Displacement	HB PDP .40 2-stroke
Tank Size Used	10 Oz.
Weight, Ready to Fly	101.5 Ozs. (6 Lbs. 5.5 Ozs.)
Wing Loading	24.3 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

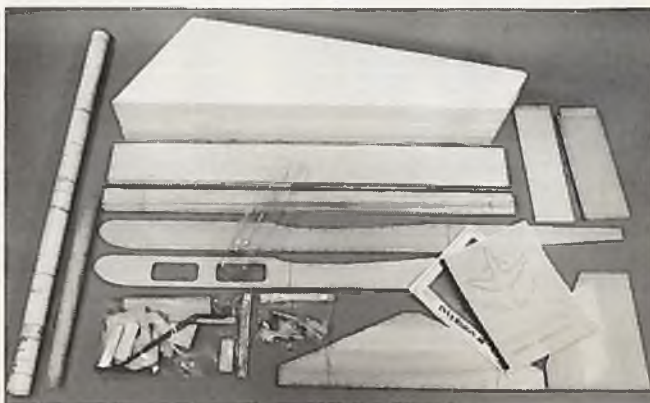
Appearance, flight characteristics, quality of pre-sheeted wing panels.

WE DIDN'T LIKE THE:

Method of sheeting wings described in instructions if you sheet the wings yourself, heavy stab and fin (see text), final weight 1 lb. over kit specs.

strong; 1/8" balsa sides with 1/8" lite ply doublers from the nose to the wing trailing edge, 1/8" lite ply bottom and formers, and 1/4" fire wall with wooden engine mounts.

The presheeted wing panels in our kit were **beautifully** finished; not a gap or a nick anywhere. We added the balsa leading and trailing edges and planed and sanded them to shape. We then cut the openings for the aileron servos in each wing panel. The holes for the aileron servo leads were drilled with a length of sharpened and notched brass tubing. After sanding the panels to the correct dihedral, they were epoxied together. The recommended two layers of 6 oz. fiberglass cloth were applied to the center section with



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A Division of Capstone Hobbies

Burn up the sky with realistic jet-like looks and performance!



The **F-20 Tigershark** was computer designed and drawn. The fully contoured fuselage, simulated air intakes and tail cone, and optional retractable landing gear are all part of the F-20 Tigershark's sleek, aerodynamic design.

Internal linkages, pushrods, and control horns add to its realistic looks and speed. Its special airfoil allows the model to slow down for **realistic nose-high landings**. Since it is a prop-driven plane with a built-up body, building one is easy! **\$84.99**

Area: 535 sq. in. - Span: 47 in. - Length: 54 in. - Weight: 5-6 lbs.
Engine: .40 to .46 - Radio: 4-5 Channel



The **PATTERN BAT** delivers the most fun possible in a small size package!! Get your heart rate going by strapping on a streamer and flying **combat** with the **BAT!!** Or just go out and enjoy the **BAT** doing loops, four point rolls, or awesome flat spins! The kit includes supreme hand-cut quality balsa wood.

Span: 36 in. Area: 375 sq. in. Engine: .10 Radio: 4-Channel
The Pattern Bat accepts standard size servos. **\$29.99**

Available separately: The Bat Accessory Pack which includes a fuel tank and all hardware needed to complete the PATTERN BAT. **\$4.99**



The **Advance** is simple elegance for relaxed flying and aerobatic training. With this gentle plane, everything happens at a reduced pace, so you can think through a maneuver, and get it right. With the thick airfoil, this plane lands slower than most trainers. The kit includes hand-cut quality balsa wood, a wing jig, tricycle and taildragger gear, and optional flaps with all hardware needed for the flaps.

.40 size: Span: 56 in. Area: 660 sq. in. \$79.99

.60 size: Span: 62 in. Area: 806 sq. in. \$99.99

Special

\$64.99

\$74.99

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Shipping and Handling \$5.00 C.O.D. \$4.50 in USA. Visa, Mastercard, & Discover accepted. Ohio residents add 5.75% sales tax.

INTRODUCING THE NEW BYRON .60 SIZE SUKHOI!

We've scaled down everything but the excitement!

SPECIFICATIONS

Wing span.....62 inches	Recommended Engines:
Length.....51 inches	Two cycle..... .60 Long
Ready-to-fly wt. (.60 engine).....9-10 lbs.	Stroke to .90
	Four cycle..... .90 to 1.20

Byron Originals continues to satisfy the needs of RC modelers everywhere with the unveiling of our new .60 size Sukhoi. It provides all the pleasure only a Byron building experience can provide. And it packs all the excitement of our giant scale kits in a smaller, less expensive package.

NOTHING FLIES LIKE A BYRON

The Byron .60 size Sukhoi is an excellent reproduction of its full scale counterpart, not only from the standpoint of appearance, but performance as well. It provides optimum aerobatic excitement, precision four- and eight-point rolls, smooth, effortless transitions from one maneuver to another, and superb stability at both ends of the flight envelope.

VALUE IS A BYRON TRADEMARK

We didn't compromise on our well-known Complete Kit Concept when it came to kitting a smaller Sukhoi. Unlike other .60 size models, the following list of components is STANDARD

with the Byron .60 size Sukhoi:

- Detailed fiberglass fuselage and cowl — a Byron Originals tradition.
- Precision wire-cut foam wings.
- Custom die-stamped spring aluminum landing gear.
- Die-cut formers.
- Complete balsa wing sheeting package.
- Steerable tail wheel with scale fairing components.
- Custom molded clear canopy and ABS cockpit.
- Complete fuel system.
- ABS air scoop detailing components.

- Spinner and backplate.
- Main gear tires and axles.
- Pressure-sensitive decals.
- Extensive hardware package that includes:

Hinges, clevises, nyrods, pushrods, control linkages, and **EVERY LAST NUT AND BOLT** required for basic kit construction. (All you add is glue, paint, radio, engine, and engine mount. Utilizes conventional glow engine mounting system.)

- Photo-illustrated owner's manual and assembly drawings.



Our 27% scale Sukhoi shown in background for size reference

If you've always wanted to buy a Byron Originals kit, but price and size got in your way, the way has just been cleared with our new .60 size Sukhoi!

ORDER INFO

Description	Order Number
.60 size Sukhoi Deluxe Kit.....	6130200
Suggested Selling Price . . .	\$295.55
(Add \$12.00 shipping and handling for orders in the contiguous 48 states. AK, HI, and overseas, call for shipping quote.)	



polyester resin. The pretapered ailerons, servos, and linkage were installed after covering was completed.

The "tail feathers" were 1/4" balsa, cut to outline. The elevators and the aft part of the rudder were pretapered. The stabilizer and fin in our kit was very hard balsa. We discussed this with the manufacturer and they will ensure that future kits have lighter weight balsa for these parts.

Hot Stuff "UFO" from Satellite City was used throughout for construction, except for areas where epoxy was recommended.

Covering:

Our model was covered with Coverite's 21st Century Film; white with neon red and neon orange accents, outlined with Great Planes' 1/4" wide gold striping tape. Before covering, we used a coat of Coverite's Balsarite over all the areas where the covering would come in contact with fiberglass resin, glue, or filler. It works great for those areas where covering material doesn't want to stick!

Engine:

We powered our "Inversion" with a smooth, powerful HB 40 PDP with stock muffler. Fuel was supplied from a Du-Bro 10 oz. fuel tank which we located as high as possible in the tank compartment since the needle valve on our engine was even with the top of the fuselage. (We still encountered some richening of the mixture during inverted flight or during negative "G" maneuvers.)

Radio:

We used a Futaba FP-4NBF radio with five S-134 servos (two for ailerons) to control our "Inversion." There was plenty of room for our radio equipment in the fuselage; a 6" long compartment aft of the fuel tank and a 12" long area for the servos under the wing. Sullivan Gold-N-Rods were used for rudder and elevator control, with cables in nylon tubes for throttle and nose wheel steering. The ailerons were connected to the servos with wire rods and clevises.

Flying:

We located the servos as far forward in the servo compartment as possible and the battery and receiver in the area aft of the fuel tank. The C.G. was located just slightly forward of the aft end of the desired range. The control throws were set according to the instructions.

The wing configuration might lead to some speculation about what the flight characteristics might be like, but fear not! The "Inversion" was very smooth both on the ground and in flight and gave us no unpleasant surprises. We did round and square loops, rolls, Cuban eights, Immelmans, and stall turns with no loss of control effectiveness. An unusual flight characteristic was the ability to descend with the throttle at idle, in a near-level attitude, with full up elevator, while still maintaining positive aileron control.

We also flew it slowly at part throttle with the nose held high, and there was no tendency for a wing to drop. Slow landing

approaches were also stable, and the landings smooth and gentle.

Conclusion:

The "Inversion" certainly does what it was designed to do and it should attract a lot of attention at your flying field. The flying characteristics are gentle enough for the flier who is past the "trainer" stage, yet its aerobatic capabilities will provide lots of fun for the more advanced flier. Though our model was more than a pound heavier than the kit specifications, it didn't seem to have an adverse effect on performance. All in all, a good flying model with a very unique appearance that's sure to draw plenty of attention at the field. □

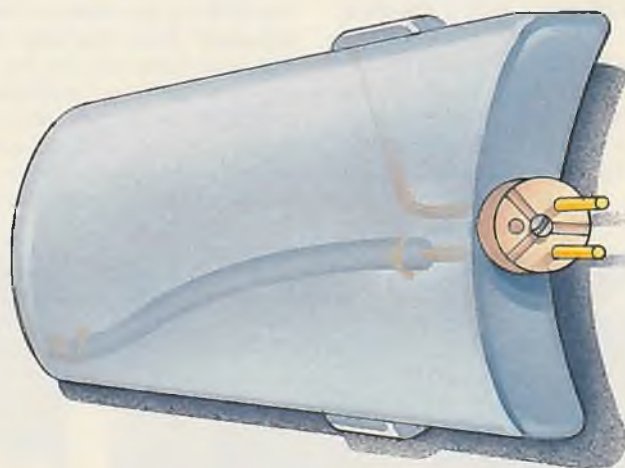
CUTTING EDGE AERO INTRODUCES

THE INVERSION 40



A UNIQUE FORWARD SWEEP WING SPORT PLANE WITH GOOD HIGH SPEED PERFORMANCE AND EXCEPTIONAL LOW SPEED STABILITY. THE INVERSION IS AN EASY TO BUILD HIGH QUALITY KIT FOR .40 SIZED ENGINES. SEND SASE FOR INFO 10829 E. FIRESTONE BLVD. SUITE 147 NORWALK, CA, 90650 (310)-929-0529

Jet Fuel Tanks So Inexpensive, They're Going Fast.



Somebody's finally come up with a ducted fan fuel tank that costs less than a Boeing 747. What's more, the 11-ounce Sullivan fuel tank #380 has all the advantages of higher priced tanks, as well as some sought-after features of its own.

For instance, it's seamless for greater protection against leaks. And it's reversible as a left or right tank.

Only 15/16" thick, it fits around virtually all 4 1/2" to 6" diameter fan units. And because it uses standard Sullivan hardware, replacement parts are readily available. Fully equipped with glow fuel parts, a simple kit enables you to convert it to gasoline use easily. The vent tube bubble also gives you maximum capacity, for longer flights between re-fuelings.

Fly down to your dealer soon and ask about Sullivan jet fuel tanks. The prices are so down to earth, we've made it easier than ever to take off.

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Getting Better Ideas Off The Ground.



SILENT POWER

As was done last month, I want to start off with a few more photos from the September KRC Electric Fly. Photo #1 is of a real pretty scale Sukhoi-26M ARF from Cermak Electronics and Model Supply Co., and flown by Tony Fiorri, Gilbertsville, Pennsylvania. This beauty is powered by an Astro FAI geared 40 with twenty-one 1700 mAh SC cells. Span is 54" and it weighs 9 lbs. This is another example of a model being marketed for engine power that has been converted to electric. The Sukhoi is available as a true ARF covered with either white or silver UltraCote or as a ready to cover model. It is of all built-up construction and comes with a fiberglass cowl.

Photo #2 is a motor mount that was on display next to the Stitzer Model Design table. I had, and featured, a smaller version of their Aero-Vee mount last year, and this one will hold the 40 size Astro, Webra, and Mega motors, to name a few. Hardware is included with this gold alodine finish

aluminum mount which also has clearance holes for the Astro brushes. Contact them at 113 William St., Centre Hall, Pennsylvania 16828 or call (814) 364-9530 after 6:00 p.m. This is not only a nice looking piece of equipment, it's easy to use and weighs practically nothing.

Photos #3-#8 will give you a better idea of the variety of models that were there. As I mentioned last month, I was unable to gather up information on all of the nice looking models primarily because of the poor weather, so if yours shows up here without proper credit please except my apologies.

Last month some performance data on a few different gear reducers and props was presented. Since that time, some flight evaluations have been run that verified that the actual results are predictable based upon static tests. What really came out of it was that the 6:1 ratio did not quite have the power to give a good climb in a reasonable amount of time when used with a two meter size motor glider.



Photo #1

Initial flights were done with 7-cell packs rated at 1500 mAh with two different props. Going from 7-8 cells with both a 12 x 7 and a 12 x 8 prop did improve the performance somewhat, but the current increased, as was expected and the flight time was a little shorter. Both 13 x 7 and 15 x 12 folders were also tried on both pack sizes and both showed some improvement over the smaller props in climbing but, again, the run times were shorter. The best way to sum it all up is to say that the flight performance was just not satisfactory.

The model used was a Vengeance motor glider with a two meter span and weighing in at 47 ozs. After a few test flights I flew another Vengeance on direct drive with an 8 x 4 prop and the difference in power was very obvious. Although the overall run time was certainly shorter, climbing time to altitude was so much quicker I doubt it made any difference in overall flight times.

The following week I flew the same model with a Windsor 3.5:1 gear ratio in place of the 6:1 reducer and the performance



Photo #2



Photo #3



Photo #4



Photo #5



Photo #6

was much better. The climb rate improved noticeably and the run time was very good. Naturally, changing to either of the 3:1 gear ratios shown in last month's figures would improve the climb even more. The 6:1 ratio can certainly give good performance but either a smaller, lighter model or changing to 9 or 10 cell power will be required.

Jomar Products has announced the latest in their new series of microprocessor based Electric Motor Speed controls. The Mini-Max, shown in Photo #9 is really tiny as it measures 1" x 1.5" x .5" and weighs all of one ounce. The unit can control up to 15 size motors using up to 16 cells with a current rating of 30 amps continuous and 50 amps peak. Some of the features of the new Mini-Max are: high rate, soft start, brake, "throttle guard" auto set-up and extensive signal processing, glitch filtering software. Included are the new solvent resistant Sermos connectors and a JR type receiver connection. The retail price is \$79.95 and it's available from retailers or them direct. I have not seen this unit yet, and of course not tried it, but over the years I have enjoyed great success with Joe Utasi's units.



Photo #9



Photo #10



Photo #11



Photo #7

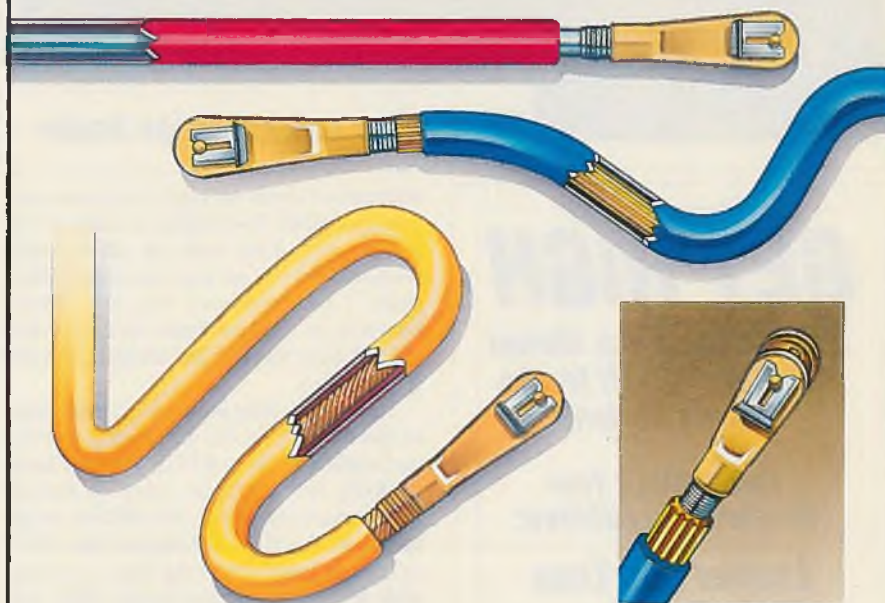
Photo #10 is a shot of the new Astro-Flight Model 217 Micro speed controller. This one is designed for 01-05 size motors and will handle up to 25 amp loads, and 1-14 cells. This unit weighs 15 grams and measures 1.25" x .9" x .25" and



Photo #8

features extremely efficient low-loss transistors with 14 gauge power wires. As only one large wire is shown I have to assume that the modeler will add the other as well as the connector. A set of signal wires is also shown but I don't have

A Push-Rod Selection That Leaves You Up In The Air.



It's true that we offer the most complete line of push-rods in the world. But that's not the most important reason to choose Sullivan push-rods. The fact is, once it's in your model, it doesn't matter how many other push-rods we carry. You just want yours to work the best. If it's one of ours, it will. Sullivan push-rods are designed and built for maximum strength, flexibility and dependability. They're also lightweight and, well, simply the best you can buy. Which means you not only get the widest choice with Sullivan push-rods. You get the best choice.

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- #3174 Skyflex Basic Kit
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Required inexpensive accessories:

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information about the type of rx connector that is supplied. The retail price of the 217 is \$49.95 and along with all other Astro products, you can get it at your local hobby shop. I have not seen this one either; however, as with the Jomar unit, over the years I have used Astro controllers with great success.

There is one other new product that I want to show and that's the new Raptor electric motor glider in Photo #11. If you have been looking for a larger, easy to finish performance type model that will not break the bank, this is it. The Raptor has a 96" fully built foam core wing that is covered with obechi and has the leading edge and tips already in place. The ailerons and cutouts are fully faced and ready for covering. The "T" tail elevator is linked by a huge bellcrank the size of the fin for precise control and the fuselage is white lightweight epoxy. The popular Eppler 387 airfoil is used on the 595 sq. in. wing and flying weight is around 85 ozs., depending upon your choice of equipment.

The Raptor is designed to fly with a variety of motors, depending on your preference and of course, your finances. Ten to sixteen cells would be in order if motors such as the Graupner 700, Astro 25, or the Graupner Ultra 1600 were selected. At any rate this one is out of the 05 and 075 class. Price is \$199.00 from Hobby Lobby International.

Upon review of the last few of my columns, I realize that my on-going efforts

on both the models for small electric flight and the two meter aileron bird have not been updated as I had promised. What it really comes down to is the small model is on a back burner and the aileron model is moving slowly. For the last two months it has been a matter of just too much to do.

There is now another problem that will be old news by the time you read this. Last week we had a fire at my company which destroyed my vacuum forming machine and some molding forms. The resultant smoke damage required us to discard all drawings, manuals, finished kits, work-in-process, cut stock, boxes, and drawing mylars. In other words we are out of production for a little while. So, it will take a little time before a few projects get back up and running.

Until next time, let's do it quietly! □

CONTEST ANNOUNCEMENTS

PALM BEACH AERO CLUB "TOP GUN INVITATIONAL TOURNAMENT"

April 28 thru May 1, 1994. Palm Beach Polo & Country Club Stadium.

For further info, contact: Frank Tiano, C.D.,
15300 Estancia Lane, West Palm Beach, FL
33414, (407) 795-6600.

CHANNEL ISLANDS CONDORS "6TH ANNUAL RALLY OF THE GIANTS" May 14-15, 1994. Condor Field.

For further info, contact: Channel Islands
Condors, 136 Via Posal, Camarillo, CA 93012; or
call Richard Krinsky (805) 981-0855 or Charles
Shafer (818) 706-1287.

WEAK SIGNALS R/C CLUB PRESENTS The 40th TOLEDO

This is the 40th annual Weak Signals Expo and we will be featuring something special for everyone including 2 new classes of competition: "Sport Jet" and "Scale Jet".

Our Swap Shop features 180 tables and the Saturday night auction is worth attending in itself.

TICKETS can be purchased in ADVANCE by sending a self-addressed, STAMPED business size (4 x 9) envelope to: TICKETS, 15387 Forrester Rd, Clayton, MI 49235

ADVANCE tickets are \$5.50 per day or tickets may be purchased at the door for \$5.00. Tickets for children 12 and under are \$1.00 per day. All orders over 10 tickets must include adequate return postage.

Please!! No REGISTERED or EXPRESS type mail.

Include a check or money order in U.S. funds made payable to "Weak Signals R/C Club".

Deadline for ticket orders is **March 18, 1994** and all sales are final.

Hotel info, a map of the local area or any other information may be obtained by sending a self-addressed, STAMPED (business size) envelope to the "TICKET" address.

**NOTE: Show hours are 9AM to 6PM, Fri & Sat-9AM to 4PM, Sun
The Saturday night auction is at 7:30 PM**

Bring your latest COMPLETELY FINISHED model to display and enter competition for exciting awards. R/C radios will be awarded to the first, second and third place finishers in the following classes:

R/C SAILPLANE (no engines, non-scale models only)
NON-MILITARY SPORT SCALE * (no jets)
MILITARY SPORT SCALE * (no jets)
DESIGNER SCALE * (no jets)
SPORT JET
SCALE JET *
PATTERN PLANE (no jets)
SPORT MONO-PLANE (no jets or full cockpit detail)
SPORT BIPLANE (no full cockpit detail)
OLD TIMER FREE FLIGHT R/C ASSIST
HELICOPTER
R/C CAR
COMPETITION BOAT
MILITARY SCALE BOAT
PLEASURE POWER BOAT
WORKING VESSEL-UNARMED

* Judging by AMA scale rules



Competitors Notes:

1. All models except R/C Sailplane must have engines installed and all scale models must have radios installed.
2. Entries are limited to one model per person, per class. (Also one per show team)
3. Former 1st place models are not eligible.
4. Models must remain on display until show closing on Sunday.
5. Deadline for entering models is 12: Noon on Saturday, April 9.

All models will be judged for "Best Finish", "Best Monokote", the "Directors Award for Achievement" and "Best of Show".

April 8, 9 & 10

SPECIAL 1

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ARIBUD: EIGHT-FUNCTION P.C.M. P.L.L. 50
CHANNELS SELECTABLE WITHOUT CHANGING
CRYSTALS OR MODULES! INCLUDES: SERVO,
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**POLK/ARISTOCRAFT
6 CHANNEL
22995**
COMPLETELY SYNTHESIZED

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FUTURES001 The Little
Brother of the 120AC
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U-C AIRCRAFT

COX BLUE ANGEL COX6200
12" Wingspan with .049 engine

2795

COX PT-19 TRAINER COX5700
22.5" Wingspan with .049 engine

3195

**COX SUPER CHIPMUNK
COX6300** 30.5" Wingspan w/ .049 eng

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COX F-15 EAGLE COX6300
15" Wingspan with .049 engine

2795

**COX F-18 HORNET
COX6100** 12" Span with .049 engine

2795

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GLW HEAD C/P AND TWO .049
ENGINE WRENCHES ALL FOR
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12.95 W/O PURCHASE

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COX6100** 12" Span with .049 engine

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**COX F-18 HORNET
COX6100** 12" Span with .049 engine

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MIKE LEE



PIT STOP

I will start out with the tech tips first, and then some product news for those of you who are shopping for car stuff. This month, our subject deals with battery charging, including the wrong way to do this little chore.

If you look carefully at our first photo, you'll see something that must be avoided at all costs. As you probably can tell, this is a rechargeable battery pack that has detonated, and luckily, did not cause any bodily injury to the owner. The photo is not retouched, nor is the arrangement of the battery guts you see in the photo. We did our best to keep the mess intact for the photo.

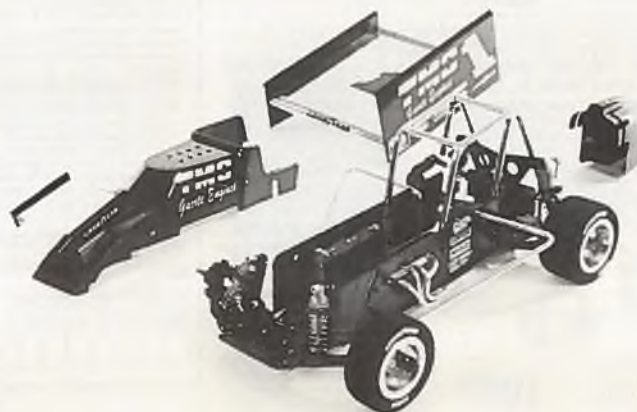
This incident occurred when the owner charged the battery using what was commonly known as a "Suicide Cord." Back about 10 years ago, this charging cord was standard equipment in many R/C car kits, and was used to charge the packs. It consisted of a carefully measured length of

resistance wire for positive and standard wire for negative. When hooked up to a 12 volt auto battery and then connected to the battery pack, it allowed a charge rate of about 3 amps. Simply wait 15 minutes and you're ready to run. Our poor victim, in this case, lost the original positive wire and decided to replace the wire with a length of zip cord, commonly used for room lamps. After hooking up his new suicide cord to the battery pack . . . you guessed it: Ka-BOOM!

Guys, I know that the suicide cord has been a dinosaur for a long time, and there are possibly examples of this thing in the Smithsonian Institution (I sent them mine . . . just in case). However, the one thing you don't ever want to do is mess with the laws of science. Thankfully, the design of this battery cell was such that the end cap was the first portion of the cell to give way under the tremendous pressure built up inside the cell. If the end cap did not give



way, the most likely situation which would have occurred would have been for this cell to become a grenade. I cannot stress enough to anyone who uses rechargeable battery packs and cells, that you must use the right equipment for the job. On top of that, you must use the right equipment in the correct manner. Today's modern charging equipment is probably the most trouble free and efficient chargers ever conceived by man. But, they still need to be used properly. I can virtually guarantee you a long and prosperous life with batteries if you follow those simple rules.



By the way, I found out another harsh reality of battery charging life. If you decide to use a 12 volt automotive battery for charging the packs, you can kiss the 12 volt goodbye after a short while. For some odd reason, these batteries can't take this kind of service, and they soon begin to fail by not being able to hold a charge. You can charge the heck out of these guys, and 24 hours later, they're deader than dead. We have even killed off some of the deep cycle type batteries by using them to charge packs. If anyone out there knows why this happens, I would sure like to know. Meanwhile, try to use a 12 volt power supply whenever possible. They may cost a bit more than the battery at first, but they don't do the slow death on you. And, you guys who are charging from your automobile battery . . . good luck.

Tech tip #3 for this month. Did you know that you can push a bit more power from a battery pack by having a bit of patience? I found out a long time ago that if you charge a battery pack to the peak voltage, and then let it sit for awhile, you can peak it off again and it will gain voltage. For example, I could charge a 6-cell pack at 4.0 amps and watch it top off at around 9.65 volts. If I hit the pack again, say 15 minutes later, the peak voltage would be about the same with no real difference. But, if I let the pack sit for 8 hours or so, then the pack would gain a full volt of power, topping off around 10.60 volts!

I heard that one of the reasons for this phenomenon seems to lie in the fact that the entire pack is only as good as the worst cell of the pack. If one cell tops off before the rest, the charger can sense this, and cuts off the juice. In a lot of cases, the entire pack will warm up slightly, indicating a topped off pack. So, I have to discount this first theory a bit.

Another theory had to do more with the physical properties of the cell make-up. As it is a chemical reaction that causes the storage and discharge of electricity from a battery pack, it appears that there is some settling of the chemicals inside the pack when it is allowed to sit. Voltage levels do not change significantly in the cells, but after everything has settled down, apparently the pack can now accept more input power. Kind of like filling up your trash can until it is full, and then stomping on the stuff to get more room. Whatever the real process that occurs happens to be, it also seems to give the packs a more consistent run with a longer run time.

Since we discovered this, we now charge our packs the night before we race, ensuring that the packs will take a full charge when we reapek them at the track. This process also allows us more time for other things, as the reapek time is much lower than a full charge cycle for the packs.

This brings me to a bit of a modeling quandry. I have been flying model aircraft for the past 32 years, and we have always heard that you should never leave a pack of

continued on page 62



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The Airtronics VG4R (114.96) is FM and it competes with the Futaba 4NBF (125.99). It has a 600MA battery pack (the 4NBF has a 500) and we sell it for less. The six channel Airtronics is also less expensive than Futaba who has recently had a price increase. Airtronics on next page.

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GOOD NEWS

as horseradish. Futaba's recent price increase (probably because of the yen) caused me to look at their 4NBF (\$126.49) and compare it with the Airtronics VG4R (\$114.96). These are the least expensive FM of the two lines. I removed the back from both and got a real surprise. The Futaba battery is a bear to remove and replace. I had to remove the antenna, loosen a circuit board and snake a long wire in and around components. Replacing it was just as hard. The Airtronics was a snap. The Futaba pots are inaccessible. The Airtronics accessible. The Airtronics battery is 600 MA. The Futaba is 500 MA. That translates to 20% less flying time with Futaba. If these price and quality differences continue I am looking for tough times for Futaba and good things for Airtronics. OS is subject to the vagaries of the yen and as of this writing, (Dec. 28, 1993), I am predicting another price increase for OS which is already as overpriced as it is underpowered. A better buy is European engines such as Moki and MVVS. The Moki 61 is the strongest, most user friendly, 60 sized engine I have flown.

The good news is we are kitting the Profile Hots (Fun Fly Hots). Teamed with our MVVS 40 engine, it will improve your flying skills. It will do tail slides to a landing or tail touch and go. Watch next month's ad for more details.

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.21 ABC RC DBB	82.99
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.40 PYLON DBB	130.99

.40 ABC RC DBB	103.99
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.61 ABC RC DBB	163.99
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25%	17.50*	15.75	15.25	14.50	600.00
40%	22.00*	22.25	19.75	19.00	825.00
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Jet Fuel 7% (castor/synthetic only)	11.25*	9.50	9.00	8.25	355.00
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continued from page 58

rechargeable batteries sitting for long periods without being charged periodically. The reasons are many, but most predominant is that the cells may reverse if there is no voltage in the cell. Meanwhile, the car buffs say that you need to discharge the packs to near nothing before you put it away for the night. In fact, most of them discharge the packs immediately after racing. They will then charge the packs only before racing to get the best possible charge. Of course, the car guys make the exact same reasoning as the aircraft people do for doing what they do. So, who is right and who is wrong?

Well, the jury is still out on this one. My racing partner and I have been conducting a five year experiment with this theory. We both fly planes, and we both are very active race drivers. Five years ago, my partner began discharging the packs like everyone else. I did not discharge at all, electing to simply put the packs into their box and leave them until the next race day. We bought battery packs of the same brand at the same time. You know something? There hasn't been much of a difference between the two methods of treatment. We both have several packs that date back to the starting date of the experiment and which still run well. Of the packs that did not survive the test of time, most were destroyed in racing

accidents or other ways we have found to mess up a pack, and neither one of us have had a pack reverse on us. Go figure . . . the experiment continues.

From the industry side of news, Associated has introduced a new line of motors under the Reedy label. First is the Sonic series of modified motors. This motor features 4.95 Gauss rated type "M" magnets, hand wound armature, new lay-down comm brushes, and "Turbo cooling" for the entire motor. The Turbo cooling is a method of directing air through the motor to help keep the operating temperature down. This keeps the motor running faster and more consistent.

Reedy also has the new Mach I and Mach

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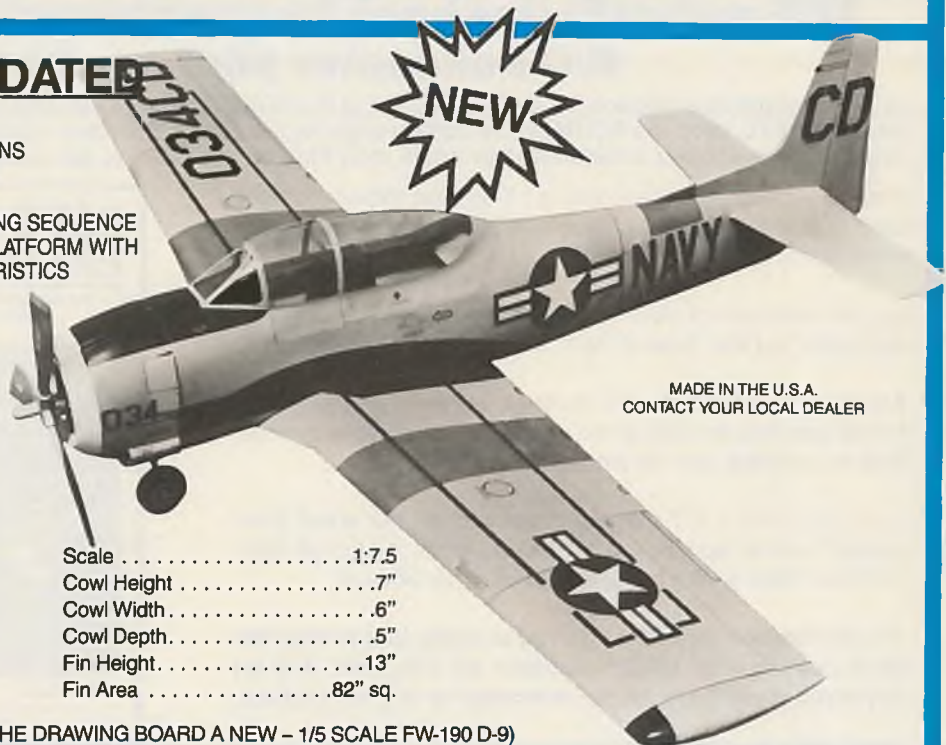
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Our congratulations to Brian Kinwald, who not only aced the ROAR National Off-Road Truck Championships, but he also won the World Championship in 2WD class. At the World's race, a guy by the

name of Joel Johnson placed second overall. Who is Joel? He is only the winningest driver ever to run the asphalt tracks of the world, only now he is invading the dirt tracks. I have to admit, Joel did terrific for a guy who doesn't get down in the dirt very often.

Check out our last photo, which is from Barts Parts. This is a sprint car conversion that turns an RC-10 to a hot looking and hot running sprinter. The conversion costs \$159.00, and includes a new chassis, roll cage, nerf wings, bumper, body and panels, an aluminum wing, and the scale headers. Quite a lot of stuff. The conversion is also available for the Losi JR-X Pro. Contact Barts Parts at HobbyCity, P.O. Box 36, 602

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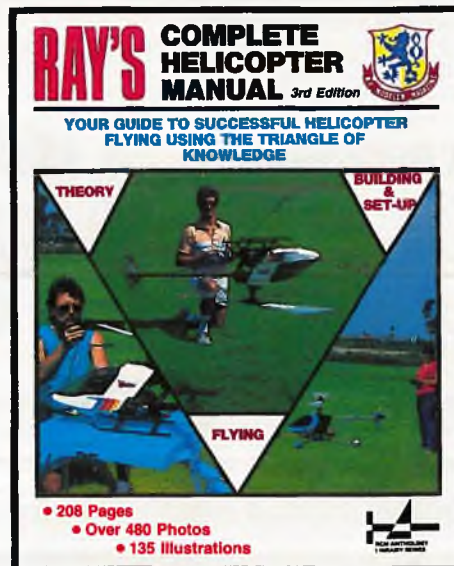
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With that, I'm off to the Chicago Trade Show, this being the very first part of November. So, next month, I hope to have some news on exciting new stuff for car buffs. Also, to our friends in Japan who make the magazine entitled *R/C Magazine*, we wish to say thanks and we would like to get your columnist for R/C Diary to drop us a line. *R/C Magazine* in Japan is our counterpart (not related), and they specialize in model cars, with a hint of aircraft and boats. It is written in the Japanese language, which I cannot read, but I have to tell you all, the guys in Japan get

some really fantastic stuff for their cars. I'll tell you about them next month. Until then, go lay down some serious rubber on the track. □

CONTEST ANNOUNCEMENTS

SACRAMENTO AREA MODELERS "Q-500 PYLON RACE"
March 12, 1994.

For further info, contact: Events Committee
Director, Jeffery P. Weiss, 14 Shady Lake Ct.,
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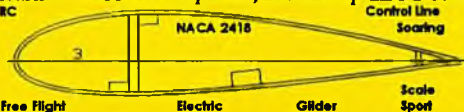
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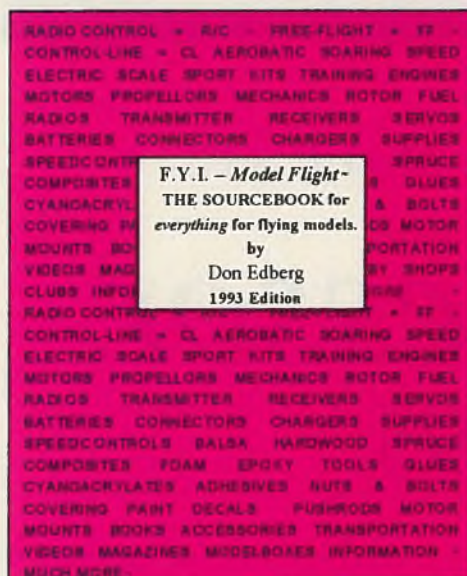
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REVIEWS FROM THE EXPERTS!

Bill Hannan, Free-Flight Columnist, Model Builder: "Received your remarkable *F.Y.I.—Model Flight™* book this morning, and am astonished by the scope of it. Truly a labor of love. ... Congratulations on having completed this compilation ... I can only imagine the time/effort involved in generating and arranging the information..."

John A. de Vries, R/C Giants Column, Model Aviation: "Don's latest publishing effort is a doozy ... its subtitle is *The Sourcebook for Everything for Flying Models*, and that's exactly what it is ... The volume is jam-packed with valuable source information ... the price is well worth it."

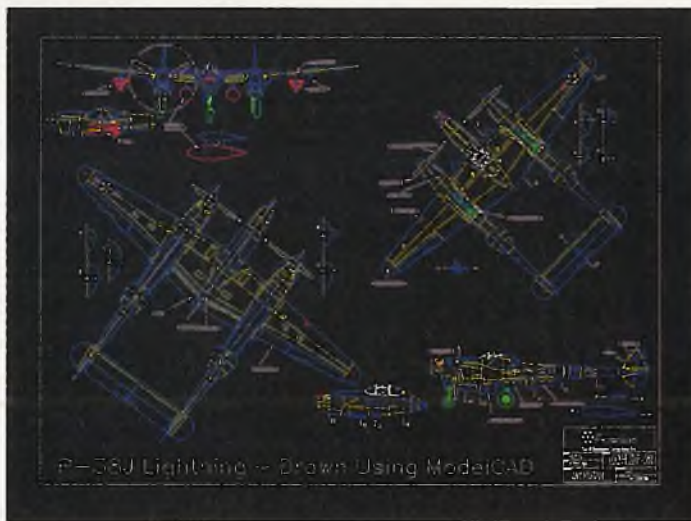
Bill Skipper, "Let's Talk Big," R/C Report: "... how many model magazines have you pawed through, trying to find that particular advertisement? ... this problem need not arise again ... This is where it's all at."

Harry Murphy, FF Duration, Model Aviation: "The thoroughness and completeness are amazing; it even includes its own *yellow pages* of available products. The 200 page book is professionally presented and is a wealth of information ... *Man, it's the annual Toledo show in book form, plus a lot more! Ya gotta git one!*

Gus Peleuses, Editor, Capitol Area Soaring Association newsletter: "... the thing is addictive. It's geared to all forms of modeling ... this thing is just absolutely jam-packed with information. ... You will want to see one, I'll have it at the next meeting — you can look, but you can't have."

Byron Blakeslee, Soaring Columnist, Model Aviation: "It's a monumental effort ... well worth the price in sheer volume of data and time saved hunting for sources."

model (mäd'l) *n.* [**<**L. *modus*] a small representation of a planned idea.



Model?

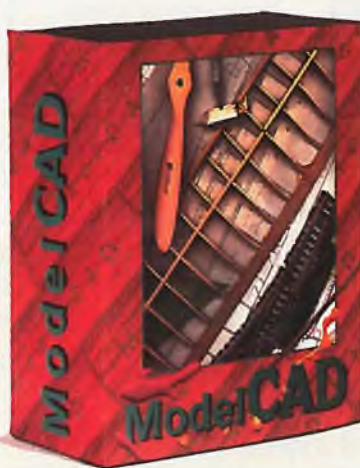
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By Hector Tschen

Gitano

With simple, lightweight construction, good looks, and great performance, the Gitano is a real winner.

The Gitano is the result of more than five prototypes, from which we have built and flown more than six of each one over the past eight years. The plane really shows its potential in the Turnaround pattern where space and time between maneuvers seems to be so tight. The inherent speed control of the design makes the maneuvers easy to plan in advance, as well as the low weight which is the key for constant low speed, tremendous vertical performance, and instantaneous response to minimal control input -- all great features for the pattern competitor.

Construction is a lot simpler and faster than most high performance aerobatic planes. Try one, you will love it.

CONSTRUCTION

Wing and Stabilizer:

Although this is not a beginner's project, the wing has very easy construction steps and only a few of them have to be done with special attention. First, the wood for the skin should be the lightest possible. Don't worry about strength, most foam-balsa wings are well over-designed. Second, very

special care should be taken to build straight wing panels; from the positioning of the templates in the foam block before cutting, to the slow cure epoxy thinly applied **only** to the balsa skin. Note that the wing has a straight trailing edge -- no taper. Third, both the wing and stab are completely finished, almost ready to cover, before

removing the ailerons and elevators. This assures the best airfoil profile shape and control surfaces matching. The stab building sequence is the same as for the wing. Wing and stab panels are hot wire cut, the old fashion way, from white foam of approximately 1 lb. per cu. ft. density.

The wet epoxied skins are then located on



GITANO 60

Designed By:

Hector Tschen

TYPE AIRCRAFT

Pattern

WINGSPAN

66½ Inches

WING CHORD

12½ Inches

TOTAL WING AREA

800 Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Symmetrical 14%

WING PLANFORM

Tapered L.E.

DIHEDRAL, EACH TIP

3/8 Inch (flat on top)

OVERALL FUSELAGE LENGTH

62 Inches

RADIO COMPARTMENT SIZE

(L) 15" x (W) 3" x (H) 3" (Avg.)

STABILIZER SPAN

27 Inches

STABILIZER CHORD (incl. elev.)

7¼ Inches (Avg.)

STABILIZER AREA

190 Sq. In.

STAB AIRFOIL SECTION

Symmetrical 10%

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

7¼ Inches

VERTICAL FIN WIDTH (incl. rud.)

12 Inches

REC. ENGINE SIZE

.60 2-stroke; .90 4-stroke

FUEL TANK SIZE

12 Oz.

LANDING GEAR

Conventional, Retractable

REC. NO. OF CHANNELS

5 (6 servos)

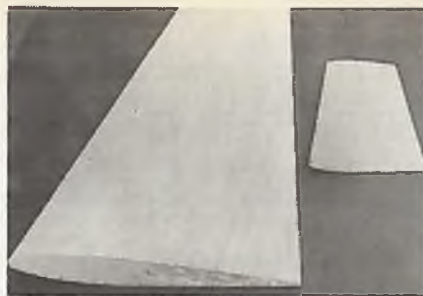
CONTROL FUNCTIONS

Rudder, Elevator, Throttle,
Ailerons (2 servos), Retracts

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Foam, Balsa & Ply
Empennage	Foam & Balsa
Wt. Ready To Fly	112 Ozs. (7 Lbs.)
Wing Loading	20-21 Oz./Sq. Ft.

the foam cores, and the entire assembly is placed into the foam casings with a heavy weight on top and left overnight to cure. Next, trim and sand L.E., T.E., and tip to accept balsa L.E., T.E., and tip block. Sand wing and stab panels to final shape.



Wing and stab panels just after covering with 1/16" light balsa. Note grain on wings.



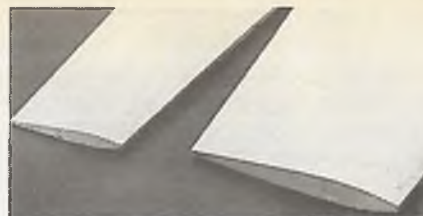
Wing and stab finished. Aileron and elevator are carefully marked before removing from the main surfaces.



Aileron is cut out from finished wing. Note central part that will be replaced with 1/4" caps. Stab has identical procedure.

You can now cut the ailerons and elevators 1/4" wider and 1/4" longer than the finished size. Then, remove 1/2" width and 1/4" length from each control surface. Add the 1/4" and 1/16" caps to wing, stab, ailerons, and elevators. Please note the slant angle on aileron's and elevator's leading edge caps to allow control surface movement.

You can now join the wing and stab halves, reinforcing the wing center with 3" wide 6 oz. fiberglass, and the stab with 3/4 oz. 3/4" wide fiberglass. Epoxy the landing gear blocks in place using anchors made from 1/4" dowel, 1 1/4" long at the same time. Assemble your retract mechanism, installing wheels and collars,



Wing and stab tip trim lines, before gluing L.E. and T.E.



Aileron servo cavity is opened here with hot wire. 1/8" ply servo mounting base is epoxied in place later.



Landing gear mount is 1/4" birch ply, and 1/4" dowel anchors are epoxied in at the same time. Wheel well is opened first with a cutting compass.

then temporarily install in the wing — gear down. Now manually close the gear to mark where the wheel wells are to be opened, leaving enough room to operate even after some hard landings. For a better finish, add some scrap 3/32" balsa as caps to the L.G. blocks, leaving uncapped just where the gear brackets fit. Sand caps to wing contour.

Now you can open the retract servo bay, and retract pushrod channel according to your retract manufacturer's instructions.

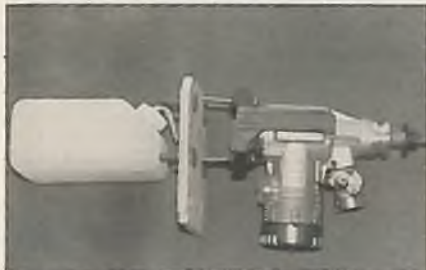
Open aileron servo cut-outs to suit. All the originals used horizontal mounted servos on a plywood platform. Finally, cut the channel where the servo wires are going to be routed from servos to center of wing.



LEFT: Belly pan sides, pipe channel sides, and screw seating blocks are installed over the center fiberglass section. Cover the area around the pipe channel with 1/8" sheet. Note the channel rear wall. CENTER: Finished wing. Note L.G. mount blocks capped, and belly pan covered, only three screw access holes are kept open. RIGHT: Tail surfaces. Fin is built up from 1/4" x 1/2" balsa stock and covered with 1/16" balsa planking. Note fin L.E. extension inserts into the top of fuselage.



Close-up of aileron linkage. Note that a 1 1/2" long 4-40 screw was epoxied through the aileron to serve as a horn.



Fire wall is prepared to accept particular engine, soft mount, and fuel tank before it is epoxied in fuselage.

This is made 1/8" wide and 3/8" deep in the bottom side of each wing; ending the channel just before reaching the belly pan, where a 1/2" hole is made toward the top center of wing. Again, this hole can be made with the hot wire angled at approximately 30°.

Now set wing aside to build fuselage. Wing hold-down holes, belly pan, pipe channel, and front screws' seating blocks are installed with the fuselage to ensure proper mating.

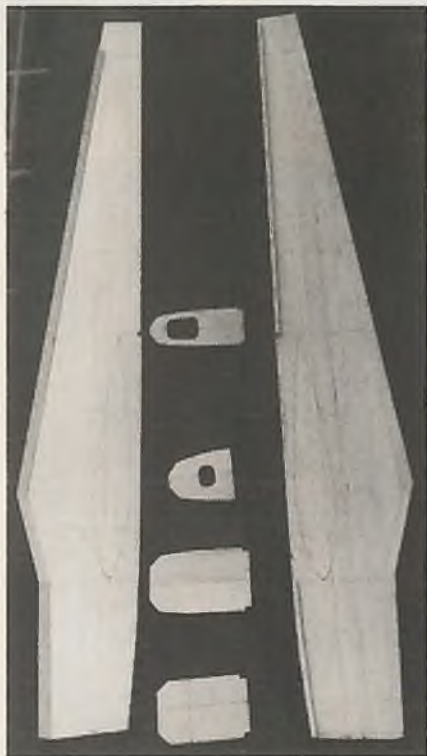
Fuselage:

Since the fuselage joins all flying surfaces and power, it's the most important alignment piece of the system. Check alignment during each step of construction. The following notes will help.

First, draw a center reference line on both sides which is located 2" above the bottom edge of the sheet stock and mark the former positions. (Both the centerline and former positions are copied from plan.) If you are using 48" long, 1/8" stock, you will need a



Top center section of wing, ready to fly. Note retract servo and separate aileron connectors from bottom of wing.



Fuselage 1/8" balsa sides with fire wall and formers. Top triangulars and 1/4" bottom stringers are already glued in place.

splice at the rear; just glue face to face, since a doubler here doesn't seem necessary because the top triangulars, bottom longerons, and stab are very near each other

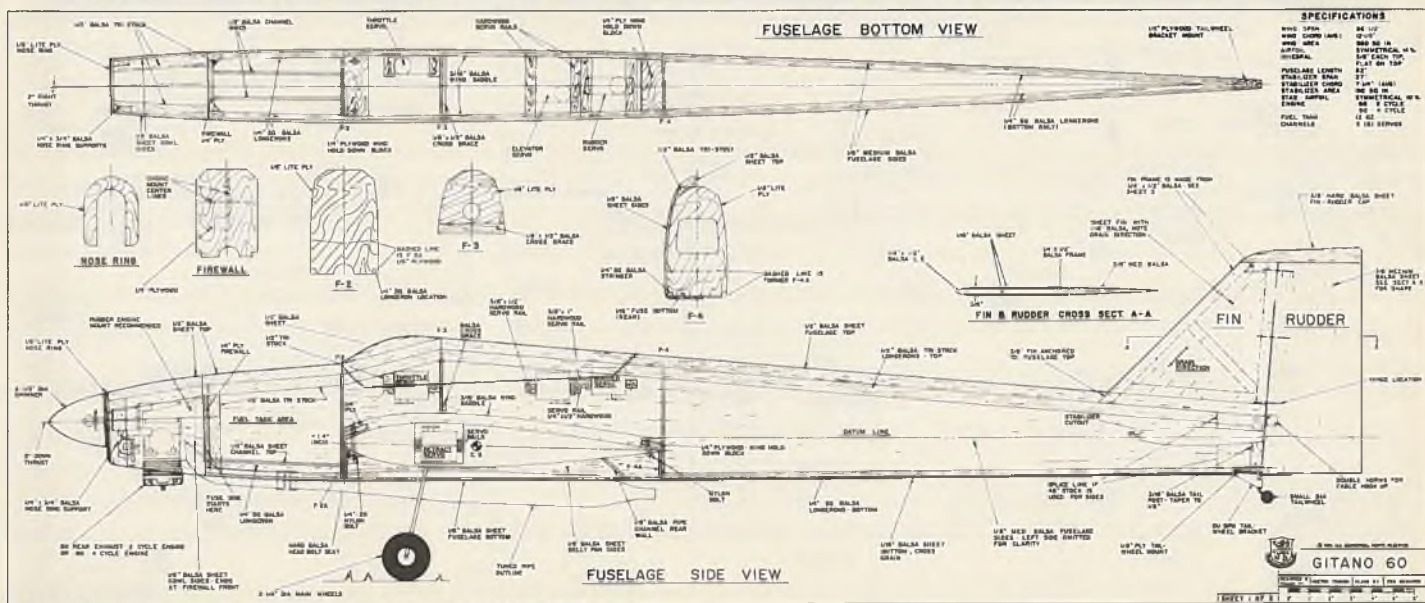


Formers F-2 and F-4 are glued first in their straight segment to one side, then to the other. Curved segment is glued after rear ends and fire wall.

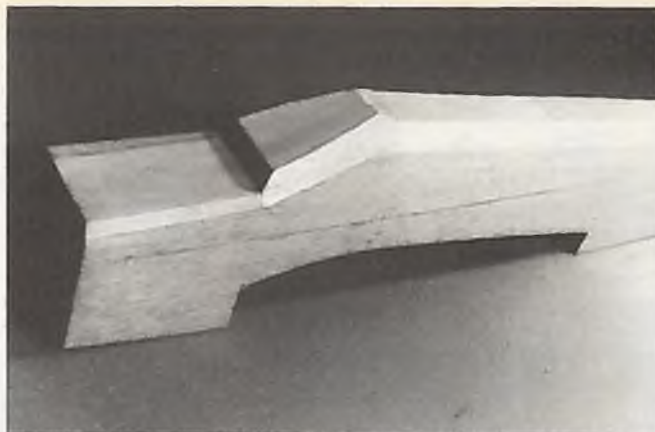
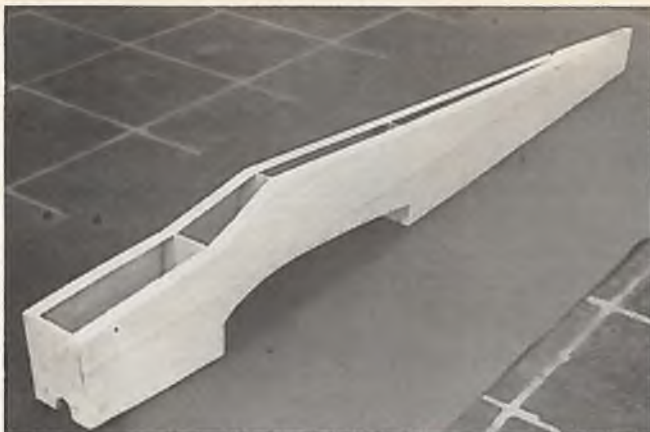
in this area. Then, glue top 1/2" balsa tri-stock and bottom 1/4" sq. longerons to the left and right sides. You can now cut out the wing saddle area, keeping this material for the belly pan sides in the bottom of the wing. First, glue the straight segment of former F-2 and F-4 to both sides; then, glue the rear end of both sides, installing the 3/4" rear spacer (see plans), working the sides fore and aft to get a perfectly straight fuselage. Refer to fuselage bottom view. After this step, it is very difficult to bend the assembly.

Second, glue the upper or curved segment of F-2 in place, both sides, and then F-4. Install former F-3.

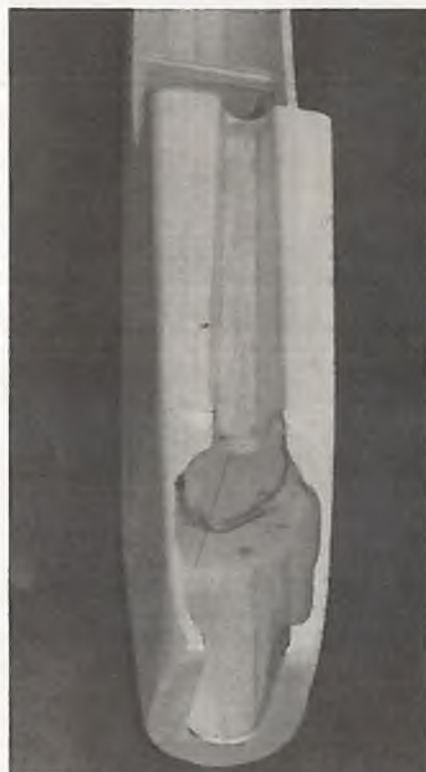
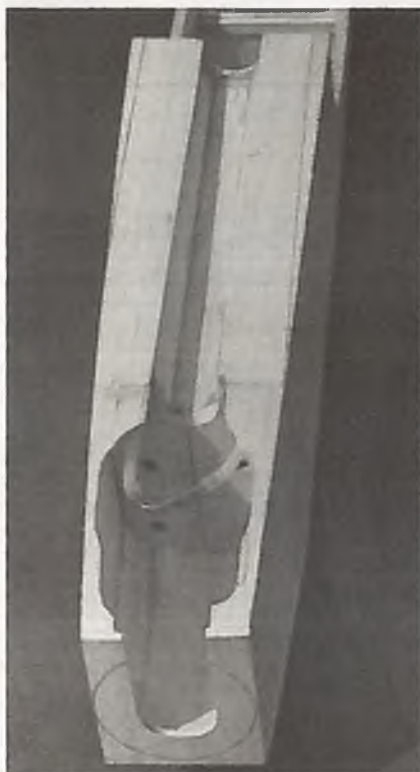
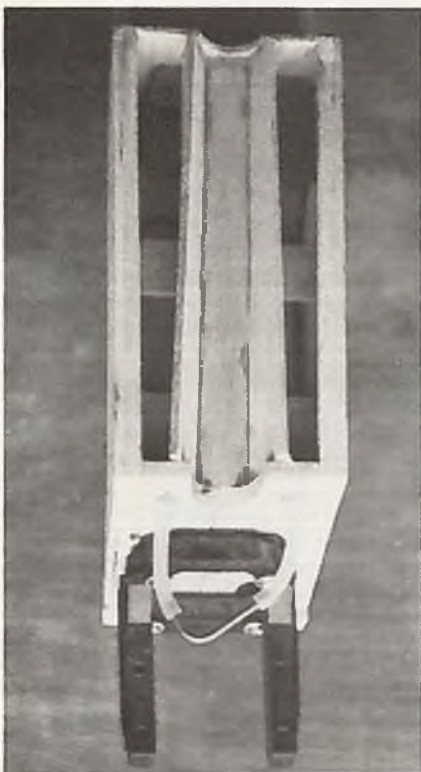
Third, epoxy the fire wall in place, checking the correct down and right thrust. At this point you will have a rather weak fuselage; don't worry, it is in this step that the strength is introduced. Glue in the wing saddles, then before adding the 1/2" sheet top pieces, sand the angled portions of the horizontal 1/2" triangular stock top longerons flat; then add the top deck, canopy blocks, and tank top block. All are 1/2" sheet soft balsa. Continue, installing the servo rails, rear bottom 1/16" balsa cross sheeting, and permanently install the fuel tank. Glue the front bottom 1/8" balsa sheeting or 1/8" "box" sheet channel if header and pipe are to be used. Now it is stiff, eh? Temporarily install engine to form the cowl, and voila! Please note that the L.E. of wing is raised 1.4° positive incidence and stab is parallel to centerline (0° incidence) when cutting wing and stab



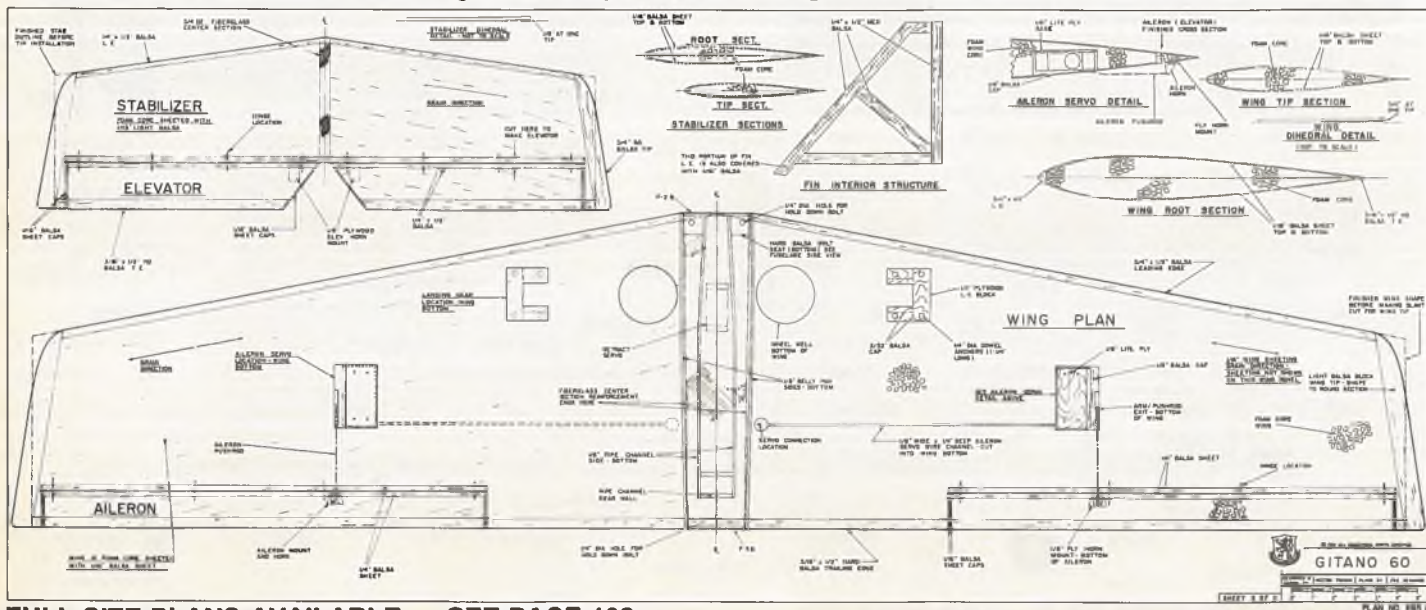
FULL SIZE PLANS AVAILABLE — SEE PAGE 192



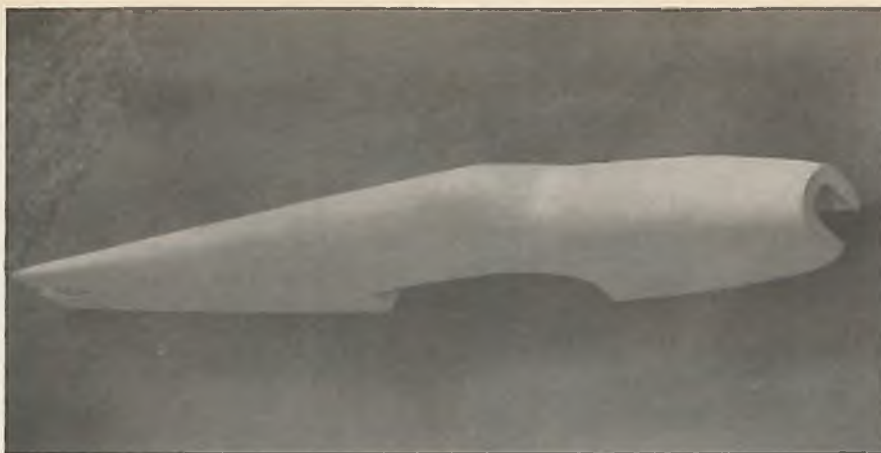
LEFT: All formers, fire wall and rear end completed. Check now for a straight fuselage. **RIGHT:** Top 1/2" deck and 1/2" canopy over deck are now glued in place.



LEFT: Bottom-front header channel is built to suit your particular engine. Sides of channel are covered with 1/8" sheet. Note left shift of mount header channel. **CENTER:** Cowling sides, 1/2" top sheet and nose ring installed. **RIGHT:** Finished view of bottom nose section.



FULL SIZE PLANS AVAILABLE — SEE PAGE 192



General view of finished fuselage.

cut-outs.

Wing hold-down plywood blocks can now be epoxied in place. Sand the center L.E. of the wing flat to fit into the fuselage wing saddle, centering the wing to fuselage (measure carefully). Make the 3/16" hold-down screw holes through the wing and blocks, keeping the wing firmly attached to the fuselage during the three-hole drilling to finish with a well-aligned wing. Then open the holes in the wing to 1/4" and tap the block holes with a 1/4-20 tap. Install the wing with 1/4-20 screws and glue on belly pan sides. If a tuned pipe will be used, install channel sides and rear channel wall as well. This can be done in the bottom of the fuselage now to end with the complete channel with the wing bolted to the fuselage. Before gluing

the 1/8" sheet bottom to the belly pan, epoxy the hard balsa front screw seats.

Note that the header and pipe channel indicated on the plans are for an O.S. Hanno 61, O.S. header, and a Hatori long pipe; plan your installation for your power plant accordingly.

Vertical Fin and Rudder:

The fin is built up of 1/4" balsa, leaving an L.E. extension as an anchor to the fuselage. It is covered with 1/16" sheet; then the fin tip is glued in place. Make the rudder from 3/8" sheet, shaped as shown on plans.

Epoxy the stab and fin to the fuselage with the wing bolted on, to check alignment of both parts. **Note:** Be sure to check for perfect alignment of the vertical fin, stabilizer, and wing prior to the epoxy curing. Next, apply fillet material in all joints. This is not only for appearance but



Vertical fin and stab are epoxied to fuselage. Apply a small fillet at the fin and stab and their fuselage joints for smooth contour and added strength.

helps a lot in strength, so do not omit the fillet.

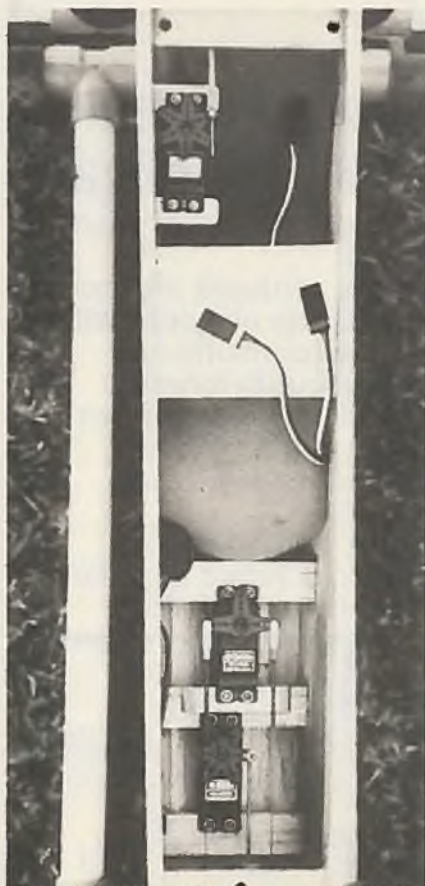
Finishing:

All the Gitanos have been covered with plastic film to keep the weight low. Remember to seal all the engine area and the exposed areas of F-2 and F-4 with thinned epoxy after covering. The landing gear and servos can be permanently installed now. Use your own method, or the L.G. manufacturer's recommendations for installation.

Uncover the aileron servo cavities and servo wire channel, then install servos and rods to aileron horn, and check travels. Install a 3/32" cap into both cavities, just leaving the pushrod exit open and apply final cover to these openings and channel.

Engine:

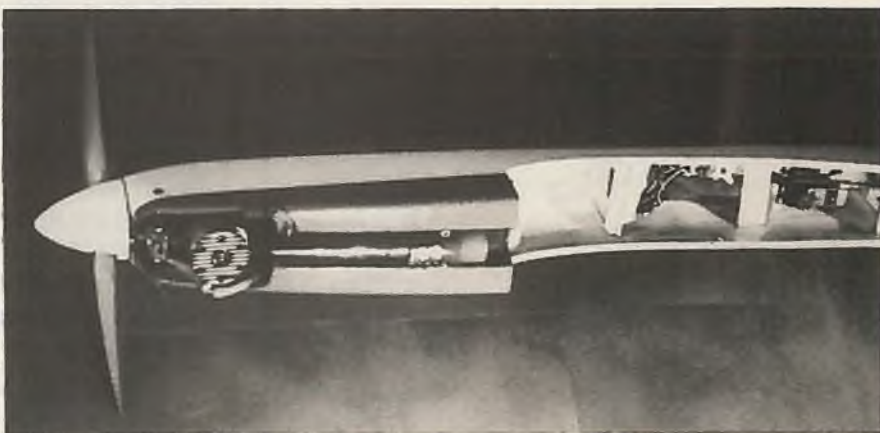
Since this is a high performance pattern plane, it needs a dependable power plant; a



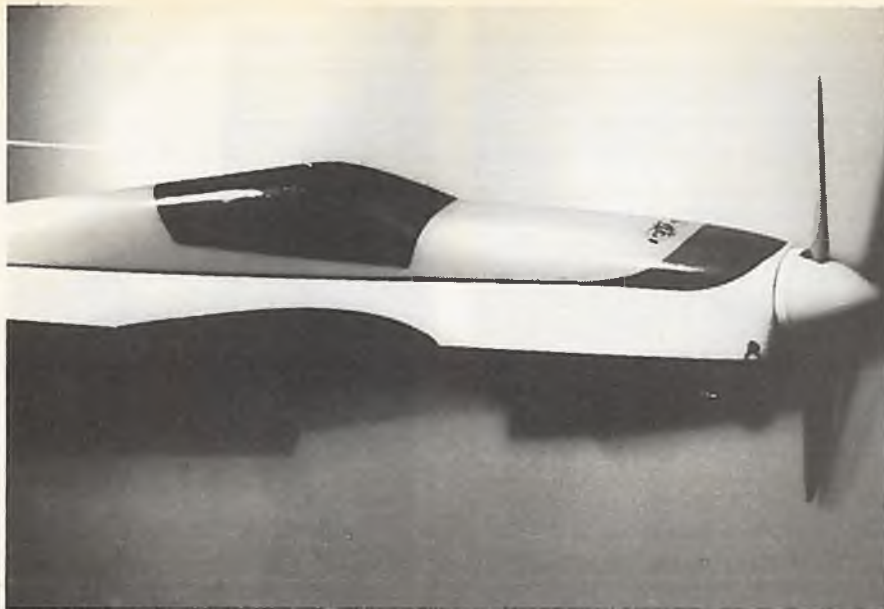
Typical radio installation, very efficient.



LEFT: Twin elevator pushrods from a single 5/16" hard balsa rod. RIGHT: Rudder push-pull cable detail. Note the small fuselage outlet needed.



Finished engine section.



Finished fuselage front section.

long stroke .61 with a 12 x 12 prop at 9500 revs will provide more than enough power for the long vertical rolling maneuvers. There is enough room in the front end for a soft mount, leaving some extra clearance between the nose ring and engine drive washer to allow free movement.

Preparing For Flying:

Before flying, some important things have to be checked.

All the R/C gear should be working free

of binding or play on the surfaces. All of the prototypes use push-pull cables for rudder surface and a 5/16" sq. hard balsa pushrod on elevators, with a "Y", dual 2-56 rods to service both elevators with independent adjustment. Try the left elevator 1/16" lower for better tracking. I personally use VTR on flying controls and 10% exp. on throttle.

Start with the control throws recommended, as well as the Center of

Gravity indicated on the plans.

Recommended surface throws: aileron, 1/4" up and down; elevators, 3/8" up and 1/2" down; rudder, all you can get on high rate.

Flying:

Most pilots who have flown Gitanos for the very first time confess that it is the easiest plane to draw lines with, either straight, in any attitude, or curved; so I will not describe the maiden flight as usual, but let you experience it yourself.

Spend your first flights trimming your plane, usually in the following order:

(1) Pitch: with full power, no climb or descent in upright-level attitude.

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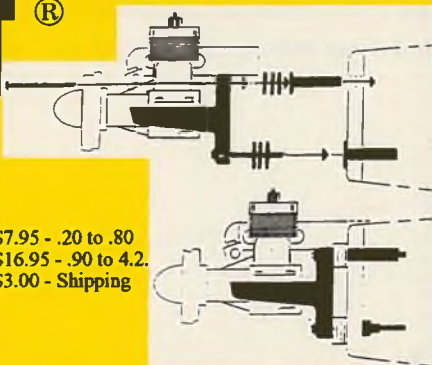
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PRODUCT REVIEW

COMPUFOIL

Template Plotting and
Airfoil Editing System

CompuFoil is the latest and perhaps the most advanced of the computer programs for the modification and plotting of airfoils. The program comes in three variations of Standard, Plus, and Professional. The Professional system is reviewed here as it has all of the features currently available. The Standard and Plus programs share the same window/drop down menu interface. The Professional version, however, sports a different interface which is much more refined and flexible. Functionally, the two lower versions differ mainly in their degree of airfoil editing ability. The professional version includes several more editing functions, as well as many utilities. The CompuFoil programs as well as the

By Col. Art Johnson

Feather/Cut foam cutting machine are available from Eric Sanders, 3904 Traine Dr., Kettering, Ohio 45429, (513) 299-7684.

The CompuFoil programs were created in an effort to provide the best possible templates for use with new foam cutters like the Feather/Cut. Foam cutters of this type give the hobbyist the ability to cut wing cores easily and accurately but only if the template guiding them is also accurate. Templates made with CompuFoil have all of the features peculiar to foam cutting techniques which are a bit more demanding than those for cutting balsa ribs in built-up wings. Templates for built-up wings can

also be easily produced.

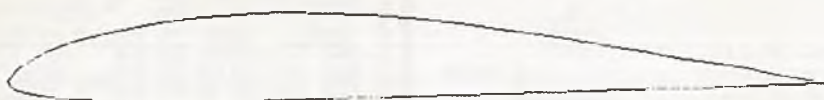
The program came on a high density 3.5" disk. A printed manual contained all of the necessary instructions. To use the program you need at least a hard drive, a VGA monitor, and a 286 (IBM AT) or more advanced processor. If you have a math co-processor, CompuFoil will use it and run much faster. Installation is automatic with the program's own install feature. The program requires your social security number to run. A set-up batch file is created by the installation program which allows the program to run without the need to enter your number every session.

The computer interface for CompuFoil is a real jewel. If you are familiar with Microsoft Windows you won't have any problem with the pull down menus, pop up windows, and mouse support. Although this is a DOS program you will think you are working in Windows. On my 486 computer, the program worked equally well when run under Windows or as a straight DOS program. You may find that printing is a bit faster under DOS.

You start working with CompuFoil by selecting an airfoil that is stored on disk. Sixteen airfoils come with the basic program but for another \$10.00 you can get an airfoil library with over 130 additional airfoils on disk. With this selection you might never have to use the airfoil coordinate window where you can modify or enter new data for an airfoil of choice. I started by selecting an NACA 2412 airfoil with the intention of changing it to sharpen

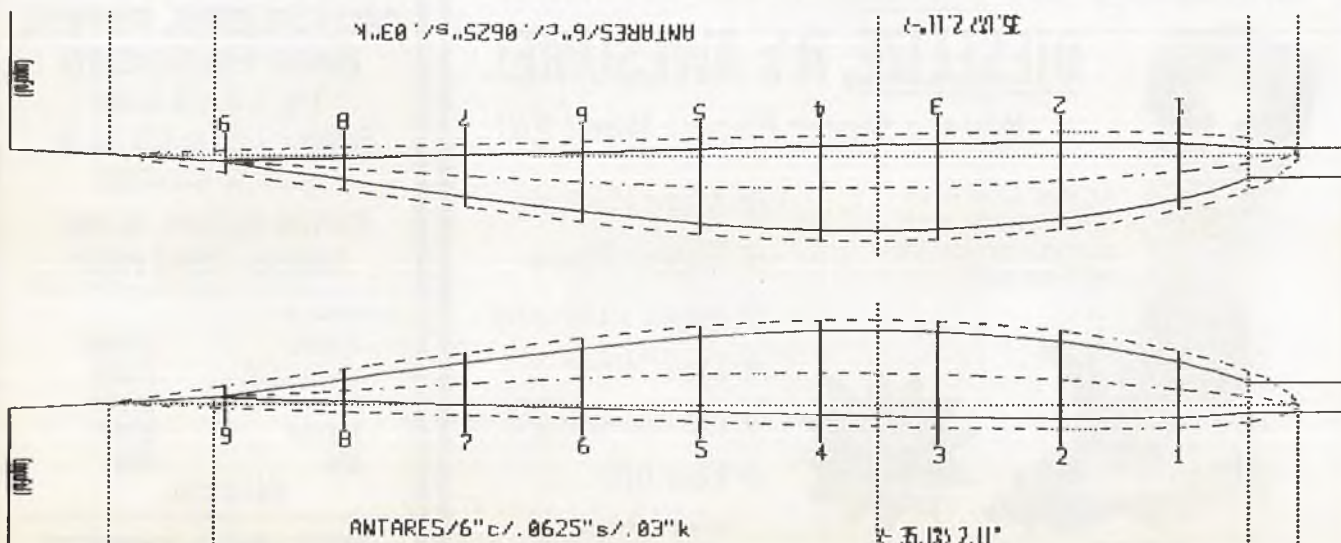
--< CompuFoil Professional Airfoil Preview Utility V1.1 (c)1993 >--

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Valid Keys > A-Z, <ESC>, <ENTER>, <↑/↓ CURSOR>

You can preview the different shapes of airfoils on file in CompuFoil as fast as you can press the cursor arrows. Great feature when you can't remember the shape of something like "E193".



CompuFoil excels at producing templates for cutting foam wings. This is a template from the default settings with standard and mirror image printed together. Template outlines are dark with wing sheeting shown dotted.

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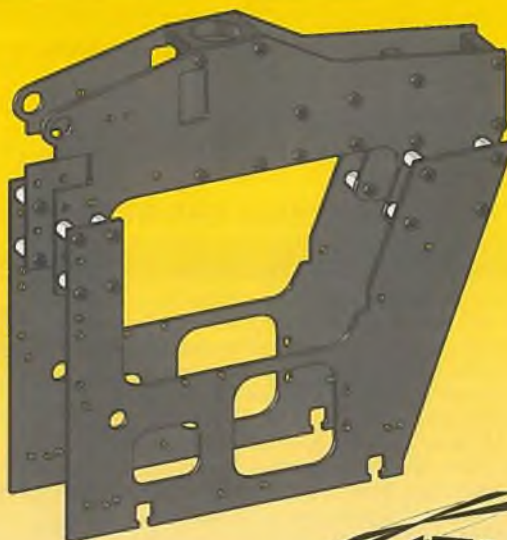
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the leading edge for use in a new military scale model.

You can do this by changing the coordinate numbers but a much easier way is to use the full screen edit function. This is an easy to use CAD function where the airfoil is displayed in high resolution with the coordinate points highlighted as dots. You can grab any point with the mouse cursor box & move it at will. It only takes a short time to modify the airfoil into any shape you wish. Zoom and pan commands let you zero in for any fine tuning that is needed. For instance, a split command allows you to create new points which you can then pull out to round out flat spots. Mistakes can be taken care of with an undo command.

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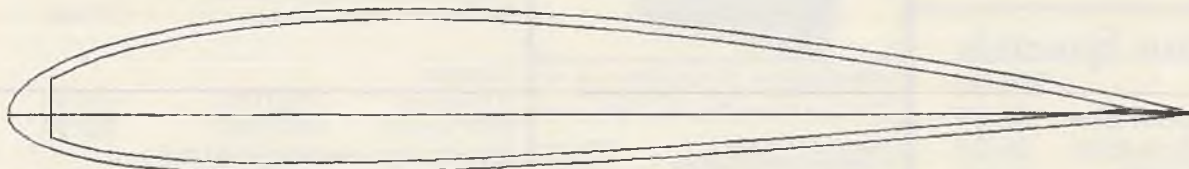
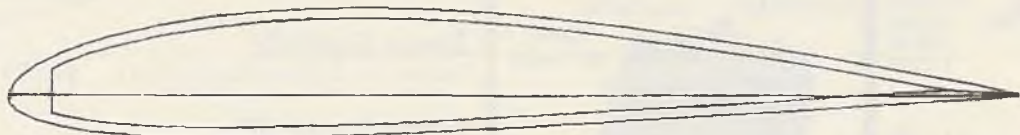
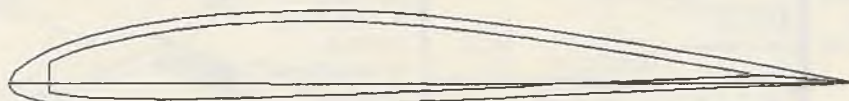
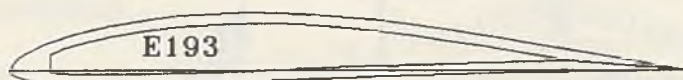
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CompuFoil can also produce templates for built-up wings including tapered, true elliptical, and use of different root and tip airfoils. Ribs for tapered wing with different root and tip airfoils shown above. Leading edge and sheet thickness is your choice as is location of spar (not shown).

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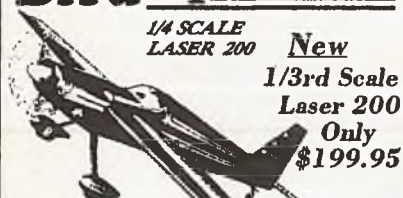
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If you only wish to change the thickness or camber, separate commands let you modify either as desired. You can combine the tops and bottoms of different airfoils, mirror one surface onto another, and locate two holes for use with wing building jigs. When you get through with the changes, you can overlay your creation with the original airfoil (or any other) and graphically see the results on screen. Different colors make the comparison easy.

CompuFoil's defaults are set for the production of templates for cutting foam wing cores and this is where the program really excels. Choices are given for template height, ramp length and angle, wire kerf, foam thickness, sheeting thickness, leading edge width, stations, and more. Kerf applies to the slice of foam lost due to the foam melting as the hot wire passes along the template. Adjusting the template for this loss is particularly important if you want accurate leading

edges. The ramp length applies to the extensions at the leading and trailing edges of the template where the wire will start and end. An appendix gives much more information on setting kerf along with examples.

Any airfoil template needs information on the leading edge dimensions and the wing sheeting thickness. Your choice is entered along with the chord after selecting the airfoil. The location of a single spar can be specified as a percentage of chord, a set distance from the leading edge, at the highest or lowest point of the airfoil, or automatically at the thickest part of the airfoil. A reference line can also be used to indicate another spar placement, but no spar width. Any degree of washout (up to 15°) can be entered and the templates or wing ribs will be produced to reflect it. This ability is significant because it is difficult to draw small degree tilts by hand.

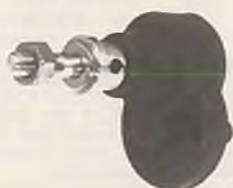
CompuFoil is not an automatic wing

design program. However, by setting the template height to zero as the default, CompuFoil can be used to produce all the rib templates required for straight or tapered wing plans. A command called "Interpolate" does the job. If you normally produce rib templates, you can also quickly put the program into rib template mode by selecting the Use Rib Parameters function. You enter the root and tip airfoils which can be of different types, the chord lengths, the panel span, washout, and rib location. The ribs created are based on the distance specified for the rib from the root rib location. Ribs will be computed correctly including any washout desired. The washout feature will tilt any jig holes so that washout will be built in correctly. The wing volume, surface area, and projected area will also be automatically computed. A simple mouse click on output and you can print each rib template as you go along. You have to print it or save it as the program only

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handles one airfoil template at a time. With the Windows type program design, this goes faster than one might expect. I created and printed all the rib templates for a sample built-up wing in about 30 minutes on a dot matrix printer. A separate option will develop rib templates for a true elliptical wing but not for a modified elliptical wing as found on the P-47 type aircraft.

If you want to import the templates into a CAD program for subsequent wing design work, CompuFoil Professional will do this by producing a DXF file every time you access the output menu.

This feature can be toggled on or off. Each template drawing is saved under the name FOIL.DXF and is replaced each time a new template is created. By running the program under Windows, I found that I could easily jump back and forth to File Manager to rename these files before they were over written by the next template.

Rounding out the CompuFoil program are several useful utilities including --- the Overlay command previously mentioned, and a Feather/Cut calculator which computes the swing arm position for the wire to achieve the proper wing taper. Several more features are included which are not covered in this article. Eric also offers and encourages free upgrades to the latest versions of the program by sending in the original disk along with a self addressed stamped envelope. Current versions are: CompuFoil Standard V1.24e, CompuFoil Plus-V1.4g, and CompuFoil Professional-V1.45.

We think that modelers who need the most accurate way to produce templates for foam wing cutting and those looking for the easiest way to modify or print out airfoils of any type will love CompuFoil. It is an easy to use state of the art program. □



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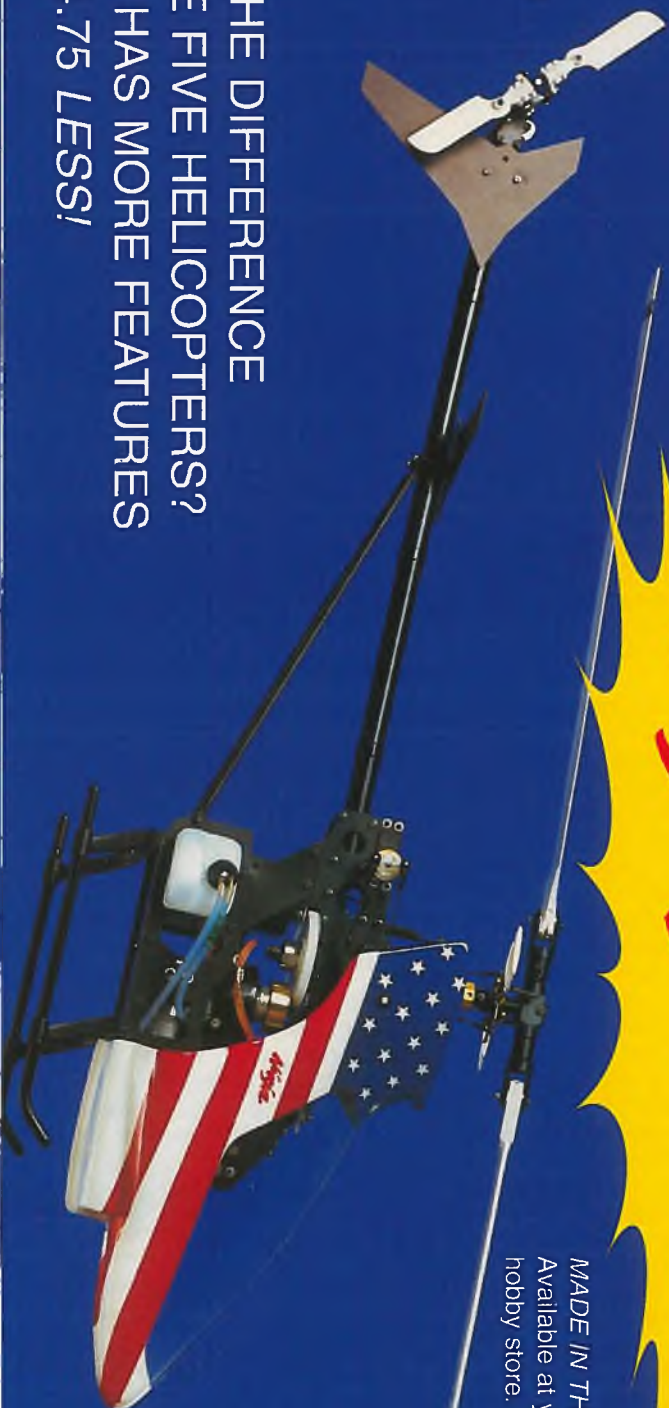
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BIG IS BEAUTIFUL

More on Charging

For those who don't like "tinkering" and want to minimize personal involvement with charging operations, there are many choices of commercial equipment available. To me, the ideal "charger" would be a wall of electronics with outputs of every size and shape and enough of them so that you could just plug **everything** into it and forget it! I can't afford that, but we can come close! Grab your ACE R/C catalog and check out their "add-a-trickle," which is a switchable electronic add-on, so that you choose between normal and trickle charge rates. Charge your batteries up, then switch to trickle rate until ready to go flying!

For those who prefer and can afford it, neat set-ups are available that can charge, recycle, and auto-switch to trickle charge. Again, plug in and forget it! My problem is that I would want/need a half dozen of them!

Check the RCM advertiser index for Tejera Microsystems Engineering, Inc. Though not familiar with it personally, I have heard good things about their TME "auto-trickle adapter." In use, numerous chargers plug into the TME and batteries can be flight ready indefinitely. I like the idea of an auto-trickle and it would do it all much the same as the timed-trickle simulation I have been experimenting with.

The oddball power supplies that I collect can work for tinkers but why not just order

what you need? ACE R/C has a variety of wall chargers that can solve any charging problem from single transmitter or flight pack to a system charger for tranny with flight packs of either 500 mA or 1200 mA size; a "Uni-charger" that you fix to handle 1-8 cells, 1.2V-9.6V packs with rates from 10 mA to 120 mA! Then, there are units like the "ChargeMaster" that can charge four receiver packs and two transmitters at a time . . . switchable to a trickle charge! It is programmable to charge even 1200 mA packs, or a mix of milliamps. The popular DMVC (dual metered variable charger) charges anything up to a 12V battery! It was not that long ago that I cussed the experts when asked how to charge a 1200 mA pack and the reply was "Charge longer!" Now, we have **choices**!

The ideal set-up for a normal modeler with a couple radios and a mix of battery capacities would be a unit with all the features; like a ChargeMaster, a battery cyclizer, a DMVC, AC/DC and an ESV, (expanded scale voltmeter). The DMVC would be handy for bench work, building-up/checking packs, etc., plus field charging from your car battery! If you have ever crashed a plane because of battery failure, that loss might have paid for the whole works!

Most commercial set-ups charge at a 1/10th capacity rate (C-10 rate) so that a 10-hour, or overnight charge, is the norm. The rate is low enough that problems from overcharging are minimized. When you read about a charger allowing you to change output rate from 50 mA to 120 mA, it means you have a choice of resistors so that the 50 mA rate (C-10 rate for 500 mA pack) can be changed to 120 mA output (C-10 rate for a 1200 mA pack). A system charger with that capability would allow overnight or C-10 rate charging of both transmitter and flight pack even if you have a big 1000/1200 mA pack! See how easy it is with a little understanding of those numbers? No more "charge longer" problems!

Battery Cycling

It's probably the most important aspect of caring for radio equipment, and yet many



Beautiful flying 1/4 scale Great Lakes Special. Scratch built by Herb Brice of Washington. A Sachs 3.2 with ignition powers the 80" span and finish is SolarTex with Krylon paint.



LEFT: New kit by Reid's Quality Model Products, 135 E. Main St., Phelps, New York 14532. The "8-Ball Special" spans 85", 1360 sq. in, and weighs 17.5 lbs. Power is Quadra Q-42, Zenoah G-38, or similar. Fast building and aerobatic. RIGHT: A beautiful scratch-built "Zero" by Livio A. Spano of Augusta, Italy. Super Tigre 3000, 18 x 8 3-bladed prop with handmade epoxy spinner. Radio is a JR x-347 PCM.



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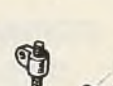
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modelers ignore it. This is the **only** way you can measure actual performance of those batteries. An ESV with a load check feature can show you whether the battery will hold up for another flight, but doesn't really let you know if it would last for, say, three rounds at a scale meet. A battery cycler, (charger/discharger), drains a battery and switches back to a charge mode at an overnight rate. The important thing is that it measures and displays the discharge time. If

you charge your system normally and then check it with a battery cycler, you have a "bench mark" or comparison standard for subsequent checks. Cycling your batteries after a flying session will give you an indication of the power used up during a normal day of flying and you have a good idea of the actual charge necessary to bring the batteries back to full capacity. No "guesstimation" or overcharging.

Routine cycling assures no battery

"memory" will develop and there is no danger of discharging so low as to result in damaged batteries. I have known others whose idea of "cycling" was to leave their equipment on or sit and watch TV while operating the equipment until it reaches a "dead" condition . . . then recharge. Not smart! One noted modeling buddy belittled me for wasting money on a cycler and bragged that he **never** had radio trouble. He was one of those guys that would charge

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HELICOPTER
HELICOPTER COMP. 30%
1/4 SCALE
LARGE SUPER "T"
JET FUEL 7%
JET FUEL 12.5%

FAI
5%
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15%
25%
40%



Castor-synthetic blend

For general use in all conventional Glo engines. Works extremely well in A.B.C. or A.B.N. engines in hot installations such as cars, boats, and cowled in installations.

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HELICOPTER
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overnight, fly his model a couple times and then spend the rest of his time flying other people's models, helping beginners, etc. One day he borrowed my cyclor to check out a new flight pack and while he was at it, cycled his regular equipment and was astonished at the result. He could get only 25 minutes on both transmitter and flight packs, no matter how much charging was done. His two 10-minute flights were all that the system could have handled . . . a third flight would never have finished whole. He wasn't smart . . . just lucky!

Cycling batteries is not something you do very often. Every 2 or 3 months would be often enough to keep a check on their condition. It would be a good idea to keep a running record for comparison purposes down the road. Here again, use of checking equipment can be real helpful by displaying deviations from your "normal" readings. A long charge on a 1200 mA pack can give you a 2-3 hour discharge time (when it should be about 4 hours). An ESV can show voltage way up, but under a 500 mA load check, the meter needle dies completely! You may get into the air but with control inputs, the current drain by those servos may just leave no power left to run a receiver!

Drawing

I've been trying out a new Windsoft Co. (check ad on pg. 8, RCM 1/94 issue), program called "Aerodraw 2d." It works with DesignCAD 2D and Scanover. Would

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you believe I can now "loft" fuselage sectionals (draw intervening former sections), quickly draw airfoils from numerical data, scale all ribs to a tapered wing, and even **elliptical wings**!

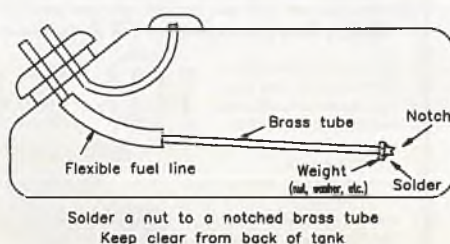
The program emulates actual full-scale designing methods and though by no means automatic, it can even straighten out my own **computer** drawn airfoils!

How about drawing a Spitfire wing, all ribs to size, wash-out/wash-in as desired and then print to any size with Dot Matrix Plotter-Basic! I'm getting good! With the right tools and correct usage, my drawings can be more accurate than 3-views, and even factory drawings . . . believe it or not! A recent visitor, Dennis Lupcho, started dragging his feet as I led him to the computer room, but when I rolled out quarter-sized drawings of his favorite home-built design, he was quickly shuffling through things looking for his set of the drawings!

The guys are starting to think I sleep with this computer! It has been a learning process for sure, but I have a kit out on the building table, batteries charged and I even went flying recently! Trouble with engine fuel draw kept my plane grounded but others let me on their sticks. A windy day and I made three landing passes that showed me it was going to be a problem to get down whole and handed the tranny back to the owner! That is the hardest maneuver I can think of . . . a windy day landing. The model ended up only slightly damaged. The circumstances can make a landing harder to do than any 10 point pattern maneuver!

Home and checking my fuel draw problem, I suspected the weighted pickup tube in the fuel tank had doubled up. I have a habit of standing models on the spinner and that sometimes happens. Usually I put brass tubing on the flexible fuel line inside the tank to prevent the problem. A check of the

Non-Kink Pickup Tube



Trouble-free fuel tank pick-up tube.

tank showed that to not be the problem. I had recently changed engines to a larger sized, rear intake 4-stroke and upon removing it, the problem was evident. Semi-flexible fuel line had been forced into an S-turn by the carbs proximity to the fire wall and one bend had all but closed the fuel tube off. Dumb, but it had worked at one time though.

Speaking of work, I'm heading for the building table . . . See ya later. □

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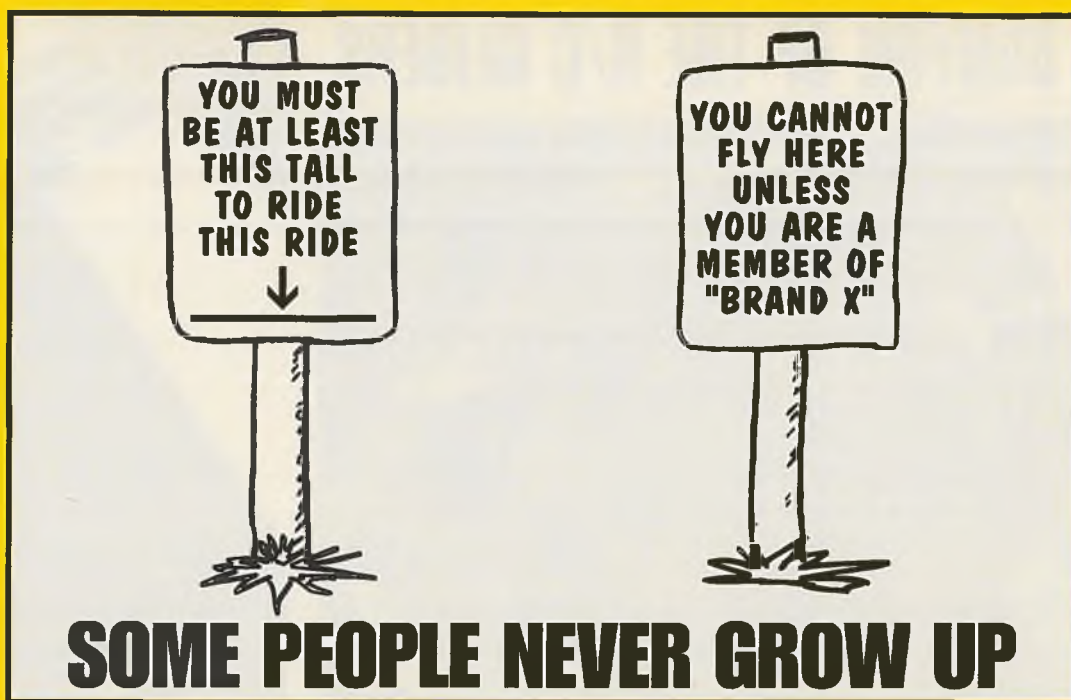
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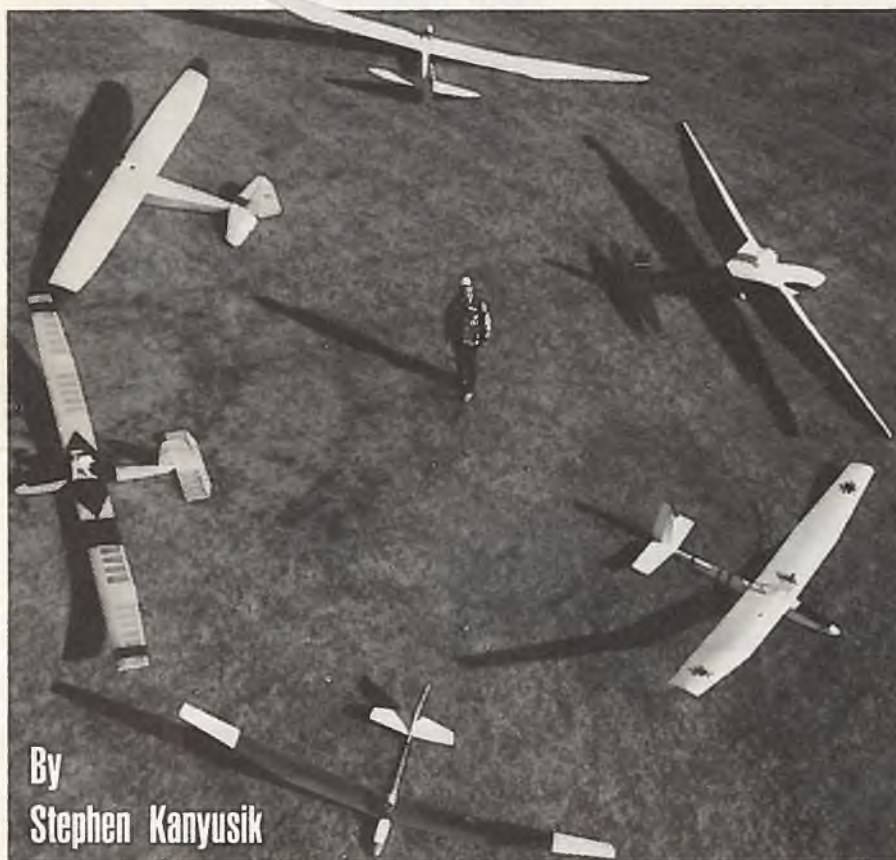
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PAUL BUNYON OF THE R/C GLIDERS



By
Stephen Kanyusik

The three upper states of our country have several things in common with each other. Michigan, Wisconsin, and Minnesota bump up against our northern neighbor, Canada. This location makes for some very interesting winters, let me tell you. Then, another interesting facet is that they have the Great Lakes in their backyards. How these lakes came to be also makes for a most interesting story. The legend in these parts says that the lakes were developed during the time Paul Bunyon logged the forests in that area. He and his ox, Babe, would drag

the fallen timbers along the ground, which caused large gouges to be formed in the earth. Over time, these gouges deepened to a great depth, and when the rains came they filled these huge openings in the earth -- and that's how the Great Lakes were formed.

Paul wasn't all work and no play. Heck, no! His hobby was making giant size gliders. Since there weren't any motors back then to power them, he would have to fling them skyward and soon they would pick up the thermals that would cause them to be airborne. This legend is told and retold around the potbellied stove at Don's Hobby Shop. Many a cup of coffee has been drunk



while we discussed this legend.

Recently, in model magazines we have been reading about the large, big, and mammoth sized gliders that have wingspans of 14'-18'. Someone in the "Big T" state claimed a biggy at 18'. Up here in Paul Bunyon's stomping ground, we have a person named Bob Kurkowski, who builds them like Paul did in those legendary years back then.

Bob's smallest glider is 14', then it scales up to 20, 21, 22, 28 -- and the latest is a 32' model! All of the models have been flown, excepting the 32 footer. He is waiting for the Super Tigre 4500 that is being made available for the market.

The models that Bob constructs are from plans that he purchased and then scales up to the size that he decides upon. The wingspans of each model have been dictated by the size of the motors that are available on the market. He is toying with a 45 footer in the future. When Bob orders his spruce and balsa, Sig Model Company scours the Iowa countryside for balsa barns which predominate that state. The covering has been MonoKote exclusively. He has used 15 rolls of the 25' size, and 16 rolls of the 6' size on all of these models. The accumulated weight of his models is 244



Grandson Matt (age 1) is all set in the cockpit of the 22' Slingsby. (Editor's Note: No, he does not fly in it!)

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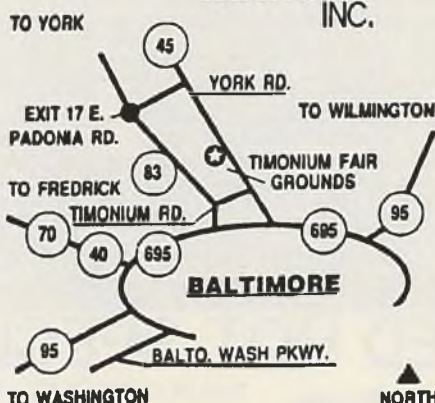
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pounds. The accumulated combined spans come to 137'. These are some awesome stats that really can make claim to some kind of world record!

To see these graceful giants flying is a sight to behold. The members of the "Key City Bald Eagles" had the privilege of experiencing the "thrill of flight" when Bob flew the 28' Buzzard on a lovely Minnesota fall day. The Buzzard wasn't looking for prey. It was making lazy circles in the blue sky and the large wings were searching for thermals that were rising from the freshly plowed farmlands that surround the flying field. The men who were engaged in harvesting the grain had stopped their chores and watched the graceful, slow-

moving glider.

The motor was throttled back to a slow idle, and Duke Fox's design was making a significant effort to stay airborne. Below in a patch of green that was the airfield were two men: Bob Kurkowski was guiding the plane with his transmitter, and his assistant caller, Gary Endersbe. These two were a team this time, as they have been doing for all of Bob's flights. Gary used to hand launch the earlier and smaller gliders that Bob made. Those were the 10-15 footers. Then the later models increased in weight, and it was very difficult to hand thrust them for Gary. Now the models are take-off launched.

Bob transports his models in a specially

designed and constructed trailer. His son, Jeff, was the craftsman who assembled the unit. It is carpeted and has padding and brackets to hold several models at once. He has painted the Polish insignia that the Free Polish Squadron used on their Spitfires and Hurricanes in the Battle for Britain in the "Big One" -- the Polish Falcon that adorned these planes that the valiant volunteers used. He has inscribed in bold lettering the word, "SZYBOWIEC," which translates into "Glider." Bob is of Polish heritage and is known as the "Polish General." In year's past, he was a performer in ice shows, and he and his sons performed as a group that played

continued on page 92



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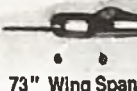
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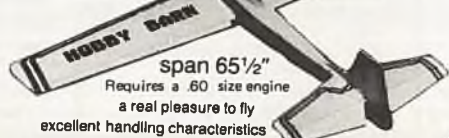
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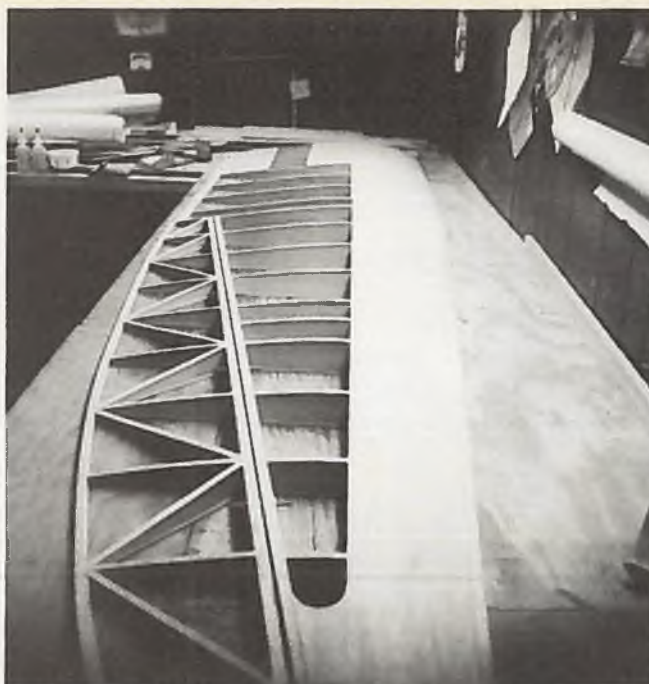
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20x8, 10	13.30



Bob Kurkowski and his rudder construction for the Slingsby.

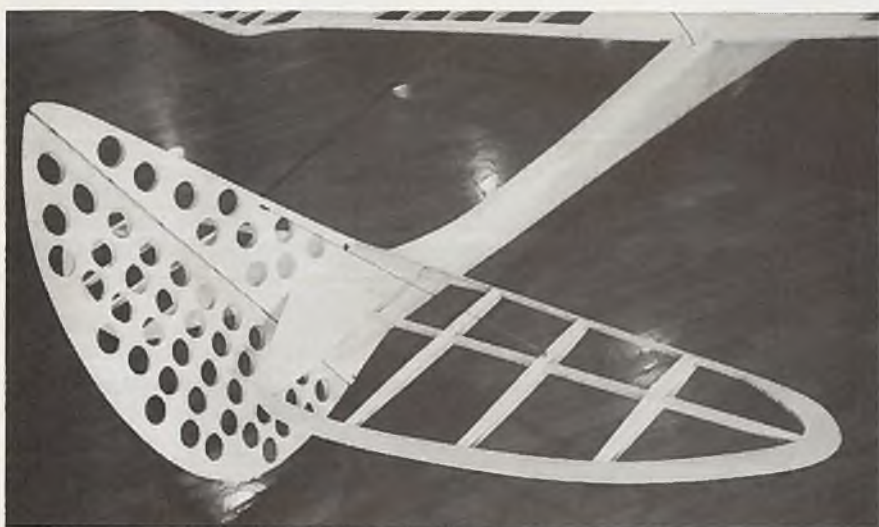


Wing view of the Slingsby.

continued from p. 89

harmonicas. They toured the fair circuit, trade shows, and whatever was available. It became apparent to Bob that he had to

decide to continue in the entertainment world or stop as the schedule was getting to be too hectic. He chose to settle down to a 40-hour week job and build models as a hobby.

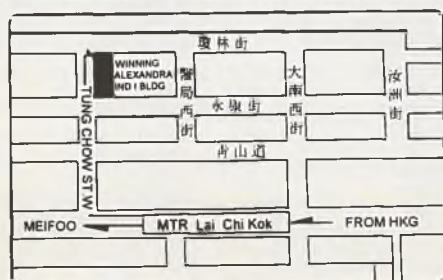


Stabilizer of the 32' Bird of Time showing the vertical fin and rudder's lightning holes.

Bob's previous experience in the entertainment world has carried over into the "Key City Bald Eagles Annual Air Show." It has developed into a very outstanding and entertaining air show. In the last couple of years, the Annual Show has had several thousand visitors attending each two-day show. Next year, there will be an attack on a Japanese airfield. There will be Zeros rising to defend the airdrome facilities. Warbirds of P-40's, Hell Cats, and P-51's will strafe and dogfight. Steve Hartwell, the munitions expert, will orchestrate the pyrotechnics. Allen Linschied will have a multi-tape sound system to give the desired sound to add realism to the action that will be taking place for the spectators. The man who produces and manages these shows is Bob Kurkowski. The "General" was overheard to remark after last year's show, "Damn it! We went five minutes over what I had planned. Next year, we will have to tighten it up." And he will . . . he always does it right . . . and in a big way!

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unseasonably nice, sunny 45° day and no breeze. The "Bald Eagles" lent a helping hand to Bob and they transported six of these lovely giant models to a park. This assembly of models drew quite a crowd. First, a TV cameraman happened to come by. He interviewed and photographed us. We were on the 6:00 p.m. and 10:00 p.m. news broadcasts that day. Our claim that "These were the world's largest R/C powered gliders," gave us a lot of attention in town. Small town folks tend to rally round and give support to local activities such as this. I was raised 35' in the air in the bucket of a boom truck. The view from that height was spectacular! I always liked to be up in the air -- whether in a TBM from an aircraft carrier or on a roof top. Being up high gives one a different perspective of the area around and below you. I shot several rolls of film and reluctantly I asked to be lowered. The crew were on their lunch hour and had to get back to the job. Again I say,

in a small town things can be accomplished without too much red tape or formality. Goodwill freebies of this type are a bonus and appreciated.

So, whenever you cast your eyes up to the heavens, no matter where you are, it's not Superman, or a bird. Heck, no! It might be one of Bob Kurkowski's R/C Gliders.

#1 Bird of Time: 10'-32', weight 71 lbs., Super Tigre 4500.

#2 Buzzard: 12'-28', weight 61 lbs., Super Tigre 3000.

#3 Paragon: 10'-20', weight 24 lbs., O.S. Max 108.

#4 Salair: 12'-14', weight 10 lbs., Super Tigre 25.

#5 Caracara: 10'-21', weight 26 lbs., O.S. Max 108.

#6 Slingsby: 11'-22', weight 52 lbs., Super Tigre 3000.

All of these engines proved to be more than adequate for the flights. The Bird of Time has been taxied with the Super Tigre

3000, and it proved to present a marginal power situation. It was decided to install a Super Tigre 4500 before making a flight attempt. At this time, it has not been flight tested. Bob will not fly his models unless all the structures, servos, and conditions are satisfactory. This has made for safe and successful flying throughout the years. Some of these models are over five years old and still capable of flight. □

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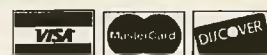
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Long or Short Coupling?

Dick Kidd asked that I take a crack at a recent letter sent to RCM. If anyone else out there has questions, give us a try. RCM,

I keep hearing about short/long coupled airplanes and that a short coupled airplane is more difficult to fly than a long coupled airplane. When does a short coupled plane become a long coupled plane? How do you measure coupling length — is there a nondimensional coefficient that could compare two airplanes?

I would appreciate any information that would shed light on this problem that has perplexed me for some time.

Thanks,
Werner C. Steinle

Let's start by defining our terms. When a modeler says a plane is short coupled, he usually means that it has a short tail moment

arm. The tail moment arm is approximated as the distance from the wing quarter chord (actually the C.G.) to the horizontal tail quarter chord. The quarter chord is defined as 25% of the mean chord length measured back from the leading edge of the mean chord. The mean aerodynamic chord can be calculated but is easier to find graphically. See Figure 1. The tail moment arm is then shown in Figure 2. Before we say what is long and what is short, let's talk. In the February column we talked about trimming and balancing the moments about the C.G. The primary purpose of the tail is to counter the moments of the wing, the thrust line and so on. Now a moment has two components, length of the moment arm and the force applied.

The force applied on the tail is a function of its area so the moment is a function of the moment arm times the area. Sometimes you will hear this referred to as tail volume. The

horizontal tail volume coefficient (a dimensionless ratio) is sometimes calculated by dividing the horizontal tail volume by the product of the wing mean chord and the wing area. Typical values for full-scale airplanes run from .5 to 1.0. Higher numbers would be used for aircraft designed to be less maneuverable such as a trainer or a bomber. Everything else being equal, if you increase the tail moment arm or the stab area you will increase the stability. So, if you have a short coupled model it could be more difficult to fly unless it had a very large stab. If you are designing a new plane you must select the tail moment arm before you can determine the size of the horizontal stabilizer. However, you can trade them off.

Charles Grant's rule of thumb for models is that the moment arm must be $3\frac{1}{2}$ times the average chord and the stab area $\frac{1}{3}$ the wing area. Notice that this would yield a tail volume coefficient of slightly over 1.0. My 120 Jekyll that we used to think of as having a long tail has a tail moment arm about 2.94 times the mean chord. The stab area is only 24% of the wing. These numbers are probably low because the Jekyll started out with a smaller wing when it was designed for a .60. However, we can see that the current trend of making the tail moment arm longer is just going back to what Grant said in the 1940's. Of course, he was designing free flights that had to be stable. Another book suggested a good starting point for the moment arm is 60% of the fuselage length. My Jekyll's is 55%. Again, it is partly due to the larger wing of the 120 versus the 60

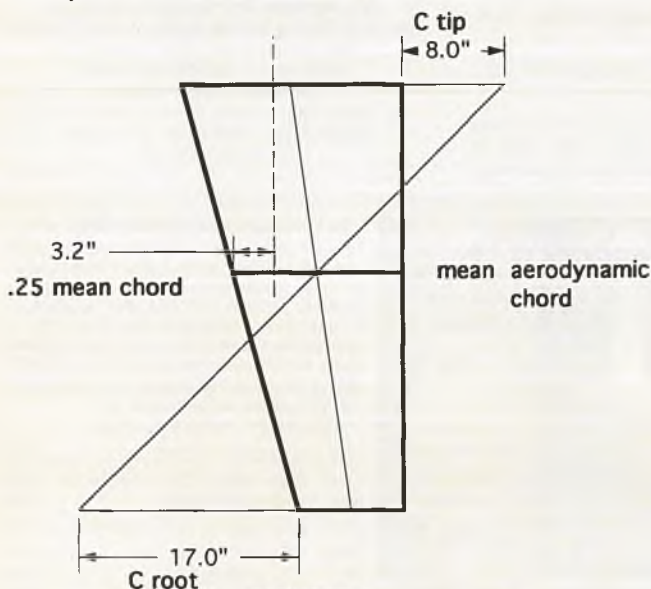


FIGURE 1

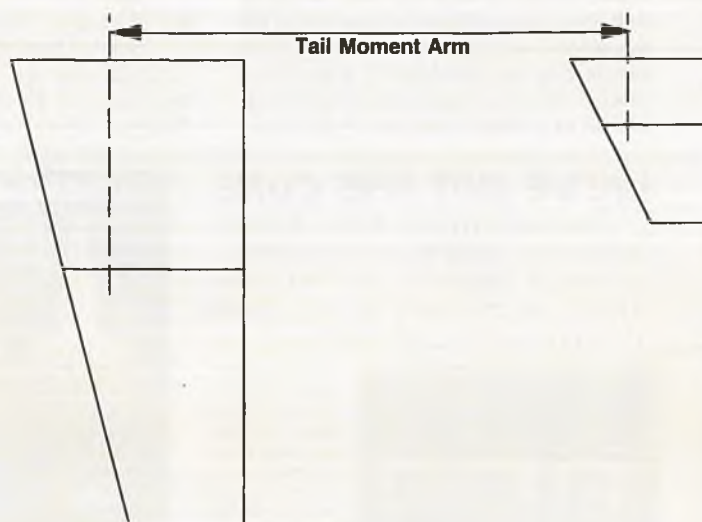


FIGURE 2

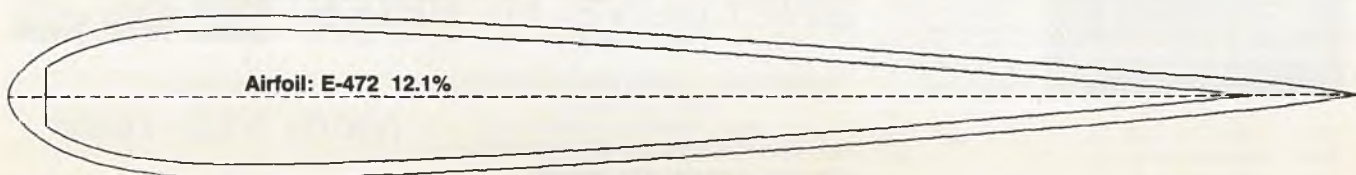


FIGURE 3

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Jekyll.

Back to the questions in the letter. The answer to the second question is to divide the tail moment arm by the mean chord to get a dimensionless coefficient to compare airplanes. Now I'm going to go out on a limb and answer the first question by saying that long coupled would have a tail moment longer than 3.5 times the mean chord and

short coupled would be less than 3.5 times the mean chord. By this standard we don't have too many long coupled designs out there but remember it is tail volume that really counts and you should compare tail volume coefficients. Short coupling can be compensated for by increasing stab area and vice versa. In pattern, the planes are getting longer and some have big stabs, too. The

results seem to be smoother flying planes that are less affected by rough air. I don't think we know how much is too much tail volume yet but I don't think you want a coefficient much larger than 1.0.

Earlier I said that increasing tail volume increased stability if all other things were equal. One might argue then that too high a tail volume would decrease the ability to snap and spin. However, the designer can also play with the C.G. to adjust the stability. It seems as if the current trend is to move the C.G. further and further back which reduces the static stability. There is a so called neutral point. If your C.G. is at the neutral point your plane will have neutral stability and then it could become a real handful to fly. Many modern military fighters and missiles actually have negative static margin (the C.G. is aft of the neutral point) and use autopilots to provide stability. One of these days we will have 6° of freedom (6 DOF) simulations of our planes and be able to evaluate performance in the computer before we actually build and fly them (the hard part will be to get the aerodynamic data). Then we will know how to trade off tail moment arm, stab size, and C.G. position.

Wingmaster Model Wing Designer

In the August 1993 column, we discussed how you could plot your own airfoils from data available in many books on aerodynamics. While the process is easy to describe and easy to comprehend, it is somewhat tedious and, therefore, many modelers wouldn't take the time to do the work. This is especially true if one wanted to make an elliptical wing like a Spitfire or a wing that transitioned from one airfoil at the root to another at the tip, where every rib is different. This month I'd like to describe a software application program called Wingmaster Model Wing Designer that makes the job easy. It is designed to work with Microsoft Windows so I had to find a PC with Windows and figure out how to use it. I found that it was very easy to install this program and get it operating; in fact, I doubt that I could have done it much faster on a Macintosh, the computer that I am most familiar with.

With Wingmaster it is very easy to produce NACA airfoils as well as many historical and modern airfoils. I didn't count them but the manual claims to have a library of over 250 airfoils. It was fun to look at the shapes of some of the Eppler airfoils designed for aerobatic aircraft. They are nothing like what we are using in models. They tend to have rounded leading edges with the high point of the airfoil way forward, and then have an almost flat

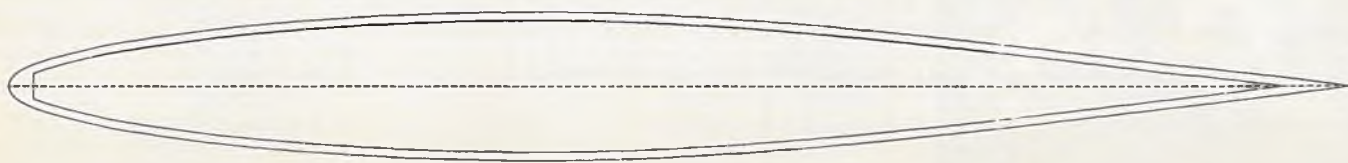


FIGURE 4

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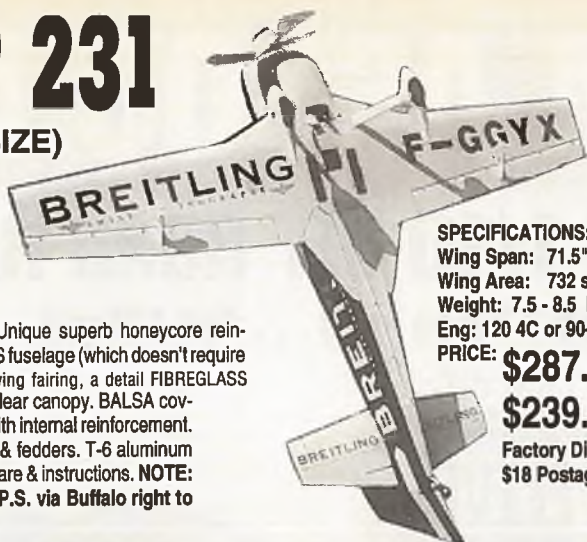
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surface back to the trailing edge. See Figure 3. The E-472 that is shown is said to have hard stalls, and may be difficult to land. I guess the idea is to have lots of drag so the plane doesn't pick up speed in a dive. The E-476 has the high point further back and supposedly has lower drag and softer stalls.

You can customize any airfoil by changing the thickness in increments of 0.1%, and the point of maximum thickness in increments of 1.0%. For example, you could start with a 64-014 which has the high point 40% back from the leading edge and is 14% thick and change it to a 44% high point and 11.1% thick. See Figure 4. You can also add camber and move the position of

maximum camber backward or forward along the chord line. Of course, you can set the root and tip chord lengths. As I suggested earlier you can use multiple airfoils in a wing with a linear or nonlinear transition from one airfoil to another. For example, you might want a thicker section at the root for strength and a thinner section or even a nonsymmetrical section at the tip. Wingmaster will draw all of the intermediate ribs between the root and tip to assure a smooth transition.

The wing may be designed for any amount of taper and sweep. You control the root and tip chord length, the half span and the sweep of the leading and/or trailing edges or of the 1/4 chord. You can set the

sweep in degrees or in inches at the tip. Straight, curved, or elliptical leading and trailing edges are possible. It is fun to experiment with different curvatures.

You can print the airfoils or rib templates. You can specify the sheeting thickness and the spar size. The spar is placed automatically and I'm not sure why it is placed where it is on some of the oddball wings I drew, but it looks like it is normally placed at the point of maximum thickness. In addition to printing the ribs, Wingmaster will print a full-size set of wing plans if you have a printer or plotter that can handle it.



FIGURE 5

See Figure 5. One could print full-scale on a normal printer and then tape the panels together but it is pretty difficult to do that accurately. You'd be better off drawing the full-size plan with your good old T-square. If your printer can handle the maximum chord and is equipped to handle rolls of paper, Wingmaster will automatically connect the panels. It would be nice if you could draw in the ailerons and move the spars around to your liking but as it is, it will save you plenty of time for either a built-up, or a foam core wing. If only one could analyze the performance as fast as you can draw them. Wait until we get that 6 DOF.

You can buy the Wingmaster Model Wing Designer from Websoft, Inc., 287 Cottonwood Rd., Pryor, Oklahoma 74361. Their Fax is (918) 825-7205. Buy it. You'll like it. And if they sell a lot they will make new and better software for modelers. □



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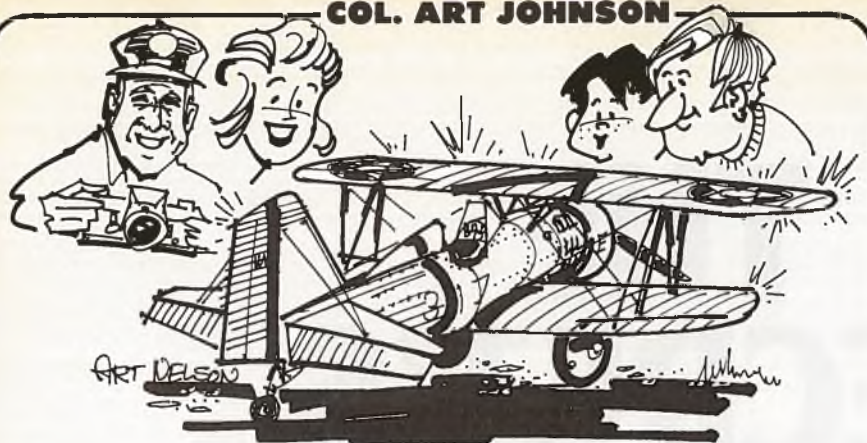
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SCALE VIEWS

Sawgrass Scale Classic

The Labor Day weekend is a natural for a contest and at that time of year you can count on pretty good weather in South Florida (if there is not a hurricane around). Afternoon thundershowers interfered a bit on Saturday but most of the time it was good at the Sawgrass Scale Classic. This year the event was sponsored by two of the major clubs in Southeast Florida, the Condors of Coral Springs and the Broward County RC Association of the Ft. Lauderdale area. Pooling resources helped provide enough judges and other personnel to make a success of this major AMA Scale and Scalemaster qualifier contest.

The Markham Park site just west of Ft. Lauderdale is a county built R/C flying facility with a 50' x 500' runway — more than adequate for any kind of scale flying. Events were the usual Expert and Sportsman Sportscale and AMA Fun Scale. As in most recent scale contests in this area, Fun Scale draws the most contestants. There must be something to the idea of flying in competition under the same rules as everyone else but not having to worry about how the looks of your model stack up. Surprisingly, there are some pretty nice looking models in the Fun Scale events.

Expert static scores were all in the 90's

with Charlie Chambers' beautiful aluminum covered Bearcat-F8F awarded a top score of 99. Charlie had the radio problems solved with this model and it flew well. Metal to metal contact between the wing and fuselage was finally pinpointed as the most likely cause of previous radio glitches. The model is still a bear (if you can pardon the pun) to handle after touch-down and only two flights were made. This model of the Bearcat has the landing gear closer to scale than that of any model of the F8F I have seen. Maybe the closer to scale it gets, the tougher to handle on the ground?

Russell Lepre's model of the Zero from the Yellow Aircraft kit is a fine flying aircraft. The wide gear and a good model configuration (other than the short nose) makes for fine flying. The Zero did well on all four flights for a second place in Expert. A Seversky P-35 (RCM Plan #1118) was first in Expert just ahead of the Zero. The P-35 did not make out this well head to head with the Zero in the early days of WWII. Today's model engines tend to even up a few design inadequacies.

Lyman Slack's model of the Jenny was second in static and it appeared to fly well. However, Lyman has never been happy with his aileron set-up and says the model was actually giving him trouble. It looked nice in the air with the 4-stroke engine



Russell Lepre from the Tampa, Florida, area brought this Zero from the Yellow Aircraft kit to the Sawgrass Scale Classic. Second in Expert, Russ says the Yellow Aircraft custom retracts work flawlessly.

moving it in a stately manner.

Fun Scale had the largest variety of models and the only multi-engined model at the contest. It was my old F-82 that I loaned to a friend so he could fly. He wasn't thanking me, as he spent most of the contest fixing things that kept falling off. Great sport in the sun at 90°+ temperature and 90% humidity. Frustrating as he watched all the other Fun Scale birds flying up a storm. Oh well, we were having fun — I think!

Joint club sponsorship of the Sawgrass Scale Classic worked out very well with Jim Scroggins as CD. A lot of us are looking forward to next year's Classic which moves to the Condors' great flying site in Coral Springs, Florida.

Scale Documentation:

The 1994 issue of the *Scale Aircraft Documentation and Resource Guide* is out. You can get a copy for \$6.00 from Bob Bank's Scale Model Research, 3114 Yukon Avenue, Costa Mesa, California 92626, (714) 979-8058. The 152 page catalog lists 5000 different Foto Paaks (800 new), 22,000 3-view drawings, and 13 scale related articles by authors well known in scale activities. The Foto Paaks are full color 3½" x 5" pictures taken with the modeler in mind to show details like paint schemes, markings, instruments, landing gear, etc. Coverage of popular



LEFT: This P-40 from the Lance Manufacturing kit was flown to second place in Fun Scale by Richard Kersul at the Sawgrass contest. Scale at 1/4 with a 91" span. The model weighs only 19.25 lbs. with a G-38 engine. RIGHT: Tom Gruenebaun's Laird Turner racer is from Wendel Hostetler's plans and American Kit Cutters. Power is a Panther 3.8 cu. in. engine with electronic ignition. Flown in Sportsman Sportscale at the Sawgrass, the model weighs 30 lbs.

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aircraft is pretty extensive. For example, you can choose from 138 P-51's, 85 Pitts, or 29 B-25's. There is enough information in the catalog about each paint scheme and aircraft detail to make an intelligent choice from among the many. A couple of my less popular favorites are covered but with fewer choices. The Martin B-26 has two Paaks and the Seversky P-35 only one. I am going to send Bob my negs of the P-35A so he can add that one.

Scale Model Research is the exclusive dealer for the well known Koku-Fan 3-views. Other 3-views are from a variety of sources. New this year is the availability of 3-views on computer disk as scanned TIFF files. An article in the catalog tells computer fans how to use these to produce their own model designs.

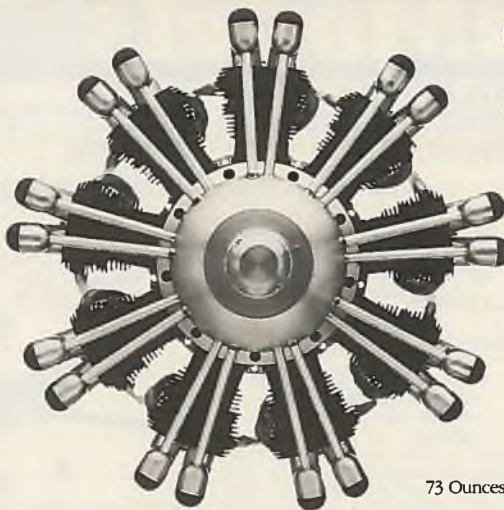
Overseas readers of RCM may like to know that Scale Model Research has dealers in Germany, Japan, Australia, England, Italy, Denmark, Spain, and France.

AERODRAW:

I have just had my first look at the latest computer drawing program intended for model designers. AERODRAW 2D, Windsoft Company, 1405 Hopkins Ave., Dover, Delaware 19901-4003, (302) 678-5174, is not a CAD program as such but a collection of computer drawing tools to be



This model of the AT-6 advanced trainer can be built from the latest Midwest kit. Kit is all balsa at 1/6 scale with 83" span. Plans provide for Robart retracts or included fixed gear.



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used with DesignCAD version 5 or 6 to aid in the accurate design and drawing of various aircraft parts. For example, it has always been difficult to accurately loft the formers and bulkheads of an aircraft fuselage. AERODRAW provides a means for computer projection of these parts with accuracy far exceeding the manual process. Once I learn this program, I am hoping to produce formers for my next model where the stringers and strip planking will just kiss the surface of each former as they follow a perfect curve along the fuselage. I have not always been that lucky in the past.

The AERODRAW 2D program also works with Windsoft's Scanover program and does good things with airfoils and wing

design. We will let you know more as we work with the program.

AT-6 Kit:

After a thousand hours spent instructing in the AT-6, I can't help feeling a bit of nostalgia for the old WWII advanced trainer. It was noisy with gas and exhaust fumes in the cockpit but it sure flew well. I have never built a model of the bird but I intend to some day. I have flown models of the AT-6 built by others and they all handled well.

The latest AT-6 kit on the market is by Midwest Products Co., Inc., 400 S. Indiana St., P.O. Box 564, Hobart, Indiana 46342. The kit is in synch with the current

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GPMA0160



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LANA1400	Lanier Stinger 1.20.....128.99
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KITS (CONT.)

SIG (CONT.)

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31⁹⁹

SIGA6166

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HCAP0175	910 AC/DC Vari-Rate Multi-Chgr	44.99
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COXG1140	Cox Tee Dee .020 with Tank.....	27.99
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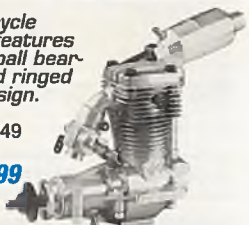
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VT .49 4-cycle Standard w/Muffler

- This 4-cycle engine features double ball bearings and ringed ABC design.

HPEG1249

139⁹⁹



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MGMG0320	.35 SE RC ABC BB w/Muffler.....	89.99
MGMG0332	.40 SE RC ABC BB w/Muffler.....	96.99
MGMG0340	.46 SE RC ABC BB w/Muffler.....	99.99
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O.S.

.40 FP ABC with Muffler 69⁹⁹



- Sport-plane punch for mid-size airplanes. 8.6 oz. ABC power plant produces 1.0 bhp at 15,000 rpm.

OSMG0140

OSMG0110	O.S. .10 FP ABC RC with Muffler.....	53.99
OSMG0115	O.S. .15 FP ABC RC with Muffler.....	59.99
OSMG0120	O.S. .20 FP ABC RC with Muffler.....	62.99
OSMG0125	O.S. .25 FP ABC RC with Muffler.....	64.99
OSMG0135	O.S. .35 FP ABC RC with Muffler.....	68.99
OSMG0140	O.S. .40 FP ABC RC with Muffler.....	69.99
OSMG0160	O.S. .60 FP ABC RC with Muffler.....	109.99
OSMG0227	O.S. .25 SF RC with Muffler.....	89.99
OSMG0232	O.S. .32 F ABC RC with Muffler.....	124.99
OSMG0242	O.S. .40 SF RC with Muffler.....	124.99
OSMG0247	O.S. .46 SF RC with Muffler.....	139.99
OSMG0265	.61 SF RC Long Stroke with Muffler.....	189.99
OSMG0308	O.S. .1.08 FSR RC with Muffler.....	274.99
OSMG0350	O.S. BGX-1 3500 RC with Muffler.....	299.99
OSMG0442	O.S. .40 SF ABC RC with Muffler.....	129.99
OSMG0447	O.S. .46 SF ABC RC with Muffler.....	149.99
OSMG0465	.61 SF ABC RC Long Stroke w/Muff.....	199.99
OSMG0626	FS-26 Suprass RC 4-Cycle w/ Muff.....	159.99
OSMG0845	FS-48 Suprass RC 4-Cycle w/ Muff.....	179.99
OSMG0848	FS-48 Suprass RC 4-Cycle w/ Muff.....	199.99
OSMG0870	FS-70 Suprass RC 4-Cycle w/ Muff.....	249.99

70 Suprass 4-Cycle Engine

249⁹⁹

- 4-cycle engine provides unsurpassed scale sound and power for .60-size airplanes.

OSMG0870



OSMG0895	FS-91 Suprass RC 4-Cycle w/ Mufflr.....	299.99
OSMG0926	O.S. FS-120 Suprass II w/Pump.....	419.99
OSMG0930	FS-120 Suprass RC 4-Cycle w/ Pmp.....	379.99
OSMG1250	O.S. FT-300 Twin RC 4-Cycle.....	999.99
OSMG1681	O.S. .81 VR-M ABC RC Marine.....	299.99
OSMG1891	O.S. .91 VR-DF RC Sml.....	319.99
OSMG1932	O.S. .32 F-H RC Helicopter Engine.....	129.99
OSMG2075	.21 RF-B ABC RC Rr Exst Buggy Eng.....	139.99
OSMG2691	#8 Glow Plg Strnd-2 Cycle Engines.....	4.99
OSMG2692	#F Glow Plug for 4 Cycle Engines.....	6.49

PERRY

PERG4430	Perry Remote Needle Valve.....	13.99
PERG4600	Perry Pump Regulator.....	20.99

R.J.L.

RJLG1000	R.J.L. K.61 Engine.....	109.99
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ROYAL

ROYG1025	.25 RC BB Schnuerle ABC w/ Muffler.....	58.99
ROYG1028	.28 RC BB Schnuerle ABC w/ Muffler.....	64.99
ROYG1040	.40 RC BB Schnuerle ABC w/ Muffler.....	66.99
ROYG1046	.46 RC BB Schnuerle ABC w/ Muffler.....	72.99

SAITO

FA-50 ABC 4-Cycle Engine

199⁹⁹

- Easy-starting 4-cycle "sips" fuel while providing massive torque and realistic scale sound.

SAIG2284



SAIG2200	Saito FA-45S ABC 4 Cycle Special.....	209.99
SAIG2284	Saito FA-50 ABC 4-Cycle.....	199.99
SAIG2926	Saito FA-65 ABC .65 4-Cycle.....	219.99
SAIG3768	Saito FA-80 ABC .80 4-Cycle.....	259.99
SAIG4000	Saito FA-90T .90 ABC 4 Cycle Twin.....	509.99
SAIG4100	Saito FA-91S .91 AAC 4 Cyl w/Muff.....	349.99
SAIG5894	Saito FA120 AAC Special 1.2 4-Cycle.....	359.99
SAIG5700	FA120SDP 4-Cycle w/Dual Plug.....	409.99
SAIG6000	FA-130TD 1.3 4 Cycle Twin 2 Plug.....	559.99
SAIG6100	Saito FA-150S 1.5 4 Cycle w/Muff.....	519.99
SAIG6362	FA325RS ABC Radial 3.25 4-Cycle.....	1439.99
SAIG9004	Saito FA50G50 4-Cycle Gold Knight.....	229.99
SAIG9100	Saito FA85G65 4-Cycle Gold Knight.....	259.99
SAIG9646	Saito FA80G80 4-Cycle Gold Knight.....	289.99

SUPERTIGRE

SUPG0105	SuperTigre G-34 Ring RC w/Muff.....	99.99
SUPG0122	SuperTigre GS-40 Ring RC w/Muff.....	89.99
SUPG0150	SuperTigre GS-45 ABC RC with Muff.....	109.99
SUPG0154	G-51 BB Ring RC with Muff.....	129.99
SUPG0180	S-61 K BB Ring RC with Muff.....	129.99
SUPG0180	S-61 K BB ABC RC with Muffler.....	149.99
SUPG0200	S-75K BB Ring RC with Muffler.....	149.99
SUPG0230	SuperTigre S-90K Ring RC w/Muff.....	179.99
SUPG0250	S-2500 1.5 Cu. In. RC w/Mount.....	209.99
SUPG0265	S-3000K 1.8 Cu.In. RC w/Mount.....	219.99
SUPG0270	GA5000 2.8 Cu. In. RC w/Mount.....	299.99

THUNDERHEAD

THEG1000	.074 Control Line Engine w/Muff.....	21.99
THEG2000	.11 Control Line Engine w/Muffler.....	21.99

YS

YSEG1300	YS .45FS ABC Schnrl RC Side Exhst.....	149.99
YSEG1310	YS .45FR ABC Schnrl RC Rr Exhst.....	144.99
YSEG5620	YS 120FS Four Cycle.....	369.99
YSEG5621	YS 120 4-Stroke with Air Chamber.....	529.99
YSEG5625	YS .81 Long Stroke Side Exhaust.....	224.99
YSEG5710	YS .81 AR Long Stroke Rear Exhaust.....	314.99

ZENOAH

ZENG1300	Zenoah G-23 1.37 RC Ball Bearing.....	244.99
ZENG1500	Zenoah G38 2.3 RC BB w/Muffler.....	259.99
ZENG1800	Zenoah G62 3.7 RC BB w/Muffler.....	364.99

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ACEP1012	Ace Abacus Assembled.....	54.99
ACEP1013	Ace Single Add-A-Trickle Assembled.....	6.79
ACEP1015	Ace Dual Add-A-Trickle Assembled.....	10.99

COX

COXP2000	Cox Super Power Starting Kit.....	10.99
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DYNAFLITE

DYFP8301	Dynaflite Standard Hi-Start.....	44.99
DYFP8302	Dynaflite Heavy Duty Hi-Start.....	49.99

GOLDBERG

GBSP2010	Goldberg Super Tote Flight Box.....	21.99
GBSP2020	Goldberg Pro-Tote Flight Box.....	32.99

GREAT PLANES

GPMP1000	Master Caddy with A.P.S.....	29.99
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HOBBICO

Hot Shot™ Glo-Starter w/Charger

HCAP2505

14⁹⁹

- Palm-sized starter packs 1400 mAh of clean-firing power. Includes charger.



HOBBICO (CONT.)

HCAP0300	Hobbico Deluxe Power Panel.....	19.99
HCAP0310	Hobbico Banana Plugs (3 Pr.).....	3.49
HCAP0350	Hobbico Expanded Scale Voltmeter.....	11.99
HCAP0355	Hobbico LCD Voltmeter w/LED.....	26.99
HCAP0400	Hobbico LCD Photocell Tachometer.....	34.99
HCAP0900	Power Core Starter Battery Pack.....	29.99
HCAP2500	Hobbico Locking Glow Plug Clip.....	4.69
HCAP2505	Hot Shot Glo-Stir 1400mAh w/Chgr.....	14.99
HCAP2510	Spr Hot Shot Glo-Stir 400mAh w/Chgr.....	24.99
HCAP2550	4-Way Wrench w/Plug Storage.....	3.49
HCAP3200	Hobbico Torqmaster 90 Deluxe 12V.....	29.99
HCAP3300	Torqmaster 180 Heavy Duty 12V.....	42.99
HCAP5020	Hobbico Ultra-Tote Field Box.....	19.99

McDANIEL

MCDP2001	101 Ni-Strtr (glw plg batt&chg).....	18.99
MCDP2002	201 Ni-Strtr w/Metr & UL Chgr.....	22.99
MCDP2021	121 R/C Trk-Str (wrench & batt in one).....	22.99
MCDP2031	221 Torq Start w/Meter & Charger.....	26.99

OMNI MODELS

Deluxe Power Panel

19⁹⁹

OMNP1000

- Compact control distributes DC power to pumps, glow drivers, starters and more.



OMNP1000

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ACEM2510	Trans-Guard Transmitter Carrying Case	16.99

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AIRJ09	AV2R AM 2-Ch 2 102 Svs 2 Stk	52.99
AIRJ40	VG4R FM 4-Ch 2 501 Svs	169.99
AIRJ49	VG4R FM 4-Ch 3 102 Svs 2 Stk	125.99
AIRJ50	VG4R FM 4-Ch 4 102 Svs 2 Stk	136.99
AIRJ59	QSGA FM 6-Ch 4 102 Svs	309.99
AIRJ60	QSGH FM 6-Ch 4 102 Svs Heli	324.99
AIRJ62	VG6H PCM 6-Ch 4 102 Svs Heli	199.99
AIRJ64	VG6P PCM 6-Ch 4 102 Svs 2 Stk	229.99
AIRJ65	VG6DR FM 6-Ch 4 102 Svs 2 Stk	164.99
AIRJ66	VG7P FM 7-Ch 4 102 NiCd 2 Stk	229.99
AIRJ67	IN600A FM 6-Ch 4 102 NiCd 2 Stk	329.99

VG6DR FM 6-Channel, 4 102 Servos

164⁹⁹

• An FM system that offers dual rates, full NiCds, trainee system and 1-year warranty.



AIRJ65

AIRJ68	IN600A PCM 6-Ch 4 102 NiCd 2 Stk	364.99
AIRJ69	IN660 6-Ch FM 4 102 Svs NiCd 2 Stk	389.99
AIRJ70	IN660 6-Ch PCM 4 102 Svs 2 Stk	419.99
AIRL24	4 Channel Micro DC RX #82745	59.99
AIRL30	6 Channel FM DC RX #82765	62.99
AIRM0115	94141 Ball Bearing Micro Srv	37.99
AIRM0119	94161 Pro Large Scale Srv	59.99
AIRM0135	Airtronics 94501 MicroLite Srv	38.99
AIRM0167	94102 Precision HD Std Srv	13.99
AIRM0188	94322 Ball Bearing Std Srv	22.99
AIRM0355	MA-6 Spd Control F/Aircraft	64.99
AIRM1130	Airtronics 6" Extension Cable	4.79
AIRM1140	Airtronics Dual Srv Harness Cable	8.59

ARISTOCRAFT

ARLJ500	8 Channel PCM PLL RC System	319.99
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COX

COXJ16	Cobra Gold 3 Ch. w/ 2 Micro Svs	114.99
COXM1040	Cox Micro Srv	27.99

ERNST

ERNM3001	Ernst Charge Receptacle-Futaba FM	3.09
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FUTABA

4NBL 4-Channel Radio

115⁹⁹

• Affordable sport radio for gas fliers includes Tx NiCd 3 S148 Servos and 1-year warranty.



FUTJ37

FUTJ09	2PB 2-Ch 2 S148 Svs Pistol	56.99
FUTJ09	Futaba 2V 2-Ch 2 S148 Svs 2 Stk	45.99
FUTJ11	Futaba 2NBR 2-Ch 2 S148 Svs	57.99
FUTJ34	4NBL 4-Ch 2 S133 Svs & Sd Ctrl	184.99
FUTJ37	Futaba 4NBL 4-Ch 3 S148 Svs	115.99
FUTJ39	4NBF FM 4-Ch 3 S148 Svs	133.99
FUTJ40	4NBF FM 4-Ch 2 S133 Svs	192.99
FUTJ10	5JAP PCM 5-Ch 4 S148 Svs Heli	236.99
FUTK16	5JAP PCM 5-Ch 4 S148 Svs	284.99
FUTK21	6NFK FM 6-Ch 4 S148 Svs	181.99
FUTK25	7NFK FM 7-Ch 4 S148 Svs 2 Stk	249.99
FUTK54	Futaba 7UGFS 7-Ch 2 S133 Svs	509.99

S148 Precision Servo-J, FM

• A 1.5 oz. powerhouse with 42 oz.-in. of torque.

14⁹⁹

FUTM0710



FUTABA (CONT.)

FUTK55	7UAFS FM 7-Ch 4 S148 Svs	354.99
FUTK56	7UAFS PCM 7-Ch 4 S148 Svs	424.99
FUTK57	7UHFS 7-Ch 4 S5101 Svs	399.99
FUTK58	7UHFS 7-Ch 5 S5101 Svs	494.99
FUTK91	9ZAP 9Ch 4 S9101 Svs	1089.99
FUTK92	9ZAP 9Ch 5 S9201 Svs	1074.99
FUTK9500	9ZAPS 9-Ch 4 S9101 Svs	1369.99
FUTK9500	9ZHPS 9-Ch 5 S9201 Svs	1429.99
FUTL65	Futaba R114H 4-Ch AM Receiver	69.99
FUTL73	Futaba R148DF 8-Ch FM Receiver	159.99
FUTM0029	S3001 Servo Stdnd Ball Bearing	29.99
FUTM0090	S9201 BB Coreless Servo-Aircraft J	40.99
FUTM0096	Futaba S9302 Servo-BB Coreless	57.99
FUTM0097	Futaba S5101 BB Servo Dual J	28.99
FUTM0340	Futaba S33 Servo (Micro)	29.99
FUTM0550	Futaba S-128 Servo (Standard J)	17.99
FUTM0590	Futaba S-131S Servo (BB Coreless J)	47.99
FUTM0630	Futaba S-133 Servo (Micro J)	27.99
FUTM0640	Futaba S-134 Servo (1/4 Scale J)	29.99
FUTM0670	S-136G Servo (Compact Retract J)	46.99
FUTM0710	Futaba S-148 Servo (Precision-J)	14.99
FUTM0805	(G153B8) Gyro Stabilizer BB J FM	104.99
FUTM0806	(G154) Gyro Stblzr-Single Axis-J FM	62.99
FUTM4230	Futaba NCC4 RX Charge Cord-J FM	5.99
FUTM4370	SWH9 Mini Swch Hms & Chrg Cord-J	7.49
FUTM4410	Futaba Trainer Cord-FM Black	12.99

6NFK FM 6-Channel Radio 4 S148 Servos

181⁹⁹

• All-NiCd system includes retract switch, dual rates and trainer system.



FUTK21

GREAT PLANES

GPMM1000	Switch/Charge Jack Mounting Set	2.69
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HOBBICO

HCAM1000	CS-51J Command Srv Futaba J Strd	12.99
HCAM1002	CS-51A Command Srv Airtrons Strd	12.99
HCAM1003	CS-51R Command Srv JR Strd	12.99
HCAM1010	CS-55J Command Srv Futaba J Dlx	13.99
HCAM1012	CS-55A Command Srv Airtrons Dlx	13.99
HCAM1013	CS-55R Command Srv Fut J Micro	13.99
HCAM1015	CS-57J Com& Srv Futaba J Dlx BB	19.99
HCAM1017	CS-57A Com& Srv Air. Dlx BB	19.99
HCAM1018	CS-57R Com& Srv JR Dlx BB	19.99
HCAM1020	CS-31J Command Srv Futaba J Mini	25.99
HCAM1022	CS-31A Com& Srv Airtrn Mini	25.99
HCAM1030	CS-72J Command Srv Fut J 1/4 Sol	33.99
HCAM1032	CS-72A Command Srv Air. 1/4 Sol	33.99
HCAM1040	CS-11J Command Srv Fut J Micro	25.99
HCAM1042	CS-11A Command Srv Airtrns Micro	25.99
HCAM2000	Command 6" Extension-Futaba J	4.29
HCAM2100	Command 12" Extension-Futaba J	4.49
HCAM2200	Command 24" Extension-Futaba J	4.99
HCAM2500	Command Y Harness-Futaba J	9.99
HCA2P000	Custom Radio Case (Single)	38.99
HCA2P100	Custom Radio Case (Double)	54.99

L.D.M.

LDMM9800	L.D.M. BB Servo Conv. Kit Futaba (4)	24.99
LDMM9700	L.D.M. BB Servo Conv. Kit Airtrons (4)	24.99
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ROYAL

ROYM1229	Royal Shorty Titan-Futaba-J	13.99
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W.S. DEANS

WSDM3003	Deans 3-Pin Connector Set	1.49
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A-JUSTO-JIG

AJUR1000	A-Justo-Jig Wing & Fuse Jig	69.99
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BADGER

BADR1395	180-11 Comprsr w/Auto Shut-Off	169.99
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BOB SMITH

BSIR1000	Quik-Cure 5 Min. Epoxy-9 oz.	7.49
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BSIR5500	Slow-Cure 30 Min. Epoxy-9 oz.	6.99
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BSIR7500	Insta-Cure+Gap Filling CA-2 oz.	5.99
BSIR7600	Insta-Cure+Gap Filling CA-8 oz.	19.99
BSIR8100	Maxi-Cure Extra Thick CA-2 oz.	6.99
BSIR8200	Maxi-Cure Extra Thick CA-8 oz.	19.99
BSIR8250	Super-Gold Thin Odorless CA-2oz.	12.99
BSIR8300	Super-Gold+Gap Filling CA-2oz.	12.99
BSIR8500	Insta-Set CA Accelerator 2 oz.	3.49
BSIR9000	Insta-Set Refill Acrltr 10 oz.	7.99

DREMEL

3952 Moto-Tool® Super Kit

84⁹⁹



• All-in one set includes 5-speed Moto-Tool, flex-shaft, 32-piece accessory set and deluxe carrying case.

DRER0660

DRER0600	5950 Moto-Tool Kit (Vari)-20 Acc	64.99
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DRER0660	3952 Variable Speed Super Kit	84.99
DRER0703	Dremel 1571 Scroll Saw/Moto-Shop	84.99
DRER0755	Dremel 1731 Disc Belt Sander Delx.	109.99
DRER0812	Dremel 212 Deluxe Drill Press	35.99

GOLDBERG

GBGR2030	Goldberg Super Jet Glue-2 oz.	6.49
GBGR2040	Goldberg Super Jet Glue-4 oz.	11.99
GBGR2130	Goldberg Jet Glue-2 oz.	6.49
GBGR2155	Goldberg Jet Free 2 oz.	13.99
GBGR2220	Goldberg Slow Jet-2 oz.	6.49
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HCAR3400	Hobbico Hobbylifter Filler 8 oz.	3.99
HCAR3401	Hobbylifter Balsa Colored Filler	3.99
HCAR3600	Hobbico Bullet CA Glue 2 oz.	5.99
HCAR3650	Hobbico Bullet CA+ Glue 2 oz.	5.99
HCAR3700	Hobbico Bullet CA-2oz. Refill	5.99
HCAR3750	Hobbico Bullet Activator 2 oz. Spray	3.99
HCAR3755	Hobbico Bullet Activator Refill 8 oz.	6.49
HCAR3900	Hobbico Bullet 6 Minute Epoxy 9.0 oz.	6.99
HCAR3950	Hobbico Bullet 30 Minute Epoxy 9.0 oz.	6.99
HCAR3960	Hobbico Bullet 45 Minute Epoxy 9oz.	7.49
HCAR5150	Hobbico Steel T-Pins 1 1/4" (100)	2.19

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HIGR1515	Harry Higley's Tap/Drill Guide Set (3)	16.99
HIGR2115	Benders 1/16 1/8 5/32	13.99
HIGR2510	Harry Higley's LeRoy's Easy Hinger (2)	12.99

HOT STUFF

HOTR1060	Hot Stuff UFO 4 UFO CA 2 oz.	16.99
HOTR1070	Hot Stuff UFO 4T UFO CA Thick 2 oz.	16.99
HOTR2030	Hot Stuff Glue-2 oz.	6.99
HOTR2130	Hot Stuff Super T-2 oz. (gap filling)	6.49
HOTR2230	Hot Stuff Special T-2 oz.	6.99

ELDON J. LIND

LINR1601	Master Magic Magnet Bldr	119.99
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MILLER

MLRR2134	Spray St w/3 Spray Guns & Cmps	119.99
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PACER

PAAR2015	Pacer Zap CA 2 oz.	7.89
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PAAR2120	Pacer Zap A-Gap CA+ 4 oz.	12.99
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• Features double action, internal mix airbrush with efficient air/color mixing systems

49⁹⁹

PASR2325

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PASR3500	Paasche D500 Air Compressor	99.99

ROBART

ROBR1404	Robart Wing Incidence Meter	21.99
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TOP FLITE

TOPR1002	Supreme CA Glue 1oz Instant	3.49
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TOPR1007	Supreme CA+ Glue 1oz Gap Fill	3.49
TOPR1008	Top Flite Supreme CA+ 2oz Gap Fill	5.99
TOPR1011	Supreme CA- Glue 1oz X-Gap Fill	3.99
TOPR1012	Top Flite Supreme CA- 2oz X-Gap Fill	6.49
TOPR1025	Supreme Activator 2oz Spray	3.99
TOPR1026	Supreme Activator 10oz. Refill	6.99
TOPR1028	Top Flite Supreme Debonder 1oz	2.99
TOPR1040	Supreme 6 Minute Epoxy 9oz.	7.99
TOPR1043	Supreme 30 Minute Epoxy 9oz.	7.99
TOPR2410	MonoKote Scissors w/Sharpenr	9.99

X-ACTO

XACR2087	No.5087 Deluxe Knife & Tool Chest	37.99
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More Plans and Kits:

A catalog from Bell Model Aircraft Co., 650 Pine Crest Drive, Largo, Florida 34640, (813) 584-4003, lists a number of kits, plans, and 3-views of interest to scale modelers. The kits are for small free flight scale models that might be used to enlarge for R/C use. Some of the 3-view drawings are of unusual aircraft, the Douglas B-23 for example. This was a bomber development with roots in the DC-3/C-47 aircraft. I have never seen a model of this aircraft but I am sure one would fly very well. The Curtiss R3C-3 racing float plane is another unusual design and I never before heard of the Sullivan K-3 Crested Harpie. This is a low wing light aircraft design with what looks like a Kinner engine. □

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RCM PRODUCT REVIEW

FUTABA'S 7UGFS

By Don Edberg



LEFT: Photo #1: The 7UGFS is Futaba's latest entry into the world of sailplane radios. It will operate the simplest 2-channel models up to the most complicated "full-house" F3B sailplanes, as well as sport aerobatic "fun-fly" aircraft. RIGHT: Photo #2: Here is what you get when you open the Futaba 7UGFS box. Transmitter can hold up to four different models in its memory. How come it doesn't come with four receivers?



The 7UGFS is Futaba's latest entry into the specialized sailplane radio (Photo #1). Physically, it looks very similar to the other radios in the Super 7 series, but there are a few subtle changes. A knob has been added to the upper left side to control wing camber. A three-position switch is set just above the left-hand stick (the "throttle" stick, in reverence to the power fliers around) to switch between flight modes. The programming in this radio is completely different from the older transmitters, and improved greatly for sailplanes, taking care of all the previous inadequacies.

The 7UGFS comes with three different aircraft programs: GLID2F, GLID1F, and ACRO. The former two are intended for sailplanes with two aileron servos and either two or one flap servos, while the latter is for aerobatic models whatever they be; slope sailplanes or power models. Unlike the earlier radios, these new ones do not include any helicopter programming.

The 7UGFS System includes the transmitter, FP-R148DF micro receiver, receiver battery (both receiver and transmitter batteries are rechargeable 500 mAh packs), switch harness, two S133 micro servos, an aileron extension, and a bunch of accessories such as frequency

flags and numbers, and a 43 page manual (Photo #2).

Until recently, Futaba has not been known for the quality of its manuals, but there are some features of this manual that make the situation much better. Each programming function is explained in the

manual, but most important, there are several pages of step-by-step instructions on how to set up a competition sailplane with six servos total: elevator, rudder, two ailerons, and two flaps.

The FP-R148DF receiver that came with the system weighed 1.09 ozs. (31g). This



Photo #3: The tiny receiver included with the Futaba 7UGFS is small enough to fit almost anywhere. Stock 2-channel system weight is just 6.4 ozs. For hand launch, it may be reduced to 3.4 ozs. (see text).

PICK YOUR POISON AND GET READY TO ROCK 'N ROLL!



Stinger 10

Fuselage Length: 23 7/8"
Rec. Engine Size: .09-.15
Flying Weight: 29 oz.-38 oz.

Wing Span: 36"
Wing Area: 270 sq. in.
Radio Channels: 4



Stinger 40

Fuselage Length: 35"
Rec. Engine Size: .32 to .46
Flying Weight: 4 3/4 to 5 1/4 lbs.

Wing Span: 48"
Wing Area: 528 sq. in.
Radio Channels: 4



Stinger 120

Fuselage Length: 48 1/4"
Rec. Engine Size: .91-2.2 2-stroke;
1.20-1.60 4-stroke
Flying Weight: 11 lbs. and up
Wing Span: 80 1/4" or 72 1/4"

Wing Area:
1344 sq. in. for 80 1/4"
or
1210 sq. in. for 72 1/4"
Radio Channels: 4



Stinger

Fuselage Length: 52 1/2"
Rec. Engine Size: 1.2-4.2 cubic in.
Flying Weight: 14 lbs. and up

Wing Span: 84"
Wing Area: 1596 sq. in.
Radio Channels: 4

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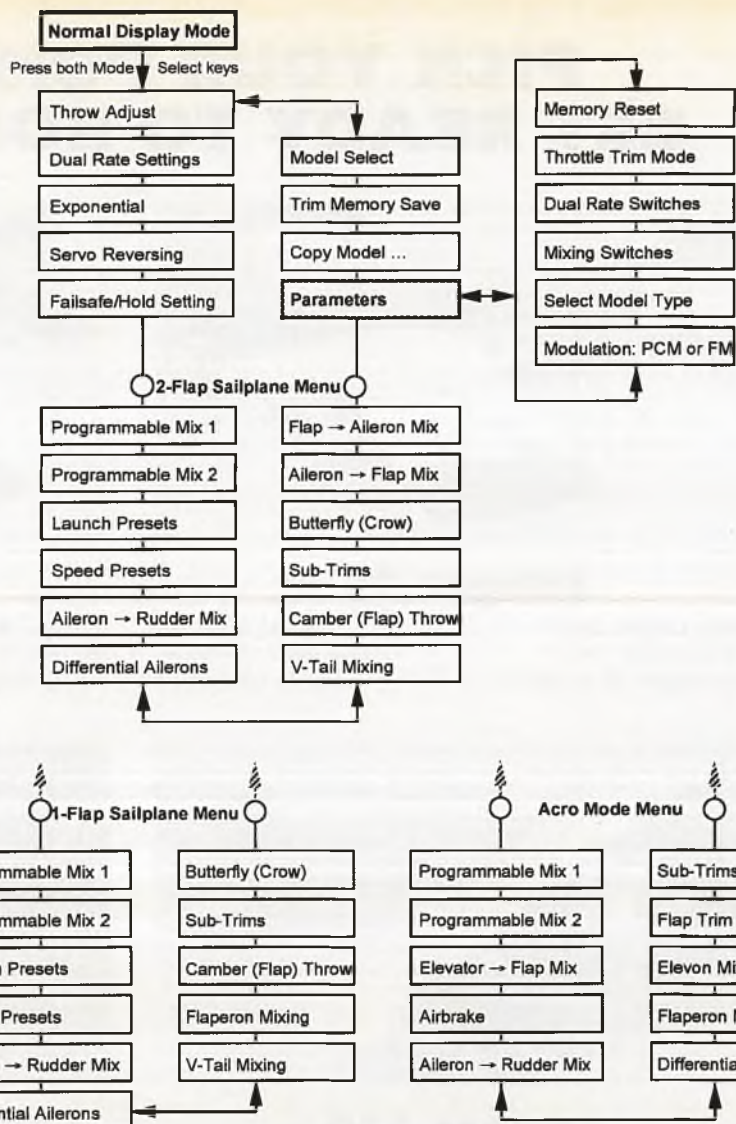


Figure 1: The menu structure on the Futaba 7UGFS contains settings for sailplanes with one or two flap servos, or an acrobatic model. The transmitter can hold four model set-ups in any combination of types.

micro receiver resembles a 7-pack of chewing gum, measuring 2.18" x 1.0" x 0.90" (55.4 x 25.4 x 22.9mm) and is small enough to fit almost anywhere (Photo #3). This yields a stock 2-channel system weight of 6.4 ozs. (181g). Folks who are interested in hand launch or light aerobatics may wish to remove the receiver case, which cuts weight down to 0.78 oz. (22.2g) and voids the manufacturer's warranty. If you do this, you can achieve an airborne weight of 3.4 ozs. (96g), including the stripped receiver, two S133 servos, and a (custom) 110 mAh battery pack (but no switch — plug directly into the receiver). Not bad!

Let's look into the 7UGFS features. Software-wise, the transmitter has memories for four different models. These four may be any combination of GLID2F, GLID1F, and ACRO model types. It is possible to copy any memory into any other one (erasing what's there, of course), or the memory may be cleared for a fresh start. Unfortunately, the memories are identified by number only, no alphabetic names, so we ended up writing the model set up

number on a small piece of tape on the transmitter front.

Although the system comes with a PPM (FM) receiver, the modulation of the transmitter may be switched to PCM as well, meaning that it may be used with existing receivers. The servo order is fixed for both versions, and, in fact, is the same as Futaba's standard, so those readers with other Futaba systems will be able to use your existing set-ups without even unplugging any servos!

Programming is done by hitting the two MODE SELECT (left-hand) keys simultaneously. When this is done, the screen displays the different programming options, one at a time. One steps up and down through the menu by pressing either of the two MODE SELECT keys. The different programming options are shown in Figure 1.

Computer Radio Functions

The 7UGFS has all the standard computer radio programming features: Adjustable Travel Volume (ATV, used to set the servo throws in each direction), Dual Rates

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(switchable control authority for ailerons, rudder, and elevator), Reverse (REV, used to switch servo direction), Exponential (EXP, used to change the response curve of aileron, elevator, and rudder), and Subtrims (STRM, used to electronically set the servo neutral positions and adjust for linkages).

The radio also has two programmable mixers, PMX1 and PMX2. These may be used to mix between any two desired channels, and the mixing rates may be set independently for each throw direction.

One neat feature of the 7UGFS is the Trim Memory function. Ever wonder whether the trim tabs were where you left them last? This radio can memorize your trim positions so that you don't ever have to worry about it. Here's how: We start by trimming the airplane out by moving the trim tabs to wherever they have to be. Next, we go into the trim memory mode and press the two Data Input keys. This loads the actual trim offsets into memory, so that now the trims may be centered. Futaba provides a detent in each trim tab so the center position is easy to find. Presto! All you have to do is center the trims and you can be sure that the model is in the same trim state.

Sailplane Functions

Let's step through the sailplane menus as shown in the figure (we'll skip the Programmable mixers, since we already talked about them). One of the handiest function on the 7UGFS is the preset switch, which may be used to switch between preset positions for launching, normal flight, and

speed. To do this, one scrolls down the menu to the STAT or SPED menus (STAT stands for "start," the German word for launch). One activates the switch, then simply sets the offset position by inputting a percentage for each aileron and flap servo, and elevator.

Aileron → Rudder mixing, also called rudder coupling, is available. One may set a different amount of mixing for each aileron direction, and it may be set on all the time or switched on and off with the rudder dual-rate switch.

Differential and flaperon settings are used to link the two aileron servos together. Differential allows one to set different aileron travel in the up and down direction,

while flaperon allows both ailerons to move up or down simultaneously.

V-Tail is the mixing that allows you to use two servos, one for each side of a V-tail, without needing a mechanical mixer.

The Flap Trim (FLTR) setting is used to set up full-span camber changing. It is controlled by a small knob on the top left side of the transmitter. This function would be better suited to control with a lever, as it is hard to feel the location the knob is turned to without turning it to one end or the other.

Butterfly mixing (BFLY, also known as "crow") allows you to set up a way to get effective glide path control without spoilers. When you activate the Butterfly mixing, both ailerons move upwards, while

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the flaps move downwards. The ailerons still provide roll control, but the resulting drag makes precision approaches and landings much easier.

Aileron→ Flap mixing (A→ F) is used to make the two flap servos move with the ailerons to increase roll authority. This really makes a dramatic difference in how a model flies, turning a sluggish responding model into a nimble one. This function has a unique feature that we have not seen on any other radios: Aileron Trim Mode Setting (AITR). This function allows you to choose whether the aileron trim tab moves just the ailerons — or both the ailerons and flaps simultaneously. In other words, when this is on, the aileron trim moves the entire trailing edge, a better way to trim a model than to have just the ailerons move.

Flap→ Aileron mixing is used to make both ailerons move together as flaps, when the camber changing knob is rotated.

Acro Functions

This radio is well-suited to the "Lawn Dart" type of aerobatic models as well. The two programmable mixers, along with the special acro mixing features make this radio very easy to use.

Elevator→ Flap mixing (2→ 6) applies mixing from elevator to flap. When you turn on this mixing, your aircraft will make very crisp corners in maneuvers. Like the other mixers, the rate of mixing may be set differently for up and down elevator commands.

Air Brake (ABRK) mixing is also available. It may be set up in two ways. The first way, called Linear mixing, makes it so that at a certain definable throttle position, the ailerons and elevator begin moving to a different position (somewhat similar to the Butterfly function in the sailplane menus). The maximum offsets occur at low throttle.

Offset Airbrake mixing is similar, only not proportional. When the throttle is moved below the preset position, the

ailerons and elevator jump to the new preset positions which are again definable. Of course, aileron and elevator controls are still active, so you can fly the thing safely as it makes a steep descent.

The rest of the ACRO functions listed in the figure operate the same as the functions that were described earlier in the sailplane section.

Special Functions

The 7UGFS has several functions that are very useful. In the PCM mode, it is possible to choose from two different types of operation if interference is encountered. The first is called HOLD, which places the servos in the position they were just before the interference arrived. The second is called FAILSAFE, and places the servos into preset positions, that the operator defines before flying.

What is interesting is that it is possible to choose HOLD or FAILSAFE for each

continued on page 117

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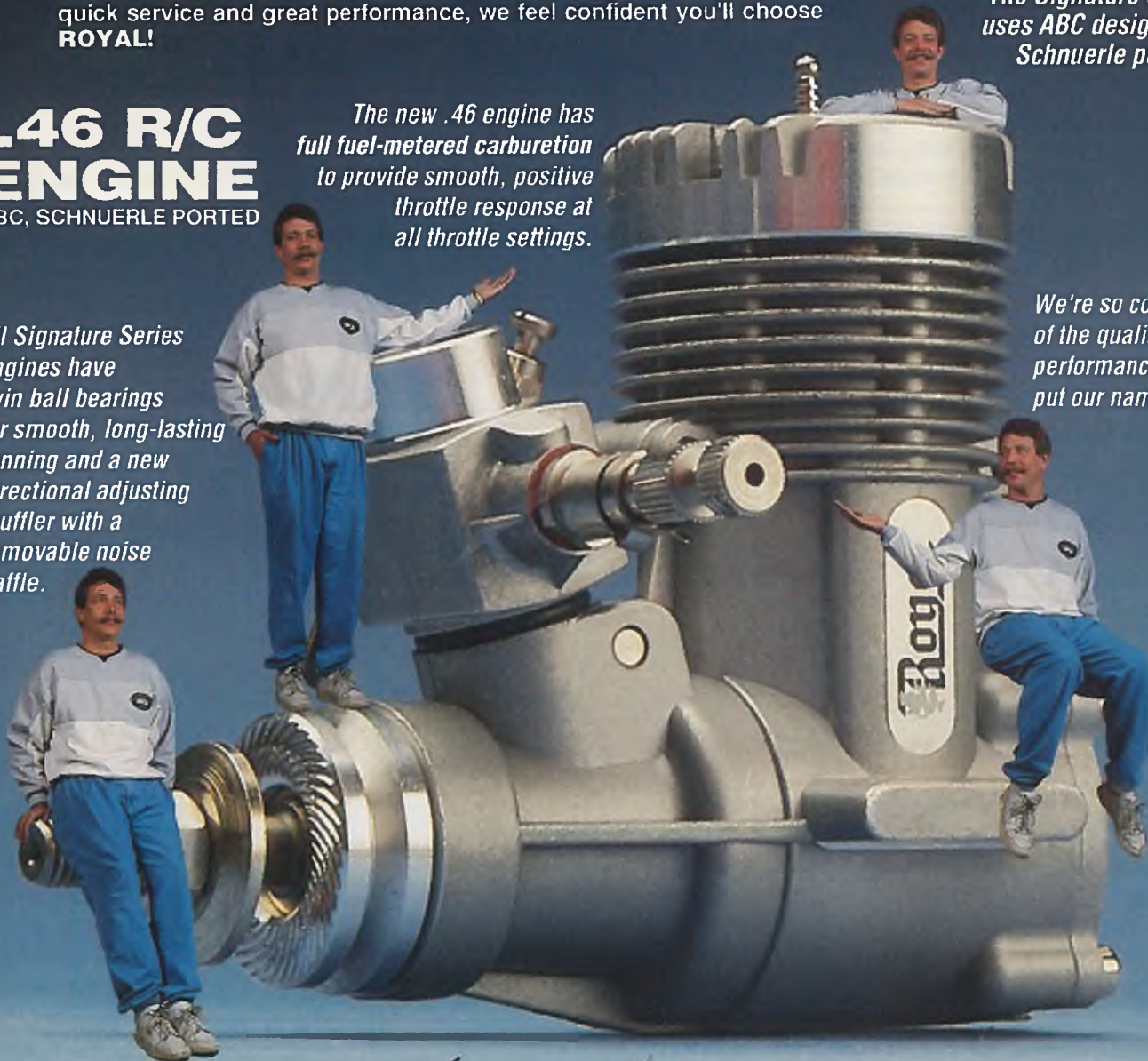
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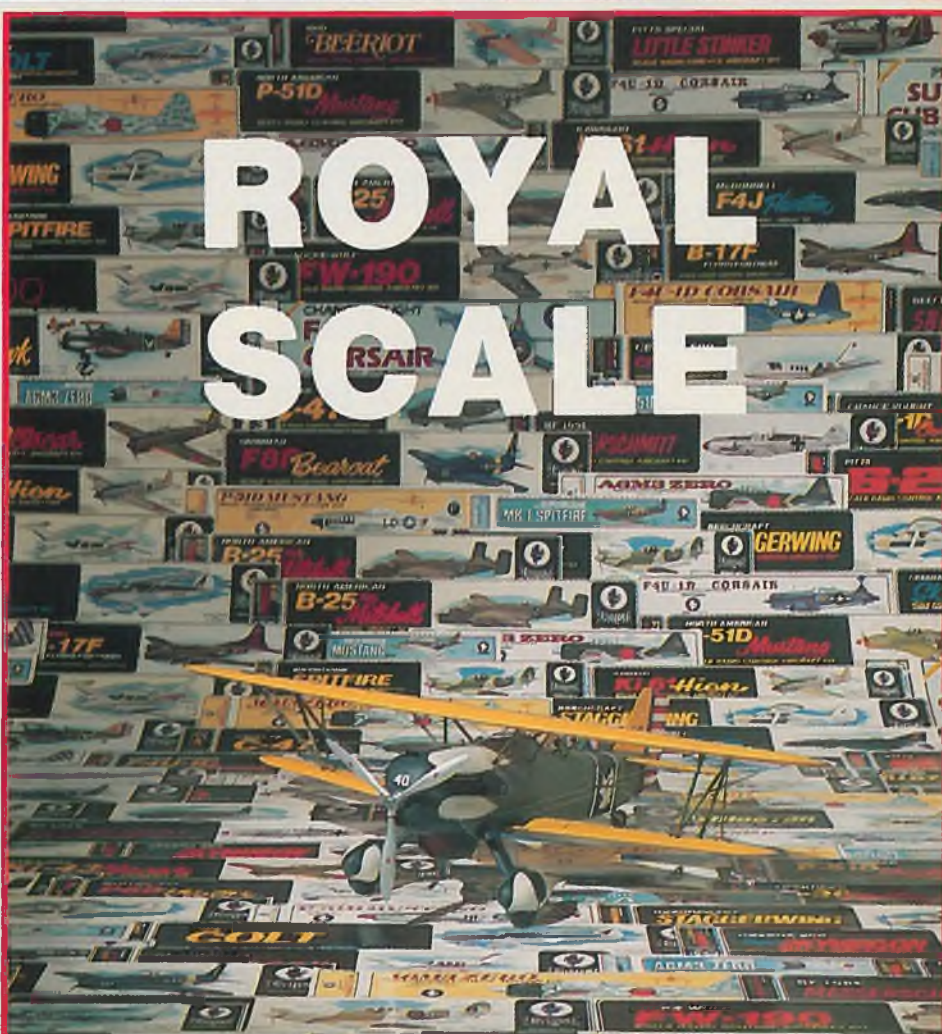
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continued from page 112

servo! You can have the throttle go to low, for example, while the ailerons and elevator stay where they were.

You may choose how the dual rates and the programmable mixers are activated by going into the Combination (COMB) and Programmable Mixing Switch (MXSW) menus. These functions define which dual rates and mixers go on when the Dual Rate and Mix switches are activated.

The menus are set up to protect against accidentally changing model memories or deleting a memory. The PAR menu must be entered manually in order to switch model memories, model type, or modulation type. It cannot accidentally be entered.

Programming

The programming of the 7UGFS is pretty straightforward. One just presses the two Mode Select keys (on the left side) to enter the programming mode. Then the Cursor right or left keys (the center two keys) are pressed to step through the menu items until you reach the menu you want to use. The two data input keys (right two keys) are then used to enter data numerically, usually in percentages from -100% to +100%. In the cases where the rates vary from one side to another (i.e., aileron left and right throws are set separately), one simply moves the stick to get to the appropriate setting. If a receiver and servos are turned on, you immediately see the effect of the numerical

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change. When satisfied, one presses the two Mode Select keys to leave the programming mode.

The radio can accommodate any of Modes I, II, III, or IV electronically, but comes in Mode II unless specially-ordered in Mode I.

Transmitter Feel and Adjustments

The 7UGFS has a good feel to the hands, and was liked by all who sampled it, from very small to very large hands. The

transmitter comes with a neck strap hook, but does not include the neck strap, so be sure to pick one up if you prefer this mode of flying. The stick length and tension is adjustable for the three centering controls (aileron, elevator, rudder). A trainer cord (not included) may be used to link up two transmitters for the teaching of beginners.

We did run across one annoyance: it took us a little while to figure out that if the transmitter is powered up with either Air

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(512) 335-9777 (512) 335-1925 fax
Satisfaction Guaranteed or Your Money Back

Brake or Butterfly mixing switches activated, it will emit a loud beep until the offending switch is deactivated. This is to prevent you from flying with these mixers on and getting a big surprise. You do have to switch the Butterfly function on before landing; you learn this after you discover it doesn't work with the mixer switch turned off!

Flying

We elected to do a rigorous range test with this new receiver. The airborne pack was loaded into a two meter sailplane and launched with the transmitter antenna collapsed. We then attempted to climb as high as possible to see when control would be lost. To make a long story short, we never lost control despite climbing to a height of 1800' (as verified by an altimeter watch)! This is a very "hot" receiver!

We then went home and left the radio on to see how long the battery would last. The low-voltage alarm sounded off at 230 minutes, almost **four hours** of operation!

We programmed the radio for a "full-house" F3B sailplane and found that set up was very simple with the reversing and subtrims available (the functions could be programmed with each servo randomly oriented). The 7UGFS could do all the desired functions easily. Individual settings for each wing servo for Start and Speed made these set-ups very simple and straightforward.

Summary

The new Futaba 7UGFS is a radio that will meet the demands of the most particular sailplane pilot. We fully recommend checking one out at your local dealers — you will not be disappointed. □

PRATHER RECORD BREAKING BOATS

WHY CHOOSE A PRATHER BOAT?

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- Quality Workmanship
- Quality Performance

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(Ready to Run Gasoline Boat)

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SPECIAL FEATURES:
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2112	4-120 BIPE 4-CYCLE PLANE	129.96
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3049	BINGO 40 SPORT	66.96
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3048	WHIZ 40 STANDARD	66.96
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2119	EXTRA 230 30%	229.96
2120	EXTRA 230 33%	239.96
3431	SIMPLE P-51 35in 049-051	26.96
3432	SIMPLE ME-109 35in 049-051	26.96
3433	SIMPLE CAP 21 35in 049-051	32.96
3434	SIMPLE EXTRA 230 35in 049-051	32.96
3435	SIMPLE STAGGERWING 35in 09-15	39.96



AEROCRAFT



WING SPAN: 52 in RADIO: 4ch W/5-servos
WING AREA: 620 sq in WT: 4 - 4 1/2 lb
ENGINE: 25-46

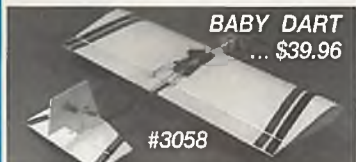
3436	APACHE 10-15	41.96
3437	SNAPPER 10	34.96
3438	SNAPPER 40	58.96
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2122	PORTERFIELD W/GEAR 25	169.96
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3264	111XL PEAK CHGR AC/DC 1-16C	89.96
3265	112PK SUPER CHGR DC 4-36C	119.96

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3059	MEGA DART 60	89.96
3153	SPORT DART 40	54.96



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SUPER STEARMAN



ASP ENGINES



- DUAL B. BEARINGS
- H.D. CON ROD
- QUIET MUFFLER
- 90 DAY WARRANTY
- EASY STARTING

ASP 40 R/C

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2166	ASP 61 FSR RING R/C W/MUFF	92.96
2167	ASP 75 FSR ABC R/C W/MUFF	109.96
2168	ASP 91 FSR ABC R/C W/MUFF	127.96
2169	ASP 108 FSR ABC R/C W/MUF	179.96
3045	ASP 65 4-CYCLE W/MUFF	176.96
2773	ASP 80 4-CYCLE W/MUFF	189.96

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High performance ready-to-cover QUICKIE 500

BRIDI MODELS



SPAN: 63.50 in
RADIO: 4-5 CH
ENGINE: 50-61

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- TRAINER SYSTEM
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- DUAL RATES AIL-ELEV

#2138 ..\$174.96



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- EASY STARTING
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2244	19 R/C W/MUFF	59.96
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2246	25 SS BB R/C W/MUFF	94.96
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2249	35 H BB HELO R/C WO/MUFF	129.96
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2252	40 CX BB R/C W/MUFF	134.96
2253	45 CX BB R/C W/MUFF	144.96
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2142	831 MINI BB SERVO	28.96
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2154	SAGITTA 900 SAILPLANE	94.96
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The **INFINITY** series features memory for four models, user assignable transmitter switches, dual rates on ailerons, elevator and rudder, two fully adjustable snap roll programs, and a plug in module.



- EASY PROGRAMMING
- 4 - 102 H.D. SERVOS
- 91 DC NARROW RECEIVER
- NICADS W/CHGR

2139	INFINITY 600A FM W/4 102	329.96
2140	INFINITY 600A PCM W/4 102	369.96
3046	INFINITY 660A FM W/4-102	359.96
3047	INFINITY 660A PCM W/4-102	374.96

DIRECT R/C



WING SPAN: 47in RADIO: 4ch
WING AREA: 535 sq in WT: 5-1/2 lb
ENGINE: 40-46 2C

2194	YARD DART FUN FLY 25-40	89.96
2195	ULTIMATE KAOS 40	89.96
2196	ULTIMATE KAOS 60	99.96
2197	DODDGER 500 RACER	49.96
2198	PATTERN BAT 10	29.96

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2228	WANDERER 72 SAILPLANE	27.96
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2230	SKETEER HL SAILPLANE	17.96
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2232	BUTTERFLY MK3	55.96
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2234	FUN SCALE P-51 25-40	67.96
2235	FUN SCALE P-51 40-60	71.96
2236	FUN SCALE CORSAIR 40-51	74.96
2237	FUN SCALE SPITFIRE 40-51	74.96
2238	FUN SCALE P-40 40-51	74.96
2239	STANDARD CLASS HI-START	49.96
2240	OPEN CLASS HI-START	55.96
2241	OPEN SMALL FIELD UP-START	29.96



SPAN: 81in
AREA: 1150 sq in
RADIO: 4ch
ENGINE: 90 2C 120 4C



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2277	DECATHLON 25	149.96
2278	DECATHLON 40	279.96
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2769	CHIPMUNK 30	189.96
2770	MYSTIC 30 AEROBATIC	199.96
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3093	BACCARA 25 PATTERN	179.96
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2290	40BB R/C DELUXE W/MUFF	86.96
2291	40BB R/C Q-500 W/MUFF	124.96
2292	45BB R/C W/MUFF	94.96
2293	50BB R/C W/MUFF	96.96
2294	60BB EAGLE IV RING W/MUFF	119.96
2295	60BB EAGLE IV ABC W/MUFF	129.96
2296	60BB EAGLE IV ABC PIPE TIME	129.96
2297	74BB EAGLE IV RING W/MUFF	129.96
2274	74BB EAGLE IV ABC W/MUFF	144.96

An American made ball bearing engine that offers excellent power, long life and easy to start. Comes complete with a quiet muffler.

40 BB R/C



FUTABA RADIOS

7UAFS

SUPER SEVEN FM

- DC NARROW RX
- 4-148 SERVOS
- SERVO REVERSING
- MIXING
- ADJ TRAVEL ATV
- ALL NICAD W/CHGR
- TRAINER SYSTEM



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2353	SKYLANE 10-15	27.96
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2318	5102 MICRO BB W/MET GR 55.6	44.96
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2321	9201 BB HT AIRCRAFT 69.5oz	44.96
2322	9301 BB HT CORELESS 69.5oz	44.96
2323	9401 BB MINI CORELESS 44.5oz	44.96
2324	9302 BB HT CORELESS 99oz	64.96
2325	9601 MINI BB CORELESS 36oz	44.96
2327	153 BB PRO GYRO	119.96
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2327	ACROSTAR 60 RTF	239.96
2328	PROFESSOR ELECTRIC RTF	164.96



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HOUSE OF BALSA

2383	P-51 MUSTANG 20	31.96
2384	T-6 TEXAN 20	31.96
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2386	2 X 6 SAILPLANE	20.96
2387	2T SAILPLANE	24.96
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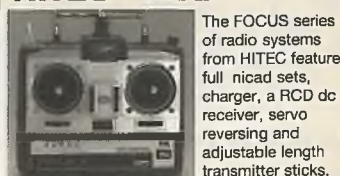
K&B MFG

2422	20 R/C SPORTSTER W/MUFF	44.96
2423	28 R/C SPORTSTER W/MUFF	49.96
2424	45 R/C SPORTSTER W/MUFF	64.96
2425	65 R/C SPORTSTER W/MUFF	69.96
2426	40 R/C BB W/MUFF	74.96
2427	61 R/C BB W/MUFF	89.96
2428	3.5CC OUTBOARD	119.96
2429	7.5CC OUTBOARD	144.96
2430	11CC OUTBOARD	229.96
2431	7.5CC INBOARD MARINE	119.96
2432	11CC INBOARD MARINE	224.96
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2434	82 DUCTED FAN STANDARD	234.96
2435	82 DUCTED FAN BYRON	239.96

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HITEC - RCD



FM R/C SYSTEMS

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3368	7 CH PRISM W/ 4-422	259.96

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3194	SUB MICRO METAL GEAR 24oz	34.96
3195	MICRO SERVO 24oz	21.96
3196	MICRO METAL GEAR 24oz	29.96
3197	STANDARD SPORT 42oz	11.96
3198	PRO SERVO 43oz	15.96
3199	PRO SERVO BB 43oz	18.96

RCD MICRO 5CH DC RECEIVERS

3200	MICRO 5CH FM FUT-J	69.96
3201	MICRO 5CH FM AIR	69.96
3202	MICRO 5CH FM JR	69.96

RCD PLATINUM 7CH DC RECEIVERS

3203	PLATINUM 7CH AM FUT-J	64.96
3204	PLATINUM 7CH AM AIR	64.96
3205	PLATINUM 7CH FM FUT-J	69.96
3206	PLATINUM 7CH FM AIR	69.96
3207	PLATINUM 7CH FM JR	69.96

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2401	SWIFT AT SLOPE SAILPLANE	42.96
2402	SWIFT 46 SLOPE SAILPLANE	42.96
2403	MINI X-CELL SLOPE SAILPLANE	59.96

JR RADIOS

MAX 4AM

#2404 ...\$119.96

- 4CH AM 91 SYSTEM
- 3- 507 H.S. SERVOS
- NICADS W/CHG
- SERVO REVERSING



2786	507 STANDARD HS SERVO	16.96
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3036	MAX 4CH GLIDER W/2-341	167.96
2405	MAX 4CH FM SYS W/3-507	144.96
2406	MAX 6CH FM SYS W/4-507	189.96
2407	MAX 5CH FM HELI SYS W/5	249.96

X-388S

The X-388S 8 channel systems from JR has all the special features required by the advanced aircraft, helicopter, and sailplane enthusiast.

Features common to all of the systems include dual rate, exponential rate, travel adjustment on all 8 channels, sub trims on all 8 channels, full nicad packs, a timer, and a sophisticated trainer system.

X-388S DOES-IT-ALL SYSTEMS

3114	X-388S FM AIR W/507	424.96
3115	X-388S FM AIR W/517BB	469.96
3118	X-388S PCM AIR W/517BB	514.96
3119	X-388S FM HELI W/5-517BB	514.96
3120	X-388S PCM HELI W/ 5-517BB	559.96
3121	X-388S FM GLIDER W/ 2-341	479.96
2409	X347 FM AIR SYS W/4-507	344.96
2410	X347 FM HELI SYS W/5-507	374.96
2411	X347 PCM AIR SYS W/4-507	409.96
2785	X347 PCM AIR W/4-517BB	435.96
2413	X347 PCM HELI W/5-517BB	459.96
2414	PCM 10S PATTERN W/4-517BB	824.96
2415	PCM 10S HELI SYS W/5-517BB	869.96
2786	507 SPORT HS SERVO 40oz	16.96
2416	517 HS BB SERVO 40oz	31.96
2417	501 STANDARD BB SERVO 40oz	29.96
2418	321 MICRO BB SERVO 32oz	39.96
2419	4131 CORELESS BB 90oz	57.96
2420	4421 CORELESS BB 83oz	59.96
2421	4721 CORELESS BB 119oz	59.96

SHIPPING & HANDLING: UPS Ground Continental USA: \$5.95, UPS 2nd AIR: \$5.95 plus 10% of subtotal, UPS NEXT DAY AIR: \$14.00 plus \$1.25 per lb. AIR PARCEL POST: \$5.95 plus 10% of subtotal. C.O.D. OK, add \$5.50 for COD fee.

HOURS: Mon & Fri 9:30 - 8:00, Tue & Wed 9:30 - 5:30, Thur 9:30 - 9:00, Sat 9:30 - 6:00 & Sun 10:30 - 5:00

SHELDON'S HOBBIES

2135 OLD OAKLAND ROAD SAN JOSE CA.95131

ORDER DEPT:
(800) 822-1688
CUSTOMER SERVICE:
(408) 943-0872
FAX: (408) 943-0904

LANIER MODELS



STINGER

3318	STINGER 10	38.96
2450	STINGER	159.96
2615	STINGER 120	134.96
2440	DART 40-60 RTF	64.96
2441	COMET 45-60 RTF	64.96
2442	SLOW COMET 40-60 3CH RTF	69.96
2443	TRANSIT RTF	69.96
2444	CAPRICE RTF	69.96
2445	JESTER 60 RTF	69.96
2446	P-51 SPORT RTF	64.96
2447	JAVELIN RTF	54.96
2448	LASER 45-61 RTF	94.96
2449	INVADER 45-60 RTF	99.96
2451	FUN FLY 40 RTF	49.96
2452	TR-260 AEROBATIC	99.96
3341	LASER 200 1/4 SCALE	149.96

LONG TAI SHIN

2453	DAS UGLY STICK RTF 40	109.96
2454	DAS UGLY STICK RTF 60	129.96



UGLY-STICK

BOB MARTIN


2455	ET-25 TRAINER	27.96
2456	ET-40 TRAINER	44.96
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2458	BOBCAT SLOPE SAILPLANE	29.96
2459	TALON SLOPE SAILPLANE	29.96
2460	KATIE II SLOPE W/DURELENE	74.96
2461	COYOTE SLOPE W/DURELENE	87.96
2462	SR-7 SLOPE W/DURELENE	89.96



PUSSYCAT # 2457
... \$26.96

MAGNUM

The **MAGNUM** series of model engines are all schnuerle ported and manufactured on state of the art equipment to exact tolerances for top performance and long life.



2463	GP 10 R/C W/MUFF	42.96
2464	GP 15 R/C W/MUFF	45.96
2465	GP 25 R/C W/MUFF	47.96
2466	GP 40 R/C W/MUFF	49.96
2467	GP 65 R/C W/MUFF	89.96
2468	PRO 25 FSR BB R/C W/MUFF	79.96
3025	PRO 36 FSR BB R/C W/MUFF	89.96
3043	PRO 36 FSR BB HELI WO/MUFF	109.96
2469	PRO 40 FSR BB R/C W/MUFF	94.96
3187	PRO 46 FSR BB R/C W/MUFF	97.96
2901	PRO 61 FSR BB R/C W/MUFF	129.96

MIDWEST PROD



MIDWEST
NORTH AMERICAN AT-6

WING SPAN:	81 in	RADIO:	4ch - 5 servo
WING AREA:	937 sq in	WT:	12-13 lb
ENGINE:	90-1.08 2C		
	120 - 150 4C		

MID177... \$229.96

- Easy to build
- Easy to fly
- All wood
- Fully sheeted wing
- Laser cut aircraft ply
- Machine cut balsa
- Full sized plan set
- Complete mylar markings
- Detailed molded canopy
- Pictorial instruction book
- Retract or fixed gear
- ABS cowl & wing fairing

RB7620 AT-6 RETRACTS \$149.96

PICA PRODUCTS

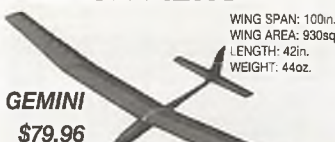
2509	SPITFIRE 1/6 SCALE	114.99
2510	T-28B 1/16 SCALE	124.99
2511	FOCKE WULF 190 D-9 1/6 SC	124.99
2512	WACO F3 BIPE 1/6 SCALE	134.99
2513	P-51 MUSTANG 1/6 SCALE	189.99
2514	CESSNA 182 1/6 SCALE	139.99
2515	BUCKER JUNGMEISTER 60	129.99
2516	DUELLIST TWIN 40	139.99
2517	WACO F3 BIPE 1/5 SCALE	189.99
2518	CESSNA 1/5 SCALE	183.99
2519	T-28B 1/5 SCALE	189.99
2520	SPITFIRE 1/5 SCALE	198.99
2521	P-51 MUSTANG 1/5 SCALE	239.99
2522	RETRACTS SPITFIRE 1/6 SC	163.96
2523	RETRACTS T-28 1/6 SC	199.96
2524	RETRACTS FW-190D 1/6 SC	172.96
2525	RETRACTS DUELLIST	199.96
2526	RETRACTS T-28 1/5 SC	199.96
2527	RETRACTS SPITFIRE 1/5 SC	229.96
2528	RETRACTS MUSTANG 1/5 SC	289.96

P-51D 1/6 SCALE



Ready for some real action? Pica's P-51 is the plane for you. Features a 74in wingspan, 950 sq. in. of wingarea and will take any .75-.91 2-cycle or .90-1.20 4-cycle for its power-plant. This all balsa kit comes with easy to follow plans and instructions.

PIERCE AERO



GEMINI
\$79.96

WING SPAN: 100in.
WING AREA: 930sq in.
LENGTH: 42in.
WEIGHT: 44oz.

A SUPERIOR MULTI-TASK SAILPLANE

2529	PARAGON 118IN SAILPLANE	64.96
2530	GEMINI M-T-S SAILPLANE	79.96
2531	RIDGE RAT SLOPE SAILPLANE	39.96

RJL ENGINES

61R/C



RPM: 2,000 - 13,000
WEIGHT: 190Z
HP: 1.8
PROP: 11X7 - 12X6

ONLY \$2783...\$109.96

- SCHNURLE SCAVENGED FOR HIGH PERFORMANCE AND A RELIABLE IDLE
- DUAL BALL BEARINGS
- QUIET MUFFLER
- EASY TO ADJUST CARBURATOR

MADE IN THE USA

ORDER DEPT: (800) 822-1688

21ST CENTURY

SPACE AGE FILM 6FT

3369	WHITE 6FT	9.96
3370	LIGHT RED 6FT	9.96
3371	DARK BLUE 6FT	9.96
3372	ORANGE 6FT	9.96
3373	BLACK 6FT	9.96
3374	CUB YELLOW 6FT	9.96
3375	DARK RED 6FT	9.96
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3379	NEON ORANGE 6FT	11.96
3380	NEON GREEN 6FT	11.96
3381	NEON RED 6FT	11.96

SPACE AGE FABRIC 6FT

3382	WHITE 6FT	12.96
3383	LIGHT RED 6FT	12.96

ROYAL PRODUCTS

46L BB R/C W/MUFF

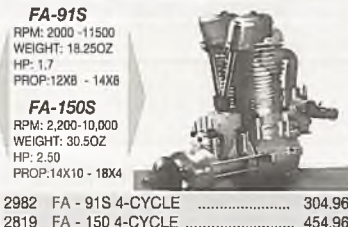
- SCHNURLE INTAKE
- TWIN BALL BEARINGS
- EASY CARB TO ADJ
- QUIET MUFFLER
- VERY POWERFUL
- LONG STROKE

... \$74.96



2532	25 BB R/C W/MUFF	59.96
2533	28 BB R/C W/MUFF	64.96
2534	40 BB R/C W/MUFF	69.96
2535	46 BB R/C W/MUFF	74.96
2536	20T RTF BASIC (FBA) TRAINER	82.96
2537	20H RTF TRAINER	79.96
2538	20S RTF SHOULDER WING	79.96
2539	20L RTF LOW WING	79.96
2540	40T RTF BASIC (FBA) TRAINER	99.96
2541	40H RTF TRAINER	99.96
2542	40S RTF SHOULDER WING	99.96
2543	40L RTF LOW WING	99.96

SAITO ENGINES



FA-91S
RPM: 2000 - 11500
WEIGHT: 18.25OZ
HP: 1.7
PROP: 12X8 - 14X8

FA-150S
RPM: 2,200-10,000
WEIGHT: 30.5OZ
HP: 2.50
PROP: 14X10 - 18X4

2982	FA - 91S 4-CYCLE	304.96
2819	FA - 150 4-CYCLE	454.96

SIG MFG.

FOUR STAR SERIES



40 #2583	WING AREA: 604 SQ IN	
..... \$51.96	WING SPAN: 59.75 IN	
	WEIGHT: 4.5LBS	
	ENGINE: 30-40 2C, 40-50 4C	
120 #3008	WING AREA: 1204 SQ IN	
.... \$134.96	WING SPAN: 81 IN	
	WEIGHT: 10-12LBS	
	ENGINE: 91-1.08 2C, 1.20 4C	

2566	PIPER J-3 CUB	49.96
2567	RYAN STA	104.96
2569	KOMMANDER	54.96
2570	LIBERTY SPORT BIPE	79.96
2571	SKYBOLT BIPE	79.96
2572	KOUGAR MKII	54.96
2573	SMITH MINIPLANE BIPE	64.96
2574	KAVALLER	57.96
2575	DOUBLER II	36.96

3384	DARKK RED 6FT	12.96
3385	CUB YEL 6FT	12.96
3386	DARK BLUE 6FT	12.96
3387	LIGHT BLUE 6FT	12.96
3388	ORANGE 6FT	12.96
3389	CREAM 6FT	12.96
3390	LEMON YELLOW 6FT	12.96
3391	BLACK 6FT	12.96

SPACE AGE FABRIC 15FT

3392	WHITE 15FT	31.96
3393	LIGHT RED 15FT	31.96
3394	DARK RED 15FT	31.96
3395	CUB YELLOW 15	31.96
3396	DARK BLUE 15	31.96
3397	LIGHT BLUE 15FT	31.96
3398	ORANGE 15FT	31.96
3399	CREAM 15FT	31.96
3400	LEMON YELLOW 15FT	31.96
3401	BLACK 15FT	31.96

TITAN STANDARD SERVO J.G,AIR JR	13.96
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2550 EXPANDED SC VOLTMR 4.8/9.6	11.96

IRON/HEAT GUN COMBO



HEAT GUN

#3056
... \$23.99 !!

IRON

Free iron bootie with each combo deal

Super combo savings on these great modeling tools from **ROYAL PRODUCTS**. Use the iron to apply your favorite film covering material and the gun to shrink it drum tight.

2551	FA-45S 4-CYCLE	184.96
2552	FA-50 4-CYCLE	194.96
2554	FA-65 4-CYCLE	223.96
2556	FA-80 4-CYCLE	244.96
2553	FA-50G GOLD 4-CYCLE	214.96
2555	FA-65G GOLD 4-CYCLE	243.96
2557	FA-80G GOLD 4-CYCLE	269.96
2559	FA-120S GOLD 4-CYCLE	353.96
2560	FA-120SDP DUAL PLG & PMP	374.96
2561	FA-60T TWIN 4-CYCLE	548.96
2562	FA-130TDP DUAL PLUG	573.96
2564	FA-300T DUAL PLUG & PUMP	874.96
2565	FA-325 R5 RADIAL 4-CYCLE	1549.96



#2831
...\$144.96

SPECIFICATIONS
WING SPAN: 84in
WING AREA: 1110 sq in
ENGINE: 90-120 2C
1.20-1.60 4C

2576	KIWI	51.96
2577	HUMMER 1/2A	19.96
2578	P-51 MUSTANG	89.96
2579	KOBRA 20	39.96
2580	KING KOBRA 60	72.96
2581	ASTRO HOG	72.96
2582	CITRABRIA 1/6sc	74.96
2583	FOUR STAR 40	51.96
2584	MID STAR 40	54.96
2585	KADET JUNIOR	37.96
2586	KADET MK II TRAINER	51.96
2587	KADET SENIOR	54.96
2588	KADET SENIORITA	38.96
3008	FOUR STAR 120	134.96

Prices subject to change without notice.
Showroom prices may vary from mailorder prices.



ASTRO HOG

#2581
... \$72.96

WING SPAN: 71 in
ENGINE: 45-60 2C
60-75 4C

One of the easiest and slowest flying low wing airplanes around. Perfect first low wing trainer. Easy to build with its complete instructions and plans.

KADET SENIORITA



WING AREA: 746 sq in
WING SPAN: 63 in
WEIGHT: 4lbs
ENGINE: 15-25 2-C
21-35 4-C
RADIO: 3CH

Very docile and forgiving,
great for the new student
pilot. Easy to build.

#2588
... \$38.96



WING SPAN: 50 in
ENGINE: 40-50 2-C

#2572
... \$54.96



SPAN: 37-1/2 in
AREA: 338 sq in
RADIO: 2-3 CH
WEIGHT: 26-38 oz
ENGINE: 09-19

SIG751
... \$33.96

NOT FOR THE FAINT OF HEART

2767	CLIPPED WING CUB 1/4 SC	139.96
2768	PIPER CUB J-3 1/4 SCALE	149.96
2589	MORRISEY BRAVO 1/4 SCALE	198.96
2590	SPACEWALKER	229.96
2591	RISER 78in SAILPLANE	29.96
2592	RISER 100in SAILPLANE	44.96
2593	NINJA SLOPE SAILPLANE	44.96
2594	SAMURAI SLOPE SAILPLANE	99.96

STERLING MODEL

2595	STEARMAN PT-17	94.96
2596	FOKKER D-7	94.96
2597	F4U-1A CORSAIR	34.96
2598	FLEDGLING 25-40 SPORT	41.96

THUNDER TIGER



2599	EXPLORER 78in RTF SAILPLANE	89.96
2600	20T OLYMPIC RTF TRAINER	89.96
2601	40T SKYLARK RTF TRAINER	109.96
2602	CHAMPION 45L RTF	159.96
2772	SPORT FLYER 40L RTF	139.96

CHAMPION 45L



WEBRA ENGINES



GT SERIES

The new GT series of high performance model engines from WEBRA is the result of many years experience and dedication manufacturing world class products.

3460	32GT ABC R/C W/MUFF	129.96
3461	40GT ABC R/C W/MUFF	134.96
3462	50GT ABC R/C W/MUFF	159.96

- ABC Piston & Sleeve
- Dual Ball Bearings
- New TN-II Carb
- Rugged
- Schnuerle Porting
- Lightweight
- Muffler Included
- 2 Year Warranty

2604	40 BB SILVERLINE R/C W/MUFF	69.96
3148	61 BB SILVERLINE R/C W/MUFF	89.96
2603	32 BB RING SPEED W/MUFF	129.96
2605	40 BB SPEED	119.96
2606	40 BB SPEED ABC	134.96
3027	40 BB H-PER SPD ABC W/MUFF	129.96
2607	40 BB Q-500 W/MUFF	189.96
2610	61 BB SPEED W/MUFF	199.96
2611	61 BB RE RACE ABC	189.96
2612	61 BB RE RACE ABC W/PUMP	349.96
2613	91 BB SPEED ABC W/TN	229.96
2614	91 BB SPEED ABC & DYN	239.96
2820	1.20 BB SPEED TN W/MUFF	239.96

YS ENGINES

Unique pressure-pump system, ABC piston/sleeve combination, dual ball bearings, excellent workmanship: all add up to an extremely high performance and long lasting contest/sport engine.



2627	45BB ABC R/C S.E. WO/MUFF	149.96
2628	45BB ABC R/C R.E. WO/MUFF	149.96
2629	61BB ABC R/C S.E. WO/MUFF	259.96
2630	61BB ABC R/C R.E. WO/MUFF	259.96
2631	61BB ABC R/C R.E. W/CHAM	349.96
2632	120 4-CYCLE W/PUMP	379.96
2633	120 4-CYCLE W/CHAMPER	529.96
2634	45 MUFFLER FOR SIDE EXH	22.96

ZENOAH ENGINES

2398	ZENOAH G-23	249.96
2399	ZENOAH G-38	267.96
3440	ZENOAH G-45	349.96
2400	ZENOAH G-62	394.96

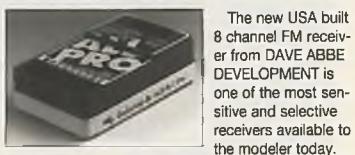
US AIRCORE



BARNSTORMER

2635	CORO STAR 40 L.W. SPORT	59.96
2636	AIR CORE 40 TRAINER	79.96
2637	CLASSIC 40 J-3 CUB	77.96
2638	COLT 40 SLT SPORT	79.96
2639	BARNSTORMER 40 BIPE	109.96

DAVE ABBE DEVEL



Available on all odd & even aircraft channels and built by ACE R/C for today's best radio systems.

Size: 3/4 x 1-5/8 x 2-5/8 in and 1.6oz

DAD200	8CH FM RECEIVER FUT - J	69.95
DAD400	8CH FM RECEIVER - AIR	69.95
DAD600	8CH FM RECEIVER - JR	69.95

WRITE OR CALL FOR OUR LATEST SALE CATALOG

ACCESSORIES

● APC PROPELLERS		
2640	9 X 6 COMPOSITE PROP	1.99
2641	9 X 7 COMPOSITE PROP	1.99
2642	10 X 6 COMPOSITE PROP	2.29
2643	10 X 7 COMPOSITE PROP	2.29
2644	11 X 6 COMPOSITE PROP	2.49
2645	11 X 7 COMPOSITE PROP	2.49
2646	11 X 8 COMPOSITE PROP	2.49
2647	11 X 9 COMPOSITE PROP	2.49
2648	12 X 6 COMPOSITE PROP	2.89
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2649	BLUE LINE MED FUEL TUBING 3FT	1.79
2650	BLUE LINE LRG FUEL TUBING 3FT	1.79
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2651	#64 RUBBER BANDS #1/4LB	1.49
● BADGER		
2652	DETAIL TOUCH-UP SPRAY GUN	59.96
● BRU-LINE PRODUCTS		
2653	ENGINE AIR CLEANER FINE	2.69
2654	ENGINE AIR FILTER COARSE	2.69
● COVERITE PRODUCTS		
2655	HEAT SEALING TOOL	15.96
2656	POCKET THERMOMETER	6.95
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2657	SIX-SHOOTER GLO FUEL PUMP	8.96
2658	SIX-SHOOTER GAS FUEL PUMP	8.96
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2660	TRU-SPIN PROP BALANCER	17.96
2661	4-WAY WRENCH	3.83
2662	KWIK-FILL FUEL VALVE GLOW	9.96
2663	KWIK-FILL FUEL VALVE GAS	9.96
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2664	R/C LONG GLOW PLUG	1.79
2665	R/C SHORT GLOW PLUG	1.79
2666	MIRACLE GLOW PLUG 2 & 4CY	2.09
● HAYES PRODUCTS		
2667	KM-40 MOTOR MOUNT	4.00
2668	KM-60B MOTOR MOUNT	4.75
2669	KM-70 MOTOR MOUNT	5.00
2670	FUEL TANK 8oz	6.00
2671	FUEL TANK 11oz	6.25
2672	FUEL TANK 13oz	6.50
2673	KRAFT POLY HINGES (20)	1.89
● HOT STUFF		
2674	HOT STUFF 2oz	6.96
2675	SUPER T 2oz.	6.96
2676	SPECIAL T 2oz.	6.96
2677	UFO THIN 7-15 SEC 50GR	11.96
2678	UFO THICK 50-60SEC 50GR	11.96
2679	HOT SHOT ACCELERATOR 3oz	4.96
● K&B MFG		
2680	R/C LONG GLOW PLUG	2.19
2681	R/C SHORT GLOW PLUG	2.19
2682	STANDARD LONG GLOW PLUG	1.89
2683	STANDARD SHORT GLOW PLUG	1.89
● MCDANIEL R/C		
2684	NI-STARTER W/CHARGER	19.96
2685	NI-STARTER W/MTR & CHGR	21.96
● MILLER SPRAY CO.		
2686	2017 COMPLETE SPRAY OUTFIT	89.96
● NORTHEAST HOBBY PRODUCTS		
2687	6 MIN EPOXY 8oz	6.49
2688	12 MIN EPOXY 8oz	6.49
2689	30 MIN EPOXY 8oz	6.49
2690	MICRO FILL BALSA COLOR 8oz	3.96
2691	DISPOSABLE BRUSHES (25-PK)	1.79
2692	MIX RITE CUPS (50)	2.19
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2693	PROP PITCH GAUGE	46.96
2694	AFTER RUN ENGINE OIL	1.96
2695	FUEL TUBING MED 3ft	2.09
2696	FUEL TUBING LARGE 3ft	2.59
● ROBERT MFG.		
2697	DELUXE INCIDENCE METER	21.96
2698	SUPER STAND	6.49
2699	DREMEL 90° BB DRIVE	24.96
2700	AIR PUMP W/GA FOR RETRACTS	24.96
● PROGRESS MFG		
2701	REV-UP 9 X 6 PROPELLER	1.79
2702	REV-UP 10 X 6 PROPELLER	1.89
2703	REV-UP 11 X 6 PROPELLER	2.09
2704	REV-UP 11 X 7.5 PROPELLER	2.09
2705	REV-UP 11 X 8 PROPELLER	2.09
2706	REV-UP 12 X 6 PROPELLER	2.59
2707	REV-UP 13 X 6 PROPELLER	3.19
2708	REV-UP 14 X 6 PROPELLER	3.89
● SONIC-TRONICS MFG.		
2709	SUPER X ELECTRIC FUEL PUMP	16.96
2710	MARK X ELECTRIC FUEL PUMP	13.96

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● SPRING AIR MFG		
2711	RETRACTS TR/FW	99.96
2712	RETRACTS MAINS 2-GEAR	79.96
● SULLIVAN MODEL PRODUCTS		
2713	HD STD ELECTRIC STARTER 12V	28.96
2714	HD DELUXE STARTER 12V	31.96
2715	DYNATRON STARTER 12-24V	43.96
2716	SS-8 8oz SLANT FUEL TANK	2.74
2717	SS-12 12oz SLANT FUEL TANK	3.01
2718	SS-24 24oz SLANT FUEL TANK	4.21
● MASTER AIRSCREW PROPELLER CO		
2719	9 X 4 GLASS-FILLED PROP	1.09
2720	9 X 6 GLASS-FILLED PROP	1.09
2721	10 X 6 GLASS-FILLED PROP	1.29
2722	10 X 7 GLASS-FILLED PROP	1.29
2723	11 X 6 GLASS-FILLED PROP	1.49
2724	11 X 7 GLASS-FILLED PROP	1.49
2725	12 X 6 GLASS-FILLED PROP	2.29
2726	14 X 6 GLASS-FILLED PROP	3.49
2727	18 X 6 CLASSIC PROPELLER	11.96
2728	18 X 8 CLASSIC PROPELLER	11.96
2729	18 X 10 CLASSIC PROPELLER	11.96
● PACER PRODUCTS		
2730	ZAP CA 1oz	3.96
2731	ZAP CA 2oz	7.29
2732	ZAP CA+ 1oz	3.96
2733	ZAP CA+ 2oz	7.29
2734	ZAP ACCELERATOR 2oz SPRAY	4.96
2735	ZAP ACCELERATOR 8oz REFILL	8.49
● ZINGER PROPELLER CO		
2736	9 X 4 PROPELLER	1.56
2737	9 X 6 PROPELLER	1.56
2738	9 X 7 PROPELLER	1.56
2739	10 X 6 PROPELLER	1.72
2740	10 X 7 PROPELLER	1.72
2741	11 X 6 PROPELLER	1.96
2742	11 X 7 PROPELLER	1.96
2743	11 X 8 PROPELLER	1.96
2744	12 X 6 PROPELLER	2.52
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CLARENCE LEE



ENGINE CLINIC

As regular readers of this column will know, from time to time I end the column with a mention of being sure to include a Self Addressed, Stamped Envelope (SASE) with your letter if you expect a reply. However, about 50% of the mail I receive does not include the SASE. Like the farmer who was bragging about how smart his mule was and when asked what the mallet was for, he replied, "that's to get his attention," I do not seem to have been getting the attention of quite a few of our readers so am making this reminder at the beginning of the column this month rather than at the end. We can only run between four and a maximum of seven letters each month depending on how much other material is run in the column and yet we receive at least this many letters every week. This past week I received 13 letters from readers. Needless to say, not all of the letters we receive can be run in the column. Then too, many of the letters we receive may be of major importance to the sender but of little interest to other readers of the column, especially those letters asking for

addresses, where a particular make of engine can be repaired, etc. The latter being particularly puzzling when the writer will want to know where he (or she) can get their Fox 40, K&B 61, O.S., etc., repaired, I sometimes wonder if some of our readers aren't living on another planet. Then we get the letters from people requesting copies of articles, engine reviews, etc., with no SASE. Along this line, copies are not sent if the back issue of the magazine that they appeared in is still available. Back issues can be had for \$3.45 which includes postage from the RCM office. If back issues are not available, then copies will be made for \$2.00 each. I rather suspect that a good many of the letters we receive without the SASE are from people who do not read the magazine. This is evidenced by letters asking my opinion of brand X or Y engine which we may have done a full review on only a month or two previously. Even so, if the letter contains a SASE it will get a reply.

Another problem along this line that we have run into of late is fellows sending Fax messages and expecting an immediate reply. Neither I nor any of the other

magazine columnists work out of the RCM office and our mail is forwarded weekly, including the Fax messages, if any. Needless to say, no SASE accompanies a Fax message. Quite a few people have questioned why I do not have Fax facilities so that they could get a more prompt reply to their question(s). As we have pointed out several times in previous years, the purpose of the Engine Clinic column is to hopefully provide entertaining reading and help readers with their engine related problems. We are not exactly running an answering service as a few of our readers and others who do not read the magazine seem to think. I purposely do not have Fax facilities, because if I did, the machine would be running continuously with fellows awaiting a reply. This could become quite expensive, not to mention the time element involved, which is something usually in short supply around here. So in short, please, no Fax messages and include a SASE with your letter. I promise you will get a reply, although it may take a couple of weeks depending on my work load, etc. Also, no phone calls related to this column. If you have a question, put it in writing and include the SASE! You readers outside the U.S. can purchase International Mailing Coupons that can be redeemed for postage. With that said, let's get to the letters this month. Our first letter is the type I like in that it is short and to the point.

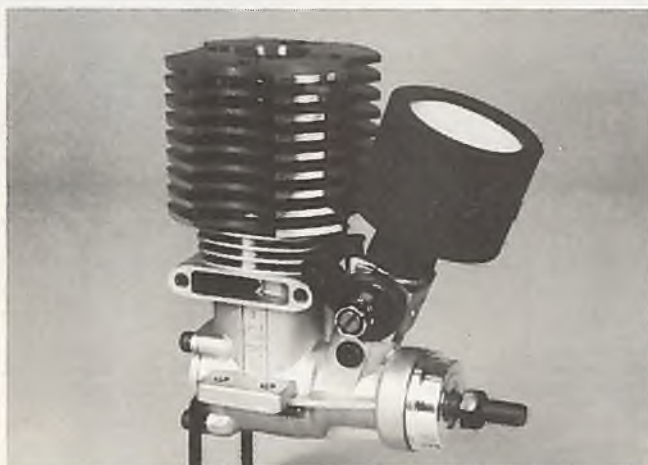
Clarence,

Which is the better engine: ring or ABC?

Earl Shuholm

Occidental, California

Which is the better engine, ringed or ABC depends to a large extent on the intended application. For high performance applications and maximum power, the ABC is best. For general sport flying, especially under less than ideal flying site conditions,



New O.S. Max CZ-12Z Car & Buggy engine. Also available with a pull cord starter with the designation CZ-12ZX. Engine has a bore of 14mm (.551") and stroke of 13.7mm (.539") for a displacement of 2.11cc or .129 cubic inches. The engine has a double ball bearing supported crankshaft and utilizes O.S.'s ABN piston/sleeve metalurgy (high silicon content, aluminum piston and hard nickel plated, brass sleeve). Intended for the 1/10 class R/C race cars and buggies, the new engine replaces the Max CZ-R and develops .56 horsepower at 29,000 rpm — 20-30% more than the older Max CZ-R. Intended operating range is 3,000 to 30,000 rpm. The standard version weighs 6.68 ozs. and the pull cord version 8.68 ozs. A rubber bodied, high efficiency air filter is included with the engine. The rubber body prevents breakage in case of a crash or roll over. Typical of all O.S. engines, the new Max CZ-12Z is beautifully made.

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the ringed engine would be better, i.e., a ringed engine can tolerate a lot more dust, dirt, and foreign matter than can an ABC engine. A little dust that might not hurt a ringed engine other than to shorten the ring life could cause an ABC engine to lose the piston fit and experience a considerable power loss right away. Proper piston fit is very critical in an ABC engine.

Dear Clarence,

I would like to say I think your magazine is super and your "Engine Clinic" is most informative.

Now for my question, I have an O.S. Max 60FP which has given me many hours of pleasure, but as my skills have increased (I'm a novice pattern flier) I find I need more power. So I would like to ask if this engine is capable of running reliably with a tuned pipe? I'm sorry to ask another "tuned pipe" question, but as I said I'm a beginner.

If possible please show the formula to measure how long the pipe should be from glow plug to the end of the pipe (or to where the pipe decreases in diameter). Exhaust duration is 145° and intake is 55° duration on the 60FP.

Thank you for such a great magazine and feel free to expand your Engine Clinic department.

Sincerely,

Gary Smith

Lake Orion, Michigan

Gary, it is really surprising how many fellows will purchase an engine intended for sport applications and then want to achieve the performance of a more expensive engine intended for competition purposes, etc. You might be able to get away with using a tuned pipe on your O.S. Max 60FP but I wouldn't recommend it. The engine utilizes a sleeve bearing rather than a ball bearing supported crankshaft and as such, was never intended for the increased loads imposed by a tuned pipe. If a person wants to use a tuned pipe it is always best to choose an engine with a ball bearing supported crankshaft. The sleeve bearing might hold up okay as long as you use a fuel with plenty of oil, i.e., a minimum of 22% and preferably castor, and do not run the engine too lean trying to get every last rpm out of it. A lean run or low oil content fuel that is common nowadays could lead to the crank seizing.

The formula for determining the length of a tuned pipe is:

$$L = E \times V \div N$$

L = length in inches

E = exhaust open period in degrees

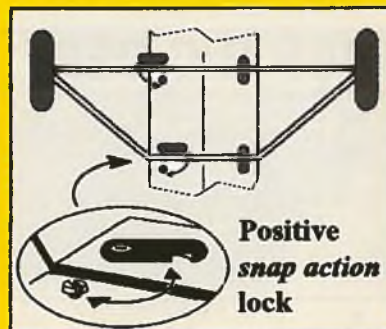
V = wave speed (1650 about right for model engines)

N = crankshaft speed in revolutions per minute.

The converging cone portion of the pipe must be extended to a point. The distance is

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then measured from the piston face to halfway down the converging cone. This can be pretty hard to measure with the muffled pipes and some do not have a converging cone but a reflector plate. Generally, for a .60 displacement size engine, a distance of about 14" measured from the glow plug to the start of the pipe's maximum diameter section is a good starting point. If the engine is a side exhaust configuration, then you measure "around the bend." This distance should actually be a little long so you then start shortening the header or pipe neck in 3/8" increments for maximum power. Actually, the easiest route to take here is to purchase one of Mac's Products "pre-tuned" systems.

Dear Mr. Lee:

Your column is a never miss item for me. Your answers always seem to be right on the money, and I've learned a lot just by reading your column.

I have an assortment of Super Tigre and O.S. engines from the late 1970's, from .25 up to .71, and a new Thunder Tiger Magnum 46 Schneurle ABC. I use Fox "Duke's Fuel" almost exclusively, since I have very good results with it, and I firmly believe its 20% pure castor oil content is the best lubricant for my engines. The 10% nitro seems to suit my engines well, too.

I have only a few minor problems with these engines, which I believe can be corrected by changing the fuel system in the plane, or mounting the engine differently. I have one problem, however, which seems to defy solution. A gummy residue forms on the outside of my engines, and I haven't found anyone who can recommend a solvent to remove it. I can recall reading in one of the hobby magazines maybe a year ago about a product specifically marketed for this purpose; however, I can't recall what it was, or where I read about it. I phoned Fox Mfg., and they told me the best way to remove baked-on oil is to soak the engine in denatured alcohol overnight, then use a brass wire brush with Windex or 409 Cleaner. It seems there must be a solvent that would quickly loosen this gum enough to allow a toothbrush to easily remove it. What can you recommend?

Sincerely,
Thomas Swain
Kansas City, Missouri

I believe you will find that methanol alcohol, the same as used in model fuel, will remove the oily residue that forms on an engine as will acetone or lacquer thinner. Any of these will work a lot faster than denatured alcohol. If you want to disassemble the engine(s), soaking in a strong solution of automatic dishwasher detergent and hot water will make an engine crankcase and parts look like new. Steel parts should be oiled right away as the detergent removes all oil and rust will begin to form right away. I use Cascade automatic dishwasher detergent for this purpose.

For the baked on gunk that forms on

continued on page 182



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014 3/32 x 3	.47	125 1/16 x 1/4	.10	242 3/8 x 1-1/2	1.01	210 3/16"	.42	330 1/8 x 12
015 1/8 x 3	.57	126 1/16 x 3/8	.11	243 3/8 x 2	1.16	Dowels - 36" Lengths		331 1/4 x 12
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019 3/8 x 3	1.02	130 1/8 x 1/4	.10	B013 (20) 1/16 x 3 x 36	7.02	358 5/16" Dia.	.24	335 1/16 x 6 - 3 ply
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48" Sheets		142 3/8 x 3/8	.30	B032 (5) 3/8 x 4 x 36	8.33	323 5/32" Dia.	.35	350 1/4 x 12 - 5 ply
037 1/32 x 3	.52	143 3/8 x 1/2	.35	B020 (5) 1/2 x 3 x 36	6.08	324 3/16" Dia.	.50	351 3/8 x 12 - 7 ply
038 1/16 x 3	.53	144 3/8 x 3/4	.46	B033 (5) 1/2 x 4 x 36	11.21	24" Birch Aircraft Plywood		A333 1/64 x 6 - 3 ply
039 3/32 x 3	.60	145 1/2 x 1/2	.42	36" Sticks		A334 1/32 x 6 - 3 ply	1.55	A335 1/16 x 6 - 3 ply
040 1/8 x 3	.75	146 1/2 x 3/4	.52	B129 (30) 1/8 x 1/8	2.29	A336 3/32 x 6 - 5 ply	2.25	A337 1/8 x 6 - 5 ply
041 3/16 x 3	.90	147 1/2 x 1	.65	B130 (20) 1/8 x 1/4	2.38	A338 3/16 x 6 - 4 ply	2.15	A339 1/4 x 6 - 5 ply
042 1/4 x 3	1.15	48" Sticks		B133 (20) 3/16 x 3/16	2.04	A340 3/8 x 6 - 7 ply	4.39	A344 1/64 x 12 - 3 ply
043 5/16 x 3	1.35	160 1/8 x 1/4	.18	B134 (20) 3/16 x 3/8	3.06	A345 1/32 x 12 - 3 ply	2.80	A346 1/16 x 12 - 3 ply
044 3/8 x 3	1.50	161 1/8 x 3/8	.19	B136 (16) 1/4 x 1/4	2.59	A347 3/32 x 12 - 5 ply	4.74	A348 1/8 x 12 - 5 ply
045 1/2 x 3	1.80	162 1/8 x 1/2	.23	B137 (16) 1/4 x 3/8	3.13	A349 3/16 x 12 - 4 ply	3.45	A350 1/4 x 12 - 5 ply
046 3/4 x 3	2.70	163 3/16 x 3/16	.19	B138 (16) 1/4 x 1/2	3.40	A351 3/8 x 12 - 7 ply	4.75	
050 1/32 x 4	.78	164 3/16 x 3/8	.21	B142 (12) 3/8 x 3/8	3.06	12" Birch Aircraft Plywood		B333 1/64 x 6 - 3 ply
051 1/16 x 4	.79	165 3/16 x 1/2	.31	B143 (12) 3/8 x 1/2	3.57	B334 1/32 x 6 - 3 ply	.79	B335 1/16 x 6 - 3 ply
052 3/32 x 4	.98	166 1/4 x 1/4	.26	B144 (8) 3/8 x 3/4	3.13	B336 3/32 x 6 - 5 ply	1.15	B337 1/8 x 6 - 5 ply
053 1/8 x 4	1.15	167 1/4 x 3/8	.29	B145 (8) 1/2 x 1/2	2.86	B338 3/16 x 6 - 4 ply	1.09	B339 1/4 x 6 - 5 ply
054 3/16 x 4	1.35	168 1/4 x 1/2	.35	B146 (6) 1/2 x 3/4	2.65	B340 3/8 x 6 - 7 ply	1.30	B344 1/64 x 12 - 3 ply
055 1/4 x 4	1.55	169 1/4 x 3/4	.50	B147 (4) 1/2 x 1	2.21	B345 1/32 x 12 - 3 ply	2.39	B346 1/16 x 12 - 3 ply
056 5/16 x 4	2.03	170 1/4 x 1	.67	36" Triangle Bundles		B348 1/8 x 12 - 5 ply	2.41	B349 3/16 x 12 - 4 ply
057 3/8 x 4	2.47	171 5/16 x 5/16	.30	B105 (8) 1/4 x 1/4	2.01	B350 1/4 x 12 - 5 ply	2.15	B351 3/8 x 12 - 7 ply
058 1/2 x 4	2.90	172 3/8 x 3/8	.39	B106 (8) 3/8 x 3/8	2.30	48" Spruce Sticks		616 1/8 x 1/8
30" Sheets		173 3/8 x 1/2	.49	B107 (8) 1/2 x 1/2	2.76	617 1/8 x 3/16	.27	618 1/8 x 1/2
062 1/32 x 3	.32	174 3/8 x 3/4	.58	B108 (6) 3/4 x 3/4	2.74	300 1/8 x 1/4	.30	301 1/8 x 3/8
063 1/16 x 3	.33	175 1/2 x 1/2	.55	B109 (4) 1 x 1	2.34	619 1/8 x 3/4	.53	620 3/16 x 3/16
064 3/32 x 3	.39	176 1/2 x 3/4	.70	36" Aileron Stock		621 3/16 x 1/4	.35	622 3/16 x 1/2
065 1/8 x 3	.47	177 1/2 x 1	.89	B224 (4) 1/4 x 1	1.89	303 1/4 x 1/4	.49	304 1/4 x 3/8
066 3/16 x 3	.56	36" Triangles		B225 (4) 1/4 x 1-1/4	2.17	305 1/4 x 1/2	.68	306 3/8 x 3/8
067 1/4 x 3	.70	105 1/4 x 1/4	.27	B226 (4) 1/4 x 1-1/2	2.42	42" Spruce Spar Stock		823 1/4 x 5/8
068 3/8 x 3	.95	106 3/8 x 3/8	.31	B228 (4) 5/16 x 1-1/2	2.46	824 1/4 x 3/4	.88	825 5/16 x 5/8
069 1/32 x 4	.48	107 1/2 x 1/2	.37	B230 (4) 3/8 x 1-1/2	2.72	826 5/16 x 3/4	1.01	841 3/8 x 3/4
070 1/16 x 4	.50	108 3/4 x 3/4	.49	Blocks		842 3/8 x 1 x 42	1.65	
071 3/32 x 4	.59	109 1 x 1	.63	599 3 x 3 x 6	.50	Birch Plywood Wing Skins		352 1/64 x 48 x 48
072 1/8 x 4	.68	36" Trailing Edges		198 1 x 2 x 12	.58	352 TWO FOR -		53.95
073 3/16 x 4	.78	118 1/4 x 1	.33	199 1 x 3 x 12	.80			
074 1/4 x 4	.95	119 5/16 x 1-1/4	.41	200 1 x 4 x 12	1.06			
075 3/8 x 4	1.46	120 3/8 x 1-1/2	.48	201 2 x 2 x 12	.84			
42" Sheets		121 1/2 x 2	.77	202 2 x 3 x 12	1.24			
080 1/32 x 3	.44	Tapered Aileron & Elevator Stock - 36" Lengths		112 1 x 2 x 36	1.60			
081 1/16 x 3	.45	224 1/4 x 1	.51	113 1 x 3 x 36	2.40			
082 3/32 x 3	.54	225 1/4 x 1-1/4	.59	114 1 x 4 x 36	3.14			
083 1/8 x 3	.65	226 1/4 x 1-1/2	.66	115 2 x 2 x 36	2.45			
084 3/16 x 3	.76	227 1/4 x 2	.72	116 2 x 3 x 36	3.56			
085 1/4 x 3	1.01							
086 3/8 x 3	1.33							
087 1/32 x 4	.69							
088 1/16 x 4	.70							

AERO SPAN

PLASTIC IRON-ON COVERING

OPAQUES	TRANSPARENT
566 Cessna White	590 Trans Yellow
567 Bright Red	591 Trans Red
568 Dark Red	592 Trans Blue
569 Midnight Black	
570 Light Yellow	METALLICS
571 Cub Yellow	594 Met. Gold
572 Light Blue	595 Met. Red
573 Medium Blue	596 Met. Blue
574 Dark Blue	
579 Dark Orange	27" x 6" Rolls
580 Bright Orange	
581 AF Aluminum	\$5.49 ROLL
582 Antique	
583 Olive Drab	

AERO SPAN IN 15' ROLLS

600 Cessna White	\$11.49/ROLL
601 Bright Red	\$11.49/ROLL
602 Cub Yellow	\$11.49/ROLL
SOLARTEX 2 METER 5 METER	
550 Red	9.25 24.95
551 White	9.25 24.95
553 Yellow	9.25 24.95
555 Antique	9.25 24.95
556 Natural	9.25 24.95
557 Olive Drab	9.25 24.95

HOT STUFF & UFO

507 2 oz. Hot Stuff	6.75
508 2 oz. Super "T"	6.75
509 4 oz. Hot Stuff	12.95
510 4 oz. Super "T"	12.95
511 3 oz. Hot Shot	4.25

512 6 oz. Hot Shot	6.75
513 24 oz. Hot Shot	21.95
514 Extra Tips	1.25
604 UFO 20 gm. Thin	4.75
605 UFO 20 gm. Thick	4.75
606 UFO 50 gm. Thin	9.99
607 UFO 50 gm. Thick	9.99

MODELER'S SUPPLIES

526 #11 X-Acto blades, 100 Pk	9.99
527 #11 X-Acto blades, 20 Pk	2.19
523 #11 X-Acto Knife Handle	1.15
524 HDSE Razor Blades, 100 Pk	6.99
499 Modeler's Wood Plane	5.29
493 Du-Bro Reg. Hinges (15)	2.09
494 Du-Bro 1/4 Scale Hinges (15)	3.39
496 Zona #500 Razor Saw	2.49
497 Zona #100 3 in 1 Razor Saw	3.49
740 MICRO-FILL - Balsa color	4.00

516 Silicone Fuel Tubing	45/FT
517 8 Ft. Fuel Tubing Sale	3.60
428 Ny-Rod Golden Rod - 36"	3.39
429 Ny-Rod Golden Rod - 48"	3.75
430 Golden Rod Cable - 36"	1.99
691 Fox R/C Long Plugs (ea)	1.69
694 Fox R/C Long Plugs (doz)	16.99

"MAGIC PRIMER"

Magic Primer is formulated for use on iron-on fabric coverings. One pint will cover most 1/3 scale models.

454 Magic Primer - 1 Pint 9.99

EPOXY

North East Hobby - 8 oz. sets	
544 5 Minute	5.49
545 12 Minute	5.49
546 30 Minute	5.49

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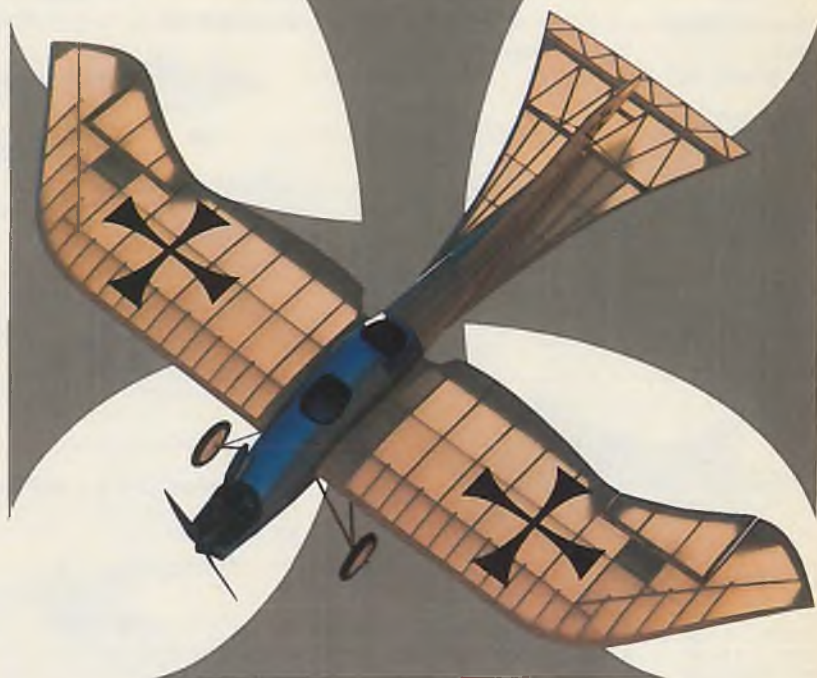
FIVE GREAT NEW KITS FROM Balsa USA

TAUBE

The Perfect Sport Scale Model For Every Sunday Flyer

Relive the days of old, when daring Aviators coaxed their fragile craft into the air to experience the thrill of early flight. Our new Taube (dove) captures all the excitement of this early era with its slow and graceful flight. Incredibly stable, the Taube features a semi-symmetrical airfoil and very light wing loading so its slow speed flight characteristics are outstanding. Unlike most other World War I models, our Taube is very easy to build. The construction is as simple as it is to fly. So, if you like the flavor of a WW I aeroplane, but were put off by the complexity of building it, the Taube is for you!

1913 ETRICH TAUBE



KIT NO. 394\$119.95

485 5" Wms. Bros. Vintage Wheels\$19.00

LENGTH: 63-1/2"
WING SPAN: 83-1/2"
WING AREA: 1250 SQ. IN.
WEIGHT: 8 to 8-1/2 LBS.
POWER: .70 - .91 4-STROKE
.60 - .80 2-STROKE



STINGRAY 40 & 120

The Stingray is the perfect sport model for any day of the week! The highly efficient wing tip end plates and midwing design make its flight performance nothing less than fantastic. Complex vertical maneuvers are as simple as they are impressive, point rolls, snaps, or whatever you like - the Stingray will perform them all with ease. As aerobatic as the Stingray is, its light weight and low wing loading allows for beautifully stable low speed flight.

Both Stingray's are ultra-fast building and features a one piece wing with spruce spars, rolled plans, top grade balsa and plywood, hardware package and photo illustrated instructions.

Stingray 120

Wing Span: 83"
Length: 60"
Wing Area: 1276 Sq. In.
\$99.95

Kit No. 390

83"
60"
1276 Sq. In.

Power: .90-1.204-stroke
.80-.90 2-stroke
Weight: 8-1/2-9 lbs.

Stingray 40

Wing Span: 58"
Length: 44"
Wing Area: 623 Sq. In.
\$49.95

Kit No. 391

58"
44"
623 Sq. In.

Power: .40-.60 2-stroke
.50-.65 4-stroke
Weight: 5 lbs.

THUNDERBUG 40 & 120

Thunderbug is a perfect sport aerobatic model for any modeler. The low wing, tricycle gear design combined with the efficient wing tip end plates make the Thunderbug a superb performer, yet it can be slowed down to a walk for landing. The Thunderbug can do it all! You can't find a better sport model at a better price anywhere.

Like the Stingray's, both Thunderbug's are ultra-fast building and feature a one piece wing with spruce spars, rolled plans, top grade balsa and plywood, hardware package and photo illustrated instructions. You will love the fast building and the great performance.

Thunderbug 120

Wing Span: 83"
Length: 60"
Wing Area: 1276 Sq. In.
\$99.95

Kit No. 392

83"
60"
1276 Sq. In.

Power: .90-1.20 4-stroke
.80-.90 2-stroke
Weight: 8-1/2-9 lbs.

Thunderbug 40

Wing Span: 58"
Length: 43"
Wing Area: 623 Sq. In.
\$49.95

Kit No. 393

58"
43"
623 Sq. In.

Power: .40-.60 2-stroke
.50-.65 4-stroke
Weight: 5 lbs.



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SUPER STICK

SPAN: 60"
KIT NUMBER 437

39.99

POWER: .40 - .60



BRISTOL M-1

SPAN: 62"
KIT NUMBER 436

44.44

POWER: .40 - .60 2 CYCLE
.60 - 1.20 4 CYCLE



SMOOTHIE

SPAN: 52"
KIT NUMBER 443

45.95

POWER: .40 - .50



TAUBE

SPAN: 62"
KIT NUMBER 439

39.99

POWER: .35 - .50

3 CHANNEL

MOONRAKER

SPAN: 54"
KIT NUMBER 444

46.96

POWER: .40 - .50



PHAETON II

SPAN: 52" POWER: .40 - .60 2 CYCLE .60 4 CYCLE
KIT NUMBER 448

49.99

PHAETON 90

SPAN: 70" POWER: .90 - 1.2 4 CYCLE LENGTH: 55"
KIT NUMBER 450

77.77



Laddie Mikulasko's

FORCE ONE

POWER: .40 2 STROKE
AREA: 611 SQ. IN.
KIT NUMBER 457

44.97

WINGSPAN: 36 1/2 IN.
WEIGHT: 72 OZ.

Laddie Mikulasko's LAKER

SPAN: 70" POWER: .40 TO .46 2 CYCLE WEIGHT: 6 LBS.
LENGTH: 59"
KIT NUMBER 445

54.95

4 CHANNEL



EAA BIPE

POWER: .60 - .90 4 CYCLE
.50 - .90 2 CYCLE
KIT NUMBER 449

69.69

SPAN: 60"
WEIGHT: 7 LBS.



ENFORCER

WINGSPAN: 48 1/2"
WEIGHT: 6 LBS.
KIT NUMBER 458

64.99

POWER: .60 2 CYCLE
.90 4 CYCLE



Laddie Mikulasko's

NORTH STAR

SPAN: 44"
LENGTH: 54"
KIT NUMBER 455

59.99

POWER: .40 TO .46 2-STROKE
AREA: 750 SQ. IN.

SOPWITH PUP

1/3 SCALE
POWER: 2.2 TO 3.7 CU. IN.
KIT NUMBER 461

174.99

SPAN: 9' - 0"
WEIGHT: 27 LBS.



CITABRIA AEROBATIC PRO

POWER: .90 - 1.20 4 CYCLE SPAN: 80" LENGTH: 51"
.60 - .90 2 CYCLE
KIT NUMBER 451

87.97

ALL ITEMS ON THIS PAGE ARE
AMERICAN MADE

Virgin Contest Balsa - Limited Supply

4 to 6 Lb. per cubic foot

783	1/16 x 3 x 36	66
784	3/32 x 3 x 36	80
785	1/8 x 3 x 36	97
786	3/16 x 3 x 36	1.15
787	1/4 x 3 x 36	1.44
788	1/16 x 4 x 36	1.00
789	3/32 x 4 x 36	1.24
790	1/8 x 4 x 36	1.41
791	3/16 x 4 x 36	1.65
792	1/4 x 4 x 36	2.29
793	1/16 x 3 x 48	.90
794	3/32 x 3 x 48	1.02
795	1/8 x 3 x 48	1.27
796	3/16 x 3 x 48	1.53
797	1/4 x 3 x 48	1.95
798	1/16 x 4 x 48	1.34
799	3/32 x 4 x 48	1.67
800	1/8 x 4 x 48	1.95
801	3/16 x 4 x 48	2.29
802	1/4 x 4 x 48	2.63

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STICK 40 PLUS™

34.99

The Stick 40 Plus™ was designed with ailerons and is the deluxe version of the Stick 40. This is one of the best "Fun Flyers" you can buy.
SPAN: 58" POWER: .30 - .40 4 CHANNEL
KIT NUMBER 434

STICK 40 TRAINER™

29.99

SPAN: 60" POWER: .30 - .45 3 CHANNEL
KIT NUMBER 441

WAVE RYDER™ FLOATS

Why waste a lot of time building wood or plastic floats that look like plastic? Our new Wave Ryder™ floats are sleek, easy to build, and inexpensive. Even the inexperienced builder can build these floats in about an hour. The sleek ABS cover is precision molded in one piece with no unsightly joints. Cross brace wires and mounting hardware are included as are complete photo-illustrated instructions.

771 .40 size - 30" Long 24.99
772 .60 size - 36" Long 29.99
773 120 size (1/4 scale) - 46" Long 34.99

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The Ultimate in Giant Scale Kits



STEARMAN PT-17

POWER: 4.2 CU. IN. AND UP
SPAN: 116"
WEIGHT: 40 - 45 LBS.

KIT 460.....\$699.00



1/3 SCALE J-3 CUB

POWER: 2 - 4 CU. IN.
SPAN: 140-3/4"
WEIGHT: 30 - 35 LBS.

KIT 467.....\$439.95

You cannot buy a standoff scale kit that is more complete, with more detail and scale fittings anywhere at any price!

These two new 1/3 scale kits were designed for those who want the best! These kits are absolutely complete. All hardware is included - everything! Included are socket head bolts, nylon insert lock nuts, kwik links, threaded rods, scale fittings, Ny-Rods, etc. A separate plan shows all pinking tape and rib stitching. Complete step-by-step photo illustrated instructions show how to accomplish all scale details in only a few extra hours right down to the panel lines and rivets in the cowl. Landing gear on both models is exact scale not only in detail, but function as well. The Cub is complete with functioning bungee cords and the Stearman includes working oleo struts. Even the exact scale wheels are included as is much much more!



FLY BABY

POWER: 2 - 4 CU. IN.
SPAN: 112"
WEIGHT: 24 LBS.

KIT 447.....\$399.95

Our new 1/3 scale Fly Baby complete with scale folding wings, was designed for those modelers who want the best, most complete kit available. This kit is extremely fast building with all the details. The folding wings make transportation easy and field assembly fast. This kit is complete, and all hardware is included. All fittings are formed, drilled and bent to exact shape. Exterior hex head bolts are exact scale and are made from stainless steel.

KIT FEATURES:

FULL SIZE ROLLED PLANS
STEP-BY-STEP PHOTO ILLUSTRATED INSTRUCTIONS
ABS INTERIOR KIT
ALL ALUMINUM PANELS WITH SCALE SIZE SCREWS
VACUUM FORMED ABS SEAT & OTHER SCALE PARTS
EASY TO BUILD, EXACT SCALE GEAR
COMPLETE WITH ALL PRE-FORMED STEEL FITTINGS AND BRACKETS
ALUMINUM INSTRUMENT PANEL WITH INSTRUMENTS AND RINGS
PINKING TAPE IS INCLUDED WITH INSTRUCTIONS FOR FAST RIB STITCHING

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1/4 SCALE J-3 CUB

POWER: .90-2.0 2-STROKE
1.2 4-STROKE
SPAN: 108"
WEIGHT: 13 LBS.

KIT 438.....\$112.95

Our 1/4 scale J-3 Cub is legendary in both flight performance and value. No other Cub kit is as complete for the price. Complete hardware package, step-by step photo illustrated instructions, detailed rolled plans, as well as top quality balsa, spruce, and plywood are included. You can't go wrong!

SCALE EDO FLOATS - 1/4 & 1/3 SCALE

The best float kit available anywhere.

Super scale, complete float kits of Edo's 1400 Series floats. Complete with scale metal fittings, scale metal water rudder, angle shaped toe rails and chine strips. Includes scale rivet details, shaped spreader bars and struts, highest quality "X" bracing with steel fork fittings. Can be adapted for use on all 1/4 and 1/3 scale models.

1/4 SCALE EDO FLOATS - 44-1/4" LONG
1/3 SCALE EDO FLOATS - 59" LONG

KIT 463.....\$109.95
KIT 464.....\$129.95

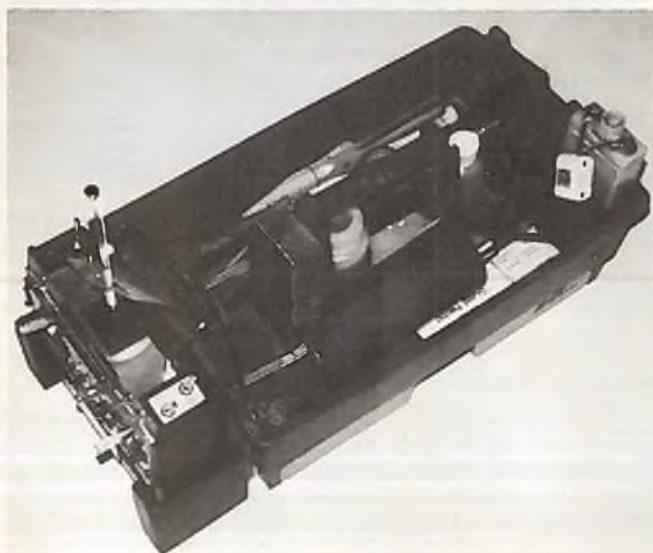
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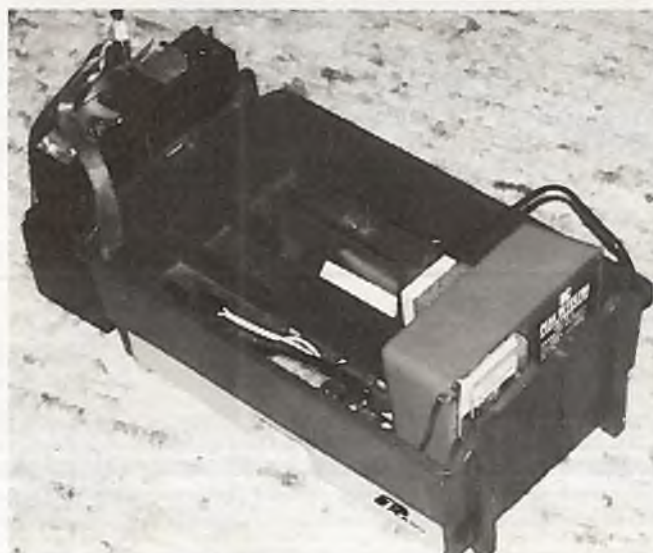
RCM HOW TO

FIELD TOTE BOX

By Joe Beshar



The field tote box rigged for 1/2A Texaco (R/C).



The field tote box rigged for electric.

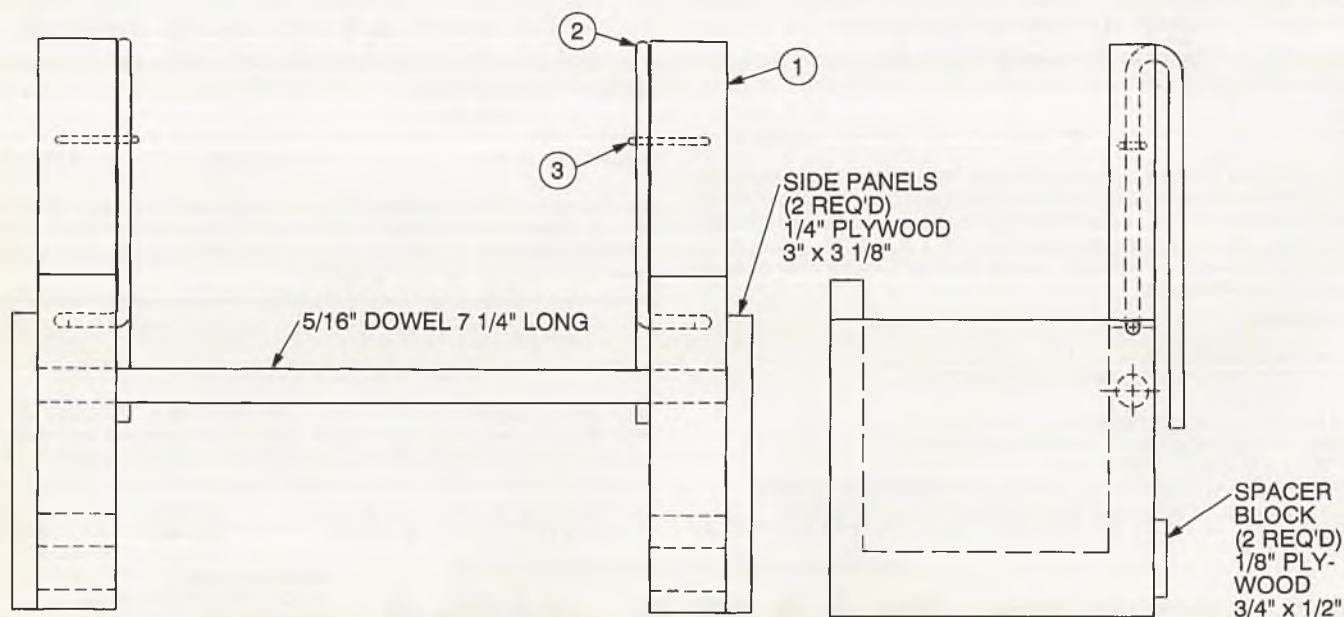
You know we all have the problem as to what to carry to the field when we practice our flying activities. I have found the Field Tote Box, which I am about to describe, very helpful, and I thought I would pass it on to others to use. It is comparatively inexpensive, as it employs an available low cost molded base unit. Hence, a separate box can be packed and ready for each flying interest,

customized to suit.

I always want to take only that which is necessary to the flying field. We all have our models to carry, as well as the supporting equipment, which is burdensome. The Field Tote Box employs as its base, a plastic hand carry unit with a utility drawer. The drawer is ideal for storing small accessories such as tachometer, screwdrivers, Allen wrenches, scissors, razor blades, etc. The top area is

available for storage of propellers, starting battery, fuel, etc.

As stated, the basic box is so inexpensive that I use one for each of the different flying activities that I participate in; e.g., one for free flight, one for electric, one for 1/2A Texaco, and each is custom fitted. In this way, I seldom forget what I need, based on past experiences. Partitions are added or removed as desired. Of course, it is not practical for the larger models where large



FIELD TOTE TRANSMITTER CARRIER ASSEMBLY

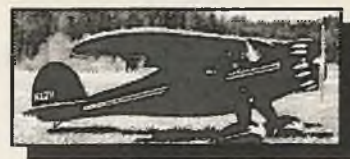
IKON offers the largest selection of giant scale kits in the world.



PILATUS PORTER
GIANT SCALE 99.25"



L-19E BIRD DOG
1/4 SCALE 108"



MONOCOUE D-145
1/4 SCALE 96"



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Foreground displays all the simple details of the tx carrier — assembly is in background.

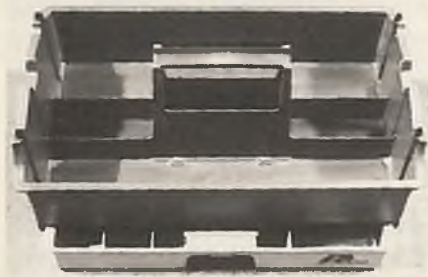
accessories are not overwhelming. For electric models, it is also ideal as it has a place to carry your battery charger and adequate storage for all of the other electric accessory items. The same applies for rubber or engine powered free flight. For radio control activities, I have detailed a supplemental carrier as an accessory which provides a storage place for the transmitter outside the regular storage area. The carrier frees more space in the Field Tote Box for other accessory items one may want to carry such as propellers, tools of all sorts, etc. The base plastic Tote Box is available at your local hobby shop or from C.E.H. Products, Inc., 112 East Blackwell Street, Dover, New Jersey 07801, (201) 328-3545, at \$7.75.



Frontal view of tx carrier



Rear view of tx carrier.



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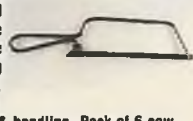
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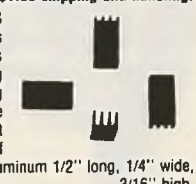
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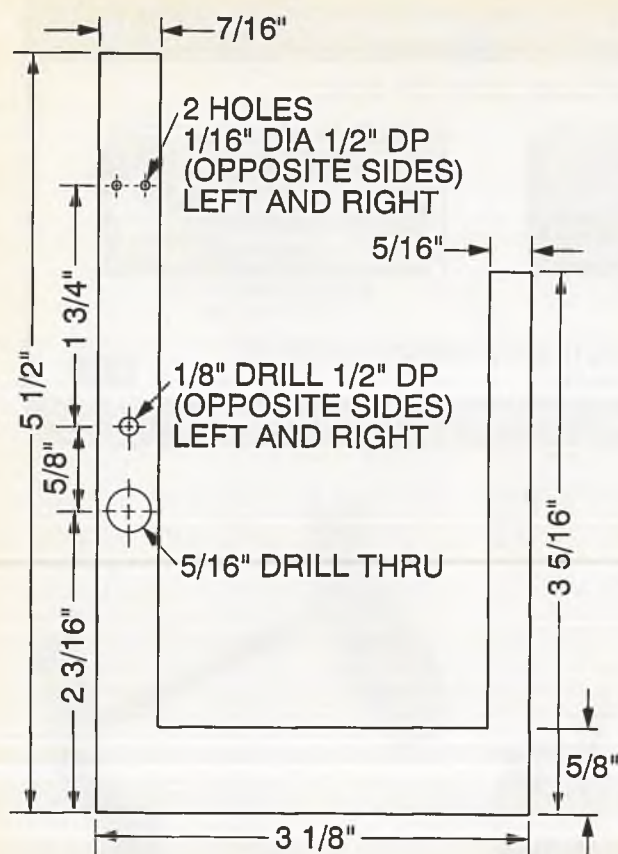
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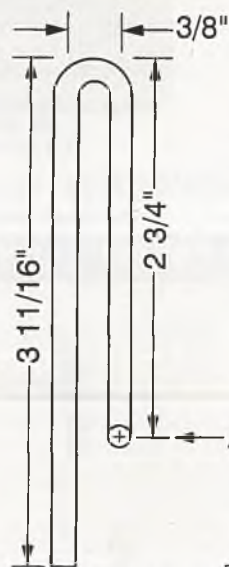


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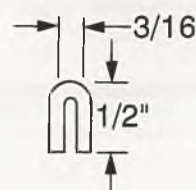
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② **HANGER** 1/8" DIA. WIRE
2 REQ'D. (1 LEFT, 1 RIGHT)



③ **STAPLE** 1/16" DIA. WIRE
2 REQ'D

VIEW AT A

FIELD TOTE TRANSMITTER CARRIER DETAILS

Construction

As detailed, the two side members are cut and drilled from 3/4" plywood, the hanger is bent from 1/8" wire (two required), as shown. Note: there is a left-hand bend, as shown in view "A", and a right-hand bend. The hangers lock into the side members, one at the left and one at the right. Two

staples are required, and are bent from 1/16" diameter soft wire. These hold the hangers to the sides as shown in the drawing. Additional material required is a piece of 5/16" dowel, 7 1/4" long, two side panels cut from 1/4" plywood, 3" x 3 1/2", and two spacer blocks, 3/4" x 1/2", cut from 1/8" plywood. The entire assembly is

glued together with white glue or Tite Bond. Before assembly, subassemble the hanger units to each of the side members, employing the staple as shown, epoxy the hanger, as well as the staple for rigidity, assemble and glue the dowel and spacers as shown for completion. It can be painted any color desired, and with any available paint, polyurethane, lacquer, epoxy, etc., it really doesn't matter. After completion, the assembly slides into the slots at the side of the Tote Box to hold the transmitter. It can also be used for separate storage of the transmitter, if desired, when removed from the Tote Box. It provides an ideal storage position, providing stability for the transmitter when charging batteries, etc.

I trust you will find the Field Tote as helpful during your flying activities as I have during mine. □



Front view of tx and carrier. Note protection it provides against impact.



Rear view of carrier with tx. Great for storage.



Tote box and carrier. Tx assembled. On stand-by.



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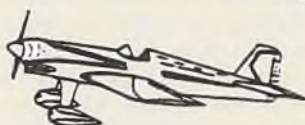
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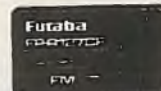
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SOARING

The Fall Soaring Festival

The Fall Soaring Festival in Visalia, California, is probably the world's largest R/C sailplane meet. It always happens the first weekend of October, and is really worth attending. I have mentioned the festival just about every year, and there is always something interesting being shown there. You might want to check it out!

Besides a competition with 225 registered pilots, all flying in a single class, there is a raffle that can only be described as incredible. And, there is a swap meet atmosphere complete with a dozen different vendors of sailplane kits and supplies, as well as private "for sales." Photo #1

shows Dave Layne and Peter Urwyler with their display of several Saturn models. Contact: Layne/Urwyler, 2821 Lou Ann Dr., Suite B211, Modesto, California 95350, (209) 544-8779 from 8:00 a.m. to 5:00 p.m.; (209) 529-8457 after 5:00 p.m. Pacific time.

This is a place for intense competition as well as a chance to see what the current "model of the month" is. The meet is so famous that some folks came all the way from Guatemala to compete! Team TACA (Photo #2) are a group of modelers sponsored by TACA International Airlines. Some of the Team TACA participants were Jurgen Vogel, Frankie Arzu, Willie Alvarado, Enrici Mertiens, and Reinhard

and Klaus Wagner.

Daryl Perkins won the meet flying a Spectrum, which is a 102"-106" model with a 3021 airfoil (Photo #3 shows Mark Triebes, who placed 3rd, and his version of the model). The fuselage is molded, with an integral skid molded into its nose cone (a standard nose cone is also available). This model has a weight of 60-65 ozs., and an articulated T-tail. The wing cores are slot-routed so that the facing wood at the aileron and flap cutouts is boxed in-between obechi, which increases torsional stiffness.

I am told that the Spectrum will be available from Northeast Sailplanes with a retail price under US\$400. It will also be available with the RG15 section for those who desire it.

The competition was tough, as usual. The spot landing was a set of very small circles as shown in Photo #4, which netted 20%, 10%, and 5% of the flight points. Photo #5 shows the top 10 pilots. Even if you can't get in (the meet had 225 registered contestants, and filled many frequencies on the first day of registration!), it is worth coming to this contest just to see all the displays, booths, and the raffle!

★

More Airfoil Testing Soon — Can You Help?



LEFT: Photo #1: In one of the booths at California's Fall Soaring Festival, Dave Layne and Peter Urwyler display their Saturn models, very nice and sturdy models with fine wood skins. **Photo #2:** Some folks came all the way from Guatemala to compete! With the assistance of TACA International Airlines, Team TACA's members appeared to have traveled the longest distance to the Fall Soaring Festival.



LEFT: Photo #3: Mark Triebes (with model) and his Spectrum placed 3rd at the Fall Festival. His helpers are Ron Vann (left) and Scott Meader (center). **RIGHT: Photo #4:** The 1.5 meter diameter spot landing circle (LSF Level II) was difficult to hit.

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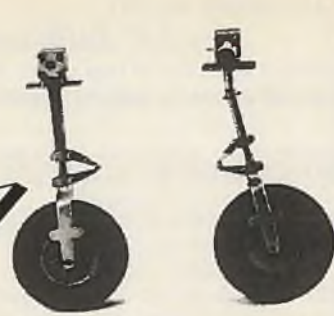
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No doubt most readers have heard of Michael Selig, whose name (along with John Donovan and the late David Fraser) has become synonymous with the famous set of airfoil testing results known as Soartech 8. Well, Michael Selig is now Professor Michael Selig at the University of Illinois at Urbana-Champaign, and he is taking up testing of low-Reynolds number airfoils again. He and his students are soliciting modelers to construct wind tunnel test models and donate money to equip and finance serious research using wind tunnels at the university. His current student, James Guglielmo, has written a letter explaining the work and asking for modeler's help in building test models as Selig and Donovan did in the late 1980's for the Princeton airfoil testing. This is another great opportunity for us all to help advance the state of the art! They have already arranged to have the new testing published for us in the modeling community in future



Photo #5: The top 10 pilots, from left to right, 1st to 10th place: Daryl Perkins (Spectrum), Joe Rodriguez (Vector), Mark Triebes (Spectrum), Richard Burns (original design), Scott Meader (Genesis), Les Peterson (Paragon), Tim Renaud (Thermal Eagle), Scott Richards (Thermal Eagle), Roger Lackey (Mako), Joe Wurts (Thermal Eagle). Competition was very close.

Wortmann Fx 67-K-170/17

Figure 1: Over 10 years ago, this man-carrying sailplane airfoil was tested, filled, and painted, stripped to bare metal, and with a plastic film covering to see which had the lowest drag.

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The models have to be built to meet the requirements of the wind tunnel. If you'd like to build a test model or simply to donate money to the cause, please contact: James Guglielmo, Coordinator, Dept. of Aeronautical & Astronautical Eng., University of Illinois, 306 Talbot Laboratory, 104 S. Wright St., Urbana, Illinois 61801-2935 (whew, what an address!). For those of you who would rather phone, call James at: (all area 217) 244-0684 work, 367-1960 home, or Fax at 244-0720. If you have an email connection, you can send your message to:

jgug@uxh.cso.uiuc.edu

on the internet. This is an effort that could lead to new and better airfoils for sailplanes and is definitely worth supporting!



An Old NASA Report Gives Information on Low-Drag Wings

Recently I happened to run across an interesting NASA report that could potentially affect model flying. I found it while browsing through NASA Conference Publication 2085, which describes the symposium on Science and Technology of Low Speed and Motorless Flight which happened in March of 1979. The proceedings carry a paper entitled "An Exploratory Investigation of the Effect of a Plastic Coating on the Profile Drag of a Practical Metal Construction Sailplane Airfoil." This was authored by Dan Somers, who has since gone on to consult on airfoil designs, and sells the Eppler airfoil analysis program in the U.S.

Anyway, the report describes a series of wind tunnel tests that measure the drag of the wing with different coatings. The wing was manufactured by Schweizer in Elmira, who made many of the full-size trainers that folks used to learn to fly (including yours truly). The wing section had a chord of 66.5cm (26.2") and a span of 91.4cm (36"). It was fitted with a flap with a bottom hinge that was also sealed with tape. One important consideration is that the airfoil was the Wortmann FX 67-K-170/17 section, which is intended to be used on full-size (manned) sailplanes. This section is 17% thick, which is a lot thicker than commonly-used model sections (Figure 1).

The testing occurred at a speed of Mach 0.1, which works out to be about 75 mph. The Reynolds number, a measure of the scale of the airfoil and its flying speed, was varied between 1.1 and 3 million. These numbers are substantially higher than the Reynolds numbers our models experience, which typically fly with Reynolds numbers of 20,000 while thermaling to, at most, 400,000 on an F3B speed run. Because of this mismatch, we can't compare the test results specifically to our models, but my belief is that there should be some similar effects at our flying speeds and wing chords.

You're probably wondering what effect I am talking about. Of the three tested sections (filled and painted, bare metal, and



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A graph showing the relationship between the drag coefficient (C_d) on the x-axis and the lift coefficient (C_l) on the y-axis. The y-axis has tick marks at 0.4 and 1.3. The x-axis has tick marks at 0.0068 and 0.0082. Three curves are plotted, representing different airfoil treatments:

- plastic film covered:** This curve is the leftmost, indicating the lowest drag for a given lift. It is labeled with an arrow pointing to the leftmost curve.
- "bucket" shape:** This curve is in the middle. It is labeled with an arrow pointing to the middle curve.
- filled & painted:** This curve is the rightmost, indicating the highest drag for a given lift. It is labeled with an arrow pointing to the rightmost curve.
- bare metal:** This label points to the rightmost curve, which is also labeled "filled & painted".

At the bottom of the graph, a horizontal double-headed arrow indicates the direction of drag change: "LESS Drag" on the left and "More" on the right. Vertical dashed lines extend from the x-axis at 0.0068 and 0.0082 to the curves.

Figure 2: This plot shows the results of the wind tunnel testing. The plastic film covering had the least drag! (It is the diamond-figure curve on the left of the three.)

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For further info, contact: Allan B. Quiat, Space City R/C Club, 5018 Hastingwood Dr., Houston, TX 77084, (713) 550-6619.

THE SHEARWATER R/C FLYERS "14TH ANNUAL FUN-FLY"

June 1994.
For further info, contact: Shearwater R/C Flyers, c/o Mark Bartley, 79 Collins Grove, Unit 101, Dartmouth, Nova Scotia, B2W 6B9, Canada

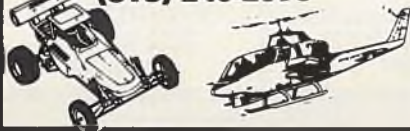
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March 25-27, 1994. Phoenix, Arizona
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reduce the drag of their aircraft by fractions of a percent, because the drag affects the fuel burn which, in turn, changes the direct operating costs and the airlines' profits.

What does this mean to us modelers? A reduction in profile drag has the most noticeable effect at higher speeds. This could mean faster speed runs, or better contest performance. It would be of good use to the radio-controlled rocket glider

guys, because the drag during boost is almost all profile drag (the wings aren't lifting much during a vertical boost). It could also make an improvement on cross country flying.

As I pointed out earlier, because of the difference in airfoils and test conditions, we can't directly conclude that plastic coverings would be a benefit for our models. Nevertheless, I believe that there is

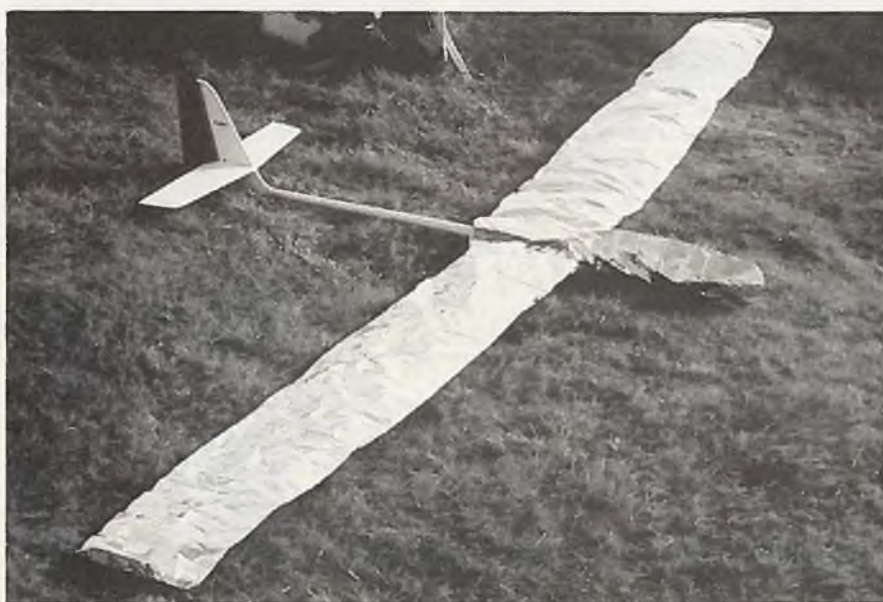


Photo #6: These special plastic wing bags keep the models at low temperatures and eliminate ultraviolet damage. They are available from CJ's Thermoban Wing Shields, Westminster, California. See text for more details.

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some merit to trying sheeted foils with plastic coverings rather than painted and filled ones, especially for events such as F3B where profile drag is very important during the speed event. Perhaps some group of modelers could build a set of test models for the continuing Selig testing that would have the same airfoil in three different conditions: with painted, metal, and plastic film coverings. It would be interesting to compare some of the different coverings as well.



Protection From Sun Exposure

Some of my models have suffered from exposure to sun. This is not a problem if one's models only last a few weeks, but as pilots become more experienced, some of their models achieve lifetimes of many years.

Sunlight contains visible, infrared (IR), and ultraviolet light (UV). I am not aware that visible light causes problems, but I have had troubles with IR. IR heats the surfaces exposed to the sun, and that heat can cause epoxy resins to lose stiffness and peel loose or "delaminate." I had this happen to me in front of the entire world at the 1983 World Championships in York, England. The wing folded at the top of a tow, with catastrophic results to both the model and my contest standings.

It seems that UV light can also cause problems in a different way. The UV can cause the breakdown of epoxy resins that

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1/32 x 4	1.23	1.88	
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3/8 x 2	.78	1.05	
1/2 x 2	.95	1.25	
1/32 x 3	.39	.53	
1/20 x 3	.39	.53	
1/16 x 3	.39	.53	
3/32 x 3	.47	.60	
1/8 x 3	.57	.75	
3/16 x 3	.68	.90	
1/4 x 3	.85	1.15	
5/16 x 3	.98	1.35	
3/8 x 3	1.02	1.50	
1/2 x 3	1.35	1.80	
3/4 x 3	1.99	2.70	
1/32 x 4	.59	.79	
1/20 x 4	.59	.79	
1/16 x 4	.59	.79	
3/32 x 4	.73	.98	
1/8 x 4	.83	1.15	
3/16 x 4	.97	1.35	
1/4 x 4	1.35	1.55	
5/16 x 4	1.62	2.03	
3/8 x 4	1.85	2.47	
1/2 x 4	2.49	2.90	
BALSA SHEETS		30"	42"
1/32 x 3	.33	.45	
1/16 x 3	.33	.45	
3/32 x 3	.39	.54	
1/8 x 3	.47	.65	
3/16 x 3	.55	.75	
1/4 x 3	.70	1.00	
3/8 x 3	.95	1.30	
1/2 x 3	1.15	1.55	
1/32 x 4	.50	.70	
1/16 x 4	.50	.70	
3/32 x 4	.59	.90	
1/8 x 4	.68	1.00	
3/16 x 4	.78	1.20	
1/4 x 4	.95	1.36	
3/8 x 4	1.45	2.14	
1/2 x 4	2.09	2.70	
WING SKINS		30"	36"
1/20 x 12	4.79	5.35	
1/16 x 12	4.79	5.35	
3/32 x 12	5.79	6.45	
MATCHED SHEETS		42"	48"
3/32 x 4	1.09	1.25	
1/8 x 4	1.29	1.48	
3/16 x 4	1.44	1.65	
1/4 x 4	1.55	1.78	
BALSA BLOCKS		6"	12"
1/2 x 3	.29	.55	
3/4 x 3	.35	.70	
1 x 2	.35	.58	
1 x 3	.45	.80	
1-1/2 x 3	.60	1.15	
1 x 4	.57	1.06	
2 x 2	.46	.85	
2 x 3	.65	1.24	
2 x 4	.90	1.79	
3 x 3	.98	1.95	
3 x 4	1.35	2.69	
BALSA PLANKS		36"	48"
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1 x 2	1.60		
1 x 3	2.40		
1 x 4	3.15		
1-1/2 x 3	3.40		
1-1/2 x 4	4.45		
2 x 2	2.45		
2 x 3	3.60		
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10 1/8 x 4	7.75		
15 3/16 x 3	9.40		
10 3/16 x 4	8.99		
10 1/4 x 3	7.65		
10 1/4 x 4	12.85		
5 3/8 x 3	9.20		
5 3/8 x 4	8.35		
5 1/2 x 3	6.05		
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BUNDLE DEALS		48"	36"
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5 3/16 x 4	6.50		
5 1/4 x 4	7.35		
TRIANGLES		36"	48"
1/4 x 1/4	.25		
3/8 x 3/8	.30		
1/2 x 1/2	.35		
3/4 x 3/4	.49		
1 x 1	.60		
1-1/2 x 1-1/2	1.15		
2 x 2	1.95		
TAPERED SHEETS		36"	48"
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1/4 x 3	.95		
3/8 x 2	.79		
3/8 x 3	1.15		
1/2 x 3	1.35		
TRAILING EDGE		36"	48"
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3/16 x 3/4	.30		
1/4 x 1	.35		
5/16 x 1-1/4	.45		
3/8 x 1-1/2	.49		
1/2 x 2	.79		
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5/16 x 1-1/4	.62	.87	
5/16 x 1-1/2	.64	.89	
5/16 x 2	.72	.99	
3/8 x 1-1/4	.68	.96	
3/8 x 1-1/2	.70	.97	
3/8 x 2	.79	1.10	
1/2 x 1-1/2	.80	1.15	
1/2 x 2	.90	1.25	
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1/16 x 3/8	.11		
1/16 x 1/2	.15		
3/32 SQ.	.09		
3/32 x 1/4	.12		
3/32 x 3/8	.13		
3/32 x 1/2	.17		
1/8 SQ.	.09		
1/8 x 1/4	.12	.18	
1/8 x 3/8	.13	.19	
1/8 x 1/2	.18	.24	
3/16 SQ.	.12	.19	
3/16 x 1/4	.18	.26	
3/16 x 3/8	.18	.26	
3/16 x 1/2	.22	.31	
3/16 x 3/4	.26	.42	
3/16 x 1	.37	.52	
1/4 SQ.	.19	.26	
1/4 x 3/8	.23	.29	
1/4 x 1/2	.25	.35	
1/4 x 3/4	.36	.50	
1/4 x 1	.45	.67	
5/16 SQ.	.23	.30	
3/8 SQ.	.30	.39	
3/8 x 1/2	.35	.49	
3/8 x 3/4	.46	.58	
3/8 x 1	.55	.75	
1/2 SQ.	.42	.55	
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1/2 x 1	.65	.89	
5/8 SQ.	.55	.75	
3/4 SQ.	.75	.98	
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1/8 x 12	1.10	1.90	3.50
1/4 x 6	.95	1.55	2.75
1/4 x 12	1.55	2.95	5.50
2mm & 2.5mm same price as 1/8"			
3 PLY BIRCH		12"	24"
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1/64 x 12	2.35	4.39	8.50
1/32 x 6	.95	1.59	2.99
1/32 x 12	1.80	2.99	5.50
1/16 x 6	.95	1.59	2.99
1/16 x 12	1.80	2.99	5.50
1/8 x 6	.95	1.59	2.99
1/8 x 12	1.80	2.99	5.50
4 PLY BIRCH		12"	24"
3/16 x 6	1.09	2.15	3.15
3/16 x 12	2.15	3.45	6.25
5 PLY BIRCH		12"	24"
3/32 x 6	1.20	2.25	4.30
3/32 x 12	2.25	4.30	7.50
1/8 x 6	1.25	2.45	4.75
1/8 x 12	2.45	4.75	8.35
1/4 x 6	1.05	2.15	3.45
1/4 x 12	2.15	3.45	6.50
7 PLY BIRCH		12"	24"
3/8 x 6	1.30	2.40	4.50
3/8 x 12	2.40	4.75	8.50
9 PLY BIRCH		12"	24"
1/2 x 6	1.75	2.95	4.90
1/2 x 12	2.95	4.95	9.70
BASSWOOD		24"	36"
1/32 x 3	.64	.96	1.35
1/16 x 3	.71	1.07	1.50
3/32 x 3	.80	1.20	1.69
1/8 x 3	.91	1.37	1.92
5/32 x 3	.95	1.43	2.00
3/16 x 3	1.07	1.61	2.25
1/4 x 3	1.31	1.97	2.76
5/16 x 3	1.37	2.06	2.89
3/8 x 3	1.42	2.13	2.99
1/2 x 3	1.76	2.64	3.71
3/4 x 3	2.58	3.87	5.44
1 x 3	2.95	4.43	6.25
2 x 3	4.04	6.06	8.51
BASSWOOD		36"	48"
1/16 x 1/4	.18	.25	
1/16 x 3/8	.22	.30	
1/16 x 1/2	.30	.40	
3/32 x 1/4	.24	.33	
3/32 x 3/8	.26	.35	
3/32 x 1/2	.34	.45	
1/8 SQ.	.17	.25	
1/8 x 1/4	.20	.26	
1/8 x 3/8	.22	.32	
1/8 x 1/2	.30	.40	
1/8 x 3/4	.42	.55	
1/8 x 1	.49	.65	
3/16 SQ.	.28	.38	
3/16 x 1/4	.30	.40	
3/16 x 3/8	.33	.44	
3/16 x 1/2	.43	.57	
3/16 x 3/4	.55	.74	
3/16 x 1	.60	.80	
1/4 SQ.	.34	.50	
1/4 x 3/8	.40	.55	
1/4 x 1/2	.45	.65	
1/4 x 3/4	.70	.93	
3/8 SQ.	.49	.69	
3/8 x 1/2	.60	.77	
1/2 SQ.	.66	.88	
1/2 x 3/4	.75	.97	
SPRUCE TRIANGLES		36"	48"
3/8 x 3/8	.47		
1/2 x 1/2	.64		
3/4 x 1/4	.81		
BIRCH DOWELS		36"	48"
1/8	.14		
3/16	.17		
1/4	.19		
5/16	.25		
3/8	.35		
1/2	.50		
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GROOVED L.G. MOUNTS		12"	
3/8 x 3/4 (1/8)	.45		
3/8 x 3/4 (5/32)	.45		
1/2 x 3/4 (3/16)	.50		
SPRUCE STICKS		36"	48"
1/16 x 1/4	.18	.25	
3/32 x 1/4	.20	.26	
1/8 SQ.	.17	.25	
1/8 x 1/4	.20	.26	
1/8 x 3/8	.22	.32	
1/8 x 1/2	.30	.40	
1/8 x 3/4	.42	.55	
3/16 SQ.	.28	.38	
3/16 x 3/8	.33	.44	
3/16 x 1/2	.43	.57	
3/16 x 3/4	.55	.74	

are used to bind the fibers together in a fiberglass or carbon fiber wing. This can lead to a failure down the line, although most airplanes don't live long enough for the epoxy to lose its effectiveness. I have also had MonoKote covering become brittle after many seasons of flying. I suspect that this, and the discoloration that also occurs is caused by UV exposure as well.

What can you do about this? Some modelers go to great lengths to stop the exposure to sunlight, and make custom wing covers for their models. The German team used to keep their white wing covers on their models until just before the flight began. Another option, which is less work, is to buy a set of CJ's Thermoban Wing Shields (Photo #6). These shields are made from aluminized Mylar, which is the same material used in emergency rescue blankets, that keeps in 95% of body heat — or reflects off the same amount of sun falling on a model.

The covers come with Velcro pads to connect the two wing bags so that they don't blow away, and a small sleeve to slide over the nose of your model. The nose or canopy portion can get very hot in the sun, and most electronic component's performance is not guaranteed above a temperature of about 100°F — much less than they can reach while directly exposed to the hot sun. This means that a hot radio can start to operate erratically, leading to glitches or a crash.

If you'd like a set of these covers, send US\$10.00 plus \$2.50 shipping and handling to CJ's Thermoban Wing Shields, 15781 Empire Lane, Westminster, California 92683, or call (714) 839-4166. Be sure to specify your wing's root and tip chords, wingspan, as well as any unusual wing planforms, so that the bags can be made to fit properly.

★

In my January 1994 column we failed to give Chuck Anderson credit for all the photos of the LSF Nationals that appeared in the Soaring column. We apologize to Chuck for this omission.

★

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Area: 504 sq. in., Weight: 3-3.5 lbs., Engine:
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The kit features pre-built, pre-sanded component parts ready for your choice
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SKYLANE 10-15 Span: 48.4 in., Area: 315 sq. in., Weight: 2.5 lbs., Engine: .10-.15 2C, Radio: 3 ch. req'd.

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SKYLANE 45-65 Span: 72 in., Area: 700 sq. in., Weight: 6.5-7.5 lbs., Engine: .45-.65 2C/.60-.90 4C, Radio: 4 ch. req'd.

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SUKHOI SU-26 30 ARF EXCITING 'IN BETWEEN' SIZED, AEROBATIC ARF...

With its big round cowl and striking pink and white finish, the Sukhoi SU-26 30 ARF demands attention whenever it's flown. Just like its full scale counterpart, the Sukhoi is capable of spins, point rolls, knife edge flight, Lomcevak, and more. The kit includes pre-built, pre-finished EZ component parts, molded cowl, clear canopy, all necessary hardware, and assembly instructions. NO building, NO sanding, NO painting...just a few evening's EZ assembly and you're ready to go! Span: 49.5 in., Area: 446 sq. in., Weight: 3.5-4 lbs., Engine: .25-.36 2C/.40-.48 4C, Radio: 4 ch. req'd.

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Weight: 32 oz., Radio: 2 ch. req'd.

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CESSNA 150-Span: 45.5 in., Area: 315 sq. in.,
Weight: 2 lbs., Engine: .10-.15 2C, Radio: 3 ch. req'd.

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CESSNA 177-Span: 48 in., Area: 384 sq. in.,
Weight: 2.5-3 lbs., Engine: .20-.25 2C, Radio: 3 ch. req'd.

NO.115329, LIST \$49.95 Only! **19.99**

Hobby Shack's Foam ARFs require a minimal amount of assembly, installation of your engine (not required in the Spirit of 76) and radio, application of trim, and you're ready to head for the flying field! All three kits include foam fuselage halves, foam wings and tail surfaces, basic hardware, window graphics and N-numbers, plus detailed assembly instructions.

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RCM PRODUCT REVIEW

Tekoa: The Center of Design SHADOW 118



The Shadow is a new open-class sailplane designed by Roger Chastain of Tekoa: The Center of Design. The design features a two-piece presheeted obechi/foam wing with a composite spar preinstalled in an SD 7037 airfoil. The root rib is also installed and ailerons and flaps are cut out. The centerpiece of the kit is the kevlar reinforced fiberglass fuselage, with the stab and wing rod holes predrilled and a canopy that fits exceptionally well. The stabs and the rudder are also presheeted with obechi, and brass joiner tubes installed and prealigned. The hardware package includes anodized aluminum control horns and a bellcrank. The kit arrived in a large 14" x 5" x 60" blue box. Opening the box, we found another box, and once inside, we found extremely careful packing with everything organized in plastic bags, and each part identified from a list of the contents that are inside the bag.

Construction:

The Shadow Plus should be considered an ARF kit since all the major sub-assemblies are prebuilt for you. The obechi/composite



SPECIFICATIONS

Name	SHADOW 118
Aircraft Type	Open-Class Sailplane
Mfg. By:	Tekoa: The Center of Design 3219 Canyon Lake Dr. Hollywood, California 90068
Mfg. Sug. Retail Price	\$399.95
Available From	Both Mfg. & Retail
Wingspan	118 Inches
Wing Chord	10 Inches
Total Wing Area	994 Sq. In.
Fuselage Length	51 Inches
Stabilizer Span	26½ Inches
Total Stab Area	96 Sq. In.
Mfg. Rec. Engine Range	NA
Rec. Fuel Tank Size	NA
Recommended No. of Channels	6
Rec. Cont. Func.	Rud., Elev., Ail., Coupled Ail./Rud., Flaps, Crow Function, flaps down 90°, and ailerons up

Basic Materials Used In Construction:

Fuselage	Fiberglass w/Kevlar reinforcement
Wing	Foam w/Obechi sheeting
Tail Surfaces	Foam w/Obechi sheeting
Building Instructions on Plan Sheets	Yes
Instruction Manual	Yes (7 pages)
Construction Photos	No

RCM PROTOTYPE

Radio Used	JR-347
Engine Make & Displacement	NA
Tank Size Used	NA
Weight, Ready to Fly	74.3 Ozs. (4 Lbs. 10.3 Ozs.)
Wing Loading	10.76 Oz./Sq. Ft.

SUMMARY

WE LIKED THE:

Very little building required, quality of hardware package, flight performance was great, quality of materials in kit.

WE DIDN'T LIKE THE:

No problems.

wing needs the flaps and ailerons separated from the wing and capped with the supplied balsa. Also, the basswood leading edge must be glued to the cores. A nice added touch is that the upper surface of the L.E. is precut at a 15° angle, saving on the dreaded sanding time. Construction on the wing is finished when the tiplets are glued onto the wing and reinforced with a strip of fiberglass. The recommended angle is 10°, although some prefer 0° for a slightly more maneuverable glider. We chose the recommended 10° for a very stable, yet still nimble aircraft. The newest trend in gliders is the unpainted fuselage and natural finish on the wing. This is definitely a very light building technique, but is not very pretty. On the Shadow, with nearly 1000 sq. inches, the "no paint" technique is not necessary. The Shadow fuselage is definitely above-average,



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designed for strength and lightness. The few pinholes were filled with one coat of auto glaze putty, then primed and painted using 21st Century white paint with excellent results. To finish the fuselage, the bellcrank and servo tray need to be installed.


The Shadow pushrods are an aluminum case with steel music wire for precise, friction-free rudder and elevator control. The result is exceptional handling. As previously mentioned, the stab and rudder come presheeted, so to finish, all that's required is gluing on the balsa tips and leading edge.

Two full-size plans are included: one showing fuselage construction and the other showing the wings. Plans are almost unnecessary because of the amount of work done at the factory. There was very little to do in as far as construction goes. It was helpful having the pushrod lengths shown on the fuselage plan layout.

Covering:

Tekoa recommends finishing the wing, stab, and rudder in a natural finish using water-based varathane. We decided to finish the top of the wing with clear varathane. Five coats were applied with wet sanding in-between coats. On the bottom of the wing, we applied dark navy blue 21st Century film. The stab, rudder, aileron, and flap control surfaces were covered in white 21st Century plastic film. We found the 21st

continued on page 154

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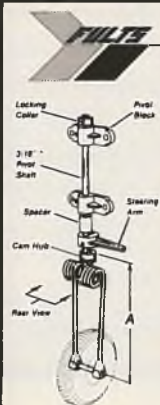
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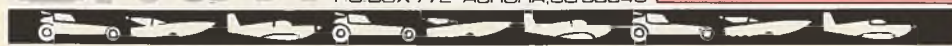
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36-474	24088 .40 R/C BB ABC	72.18
36-178	24800 .45 R/C BB RING	84.19
36-475	25000 .50 R/C BB RING	97.62
36-489	24197 QUICKKEE 500 BB	77.51
35-708	24097 QUICKKEE 500 BB ABC	115.99
36-490	26800 EAGLE .80 R/C W/RING	101.57
35-711	26700 EAGLE .80 R/C ABC	112.27
35-712	26800 EAGLE .80 R/C ABC	112.27
36-493	27400 EAGLE .74 R/C W/RING	112.27
35-713	27500 EAGLE .74 R/C ABC	129.95

** K & B **

49-163	.20 SPORTSTER	41.50
49-182	.28 SPORTSTER	44.99
49-165	.45 SPORTSTER	57.87
49-178	.85 SPORTSTER	64.99
48-688	.40 R/C	66.98
48-341	.61 R/C	84.98
48-792	.45 DUCTED FAN	139.56
48-790	.82 DUCTED FAN	217.82

** MOKI **

67-000	M-15 C U/C RACING MODEL ABC	136.80
67-001	M-15 TR R/C TEAM RACE DIESEL ABC	177.60
67-002	M-15 SP U/C SPORT MODEL	70.80
67-004	M-51 U/C FRT SHFT ROTOR RINGED	142.80
67-005	M-51 R/C FRT SHFT ROTOR RINGED	151.20
67-006	M-61 R/C LS REAR EXHAUST ABC RINGD	183.80
67-007	M-61 R/C LS REAR EXHAUST ABC	187.20
67-008	M-61 R/C LS SIDE EXHAUST ABC RINGD	193.80
67-009	M-61 R/C LS SIDE EXHAUST ABC	187.20
67-012	M-150 R/C FRONT SHFT ROTOR RING	223.20
67-013	M-180 R/C FRONT SHFT ROTOR RING	282.80
67-014	M-360 R/C IN-LINE TWIN RING	550.80

** MVVS **

59-502	.12 GLO STUNT	53.99
59-506	.15 ABC R/C	69.95
59-508	.15 ABC W/PIPE	94.99
59-511	.40 ABC R/C	106.99
59-518	.40 ABC W/PIPE	134.99
59-513	.81 ABC R/C	159.99

** ROSSI **

76-510	R-21 PLANE F-1 RC	140.22
76-487	R-40 PLANE F-1 RC	150.48
76-488	R-45 PLANE F-1 RC	190.84
76-489	R-60 PLANE F-1 RC	193.36
76-490	R-80 PLANE F-1 RC	232.58
76-492	R-61 PLANE F-1 RC	244.67

** ROYAL PRODUCTS **

79-655	ROYAL 21 R/C ABC CAR ENG SIDE EX	69.38
79-663	ROYAL 21 R/C ABC CAR ENG REAR EX	72.12
79-652	ROYAL 25 R/C ABC W/MUFFLER	58.69
79-659	ROYAL 25 R/C ABC W/MUFFLER	64.05
79-657	ROYAL 28 R/C ABC HELICOPTER ENG	64.94
79-650	ROYAL 40 R/C ABC W/MUFFLER	69.38
79-651	ROYAL 48 R/C ABC W/MUFFLER	74.37

** FUTABA-YS **

97-250	.45 SIDE EXHAUST	147.99
97-251	.45 REAR EXHAUST	147.99
97-258	.61 SIDE EXHAUST	249.85
97-259	.61 REAR EXHAUST	249.85
97-257	1.20 4 CYCLE	372.89
97-252	1.20 4 CYCLE (AIR CHAMBER)	525.99

FUEL

** MAGNUM **

60-100	5% W/CASTOR	8.13
60-101	10% W/CASTOR	9.38
60-102	15% W/CASTOR	10.63
60-104	15% BIG MOKI	10.63
60-105	15% 4-CYCLE	10.63

(Add \$6.00 Shipping for Fuel)

RADIO ACCESSORIES

** FUTABA **

36-895	16" J EXTENSION CABLE	5.75
37-085	DUAL SERVO EXT CORD FM/J	9.95
37-447	FM/J MINI SWITCH HARNESS	7.50
37-279	FM/J MINI SWITCH HRNSS W/CHG CORD	7.50
36-800	AM TRAINER CORD	12.95
36-808	FM TRAINER CORD	12.95
37-310	S148 SERVO	14.85
37-471	9301 SERVO	42.48
37-295	S-133 SERVO (MICRO)	27.88

** AIRTRONICS **

11-995	TRAINER CABLE	9.95
11-984	94102 HD SERVO	16.00

** ROYAL SERVOS **

STD TITAN SERVOS	12.98
MINI TITAN SERVOS	16.83
MICRO TITAN SERVOS	21.97
MAXI TITAN SERVOS	21.97

(Titan Servos are Available with Airtronics, Jr., Futaba FM/J or G Connectors)

PROPS

** MASTER AIRSCREW **

60-166	7-8 NYLON PROP	95
60-168	8-8 NYLON PROP	95
60-170	9-8 NYLON PROP	1.15
60-172	10-8 NYLON PROP	1.30
60-191	11-8 NYLON PROP	1.44
60-185	12-8 NYLON PROP	2.14
60-187	13-8 NYLON PROP	2.75
60-181	14-8 NYLON PROP	3.54
60-182	16-8 NYLON PROP	4.70
60-207	8-8 WOOD PROP	1.55
60-210	10-8 WOOD PROP	1.79
60-213	11-8 WOOD PROP	1.99
60-217	12-8 WOOD PROP	2.58
60-220	13-8 WOOD PROP	2.86
60-223	14-8 WOOD PROP	4.12
60-226	16-8 WOOD PROP	7.07
60-229	18-8 WOOD PROP	11.17

GLOW PLUGS

** K-B **

48-596	K-B 1L	1.89
48-600	K-B 1S	1.89
48-253	RC-LONG	2.31
48-254	RC-SHORT	2.31

** FOX **

35-750	STD SHORT 1.2V	1.33
35-751	STD LONG 1.2V	1.33
35-754	R/C SHORT 1.5V	1.82
35-755	R/C LONG 1.5V	1.82
36-472	MIRACLE PLUG	1.87

COVERINGS

** BLACK BARON **

BLACKBARON FILM	7.59
(White, Red, Dark Blue, Light Blue, Cub Yellow, Orange, Black, Cream, FK Red, Trans Red, Trans Blue, Trans Yellow)	

** ULTRACOTE **

ULTRACOTE FILM	9.49
(White, Red, Yellow, Dark Blue, Black, Sky Blue, Cocoa, Orange, Green, Gold, Cream, Lite Gray, Flame Red, Cub Yellow, Mid Blue, Chrome)	

ADHESIVES

** DEVCON **

27-200	5 MIN EPOXY 2.5 OZ.	4.70
27-208	5 MIN EPOXY 9 OZ.	10.29
27-209	30 MIN EPOXY 8 OZ.	10.29
27-205	5 MIN EPOXY 1 OZ.	3.00

** JET **

36-595	SUPER JET 1 OZ	3.89
36-592	SUPER JET 2 OZ	7.20
36-594	INSTANT JET 1 OZ	3.89
36-593	INSTANT JET 2 OZ	7.20
36-611	SLO JET 1 OZ	3.89
36-612	SLO JET 2 OZ	7.20

FIELD EQUIPMENT



** ROYAL PRODUCTS **

80-032	ESCORT FIELD BOX	19.95
80-150	HEAT GUN	15.23
80-151	HEAT IRON	12.89
79-005	HOT HEAD LOCKING SCKT	17.87
79-008	GLO-PLUG CLIP	3.95
78-461	HVY DUTY ENGINE STARTER	28.07
78-480	JUMBO ENGINE STARTER	37.23
80-030	POWER PANEL	18.35
79-240	12 VOLT FUEL PUMP	13.95
79-055	DIGITAL TACH	32.83
79-238	12 VOLT WET CELL BATTERY	13.58
79-194	WET CELL CHARGER	10.08
79-239	12 VOLT SEALED LEAD ACID BATTERY	20.15
79-052	EXPANDED SCALE VOLT METER	10.95
80-034	DELUXE FIELD BOX KIT	29.79

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Wing Area: 965sq. in. Engine: .60

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Wing Area: 900 sq. in. Engine: 1.20

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Wing Area: 840 sq. in. Engine: 1.20




Desire 120
Wing Span: 66" Weight: 8.5-9.0 lbs.
Wing Area: 940 sq. in. Engine: 1.20

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continued from page 151

Century a little harder to apply, but the results are fantastic. Another plus is that it doesn't ever sag when exposed to high temperatures or moisture.

Radio:

Being a competition glider, we felt it needed an equally serious computer radio, with crow function and mixing to be able to push the performance capability of the 7037 airfoil. A JR-347 radio was used in our review model, along with JR 9021 servos for elevator and rudder functions. Four JR 341 microsensors were installed in the wing for ailerons and flaps. The micro 341's are small and powerful, featuring plastic gears

nearly as strong as the metal gears, but at a fraction of the weight.

6.7 ounces of lead was needed to obtain the balance point recommended on the plans. The total flying weight of the Shadow came to 72.1 ozs. (minus the wing rod). Three wing rods are available: (1) the standard aluminum supplied with the kit (4.3 ozs.), (2) an optional carbon fiber rod (2.2 ozs.), and (3) the ballast steel rod (12 ozs.). Equipped with the carbon rod and a JR 1000 mAh battery, our Shadow was ready to fly at 74.3 ozs., giving a wing loading of 10.76 oz./sq. ft.

Flying:

Our Shadow was ready to fly in early April. In New Hampshire, April is usually

quite windy and still cold. The wind persisted for days without letting up. Finally, wind or no wind, it was time to fly. We could resist no longer. Our first flight was off a Northeast Sailplane Products large high start, just to check the trim. Because of the severe gusts, and a little "skittish" feeling, the C.G. was moved slightly forward about 1/4" more than recommended on the plans.

Our second launch produced a twelve minute flight by working some lift off of the tree line. Both launching off of a high start or a 12-volt winch produced straight and very high launch altitudes. Want to zoom? Go ahead -- the wing will flex some, but it's up to the task because of the composite spar.



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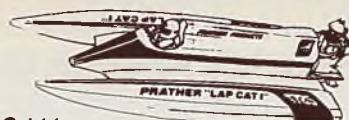
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#LC-111

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#73-950 - **\$666.50**

BOATS

** BOATECH **

16-050	TUNNEL WITH RADIO BOX	210.00
16-051	TUNNEL READY TO RUN	553.00
16-052	TUNNEL WITH RADIO BOX	228.00
16-053	TUNNEL READY TO RUN	680.00
16-054	MONO WITH RADIO BOX	150.00
16-055	MONO I.B. WITH RADIO BOX	150.00
16-056	MONO R.T.R. OUTBOARD	480.00
16-057	MONO WITH RADIO BOX-TANK	162.00
16-058	HYDRO	360.00

(Allow 30 days for delivery on Boatech items).

** PRATHER **

73-938	1061 LAP CAT I TUNNEL	115.88
73-938	WITH 1209 ACC PKG	199.95
73-878	1066 LAP-CAT II TUNNEL	133.26
73-878	WITH 1212 ACC PKG	223.21
73-730	1058 32 INCH TUNNEL	139.95
73-730	WITH 1212 ACC PKG	229.80
73-919	1087 LAP CAT III	183.33
73-919	WITH 1214 ACC KIT	230.63
73-943	1072 SPITFIRE HYDRO	169.99
73-943	1072 W/1216 ACC KIT	226.95
73-948	1073 SPITFIRE II HYDRO	193.16
73-866	1042 31" DEEP VEE O/B	92.70
73-866	WITH PKG	135.45
73-865	1041 31" DEEP V KIT	96.68
73-865	WITH PKG	175.20
73-852	1011 40" DEEP VEE O/B	115.88
73-852	WITH PKG	158.88
73-85C	1011 40" INCH DEEP VEE	115.88
73-85B	WITH PKG	204.86
73-854	1015 46" INCH DEEP VEE	139.07
A3-865	1015 W/1016 1020 8100 I/B	229.73

** MAUS MOTOR SPORTS **

MAU21	MAUS CHAMP .21	183.99
MAU21B	W/ACC	285.12
MAU45	MAUS CHAMP .45	224.95
MAU45B	W/ACC	315.42

** MIDWEST **

62-022	#982 THE HARBOR MASTER	36.24
62-031	#950 THE DINGHY	14.50
62-034	#953 THE MAIN LOBSTER BOAT	47.64
62-041	#960 THE FIRE BOAT	58.10
62-042	#966 GRAND BANK DORY	24.88
62-565	#961 TOUR MASTER BOAT	40.68
62-574	#964 BOOTHBAY LOBSTER BOAT	101.69
62-594	#965 CHEASPK BAY FLATIE	20.90
62-605	#967 SKIFF BOAT KIT	14.50
62-606	#968 SHARPIE SCHOONER	34.85

** DUMAS **

29-498	#1320 HOT SHOT IV 3.5	55.18
29-929	#1326 HOT SHOT SPRINT	59.65
29-518	#1327 ABS 3.5 SPRINT	117.19
29-487	#1318 HOT SHOT .45	68.25
29-926	#1323 HOT SHOT SPRINT	68.25
29-936	#1329 HOT SHOT SPRINT	66.89
29-359	#1436 SKATER 67	197.08
29-865	#1426 SORCERER	50.58
29-407	#1435 SCARAB 38-KV	231.84
29-467	#1438 SCARAB W/LINE TRIM-ENG	529.99
29-411	#1101 HOBIE-CAT SAILBOAT	13.95
29-429	#1107 STARCLASS SAILBOAT	136.60
29-445	#1217 MR. DABBY TUG F/G	227.97
29-918	#1322 MILLER AMERICAN	133.68
29-930	#1325 MISS CIRCUS CIRCUS	145.31
29-490	#1502 L'I'L SWAMP BUGGY	18.85
29-489	#1501 SWAMP BUGGY	38.38
29-491	#1505 BIG SWAMP BUGGY	49.99
29-839	#1506 WINDY AIR BOAT	37.20
29-931	#1229 PRIME TIME ELECTRIC	231.84

MARINE ENGINES

** K & B **

48-805	.40 SPORT MARINE	73.74
48-848	.21 R/C INBOARD	106.71
49-158	.45 R/C INBOARD	121.73
48-207	.67 R/C INBOARD	208.70
48-793	.82 R/C INBOARD	214.99
48-216	.21 R/C OUTBOARD	110.99
48-215	.45 R/C OUTBOARD	131.95
48-159	.67 R/C OUTBOARD	210.00

** PICCO **

73-812	P-5 .21 MARINE	237.60
73-813	P-45 .45 MARINE	200.40
73-814	P-87 .87 MARINE	237.80
73-815	P-80 .80 MARINE	252.00
73-816	P-90 .90 MARINE	309.80
73-8HY	P-90 HYDRO MARINE	391.20

ENGINE ACCESSORIES

** PICCO PIPES **

NP-615	.21 ENGINES	32.40
NP-616	.45 ENGINES	32.40
NP-617	.67 to .80 ENGINES	34.80
NP-618	.90 ENGINES	39.80
NP-619	.90 MUFFLED	48.00

** PRATHER PIPES **

73-885	.21 ENGINES	22.68
29-999	w/CLAMPS & CPLR	27.38
73-886	.45 ENGINES	29.58
29-999	w/CLAMPS & CPLR	34.31
73-911	.67 to .90 ENGINES	33.45
32-999	w/CLAMPS & CPLR	39.20
73-732	.67 to .90 MUFFLED	37.01

** PRATHER MOUNTS **

73-775	.21 OB ADJ./MOUNT	19.95
73-860	.45 OB ADJ./MOUNT	19.95

** DRILLED & TAPPED **

73-931	PICCO .21	11.98
73-934	PICCO .45	12.78
73-937	PICCO .67 & .80	13.56
73-930	K&B .21	11.96
73-933	K&B .45	12.76
73-936	K&B .67	13.56

RADIOS

** AIRTRONICS **

11-766	AV-25 2ch-2stk	44.99
11-855	VT-2R 2ch-2stk w/Servo Reverse	58.40
11-853	VT-2P 2ch-Pistol Grip	56.45
11-864	XL-2P 2ch-Pistol Grip	85.20

** FUTABA **

37-326	FP2V ATTACK	47.74
38-981	2NBR ATTACK	58.54
38-987	MAG-SPORT w/S148 Servos	62.14
37-225	MAG-JR. w/S148 Servos	87.54
37-300	4NBL w/3 S148 Servos	113.95
38-889	4NBF w/3 S148 Servos	139.94

** FUTABA SERVOS **

37-310	S-148 SERVO 42 oz in.	14.65
37-471	S-9301 SERVO 69.5 oz in.	42.46
37-468	S-9101 SERVO 41.7 oz in.	42.46
38-836	S-134 SERVO 112.8 oz in.	38.85
37-203	S-6101 SERVO 55.8 oz in.	31.14
38-939	S-5102 SERVO 27.8 oz in.	45.54
37-385	S-125 SERVO 129.3 oz in.	41.98
38-888	S-3002 SERVO 44.0 oz in.	45.54
38-936	S-3302 SERVO 110.0 oz in.	47.54
38-937	S-9401 SERVO 44.5 oz in.	45.54
38-958	S-9601 SERVO 36.1 oz in.	45.54

PROPS

** PRATHER **

73-888	S-215	11.35
73-890	S-220	11.35
73-892	S-225	11.35
73-894	S-230	12.15
73-896	S-235	12.15
73-898	S-240	12.15
73-900	S-245	12.85
73-902	S-250	12.85
73-904	S-255	12.95
73-906	S-260	13.75
73-908	S-265	13.75
73-910	S-270	13.75
73-887	B-215	9.56
73-889	B-220	9.56
73-891	B-225	9.56

BUILDING ACCESSORIES

48-762	8150 SUPER Pxy Resn w/CAT 1 qt	11.15
49-180	8152 SUPER Pxy Resn w/CAT 1 qt	7.15
48-653	8151 RESIN HARDENER 1/2 OZ.	2.02
48-772	8180 3/4 OZ. GLASS CLOTH	5.41
48-773	8181 2 OZ. GLASS CLOTH	5.35
48-774	8182 6 OZ. GLASS CLOTH	4.95
48-784	8172 Measuring & Mix Cups 1 oz. [24]	2.02
48-782	8188 Measuring & Mix Cups w/Lids 8 oz. [4]	2.97
49-157	8182 MICRO-BALLOONS 8 OZ.	2.25

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** MAGNUM **

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60-108	50% BOAT FUEL	22.81
60-116	60% BOAT FUEL	24.90

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- Rapid cycler. Up to 1000mA discharge. Up to 1000mA 80% charge, slow charge to 100%, trickle.
- Indefinite C/10 charger, trickle.
- Fast charger. Up to 1000mA 80% fast charge, then slow charge to 100%, trickle. 4 digit DVM.
- Advanced peak charger. Up to 1000mA 100% charge, trickle. 4 digit Digital Voltmeter (DVM).
- Normal C/10 charger for new battery priming.
- Trickle only charger. Will charge up to 48 ni-cad cells in pack combinations.
- Wet & gel cell charger. Up to 1000mA 100% charge, float. 4 digit DVM included.
- Dual voltmeter. 4 digit no-load & 4 digit auto load. Cell tests with diagnostics. Quick charge.

ALPHA-4 HAS THESE FEATURES:

- 115V AC operation & 12V DC field operation.
- Processes four batteries simultaneously with any of the ten built-in devices.
- Trickles 48 cells in various pack combinations.
- Processes ni-cads from 1 to 12 cells and cap. from 10mAh to 9999mAh. Wet & gel cells from 2V to 18V and cap. from 10mAh to 1000Ah.
- Charge current 4mA to 1000mA in 1mA increments.
- Discharge currents: 250, 330, 500 and 1000mA.
- Trickle switchover based on charge using microprocessor slope-following technique.
- No 17 hour timers to ruin your batteries.
- Complete flexibility. Simple programming of custom setups. 10 standard setups at a keypress.
- Data input through sealed keypad. Output through scrolling alphanumeric LCD display.
- Text error reporting on 4 ports for: open, short reverse polarity, voltage high, voltage low.
- Batteries are not processed if there are errors or batteries do not conform to user entered battery parameters. All problems are explained by appropriate error messages.
- Full protection against reversed polarity.
- Auto polarity correction of 12V DC power input.
- Auto power outage protection utilizing one of the user batteries. Less than 1mA drain during power outage.
- Dual microprocessor multitasking, interactive user friendly operation.
- Extensive diagnostic text messages. All errors detected immediately and explained.
- Help text messages scroll through the display on demand and can be interrupted at any time.
- Displays for 4 battery ports include: port number, device type, number of cells, user specified capacity in mAh, measured capacity in mAh, 4 digit no-load voltmeter (DVM), 4 digit load DVM, discharge, fast charge, slow charge, C/10 charge, trickle.

-Alpha-4 has total of five standard 2.5mm jacks. One jack is for 12V DC or for wall transformer AC power input. The other four jacks are for battery ports. Unit comes with 3 Amp wall transformer terminated in 2.5mm standard plug. Adapter cables to fit 2.5mm jacks are NOT SUPPLIED.

with the unit and must be made by the user or purchased separately. See below.

Alpha-4 is an advanced technology multifunction, multitasking battery management unit of unprecedented flexibility and performance. It can maintain virtually any rechargeable battery. You can for instance process simultaneously your TX, Rx, camcorder battery and field box gel cell. For the power source you can use 115V AC or 12V DC battery. The unit contains voltage boost circuitry so that up to 12 ni-cad cells can be charged with 12V DC as a power source.

Why pay up to \$150.00 for a single function obsolete and inflexible unit, when for a little more you can move light years ahead in performance, sophistication and flexibility and have ten devices in one integrated microprocessor controlled system.

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Alpha-4 (includes 3 Amp AC wall power transformer with 2.5mm plug).....\$199.00
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 C3- 2.5mm adapter cable with cigarette lighter plug. Connects 12V car battery to Alpha-4 power jack.....\$9.50
 P1- 2.5mm plug only.....\$1.50
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The flight envelope is wide with trailing edge camber or reflex. With the light composite wing rod, it's capable of ultra slow flight; with the trailing edge reflexed a little, it can really move out. While flying in heavy wind, if it doesn't penetrate to your satisfaction, just add the 12 oz. ballast rod and she can fly in a hurricane. In light lift, it excels by climbing quickly due to light wing

loading and the airfoil's ability to hold a high angle of attack while in the thermal turn. Throw the flaps down 90° and she can slow to a crawl (be careful -- you must maintain flying speed or she could stall). With crow added, the descent angle will steepen, but we found that crow was not really necessary. With slow approach speeds and 90° flaps, spot landings become consistently easy.

Summary:

The Shadow may be the standard to which all others will be compared. The kit sets new standards in the areas of design, and in quality of materials. It's flying characteristics can be summed up in this way: "It does what you want it to do." □

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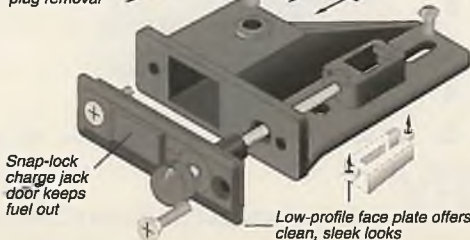
Our full line includes zinc plating for all metal fasteners, so you'll never find a part "frozen" in place by rust or corrosion. Ball link sockets that feature hex-shaped

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If you could only have one R/C airplane, Telemaster 40 should be the one!



HLA111 Hobby Lobby Telemaster 40\$79.50

List price \$99.95

There are beginners who could probably solo fly a fast RC pattern plane successfully. And there are other beginners who may not be able to solo fly anything. But, if ever there was an airplane that could be said to have the best chance of being flown (i.e.: landed) successfully by a beginner, Telemaster 40 is the one.

Telemaster 40 will take off, fly itself, and land itself. If you are a beginner, build it fairly well, and do some imaginary flights before the actual first flight, you will probably have no problems soloing the Telemaster 40 on your first RC flight. If this sounds boring and you'd like a bit more action we can assure you that Telemaster 40 will also do loops, rolls, tail slides, inverted flight, Cuban Eights, Immelmans and other aerobatics as yet unnamed. At full power with a .40 engine it will fly 70 mph. But, it will not stall at 10 mph. It's big enough to be clearly visible in the air, and is readily discernible to be inverted or right side up at a distance.

Telemaster 40 has an Assembly Instruction book that describes and pictures every building step. And the wood parts are as precisely cut as the most expensive kits on the market. Quality is tops - the Telemaster 40 is made for us by Great Planes Model Manufacturing Company.

Telemaster 40 has a wing loading lighter than most gliders. Light airplanes simply fly better than heavy ones. We have seen Telemaster 40's fly successfully that were so badly assembled we could hardly believe they would fly. But they do fly. One in particular: The pilot's little brother sat on the tail and broke it off. The field repair was a piece of 2" by 4" balsa block under each side of the horizontal stab. The builder flew the repaired Telemaster 40 three times successfully and unassisted and these were his first RC flights ever.

Telemaster 40: 73" wing span, 848 sq. in. wing area. 53-1/2" long fuselage (the airplane is big), all balsa and hardwood RC model airplane kit. For 3 to 5 RC channels. It flies well on only 3 channels - rudder, elevator and throttle. But the kit includes both wing flaps and ailerons. With flaps extended Telemaster 40 can land on a headwind at zero ground speed. It flies nicely on .19 through .40 size engines. It comes with tricycle landing gear, but can also be flown as a tail dragger.

We have sold over 17,000 Telemaster 40's and most of them were bought because of recommendations from modelers who own them. We figure that a fourth of them are bought by beginners. But, most Telemaster 40's are bought by long-time RCers who seem to like airplanes that build up the way they're supposed to and fly like airplanes ought to.

NEW! Cheap, powerful, electric power for Telemaster 40!

GR1770 Graupner Power Gear 2:1\$69.50

We tested this with a TURBO 700BB motor (GR3307), a 12-1/2-6 Graupner prop (GP12560) and 2, 7-cell nicad packs. The full power thrust was 50 oz. (3 lbs., 2 oz.) — good power for a 6 to 9 pound airplane like a Telemaster 40. Current flow was 24 amps. This current flow would give 3-1/2 minutes of full power running with 1400 SCR nicad packs, and 4-1/2 minutes at full power with 1700 SCR nicad packs. Flight times of 7 to 9 minutes should be normal because you don't run at full power all the time. Finding room in the Telemaster 40 for 2 little 7 cell packs is about as hard as parking your bicycle in a blimp hangar.

4" long, 5-5/8" including shaft (which can be cut shorter). Shaft is 6mm. Use GR1770/1 or HLAN2412 Propeller Couplers for 6mm Shaft to affix a prop to this shaft. Weight of the Power Gear with the big TURBO 700BB motor is 18 oz. Our adjustable Engine Mount HLH698 mounts this perfectly and includes steerable nose gear bearings.

GR1770/1 Propeller Coupler for 6mm Shaft\$5.90



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105" wing span, magnificent plastic body, balsa sheeted foam wing sailplane for the inexpensive GR1165 drive unit.

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F. HLA130 Freshman Electric Sailplane \$39.00 — **SALE! \$29.00**
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G. MID169 Midwest Electric 'HOTS' Basic Kit, List \$69.95 **SALE! \$19.00**
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Balsa kit, majestic 96" wingspan soarer. For rudder, elevator, throttle control, ailerons optional. Use GR1165 drive system. On our Video 3.

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

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

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A. GR2172 Graupner Shark R/C "Aerobatic" Submarine **\$179.00**
22" long Graupner sub is so fast it can actually leap out of the water like a frightened sailfish! Order Graupner's GR1979 Multispeed 500 Duo drive.

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C. GR2171 Graupner Key West Electric Boat **\$59.00**
21" long very high speed electric racer. Order the gigantic Graupner GR1161 700 Turbo Hydrodrive for this — the motor is so big it barely fits into the boat, but it goes like crazy!

D. HLK2081 Alexandra Launch for Steam **\$212.00**
37" elegant launch. Preformed ABS hull with open deck for Cheddar "Pintail" steam engine.

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F. NEW! Saito Steam Engines
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2 Horizontal Y2DR
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G. GR2000 Electro-Vee Complete Race Boat **\$147.00**
31" long. EVERYTHING is in the box except nicads and radio! Fast boat. Easy assembly.

H. Cheddar Steam Engine kits with Assembled Boilers:
HLCM096 Pintail Vertical Steam Engine (for Alexandra) **\$433.00**
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J. HLK2061 "Victoria" Launch without steam engine **\$199.00**
46" long, with formed ABS hull. Order HLCM101 "Puffin Vertical" Steam Engine Kit with Boiler for Victoria.

K. GR2147 Graupner Buggier Tug Boat **SALE! \$177.00 — \$199.00**
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32" long, ultra detailed scale kit from Graupner.

L. JP001 Cup Yacht 508 12 Meter Sailboat **\$59.00**
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JERRY SMITH



The suggestions appearing in For What It's Worth have been submitted by individual hobbyists or reprinted from club newsletters. RCM has not tested, or otherwise tried, each idea printed herein. Send your hints and kinks to R/C Modeler, Attn: FWIW, P.O. Box 487, Sierra Madre, CA 91025 — win a free book from RCM's Anthology Library series if your idea is used.

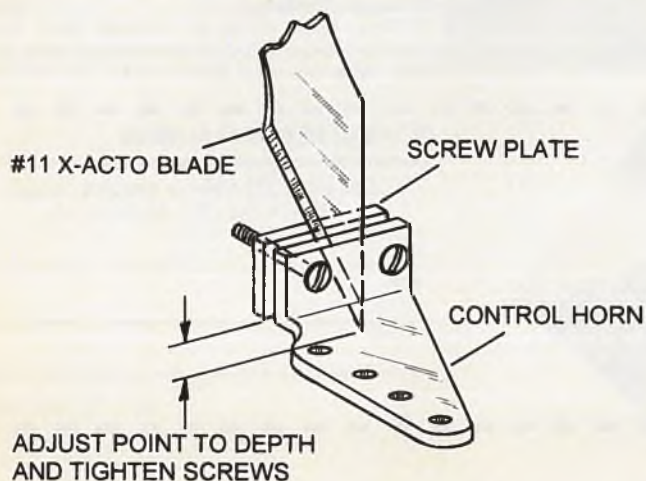
CA BOTTLE HOLDER

To keep from knocking over open bottles of CA glue, drill a hole approximately 1" deep in a scrap piece of 2x4 with a bit that is just a little bigger than the diameter of the CA bottle (assuming that the bottle is round). Place the bottle back in the holder and never topple it over again. Submitted by Steve Shibuya, Jackson, Wyoming.

CUTTING DEPTH GAUGE

When mounting control horns on solid balsa flying surfaces, use an inlay platform of plywood to provide a solid mounting surface. Frank Elliot, Albuquerque, New Mexico, discovered a simple method of controlling the depth of the cut for the inlay using a control horn; the very thing he was going to install, and it's reusable for the purpose intended when you are finished.

Screw the mounting screw down until the screw plate is almost in contact with the mounting flange on the horn. Insert the blade of your hobby knife through the slit



between the screw plate and the flange, set the depth of the cut from the control horn to the tip of the blade, and tighten the screws (see sketch). You can now accurately cut the depth you need.

After the side cuts are to depth, the undercutting to remove the balsa plug is easy since the side cuts more or less guide and define the depth of the rest of the cutout. Care must be taken to do a good job and wind up with a flush plywood mounting plate. This makes it a lot easier and neater.

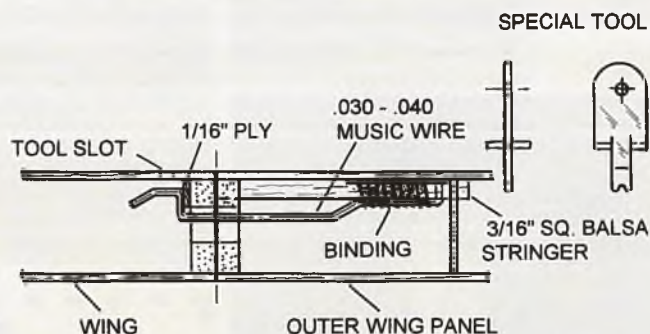
4-STROKE BLUES

If you have a love affair with your dear 4-stroke engines but suffer from post flight blues due to an oily residue on your plane, and you have sealed the exhaust and pressure tap with silicone, 80% to 90% of your problem is from the crankcase vent. Here's the cure for your blues: Use a piece of antenna tubing like SU-PR-LINE, or other brand, and a short piece of regular fuel tubing to connect it to the vent tap. Run the tubing through your fuselage and out the rear of the plane where the residue will be expelled. If you can't run the semi-rigid tube, you can use fuel tubing for the entire length as needed.

You may still get a very small amount of oil on your plane from around the prop drive washer, but it will be minor compared to what you're getting from the crankcase vent. Submitted by Andre Landrum, Ridgeland, Mississippi.

WING LATCHES

After building an excellent sailplane kit with a three-piece wing, C. Beaumont Lewis, San Miguel De Allende, Mexico, found no provisions for holding the wing panels together. He devised this simple music wire latch attached to a short 3/16" square balsa stringer between the two ribs adjacent to the wing joint. (See sketch.)



SPECIAL TOOL

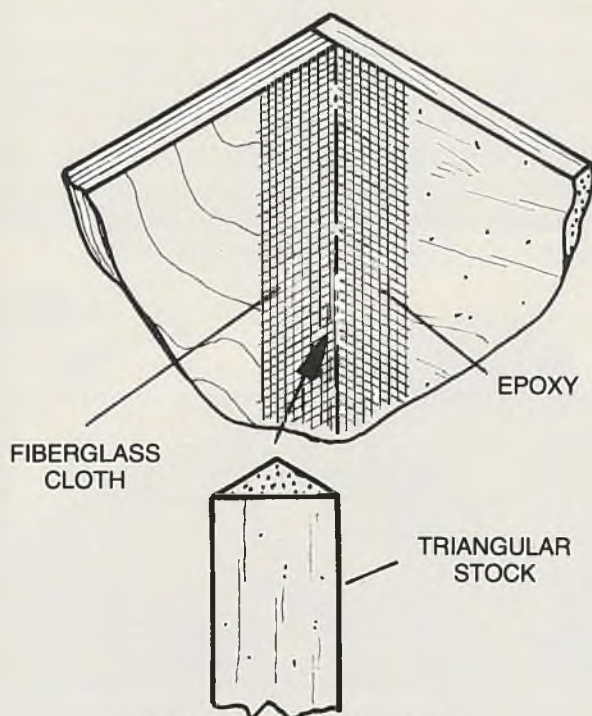
The 1/16" ply bearing plate is sanded on assembly to the thickness that gives a snug fit, but not so snug as to prevent the latch from engaging. Harden the bearing surfaces of the holes in the ribs with thin Hot Stuff.

The special tool is easily made from brass plate. When the two lugs contact the skin of the wings, the latch is depressed far enough to slide the wing panel out easily. The line scribed on the tip of the tool tells you when the latch is fully engaged. The hole in the top of the tool is there so you can tie it around your neck with a piece of string. All that is visible from the outside is a small slot in the top of the wing.

FOAM CUTTING WING TEMPLATE

Looking for a good foam cutting template that's quick and inexpensive to make? Recently, Jeff Casale, Richardson, Texas, has been experimenting with corrugated cardboard and coat hanger wire. The results were very acceptable.

Using ordinary cardboard, cut out the airfoil configuration slightly undersized. Then, using coat hanger wire, form it into the groove of the corrugations. The wire is soft and will form easily. A few drops of Super T CA to hold the wire in place and it's done. The cardboard holds the shape of the wire, and the wire keeps the cardboard from burning. No fancy tools required.



EXTRA REINFORCEMENT

When reinforcing a corner with triangular stock, include a piece of fiberglass cloth between it and the adjacent surface using epoxy. The strength of the corner is significantly increased over just adding the triangular stock (see sketch). Submitted by Art Goris, Ocala, Florida.

BALSA WOOD FILLER

A terrific balsa wood filler can be made by mixing a light spackel compound, such as Model Magic, with water to a consistency of cream. Brush it on and sand when dry. Next, apply automotive primer with a light sanding afterwards, then apply the finish coat. It works great. Submitted by Jerry Kust, Mound, Minnesota.

1/4 SCALE AILERON EXTENSION RACEWAY

This suggestion is for use in built-up wings using 2" wide gummed paper package tape. Cut two pieces twice the length of the raceway required and then cut these into 1" strips. Use 1/2" PVC pipe as a mold. Spray a coat of silicone on the pipe to act as a release agent. Wrap the first layer around the pipe in a spiral, with the gummed side out, and hold at each end with Scotch Tape. Wrap the second layer

from the opposite direction with gummed side down. Check fit of spiral before wetting. When satisfied with fit, wet the first inch or so and hold down to dry. Mist on a fine coat of water and continue to spiral the second layer. When dry, cut through the ends with a razor and carefully slide the paper off the pipe. The result is a lightweight (approx.) 5/8" dia. paper tube. Submitted by Hugh Bainard, Lodi, California.

SCALE TRICK

While working on his new P-51 Mustang, John Beech, APO AA, was tempted to cut out the hole in the underbelly radiator scoop and put in a piece of window screen, painted black, to make it look sharper. However, he remembered reading somewhere that the open hole with the screen caused a lot of drag. Instead, he put the piece of window screen on wax paper, applied a thin coat of epoxy on it, followed by a coat of black paint. The screen still looks like it's open and two side benefits occurred: You don't have to paint behind the screen and since it's sealed, it doesn't let dirt and fuel in the scoop.

REPLACEMENT THROTTLE ARM

Ron Watson, Visalia, California, broke the throttle arm on a small O.S. Max engine and wasn't too thrilled with the prospect of ordering a new one; the wait, plus cost of shipment for a small part.

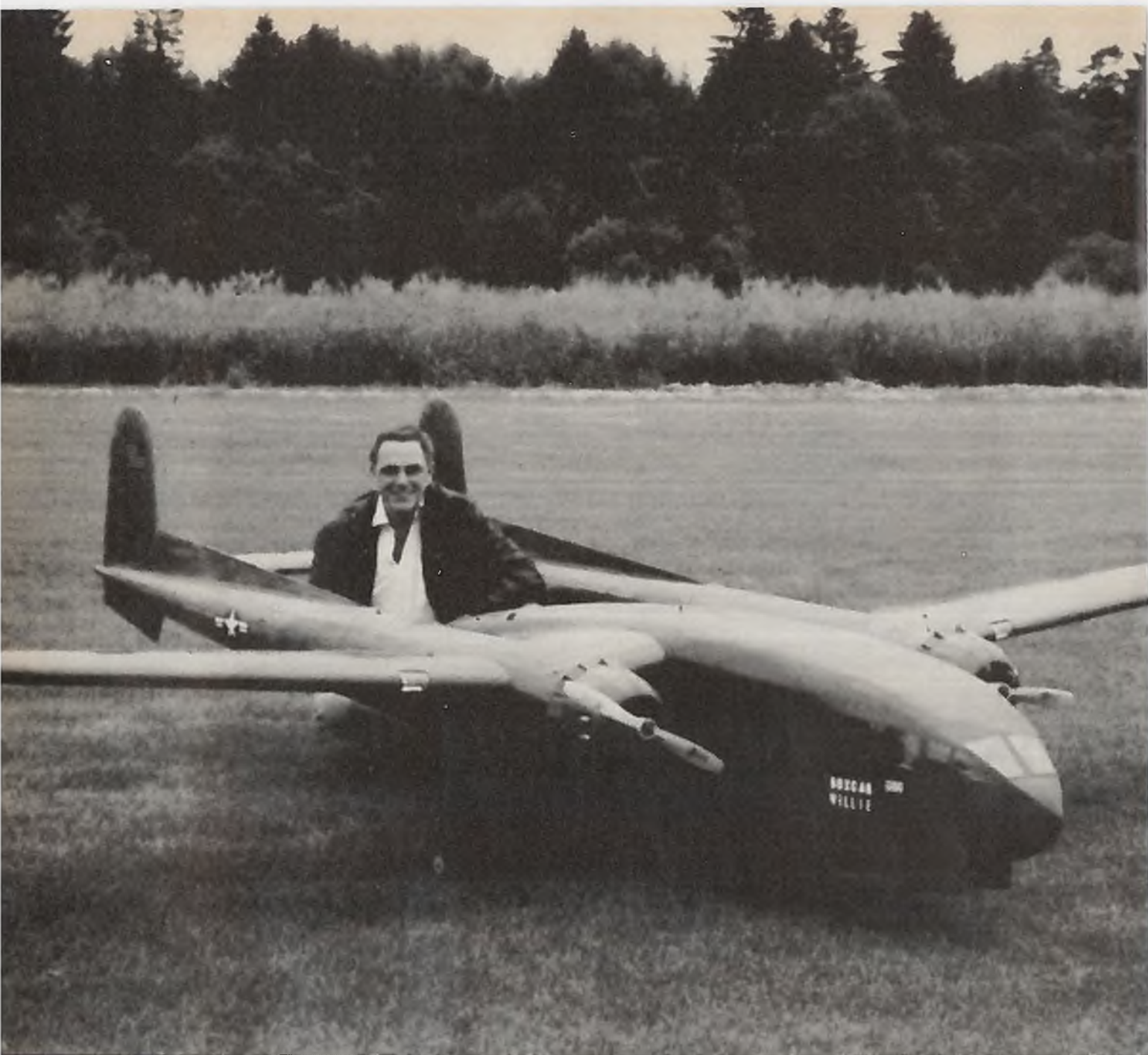
Ron solved his problem by modifying a servo output arm and installed it on the carburetor. A star washer was placed between the new throttle arm and carburetor to keep it from slipping and changing positions. The star washer is a good idea even if you don't need to replace the throttle arm.

IN CASE YOU CRASH

Every once in a while I get a suggestion that tickles me. Jim Irwin, Los Alamos, New Mexico, certainly lacks confidence in his flying ability and expects to crash. Here's Jim's suggestion: While building the fuselage for a .40 size or larger airplane, take a lightweight garbage bag, fold it in half lengthwise, and roll it up tightly like a cigar. Put a piece of tape around it to hold it together; it can then be folded or bent to fit inside the fuselage as it is being built. When you finally have the last, really hard crash, you won't have to walk back to the car for a bag to carry out the pieces.

ORGANIZING ARTICLES

In order to avoid hunting through countless magazines for specific articles you want to refer to later on, try this suggestion: As you read each model magazine, put a paper clip on the top of the page of anything you may want to save for later; such as electronic articles, model plans, or any other useful information. Also note the magazine, month and year in which the article appeared. Then, once a month use a copy machine to copy them. File each under an appropriate heading such as R/C Plans, Electric Planes, etc. This method will enable you to readily refer to specific articles that interest you without all the hassle of hunting. Submitted by Clyde Wealand, Akron, Pennsylvania.



THE FIRST FLIGHT OF BOXCAR WILLIE

By Ron Campbell

This is a story of the concept, design, and construction of an original radio controlled aircraft. It is also the story of the first flight of that aircraft.

First flight, that collection of wild emotions that culminate in what becomes a special memory for the radio control enthusiast. The product of his labors finally rides the wind alone, now relying only on his craftsmanship, skill, and guidance for its

safe return to earth. All radio control nuts have them, these first flights. Some more memorable than others and memorable for both good and bad reasons.

I remember first flights in the early days of my participation in the hobby when, with sweaty palms and a heart rate at about the same rpm as the engine, I would watch my .40 size trainer take off with a roar and disappear in a cloud of dust. Then, after gathering up as many big parts as I could find, I'd take them home, glue them back together again so I could try another flight the next day.

And then later, with just a little more

flying experience, the memory of another flight terminated by terrain somewhere just beyond the curvature of the earth. My daughter standing a sunset vigil atop my old pickup truck trying to provide a far distant clue as to the probable impact point. We never did find all of that one. But, no matter, it had so much epoxy on it, it flew like a pair of pliers anyway.

This first flight of Boxcar Willie, though, was especially satisfying and memorable for me because it was the culmination of two and a half years of extended effort in design and construction and, to see the first lift off and graceful first flight of this impressive

airplane was particularly gratifying.

I have been asked why I chose the C119 Flying Boxcar for my next big bird project. I have no particular attachment to the C119. The only flight I ever had in one was a very forgettable trip from Japan to Okinawa while in transit to join my squadron off Vietnam. The trip had been preceded by a lengthy display of very poor judgment at the Atsugi NCO club the night before so, my only direct recollection of the old Boxcar has a lot to do with loud noise and the Smithsonian proportions of a semi-terminal hangover.

It was nothing special about the big Fairchild itself that lead me to develop it for my next R/C design, but rather a desire to design and build a large R/C aircraft that is not otherwise done every day. Everyone builds B25's, B26's, P38's, C47's, etc. I wanted something sharp (of course, what airplane isn't — even the "Agcat" looks good to an airplane person). But, I wanted this one to be distinctive, and of Korean war or earlier vintage.

I had recently finished converting one of my existing big bird designs from twin O.S. .60 ducted fans to O.S. .60 props. The aircraft, which we call the Blue Goose, is a replica of a Navy A3D Skywarrior with a 10' wingspan and a weight of 30 lbs. (The two .60 fans flew the airplane well but it was exceptionally noisy measuring 122 db at 17,500 rpm.) I have been flying the "Blue Goose" on props for a long time now. It is a real crowd pleaser and much fun to fly, albeit somewhat restricted in maneuvers due to light "G" load limits. I wanted something bigger, more impressive, and even more fun to fly.

Then one day while thumbing through a section of one of my old airplane books that hadn't been all slobbered on, I came across a photograph of a C119 "G" all done up in jungle feathers. That was it. What a distinctive and impressive airplane — the inception of "Boxcar Willie."

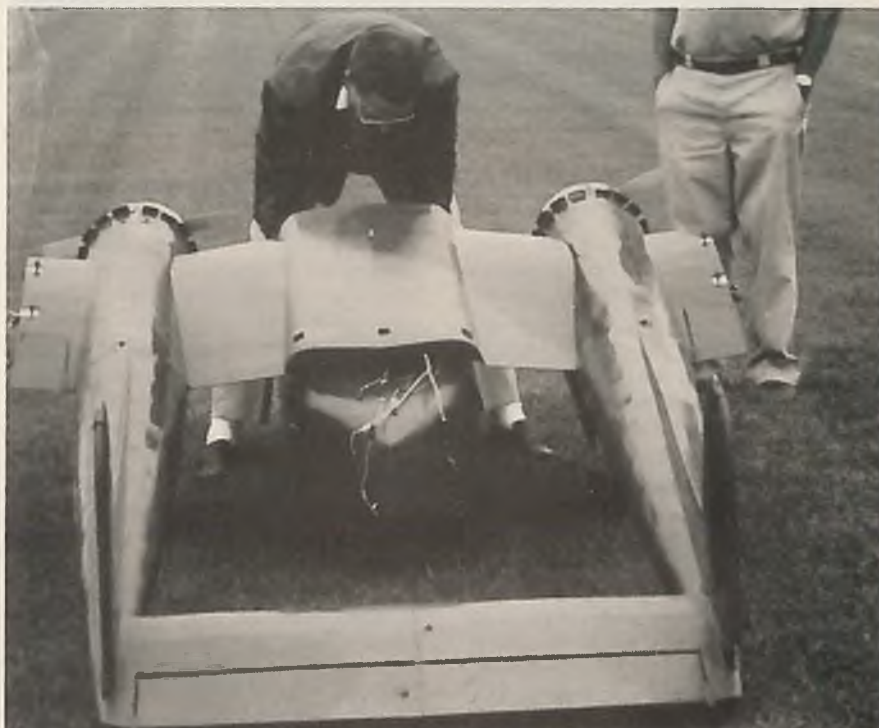
I started the design replication of the Fairchild C119 "G" in January of 1989. The full scale construction drawings were complete by April, 1989. As I have done with all of my big bird designs, I have taken some minor liberties with the design of Boxcar Willie in order to enhance the Radio Control performance of the aircraft. I like to add a little of my own aesthetics to the finished product also. Sort of like: "If Fairchild had bothered to call me at the time they were first designing it, this is what the original would have looked like anyway."

The actual construction of the model began in May of 1989 and was finished in June of 1991. My work requires a lot of travel with considerable time spent away from home so I am not able to devote as much of my spare time to building model aircraft as I would like. However, every weekend that I was home was spent engulfed in the construction of this airplane.

All parts and pieces are "shop fabricated" construction including the pneumatic retract system. That is, none of



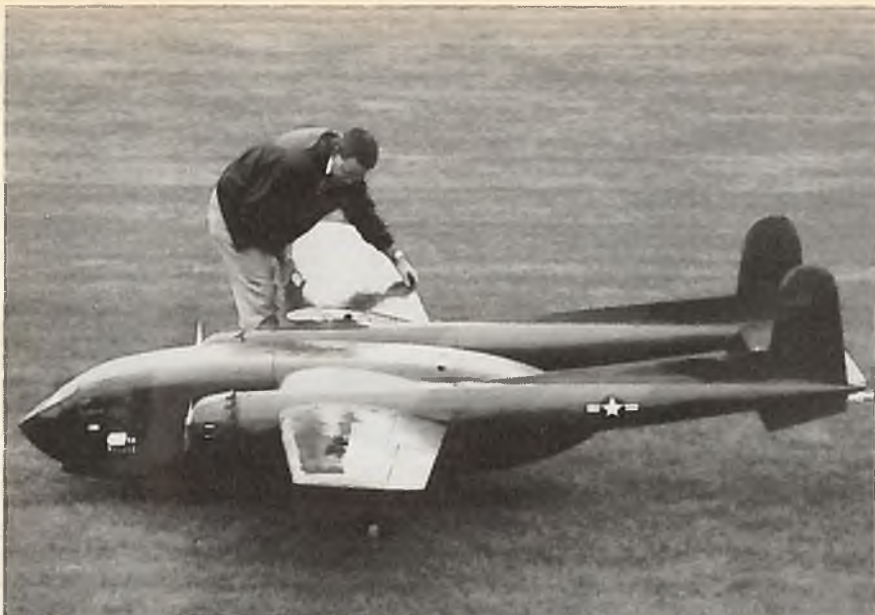
This is the day — July 13, 1991 — first flight. Let's see — "Da main boom's connected to da tail boom."



The tail booms and wing center section are all bolted together. The main gear are down and locked. All intra-section servo connections are electrical. Each control surface has its own individual servo, there are lots of servos!



The center section and booms bolt up to the fuselage. Field assembly can be accomplished by one individual without assistance.



The outer wing panels bolt on.

the parts required to build the model were fabricated or machined outside of my workshop. The cylinders for the main landing gear retract system were fabricated from 1" diameter bicycle tire pumps and the cylinder for the nose gear was fabricated from 1/2" brass tubing. The pressure source for the retract system is a full can of spray paint propellant mounted upright in the fuselage. Two small receivers, one inverse to the other, are installed in series with the pressure circuit to provide liquid propellant traps to protect the pneumatic cylinders from incursion of "raw" propellant. The seals within the cylinders are neoprene "O" rings which would not be compatible with super cooled liquid propellant, were it to reach the cylinders. The model can make one negative "G" or inverted maneuver per flight without "freezing" the retracts. The full scale C119 "G" was not noted for its aerobatic prowess anyway. The model is designed for gentle aerobatics, i.e., loops, barrel rolls, hammer heads, etc.

The structure or airframe is constructed

entirely of light ply and balsa, utilizing a "honey comb" type construction with a skin of 1/32" balsa sheeting covering the entire model. The balsa skin is covered with MonoKote — lots of MonoKote. The main wing spars (two per wing) are 3/4" aluminum tubing with 5/8" aluminum tubing "snug fit" inside the 3/4" tubing to accommodate outer wing panel removal.

One of the major challenges in the design of the model was transportability. In order to fit the model into any reasonable R/C aircraft transporter (mine happens to be a Chevy 20 van), it was necessary to design it to be broken down into six sub-assemblies. The tail booms separate in the middle of the horizontal stabilizer with each boom then also separating from the main airframe just aft of the main wing section. The two outer wing panels each separate from the main wing section just outboard of the engine nacelles. The fuselage is the largest single sub-assembly and separates from the main wing section looking like some sort of fat canoe when sitting all by itself.

The aircraft is powered by two Saito 300 horizontally opposed twin cylinder engines which provide more than enough thrust from each of the 20" props. The gross weight of the model is 65 lbs., including 1/2 gallon of fuel and a television camera. At that weight the total loading is still a relatively low 24 ozs. per square foot of effective lifting surface.

The model is not intended to be detailed scale but is 12.5% of full scale with the design modified for the safest radio control operation possible. It handles superbly, beyond the expected design performance estimates, and is an absolute delight to fly. The stall speed is so slow that I am still developing an effective approach and landing technique. The tendency is to overshoot the intended landing spot.

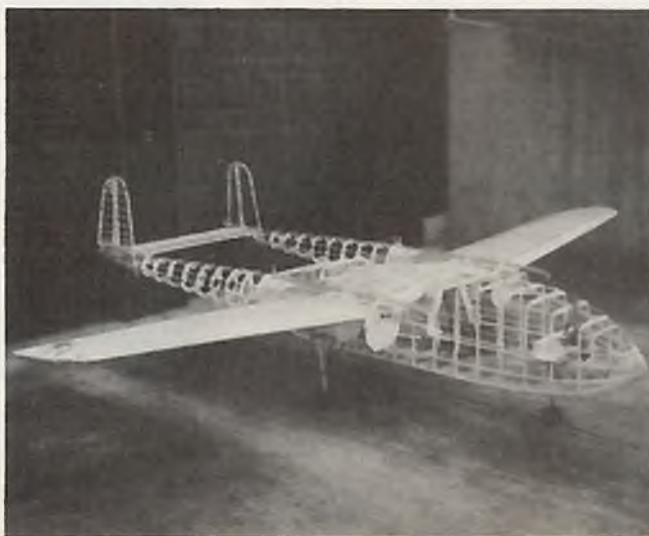
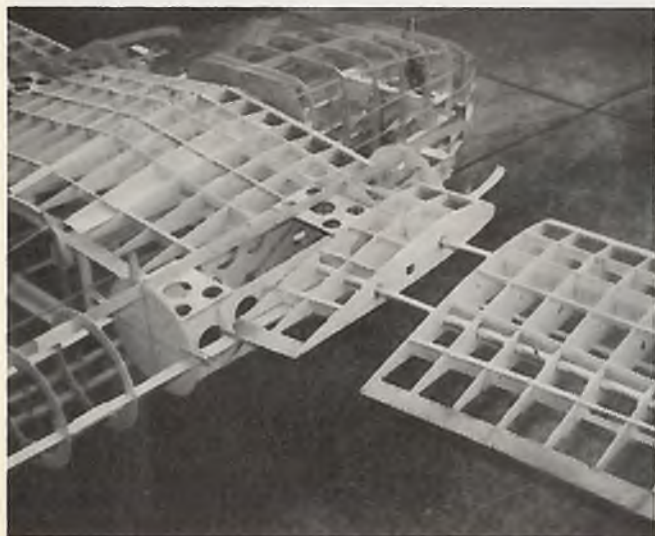
Those fellow R/C enthusiasts out there who also design and build large radio controlled models can imagine the satisfaction factor that was experienced upon the effective completion of the first flight of this aircraft.

The basic dimensions and some of the calculated performance of the aircraft are as follows:

Wingspan — 180" (15')
 Wing area — 4320 sq. ins. (30 sq. ft.)
 Horizontal stab. — 15.5" by 43"
 Horizontal stab. area — 666 sq. ins.
 Fuselage — 16" by 92"
 Effective Fus. lift area — 1178 sq. ins.
 Total effective lift area — 6164 sq. ins. (42.8 sq. ft.)
 Gross weight — 65 lbs.
 Effective lift loading — 24 ozs. per sq. ft.
 Max calculated air speed — 88 mph
 Stall speed clean — 21 mph
 Stall speed gear and flaps — 17 mph
 Max design G loading — 3 positive and 3 negative

Approximate total cost — \$5,000.00

One item of interest that puts the magnitude of the project in some measure of perspective: 73 ozs. (4.5 lbs.) of Cyanoacrylate Adhesive (CA) was consumed in the construction of the model. □



March of 1990 — midway in construction.

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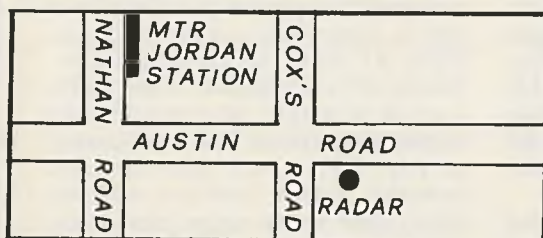
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Weight: 2 lb. Engine: 20-25
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A Miracle Cure for Corrosion



All metals, when exposed to water with various chemicals (either salts or acids) will corrode. This process involves a very small electric current caused by the chemical characteristics of the system. This electric current causes the metal to undergo chemical changes. Typically, this change is oxidation. If the metal contains iron, the oxidation is called rust. This rust is the number one problem in model engines exposed to water like mine, or to water in the form of humidity when an engine is "pickled" for storage. Unprotected bearings rust into unusable lumps of metal. The aluminum parts can also oxidize, but this is a less critical problem for model aircraft.

damage. Half a shipment of helicopters on the deck of a ship were treated before shipment with Corrosion Block. Those helicopters arrived in perfect condition. The highly reactive magnesium parts of the others were severely damaged by corrosion. Finally, the U.S. Army heard reports from Petroleum Helicopter, Inc., about Corrosion Block and commissioned a year long \$200,000.00 research report. The result: Corrosion Block works. It outperformed all the rust preventers tested, unless the area involved was continually exposed to extreme conditions.

To determine the application of Corrosion Block to model aviation, I went to my local surplus shop and bought a few ball bearings. They were carefully cleaned with solvent, then placed in my torture chamber. Each bearing was submerged for an hour in seawater from an aquarium, and suspended over the seawater for an extended time. It should be noted that seawater is a witches' brew of salts and acids as corrosive as almost anything in the lab. Nothing in freshwater is likely to cause trouble as quickly or severely as seawater. Around this mistreatment, some bearings were treated in various ways to find the best way to protect your engine investment. Photo #1 shows the dramatic results. Bearing #1 was untreated. It had visible rust on it within 30 minutes! This emphasizes two things: First, use a good oil in your fuel. It will provide some protection. Second, when you rekit your plane, clean up the engine **now!** There really isn't much time till demon rust sets in if there has been any exposure to water. Remember that water is the common factor in all corrosion.

Most full scale aircraft are constructed largely of aluminum. Most such aircraft are stored outside, exposed to the weather. They suffer corrosion of their aluminum structure unless protected. Furthermore, once corrosion has started, it tends to keep itself going. This problem led chemists to seek a solution. Corrosion Block (formerly ACF-50) has proven to be the best option yet available. It is a proprietary petrochemical formulation that, when "fogged" into an aircraft structure, wicks into every crack and crevice. It even wicks **under** any water present, lifting it away from the metal, **preventing** the small electrical current that is necessary for corrosion to take place. It also wicks under the corroded metal, stopping further corrosion.

These claims sound difficult to prove, but the facts are in. In a flood in Washington State, several airplanes were immersed. Some were treated with Corrosion Block, and the treated aircraft survived without

By Theodore A. Noel II, M.D.

When I named the lake at our club field by crashing my Evans Simitar Slo-Motion straight down into the muck (I was shot down by an outlaw flier!). The Enya 21CX had to be recovered from under water. I was too distressed to do the necessary tear-down and clean-up that night. The next day, after work, I set out to do the needed work to get the engine running, and was greeted by graphic evidence that "rust never sleeps." The ball bearings looked like something out of a horror film. Fifteen dollars later, the engine ran again.

Some time later, I had occasion to read about a Canadian developed product designed to prevent metals from corroding. The claims I read seemed too good to be true. But the more I read, the more it appeared that this "snake oil" really could work. And now, a word from your neighborhood chemist.

Bearing #2 was treated with Corrosion Block before being soaked in seawater. Months later, with no other treatment, it is in pristine condition. Unfortunately, we can't pretreat our engines with Corrosion Block. It is probably impossible to mix Corrosion Block with fuel, since it impairs combustion (it does burn, but poorly). Can we just soak the engine after the crash? Bearing #3 suggests that it will not be enough. This bearing was soaked in seawater, then sprayed with Corrosion Block. It looks a lot better than #1, but it still has some rust on it. This clearly points out that your engine needs to be cleaned up, washed out, and then sprayed with Corrosion Block. In fact, that is what happened to Bearing #4. It was soaked in seawater, rinsed with tap water, then sprayed with Corrosion Block. This approximates what would happen if you treated your engine the way most authorities recommend. The major difference is that most of them recommend rinsing the engine out, then drying it. Bearing #4 was sprayed while still wet with tap water. It looks just like Bearing #2. It has no rust anywhere.

What about pickling engines? The easiest thing to do is treat Corrosion Block like an after-run oil. Spray it into the carburetor and flip the prop a few times. Because it wicks and penetrates so well, you probably do not need to spray it in through the glow plug hole or exhaust port. It should cover every part of the inside of the engine without further work. Also, it will not thicken and gum up the engine after a long period of storage like some oils do. It leaves your engine free and ready to run. You don't even need to put the engine in a Zip-Loc bag like some pundits suggest. Corrosion Block doesn't evaporate. It binds itself to the metal so that it doesn't come off readily. How simple can you get?

Corrosion Block: Act II

If engine protection was all Corrosion

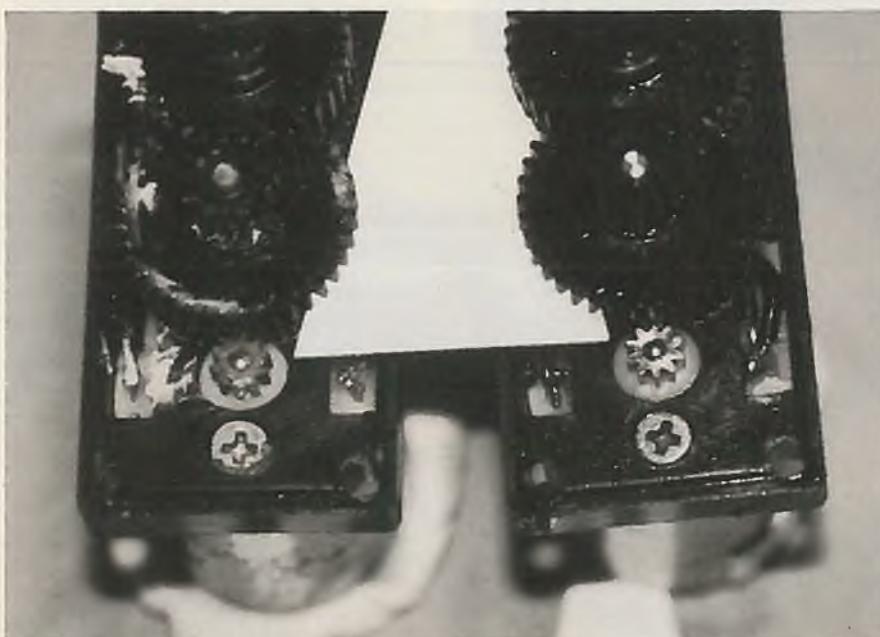


Photo #2: Servos after Sea Water Torture Test. Left – untreated. Note corroded gear. Right – pretreated with Corrosion Block. Note pristine condition.

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Block was good for, it would just be a bit better than competing products. Its talents aren't nearly that limited. When those airplanes became submarines in the Washington flood, everyone figured that the radios were trashed. (Some would say that you couldn't trash Cessna radios since they were junk when they left the factory.)

Since the radios were trash, when the technicians fogged the airplanes with Corrosion Block, the radios were left in place and they got soaked with Corrosion Block. Some wag turned them on, and discovered that they worked! Not only did they work, they worked better than when they were brand new! All of the intermittent switches and scratchy volume control pots had cleaned up. A new use for Corrosion Block had been found by accident.

I hear you saying, "This guy is crazy! There is no way you can pickle engines and fix radios with the same stuff. It just doesn't make sense." Let's go back to chemistry. Potentiometers are the volume controls with which we are all familiar. They are also the electronic component which changes your transmitter stick position into an electronic signal. Pots have ferrite (iron based) disc and a metal wiper. Any water from the air over time will allow the two metals to interact electrically, allowing a small current to flow and oxidation to build up on the ferrite. Each time the wiper moves, it cleans off the oxidation, but as it gets older, it does it less well. Eventually, the pot becomes noisy. Corrosion Block prevents this oxidation from occurring. Then, when the pot is moved, a couple of passes clean off the oxidation, and the Corrosion Block prevents it from coming back. The switches clean up the same way.

And it works! It doesn't just work on Cessna radios. My home stereo, TV, and computer were all repaired this way. The fix is permanent. But is it safe? The company now demonstrates its safety by suspending a color TV halfway into a bucket of Corrosion Block with the TV operating! It turns out the Corrosion Block is a "high-voltage dielectric." In lay terms, it does not conduct electricity. Incidentally, many aircraft radio shops now fix troublesome radios by dunking them in Corrosion Block, letting them drip dry, then reinstalling them. Most of them work fine after this simple fix.

Will Corrosion Block help with our radios? Most emphatically, yes! No boater or float flier needs to ever again worry about a dunked radio. Just open all parts of the flight pack, spray in Corrosion Block, and close it up. If you get dunked, you will need to dry out the pack, but there will be no

continued on page 184

PHARAOH



Using both slats and flaps, this .40 powered sport flier is your ticket to some "slow flight" fun!

**By
Steven
Galea**

The Pharaoh is a 60" span model designed for short take-off and landing and safe slow speed flying. I had intended to design and construct a model of this type for quite a long time, and now at last, after finishing other projects, I have gotten around to doing it. A high aspect ratio and high lift wing section was called for, so as to produce safe slow flying characteristics. The parasol

wing also helps in this respect as well as making the Pharaoh look a bit different from the rest. Flaps and slats were added to make an effective STOL machine. Construction of the model is very simple and should be of no problem to any of you balsa cutters.

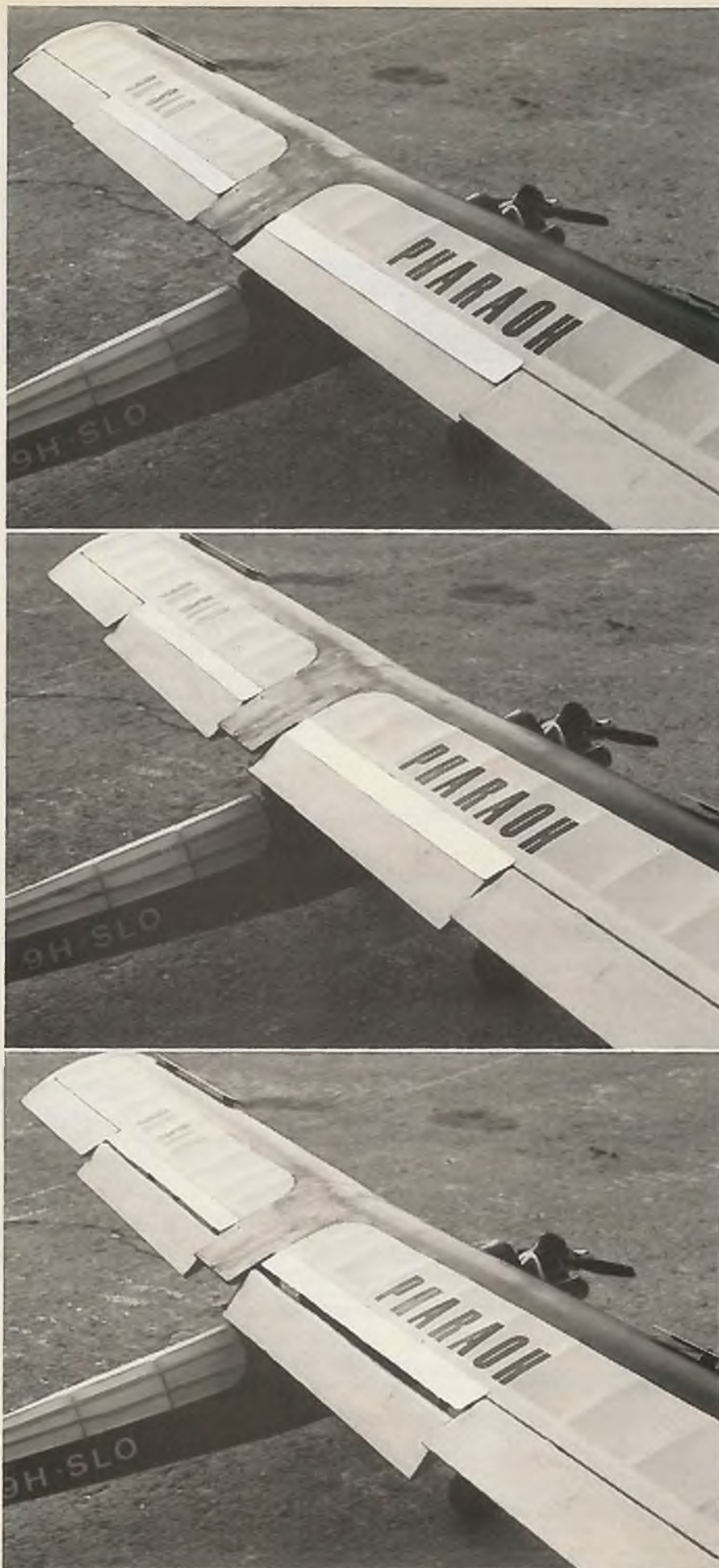
CONSTRUCTION

Fuselage:

Fuselage construction is the standard box type with rounded top decking. The best way is to prepare a kit of all the parts needed. Fuselage sides are made from 3/32" medium hard sheet balsa, to these, 1/4" sheet doublers and 1/4 sq. in. longerons are added. Note that the fire wall has a small amount of side and down thrust; therefore, the front doublers have to be cut keeping this in mind. At this point, be sure to make one left and one right fuselage side. Next, all formers can be added and the sides joined together, making sure that everything is glued straight and square.

The fuselage is nearly complete and all that is left is to put the top longerons in place, add the front decking, and sheet the fuselage bottom with 1/16" balsa. Before





PHARAOH

Designed By:

Steven Galea

TYPE AIRCRAFT

Sport

WINGSPAN

63 Inches

WING CHORD

9 Inches

TOTAL WING AREA

567 Sq. In.

WING LOCATION

Parasol

AIRFOIL

Clark Y (Mod)

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

1 Inch

OVERALL FUSELAGE LENGTH

44 Inches

RADIO COMPARTMENT SIZE

(L) 6" x (W) 3½" x H 3"

STABILIZER SPAN

19 Inches

STABILIZER CHORD (Incl. elev.)

6 Inches (Avg.)

STABILIZER AREA

114 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

9 Inches

VERTICAL FIN WIDTH (Incl. rud.)

6½ Inches

REC. ENGINE SIZE

.40 2-stroke

FUEL TANK SIZE

10 Oz.

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4 (5 w/Flaps)

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail., Flaps

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage Balsa & Ply

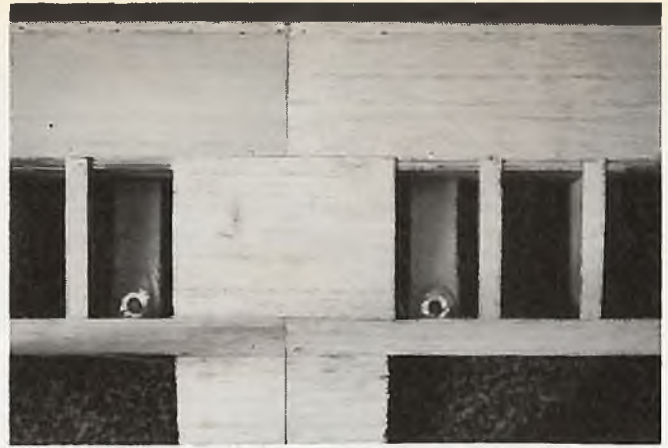
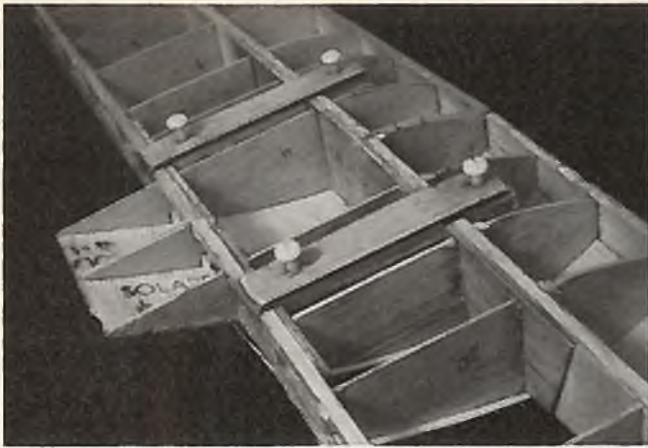
Wing Balsa & Ply

Empennage Balsa

Wt. Ready To Fly 80 Ozs. (5 Lbs.)

Wing Loading 20 Oz./Sq. Ft.

covering the front top decking, the wing struts should be bolted in place to the ply plates. The bottom sheeting should be done cross-grain so that maximum strength is obtained. The rear top decking can be covered with balsa, but there is no structural need. I preferred to cover with heat shrink fabric, at the same time saving a bit of weight.



LEFT: Bottom view of wing structure showing hold-down bolts and wing center section. RIGHT: Top view of wing center section.

Wing:

Wing construction is all built-up from balsa and ply. Start by cutting all ribs and spars needed as specified on the plan. Pin spars to the board and glue ribs in position. Add the upper spars in place and after the glue sets, add the 1/16" balsa sheeting on the L.E. and T.E. Capstrips should be added at this stage. You can now detach the panel from the board and complete the other panel in the same manner.

Flaps and ailerons should be cut away from the wing and their construction completed, keeping in mind horn and flap hinge attachment points. Ailerons and flaps

are best permanently attached to the wing after covering is complete.

The wing panels can now be joined together with the 1/8" ply dihedral braces at the angle specified on the plan. At this stage, the ply plates for the wing attachment can be glued in place and drilled to accept the captive nuts after aligning with the fuselage.

I made the slats out of 1/32" aluminum sheet, formed over a suitable circular section and attached to the L.E. as shown on the plan. If aluminum sheet is not available, the slats can easily be made out of balsa. Care should be taken when installing the

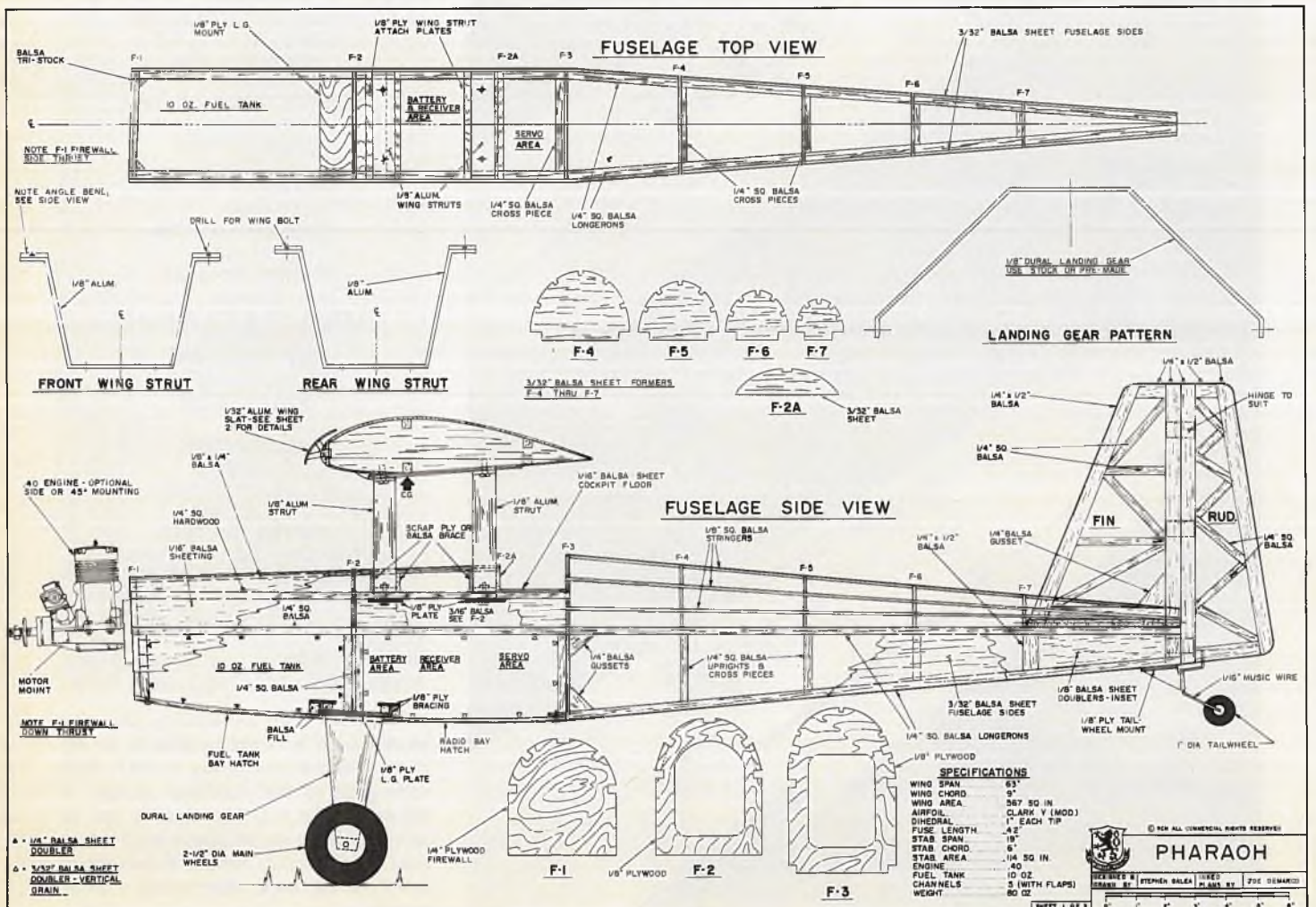
slats as it is important that the gaps between the slats and the wing are made as shown.

Tail Feathers:

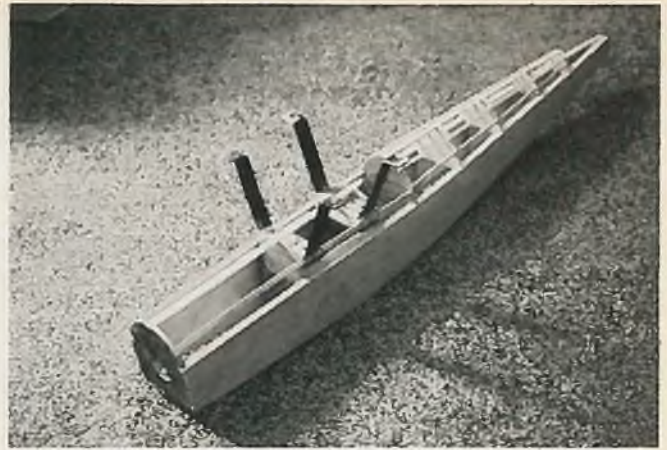
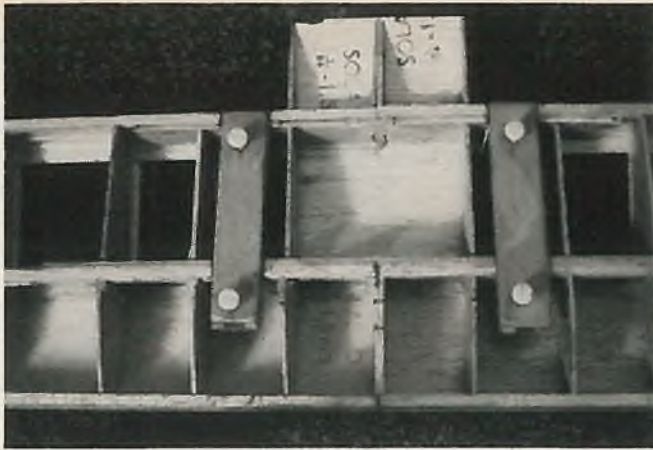
The horizontal stabilizer and vertical fin are from 1/4" square balsa. Lazy guys may prefer to make them out of sheet balsa, but the built-up construction is obviously lighter and looks better.

Radio and Engine:

There is ample space in the radio bay to fit all servos and rx equipment without any problems, the engine and fuel tank installation is straightforward. The tank bay offers space for a fuel tank up to 12 ozs. in size which is more than enough for the .40



FULL SIZE PLANS AVAILABLE — SEE PAGE 192



LEFT: Nylon wing hold-down bolts allow wing to break away if crashed. RIGHT: Cabane struts.

engine I used.

Covering and Finishing:

I covered all open structure with opaque heat shrink fabric. This is very attractive, especially when the model is flown on a sunny day and the wings are lit up by the sun. The sheeted areas are sprayed with cellulose paints, preparing in the usual manner with dope and sanding sealer.

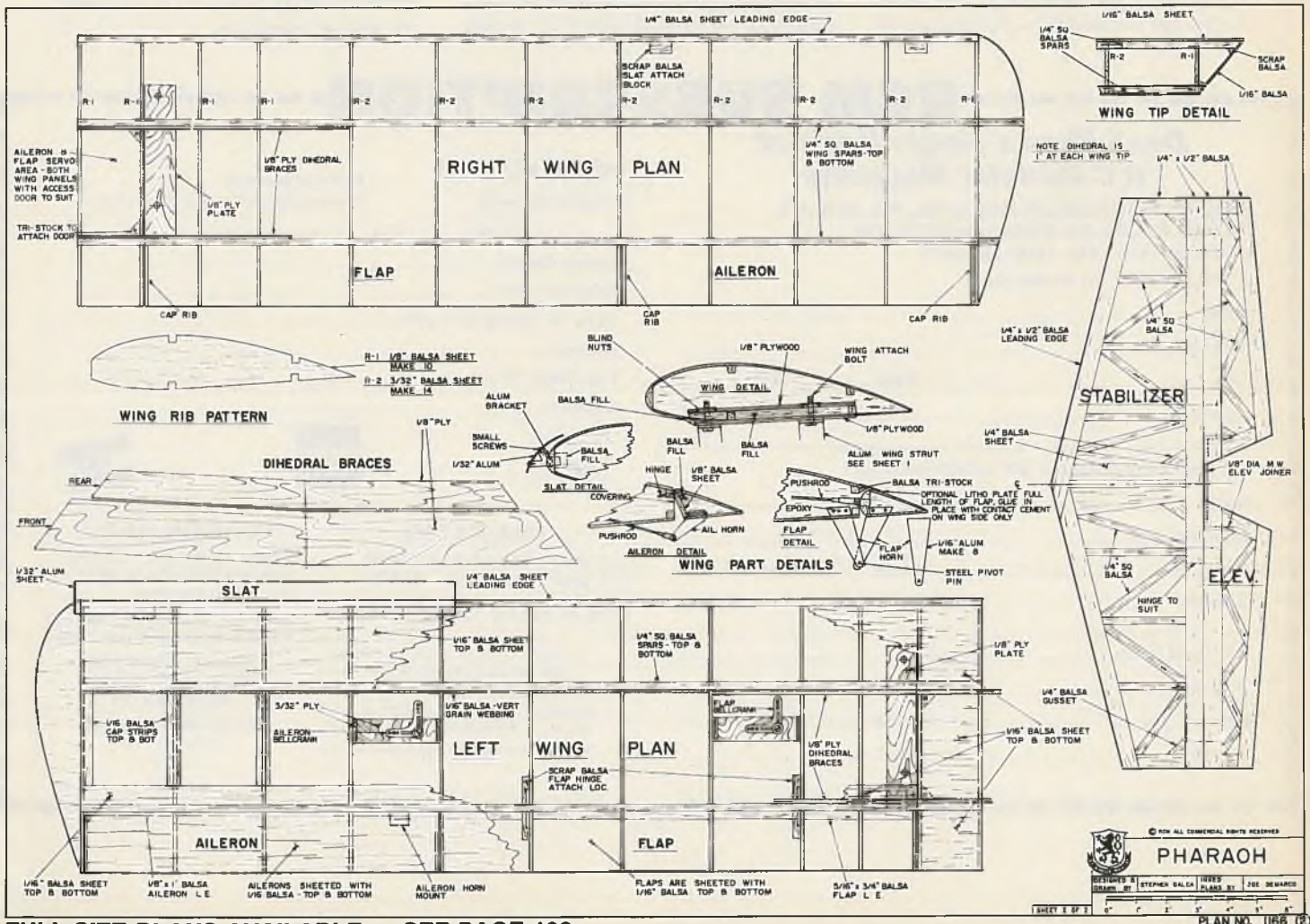
Flying:

After checking for correct C.G. position, correct direction of movement on flying surfaces and a range test, you can do the test flight with no trepidation. The Pharaoh is generally well behaved and has no vices.

Bill of Materials

- 6 — 3/32" x 4" x 36" sheet balsa (fuselage sides, ribs, formers)
- 2 — 1/8" x 4" x 36" sheet balsa (fuselage sheeting, ribs, doublers)
- 6 — 1/16" x 4" x 36" sheet balsa (wing sheeting, fuselage top decking)
- 4 — 1/16" x 3" x 36" sheet balsa (wing sheeting)
- 4 — 1/8" x 1/8" x 36" strip balsa (longerons)
- 3 — 1/2" x 1/4" x 36" strip balsa (stab and fin structure)
- 16 — 1/4" x 1/4" x 36" strip balsa (wing spars, longerons)
- 1 — 1/4" x 1/4" x 36" strip spruce (cabane attachment points)

- 1 — 4" x 4" 1/4" ply sheet (F1)
- 1 — 12" x 6" 1/8" ply sheet (F2, F3)
- 1 — 1/16" x 3" piano wire for tail wheel
- 2 — yards covering material
- 4 — horns (rudder, elevator, ailerons)
- 2 — 2 1/2" dia. wheels
- 1 — 1" tail wheel
- 11 — hinges
- 1 — 10 oz. fuel tank
- 1 — motor mount
- 12" silicon line
- 1/8" aluminum sheet for landing gear — wing struts
- 1/32" aluminum sheet for slats

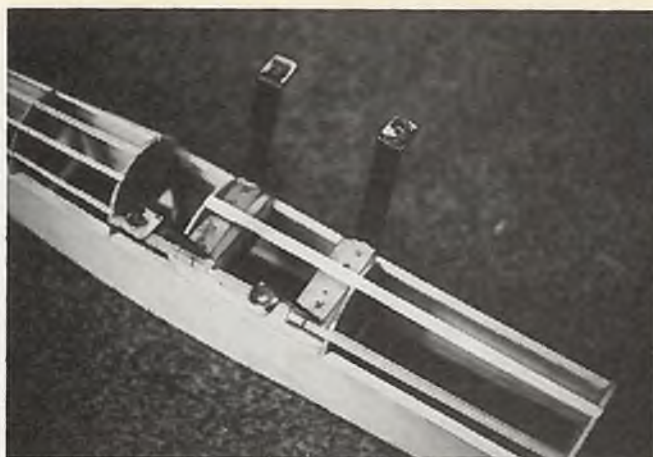


FULL SIZE PLANS AVAILABLE — SEE PAGE 192



PHARAOH

DESIGNED BY STEPHEN GALLA THREES
PLANS BY JOE DEWARDO
SHEET 6 OF 7
PLAN NO. 1166 (2)



Cabane struts and fuselage structure.

Take-off is the usual procedure for taildraggers; a touch of right rudder to keep the model tracking straight into wind until speed builds up, then a touch of up elevator will get you airborne. After a few familiarization circuits you can start trying out the slow speed handling and flaps. When the flaps are deployed, there is little trim change. The slats really work and I strongly recommend that you fit them, as slow speed handling is greatly improved. To spin the model is almost impossible, with full up elevator, the model just mushes around. When you get used to the flaps, flying does get interesting with steep approaches and short take-offs. My favorite



Wing slats. A must for good, low speed handling.

maneuver is to hover on the threshold at around 100 feet with full flaps applied, then cut the throttle and push down elevator for a steep dive and flare out to a landing. With a 10 knot wind you can hover, and in anything stronger you can actually fly backwards and land with no forward speed. It is also

possible to make a landing from a low loop over the runway, by deploying full flap when inverted at the top, let the model drop towards the ground and flaring out for the landing. I can assure any of you who build a Pharaoh good fun flying, lots of excitement, and unusual maneuvers. ☐

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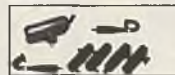
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SUNDAY FUN

Battery Business

All of our Sunday fun starts when we flip a switch to start the flow of electrons from a battery. Those electrons squirt through filters, get speeded up by space-age transistors and eventually make oscillators oscillate at radio frequencies from an antenna to send signals to our model. A kind of "reverse sequence" happens when our model gets switched on; the battery inside our model powers everything to make the servo wheels follow our commands. Without batteries, there's no Sunday fun for us.

For about the last dozen years the Sanyo CADNICA cells (we simply call them "NiCds"), or maybe their competitors' cells have been welded and soldered together; usually eight cells for our transmitter and four cells for the model, to provide the source of electrons. Most of us hook the batteries to a second-rate simple wall charger the night before we go flying to pump electrons into our batteries so we can get four to six flights of fun. A few of us are learning to use first-rate peak detection charging and to monitor charge and discharge voltages so we'll know when the fun should stop.

I crashed my PT-40 ARF last week, I apparently overflew the charge in the x-347 transmitter and couldn't hear the low-voltage beeper warning due to my deafness in the beeper's sound range. 9½ minutes into my sixth flight, I'm sure my receiver heard the strong adjacent frequency of scrambled voice transmission for the City of Orlando's fleet of cars and trucks . . . the flight path got scrambled right into the ground! I was having so much fun I never noticed the LCD showing below 9.6 volts -- **dumb!** Our fun is dependent on the flow of electrons.

We mostly use AA-size NiCds and they have a capacity we'll simply call 500-600 electrical "zaps." A fully-charged AA NiCd can deliver its zaps at over 1.4 volts per cell. Some of us are trying five cell airborne packs, and if you multiply 5 x 1.4 + you'll see you're up over seven volts for the airborne which is usually max-rated at six volts. On older sets I think this may be a crash waiting to happen, although servo **speed** sure is enhanced.

Some of the lower cost radios (like the surface car sets) use eight alkaline cells in the transmitter and four in the car, and they last a **long time** because the same AA size



Renewal cells can be recharged in this power station — available in AA, AAA, C, and D sizes.

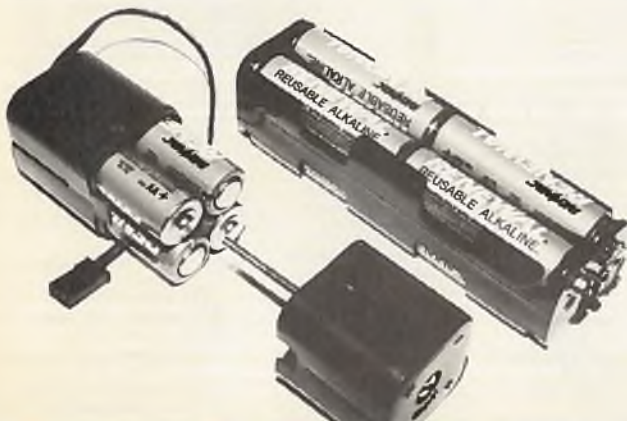
alkalines have about 2000 zaps per cell, but when the zaps are used up the alkalines are too and they go in the trash. Then, we buy more Rayovac or Eveready (the energized bunny) or copper-top Duracell alkalines to re-zap our radio.

The zaps run out of our NiCds at a predictable rate until each cell gets to about 1.2 volts where the zap flow can quickly **slow to a trickle** and end our fun. We've all seen the drop-off curve for NiCds. Alkalines have a continually down-sloping discharge curve with no sudden drop-off.

The new news is about the Renewal reusable alkaline cells. I'm **currently test flying these new cells without a problem!** If you try them we'd welcome your feedback on this revolutionary new product. They're made in the USA by Rayovac under patent rights of a Canadian company who



This Tom Stryker cartoon shows the fun of competing in the first R/C Heavy Lift Event for .40 size engines.



LEFT: Eight cell holder fits Stu's Futaba SUAP transmitter and JR, too. Four cell holder has an Airtronics pigtail and is flying with his Infinity. (Editor's Note: Don't ever plug these battery packs into your conventional charger. They may rupture and someone will get hurt.) RIGHT: Left-right are Rod Gier on airframe/loadmaster, Sunday Fun on power plant, Travis Gier on R/C piloting. Team lifted 21 lbs. of lead weight to win.



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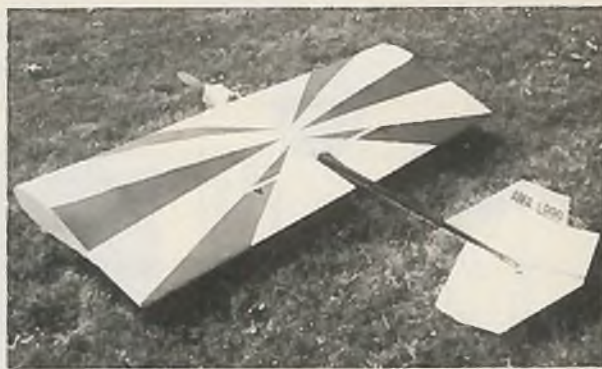
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A .40 size engine had to retail for not over \$220.00. Team won with this new made in America Sport Jett 40.

developed these unique cells and the charging system for them. I'm told the heart of the charging system is a Motorola chip that monitors the charging voltage 200 times per second to recharge cells in three to five hours for AA size and AAA size. C and D cells get fully recharged

overnight. Rayovac's Renewal alkalines cost about twice what the throw away variety costs, but they can be recharged 25 times, and technically it's possible to get 100 recharges! The failure mode for Renewal cells seems to be that they simply will, with time, fail to hold as many zaps as when they were new. I'm monitoring with the Hobbico Digital Voltmeter and will recharge when the airborne gets to 4.8 volts (it starts at six volts with four Renewal cells). The transmitter pack starts at 12 volts with eight Renewal cells and I plan to recharge at 9.6 volts. Like all alkalines, the Renewal cells can hold their practical charge for years; losing about .2% of their zaps per month. I'm using the deluxe charger or "Renewal Power Station" that costs \$30.00 or less and rezaps eight cells with red indicating lights for each cell. There's a four cell Power Station that rezaps only AA and AAA sizes for half the money. Directions are simple and concise. Radio Shack's Archer 270-407 holds eight AA Renewal cells . . . the 270-383 holds four cells. At this time the Renewal cells can only be individually charged as the photo shows. As technology advances this may change. I keep checking the transmitter and airplane with my meter . . . it's unbelievable how slowly the voltage readings drop compared to air time. I vibration-checked the four cell airborne by reading with the meter as I pressed it (on all sides) against my Dremel saw's vibrating

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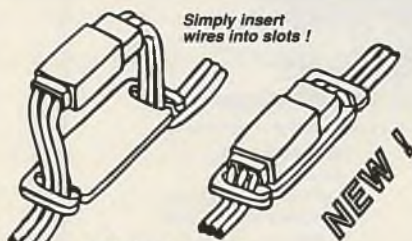
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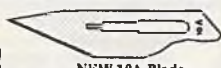
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Delmar Benjamin used to build models. He now flies this crowd pleasing replica of the famous Gee Bee R-2 racer as seen at the Reno Air Races. Watch for an 80" model from Byron Originals soon!

platform. Rayovac Renewal cells and chargers are now in all Wal-Mart and similar places where batteries are sold. Their prime market is to power children's toys. Your feedback is welcome!

(Editor's Note: **Disclaimer:** Stu's test flying of Renewal cells is in the leading edge of new battery technology, RCM in no way endorses using Renewal cells in a high vibration R/C environment at this time. Again, keep these cells away from your constant current chargers.)

The Heavy Lift Event

Progressive Miniature Aviation sponsored the First Annual Heavy Lift Event with \$100.00 to the winning team. Rules were listed in November 93's column, page 11. Five teams showed up and the spectator crowd was huge. The first lift was 6 lbs. by the Thomas/Gerney team. Huhn/White/Gostago lifted 8. Johnson/Smith lifted 9. Thomas lifted 10. Huhn tried 12 and failed. Johnson tried 16 and made it. Huhn tried 18 and crashed. Gier/Richmond easily lifted 18. Thomas tried 20 vainly. Johnson lifted 20 and made it on the edge of a stall to a roaring clapping crowd. Tensions were terrible with the crews... the crowd loved it! Every success and failure was appreciated. Gier roared down 400+ feet of the runway and

lifted off with 21 lbs. of scuba weights to win the event for 1993. Rod Gier was the airframe/loadmaster.

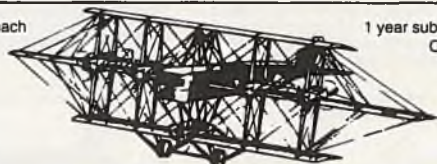
Rod's wife, Sandi, was the team recorder, Rod's son, Travis, was our pilot and I was in charge of the power plant. We'd lifted in practice 17 with a Rossi 40 easily. Bob Benton had seen it but, sworn to secrecy, he told nobody. We thought we could do more. When we screwed on the new red Sport-Jett 40 engine we showed you in the February column, our spirits went up with the rpm's! To win we only needed to safely take off and land with 21 lbs. of lead, and that's exactly what we did. Specs are: 96" Telemaster at 10 lbs. empty, new Sport-Jett 40, Golden Break-In mix, 10 x 6 Master Airscrew, Airtronics Infinity, and some discreet clever engineering. How about your club trying this great Sunday fun?

Next month: Ground spins, new servos... and diesel doings. □

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Only
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As pictured, the Cutlass 10 is shown in white with blue and red stripes.

SPECIFICATIONS

Wingspan: 34". Wing Area: 240 sq".
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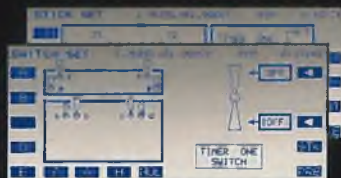
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F3C/SAIPLANE

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ENGINE CLINIC

continued from page 126

heads and exhaust stacks you need a stronger chemical. Sunbeam used to market a product called "Metal Klean" that was ideal for this purpose but is no longer being made, although you can still find it in some more remote hardware stores. The product you saw in one of the hobby magazines was probably "Z-Best Engine Cleaner" distributed by Airborne Hobbies, 3764 30th St., San Diego, California 92104. The price is \$6.95 plus \$2.00 shipping and handling. Z-Best appears to be the same thing as the old Sunbeam Metal Klean. Dave Shadel, who heads Performance Specialties, is now marketing a similar product. Z-Best is a paste, whereas Dave's product is a liquid and easier to soak parts in. You will have to check with Dave on the price. Performance Specialties, P.O. Box 3146, Gardnerville, Nevada 89410, (702) 265-7523.

Dear Mr. Lee:

Although the subject of this letter has to do mainly with plastic propellers, I'm hoping you will be able to give me some advice even though your column has engines as its main topic.

I have a small .049 engine attached to a glider, and one day recently while starting the engine, the engine roared at a very high rate of speed. The next thing I knew there was a swish as pieces of the prop flew through the air. The motor had to be

stopped as the engine really roared without the prop. My fuel can was at least two years old as I thought I would use that can and finish it while not using a new can of fuel that I had recently bought. The prop had been on that engine for a long time, and I probably have tightened it every time I started the engine. Should I remove the prop when the engine is not in use? Also, since the fuel used was rather old, did that effect the speed of the engine? It really roared that day. I'll enclose the stub and a piece of the prop so you can see how it separated.

Very truly yours,

Edward Cook

Toa Alta, Puerto Rico

It is very doubtful that your two year old fuel would cause the engine to "roar" any more than usual. If anything, the fuel should have had less power. I'm guessing that prop first threw one blade causing the roar followed by the second blade. Why this happened would be pretty hard to say. Too often fellows will forget about things that have happened in the past such as the prop blades striking the ground on landing, etc. Whereas a wood prop would break, the plastic blades suffer stress cracks that let go at a later date. The picture you enclosed of your aircraft showed the engine mounted above the wing which would make hitting the prop on a landing pretty difficult. However, how many times has the ship flipped over on its back during a landing? There were also gouge marks on the piece of prop blade you sent to me. This would indicate that something hit the prop. Possibly the starting battery clip, rocks, etc. It is things of this nature that are responsible for prop blades breaking. In the case of nylon propellers, the nylon dries out and should be boiled in water when new and after considerable use. However, this does not pertain to the plastic types that hold up pretty well with age except when making ground contact or being hit by something like a battery clip, etc.

Dear Mr. Lee:

My question has to do with the O.S. Surpass 4-stroke engines in their various displacements, carbured and throttled for R/C use. My friend and I each own several, and it has been our experience that most, if not

all of them, when running with muffler pressure to our tanks, do not run smooth and up to their full performance potentials in terms of rpms and power, with 4-stroke fuels and recommended propellers. What we've found is that, once running and warmed up a bit, we yank the pressure line loose and let it dangle for the entire flight and the engines perform much better and idle smoothly. And yet, we've known of others of this very same engine which run well on muffler pressure. In our cases, we are using a good name brand 4-stroke fuel, the correct props, and our tanks are all of the standard plastic clunk types, with two lines, one to the engine carb intake and the other a vent line to the muffler. What are we doing wrong? In a couple of instances, ours have started life running fine with muffler pressure, only to regress into the situation I've described above in order to run up to their full potentials.

We would appreciate any information as to these two matters that you can give us. Thank you very much.

Sincerely yours,

Paul Rundell

Topeka, Kansas

If an engine that has previously run okay with muffler pressure begins to run erratically, the chances are pretty good that the pressure line from the muffler to the fuel tank has become obstructed or plugged. After considerable use, carbon build-up in the muffler can plug the pressure fitting. Check this to be sure it is open and there is no congealed oil in the pressure line itself. Also be sure you do not have a loop or low spot in the line where fuel can collect.

Dear Mr. Lee,

I can't boast of having read your fine column for 20 or more years, as I only discovered R/C a couple years ago and your column sometime after that, but I do find it helpful and informative if somewhat technical.

I recently took in trade a brand new Royal Signature Series 28 ABC engine. I broke it in on a stand with 5% "Tower Power" swinging a Master Airscrew 9 x 6. It runs great and idles slow.

I desperately want to build a completely "cowled-in" plane; unfortunately, there

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doesn't seem to be a great selection of airframes for an engine of this size. One possibility I have noted is the GeeBee model's Tiger Moth biplane .25-.35.

My question is, in the event I have to mount the Royal inverted, what if any special considerations are there, and should I expect reduced performance?

Also, in the advertisements for "cowled-in" style mufflers none mention Royal as far as fit is concerned. Is their's a compatible "cowled-in" design that won't rob me of every last ounce of power? If so, what about the pressure tap, do I have to add it myself?

One last question concerning fuel tank alignment. What constitutes "on-line" or "centered," and what are the reference points?

Art Griep
Waxahachie, Texas

Although many modelers are doing it, inverting an engine can lead to a variety of problems and is not a good idea. When an engine is inverted, the glow plug becomes a sump and fuel and oil run into it, putting out the fire. An onboard ignition system is always desirable with an inverted engine that turns on below half throttle to keep the glow plug lit. When an engine is inverted, you also increase the chances of a hydraulic lock which can, in turn, bend or break the rod and, in worse cases, the crankshaft, especially if an electric starter is used with the engine flooded. An inverted engine should always be pulled through by hand

half a dozen times prior to hitting with the electric starter. With an inverted engine, the carburetor fuel mixture has to be kept on the lean side at idle, the fuel tank properly positioned, etc. Due to the easy "drowning" of the glow plug, starting can be difficult and the aircraft requires turning over for starting. As far as power, being inverted will not have any effect once the engine is running.

J'TEC markets a line of universal "in cowl" type mufflers that will fit just about any engine. These do not come with a pressure fitting so you would have to install this yourself which is actually no big deal. You have only to drill the proper size hole and thread it with the appropriate size tap

available at any hardware store.

When positioning the fuel tank, it is the centerline of the tank in relation to the needle valve that determines the tank position. This should be no higher than the needle valve and preferably 1/4" to 3/8" below, especially with an inverted installation. If by chance the carburetor does not have a horizontal needle valve, then the fuel jet in the carburetor throat would be used as the reference point. This would not pertain to the Royal 28 which does have a horizontal needle valve. ☐

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continued from page 169

corrosion. Not only that, but the servos will not become noisy as they get older. Photo #2 shows two servos soaked in seawater. The left servo was untreated. The brass motor drive gear is both oxidized and sulfated. The internal electrical components are also affected, but they don't photograph well. As a practical matter, if you don't have Corrosion Block, your flight pack is doomed to slow degradation once it gets wet. You just don't know when it will get you. Whether a solder joint quits, a component dies, or your black wire corrodes won't matter.

Your transmitter is not immune. The pots which translate stick position into electronic

signals are no different from volume controls. They will eventually get scratchy. Corrosion Block will prevent or treat this scratchiness. If you should have the misfortune to get rained on, spray the inside of the transmitter with Corrosion Block. Three things will (not) happen: (1) Your transmitter will smell better. (2) Corrosion Block will wick under the water to protect your transmitter's innards. (3) Nothing bad electrical will happen. Because Corrosion Block is an insulator, even computer radios are safe. Just to show you I'm not blowing smoke here, I practice what I preach. My home computer and my laptop both have been treated. If they had problems, I would not be able to write this.

If it sounds like I'm high on Corrosion Block, you're right. There is nothing this stuff can do wrong. Just don't use it for things for which it's not intended. It can't replace castor oil, since its lubricating qualities are minimal. And even though it smells good, don't try to use it in place of your after-shave lotion. As long as it is used to prevent corrosion, it has no peer. It is the elixir of life for metals.

(Editor's Note: We just recently heard from Ted Noel and he has been able to verify that Corrosion Block and AFC-50 are both being sold. They are essentially the same product, packaged by the manufacturer for different markets. AFC-50 is marketed for aviation and Corrosion Block for boating. Corrosion Block, Inc., P.O. Box 551625, Dallas, Texas 75355-1625.) □

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From Global Hobby Distributors, is the new, almost ready to fly EZ Sports Aviation Mystic 90. Designed by multiple FAI World Champion and multiple Tournament of Champions winner, Hanno Prettnner, the Mystic 90 is capable of all FAI, Aresti, AMA Masters, and Turnaround Patterns. Its big, 4-stroke .90 size airframe delivers the ultimate in smooth, flowing maneuvers and "on-rails" like handling. The Mystic 90 comes with fully factory built airframe that's factory covered in a colorful, white, yellow, red, and green EZ type skin. The kit also comes with complete hardware to simplify the assembly process. All that's left is to supply your own radio, engine, prop, and field support equipment.

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RJL Industries has just announced the release of the first edition of their official newsletter entitled "Model Engine Enthusiast." This first edition contains 28

pages and is loaded with useful information on engines, parts, and accessories. In this first edition you will find tuning tips, servicing information and more, all pertaining to their ever expanding line of model engines and accessories.

To obtain your free copy of the RJL newsletter, simply phone or write to: RJL Industries USA, 1831 Business Center Drive, Duarte, California 91010, (818) 359-0016, Fax (818) 301-0298.

HP-200

New from Wing Mfg., the HP-200 is a true hybrid with many classic design features. The ease of construction and amazing flight performance of this aerobatic bird is attributed to its designer, Hal Parenti. The HP-200 is an 80½" sport/stunt plane, and requires a 4-channel radio. Engine recommendations are: Super



Tigre 3000, G-38, Quadra 42, or 1.20 to 1.604-stroke. Flying weight ranges from 14 to 16 lbs.

It comes in semi-kit form which includes two plan sheets, construction manual, foam wing cores, preshaped foam turtle deck, heavy vacuum formed cowling, wheel pants, clear one piece canopy, formed aluminum landing gear, heavy plywood



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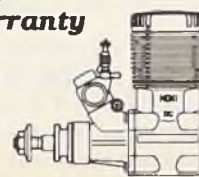
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MODELER'S TOOL KIT

The Xuron Modeler's Tool Kit is now available from The Tool Resource. This kit belongs on every modeler's workbench. The High Precision Shear, Tweezernose Pliers, and Modeler's Scissors come in a durable, protective, tri-fold fabric pouch. Two additional narrow pockets in the pouch are ideal for tweezers, scribes, ruler, etc. Keeps tools together, organized, protected, and clean. Safeguards your investment in quality tools. Part #CPTK210, price \$28.49. For more information, contact: The Tool Resource, P.O. Box 1106, W. Dundee, Illinois 60118. Phone/Fax (708) 468-0849.

WEBRA SPEED GT ENGINES

Webra, one of the most respected names in 2-stroke engines, and '92/'93 World Aerobatic Champion, proudly announces a new series of engines: The Speed GTs. The Speed GT engines bring to the modeler the high performance and quality of Webra's Speed engines at a substantially reduced price. Each GT includes the updated, TN II

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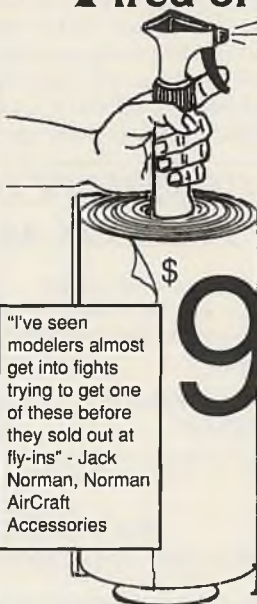
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KLINGBERG ROCKET WING

The Klingberg Rocket Wing is the newest quality kit offering from Future Flight. Based on the extremely popular 2 meter Klingberg Wing, this scaled down version has a 52" wingspan, and a wing area of 377 sq. in. With an "E" size rocket motor, take-off weight is a mere 14.5 ozs., so you can launch to over 600 feet. The Wing also features Autoyaw[®] which makes the launches easy, even the first time out. After the launch the well known superior aerodynamics of the Wing will allow you to climb on the lightest lift or perform many



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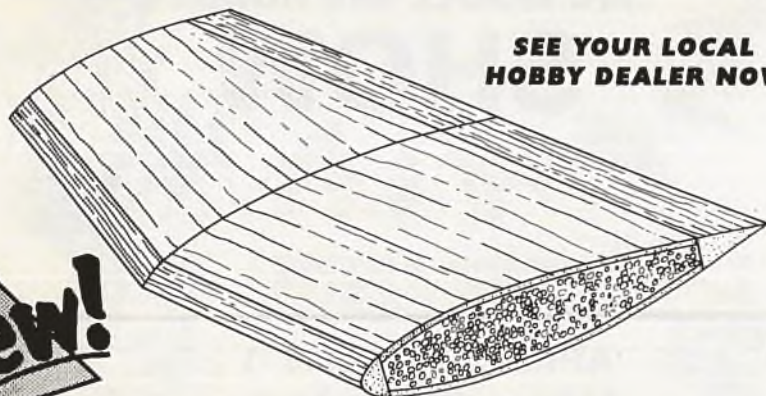
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1941 TAYLORCRAFT MODEL BF-12 DELUXE

Alliance Aviation Products introduces the Taylorcraft series for the scratch-builder with the "Dream System" designed for the veteran builder or the beginner. The package comes with three sheets of rolled plans (36" x 48") with the building area located at the bottom portion of the plan. Also included is a six page construction manual and parts list along with suggested factory paint schemes.

The first in a series of Taylorcraft planes is the 1941 model BF-12 Deluxe which is 1/6 scale and spans 72". Ideal power is a .40 4-stroke. Construction is conventional balsa and ply.

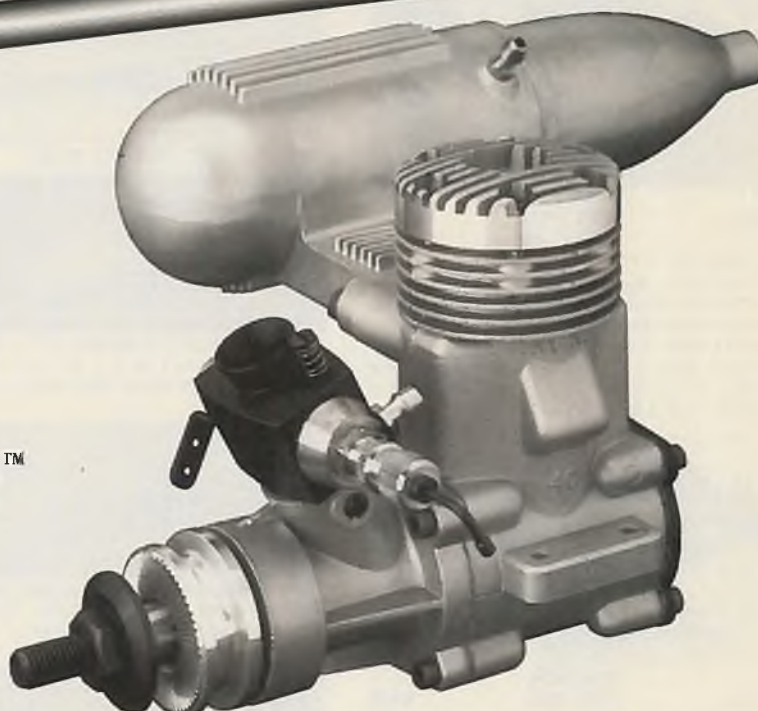
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Alternate means of entry: send your name and address on a postcard to: RCM, P.O. Box 487, Sierra Madre, CA 91025. No purchase necessary. Void where prohibited by law.

Jan. 1994 Winners

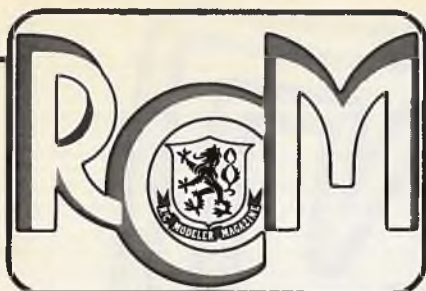
The following two people won a prize from RCM and Irvine.

Jay F. Dill
 PPO AP 96349

Bobby Smith
 Goldsboro, NC

Congratulations!

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RCM currently lists over 875 different plans for R/C models and related items. Each plan is a full size, individual blueprint print of the highest quality. Along with each plan ordered, you will receive a reprint of the construction article text to aid in building your project.

For a complete listing of all RCM plans currently available, see the RCM Plans Catalog.



#1165 GITANO 60
APRIL 1994 \$14.50

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#1166 PHARAOH
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#974 TRACER 60: by Bill Evans. Cat. 1, 60¾" span, 846 sq. in., .61, 4-ch.; built-up balsa, plywood, and foam core wing. One sheet 35½" x 52½", RCM 8-86, \$6.50.



#975 SPINIFEX 100: by John O'Sullivan. Cat. 5, 100" span, 837 sq. in., 3-ch.; built-up balsa and plywood. One sheet 34" x 55½", RCM 9-86, \$6.50.



#976 M.V. SPORT: by Nick Stamos. Cat. 1, 55" span, 550 sq. in., .40, 4-ch.; built-up balsa and plywood. One sheet 35½" x 52", RCM 9-86, \$7.00.



#977 4-40 BIPE: by D.B. Mathews. Cat. 1, 48" span (T), 43¼" span (B), 625 sq. in.; .40-.46, 4-ch.; built-up balsa, plywood, and spruce. One sheet 35" x 53½", RCM 10-86, \$6.50.



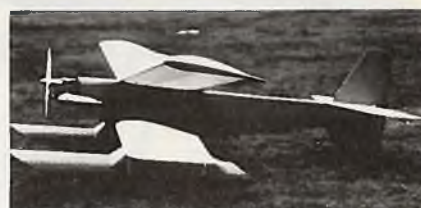
#978 BUMBLE-VEE: by Henry Arance. Cat. 1-4, 37" span, 277 sq. in., .049 or .05 electric, 2/3-ch; built-up balsa, plywood, and spruce. One sheet 35" x 41", RCM 10-86, \$5.25.



#979 WHIMPY TOO: by Roger Tennyson. Cat. 1, 62" span, 545 sq. in., .40-.45, 4-ch.; built-up balsa, plywood, and spruce. Two sheets 34½" x 68", 34½" x 63", RCM 11-86, \$14.75.



#980 KITTIWAKE: by Scott Christensen & Ken Willard. Cat. 7, 45" span, 315 sq. in., .20-.25, 4-ch.; built-up balsa and plywood. Two sheets 34½" x 70½", 34½" x 65", RCM 11-86, \$15.25.



#981 SESQUIPHIB "D": by Francis Reynolds. Cat. 7, 69" span (T), 30" span (B), 1274 sq. in., .61, 4-ch.; built-up balsa, plywood, foam board, and foam core wing. Two sheets 34½" x 79", 34½" x 72½", RCM 12-86, \$16.50.



#982 S.T.O.L. PIGEON: by Michael Leasure. Cat. 1, 44" span (T & B), 584½ sq. in., .15, 2½-ch.; built-up balsa and plywood. Two sheets 34¼" x 61¼", 34¼" x 49¼", RCM 12-86, \$12.50.



#983 BIPLUM: by Paul Denson. Cat. 2, 48" span (T & B), 768 sq. in., .15-.25, 3-ch.; built-up balsa, plywood, spruce, and pine. One sheet 34" x 56", RCM 1-87, \$6.50.



#984 SNIPER: by Hans Hochradel. Cat. 1-8, 37½" span, 234 sq. in., .051-.10, 3-ch.; built-up balsa and plywood. One sheet 29" x 42½", RCM 1-87, \$5.25.



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#986 SIMPLE DUSTER: by Fred Reese. Cat. 2, 35" span, 166 sq. in., .049-.10, 2/3-ch.; built-up balsa, plywood, and Ace R/C foam wing. One sheet 22" x 30", RCM 2-87, \$5.00.

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Weight: 8.5-9.5 lb (3.9-4.3 kg)
Length: 52 in (1321 mm)
Requires: 2-cycle .60-.91 cu in (10-15 cc) or 4-cycle .90-1.20 cu in (15-20 cc) engine and 4-channel radio

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Jan. 1994 Winners

The following two people won a prize from RCM and Great Planes.

Ray. P. Hobson II
N. Plainfield, NJ

Darrell H. Bunch
Eureka Springs, AR

Congratulations!

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WANTED: OLD COX, WEN-MAC, O&R, Gas powered cars, airplanes, others. Plastic/metal, complete or parts. Also: old model engines, Dooling 61, McCoy 60. Willie Shuhair, P.O. Box 1732, Walnut, CA 91788, (818) 913-4923.

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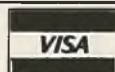
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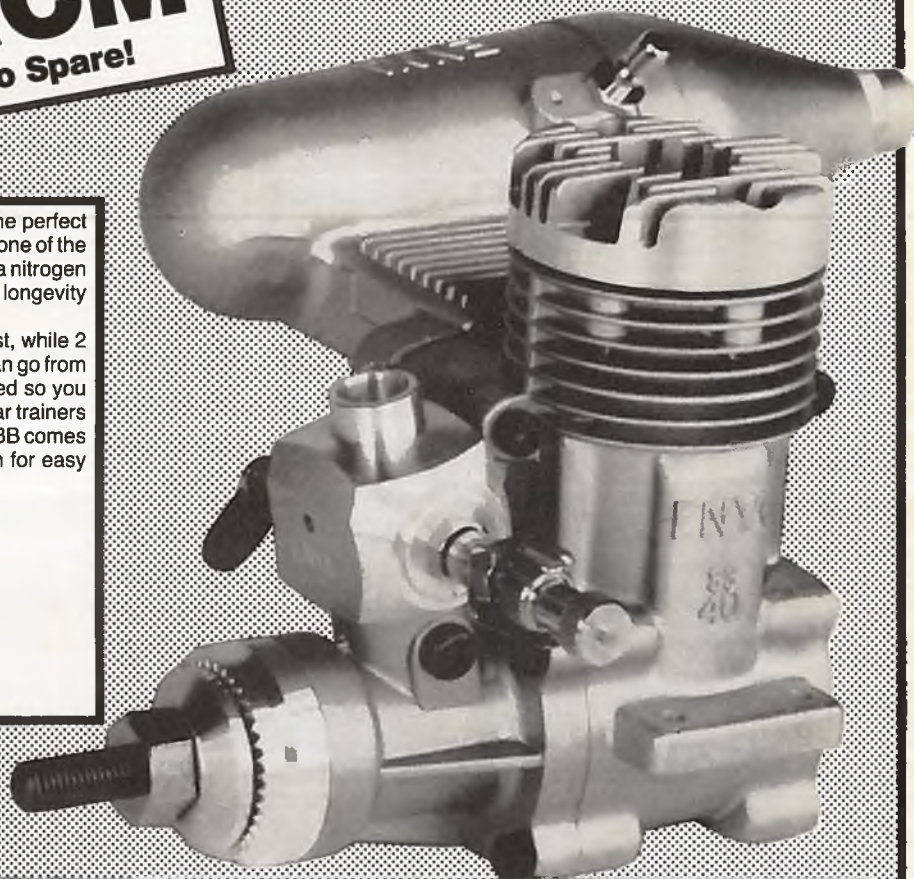
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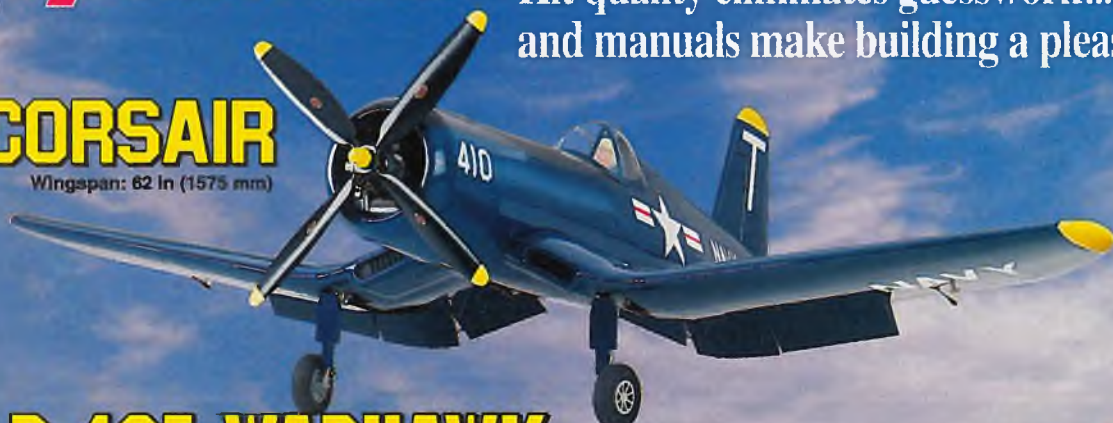
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—Model Airplane News on the Gold Edition Mustang

All three include vacuum-formed parts that speed up assembly and accurately reproduce such fine details as wing guns, canopies and exhaust ports.

Top Flite also includes huge decal sheets that are loaded with authentic markings. Special touches, like the Warhawk's fully operational split flaps, are guaranteed to get a "Wow!"

Thorough, photo-illustrated instruction manuals and full-size rolled plans lead you through assembly step-by-step. Complete directions are included for adding optional retracts.

Performance? It's sensational. These kits will do any maneuver that your skills allow—loops, rolls, chandells, Immelmans—and do them well.

Even if you've already built a scale warbird, you might just find that the results are better—and easier!—with a Top Flite Gold Edition kit. For a free brochure and the location of the dealer nearest you, please call 1-800-682-8948 ext. 012R.

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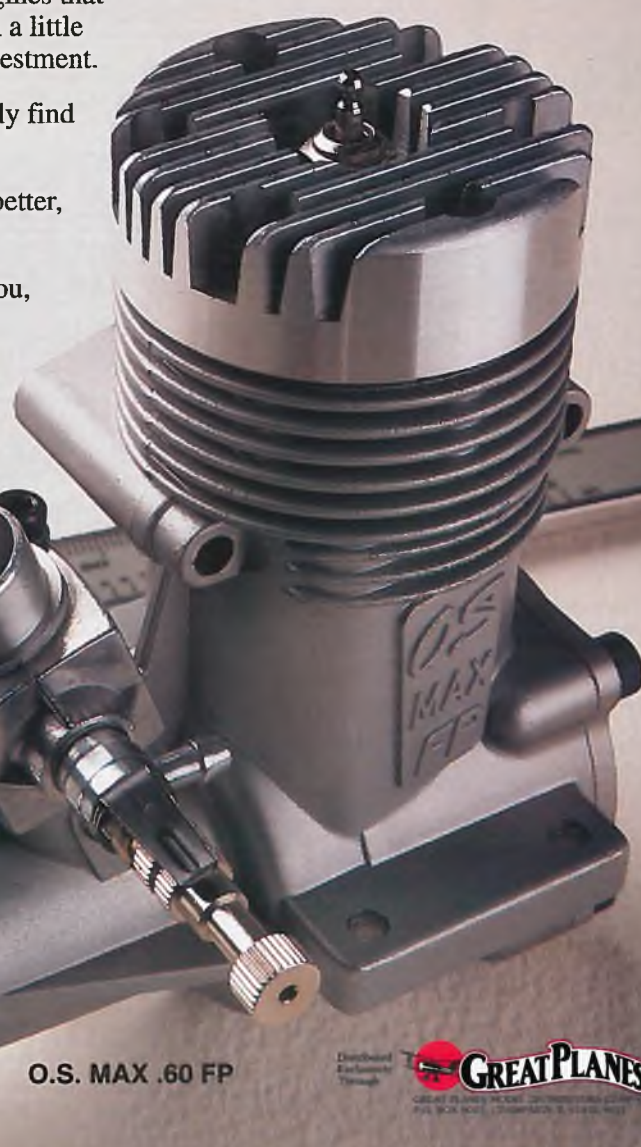
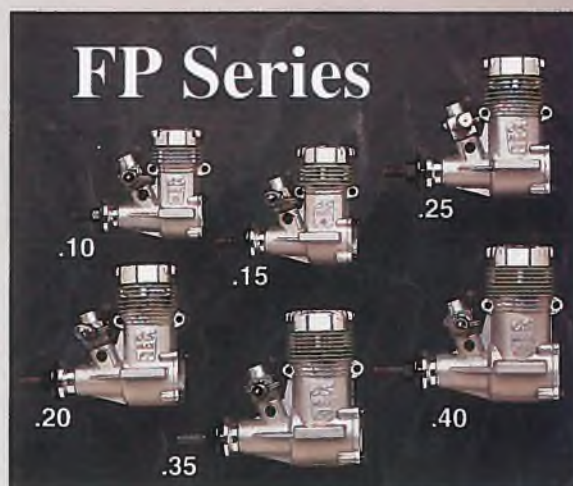
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- 1.** New blade holder with integrated pitch arms for more precise control. Blade holder has thrust bearings installed (standard on ZXX, optional on Z & ZX) to allow for heavier blades to perform the most advanced maneuvers.
- 2.** New, shorter machined metal center hub to further increase the Shuttle's legendary stability and maneuverability.
- 3.** New, adjustable pitch control rod for even more precise tuning.
- 4.** New 360 degree in-line stabilizer arm for ease of assembly and maintenance.
- 5.** New, exterior location of the elevator lever allows for direct access, quicker building and easy adjustment.
- 6.** New switch location is positioned high on the frames for better protection from oil contamination.
- 7.** New vertical shaft starting system with double ball bearings (standard on ZXX, optional on Z and ZX) to ensure better alignment

ment of engine and drive train as well as providing you with the easiest starting method available.



- 8.** New main frame allows for easy replacement of engine, bearings and drive parts. Helps you get back in the air more quickly.
- 9.** New, larger fuel tank, 250cc, for longer flights, more enjoyment.
- 10.** New materials used in side frames include space age ceramics for increased durability, a benchmark in 'copter technology



- 11.** New 1.7 mm tail rotor control push rod for better stability and less control rod flex, allows you to utilize the advantages of the longer tail rotor blades.
- 12.** New and longer tail rotor blades provide more precise control, increased performance. This lets you easily perform tail rotor maneuvers once thought to be difficult.

- 13.** New aerodynamic cabin protects the swash-plate area to allow for even higher speeds.



- 14.** New and improved starter pulley and high performance cooling fan (standard on ZX, ZXX, optional on Z) lets you demand even more power from your engine.
- 15.** New, durable swash plate with stainless 8mm balls and metal pivot bolts (standard on ZXX, optional on Z and ZX) ensures long life of control linkages and more precise control.
- 16.** New radius arm takes the control system to the most precise level of control available in this class of helicopter. (standard on ZXX, optional on Z and ZX)
- 17.** New, ball bearings on all control levers (standard on ZX and ZXX, optional on Z) ensures more precise control linkages and better control.
- 18.** New parts described here are compatible with previous Shuttle designs, so present Hirobo owners can also enjoy the benefits of these major advances.

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For maximum satisfaction and safety, always carefully follow the cautions and safety instructions that come with the helicopter. Seek qualified help and always wear eye protection.