

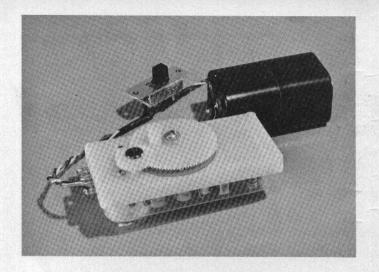
Radio GRID Control World

Vol. 7 No. 6

November-December 1966

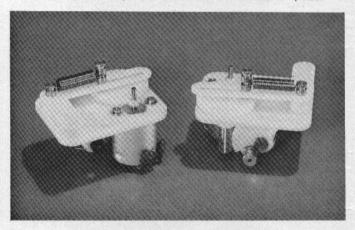
35 cents





NEW!!! Controlaire Robot

Another new item from Controlaire is making the R/C scene. This time it is the ROBOT, a completely solid state device that combines a superregen receiver and a rudder servo in one package. The Rx-Servo unit is pre-wired with a wiring harness that includes an on-off switch and a battery pack. It couldn't be easier. Once the ROBOT has been fixed in the model, push rod connected, three pen cells installed and antenna strung out — you're ready to fly! The control sequence is straightforward; one blip gives right, two blips left and three motor control. No signal gives neutral. In the third position the motor control will only advance one position and will not run through. This motor control unit will be announced later. Extra batteries will not be needed for this. Small size: 15%" wide X 31%" long X 1%" deep overall will enable the ROBOT to be mounted in many of the small 049 R/C models. Servo output is such that models with up to 30 size engines may be used. Rx will operate with any Tx furnishing a 90% or better modulated signal. Price of the Robot will be \$21.95. Motor Control also available for \$12.98.



NEW!!! Controlaire Ghost

We are pleased to announce the new Controlaire GHOST actuator. The GHOST is a single channel Galloping Ghost type actuator and is designed to use push rod connections to all flying surfaces. This eliminates the troublesome wire bale which is usually hung on the rear of the plane. The Furuichi motor is used because of its low current drain and high power. The five pole design of this motor assures you of positive starting and a quick reversal of shaft rotation. The motor is noise free allowing the GHOST to be used with most relay type superhet receivers such as the SH-100. The power takeoff arm on the motor control output can be changed to push or pull for low speed. This allows you to set the servo up for a correct fail-safe sequence. That is the plane's engine goes to low throttle under this condition. The GHOST measures $1^1\%_6{}''$ long, $1^1/2''$ wide and $1^1\%_6{}''$ high. This compact shape allows the GHOST to be mounted in most of the 049 powered R/C models. However, the GHOST is powerful enough to use in planes with engines up to 19 in size. Price of the new GHOST is \$11.98.



INCORPORATED 8206 BLUE ASH ROAD TEL. 513-891-7936 CINCINNATI, OHIO 45236



Controlaire Ghost Board and Switcher Kit

R/C flyers using the Controlaire Ghost Actuator will welcome this new item from Controlaire. A printed circuit board/mount was combined with servo switcher circuitry and related components to give you added convenience when installing the Ghost Actuator in your model.

Aside from forming the circuit, the P.C. board acts as a mount plate for the Ghost. Four bolts fix the unit in the model. The switcher circuitry is identical to the popular NND-1. A few items have been added — two plugs mounted on the board, are used to connect the power supply and the receiver to the unit. The battery pack and Rx are not furnished but their connecting plugs are. A slide switch is also fixed to the board/mount, and it is used to turn on or off the radio gear in the model. Chokes have been added to further reduce motor "noise".

The entire unit with actuator weighs 234 oz. and is 41/4" long and 21/2" wide. Prices are as follows — Board and Switcher Kit, less Ghost, \$7.98; Board and Switcher assembled, less Ghost, \$9.98; and Board and Switcher assembled, with Ghost installed, \$21.50.

Controlaire is also offering a Galloping Ghost package consisting of a G. G. Transmitter, SH-100 or Controlaire 4 receiver, Ghost Actuator mounted on an assembled board and switcher unit, factory wired with battery box and all connectors. of above package with Controlaire 4 superregen Rx — \$99.98; with the S. Superhet Rx — \$109.98. This package is ideal for a flyer starting into Galloping Ghost operation.

Digitrio - 4 Tx Modification Kit

Now that the series of articles concerning Digitrio-4 modifications are appearing, World Engines is pleased to announce the release of the Digitrio-4 Transmitter Modification Kit at a price of \$7.98.

Parts Price List



REFERENCE NUMBER	DESCRIPTION	QUANTITY IN KIT	PRICE
C1,3,5,6	.001 Disc Condenser	4	.15
C2,4	.1 Disc Condenser	2	.35
D1-4	Silicon Diode DHD-806	4	.35
Q1-4	2N3640 Transistor	4	1.50
R1,5	27K 1/4W. Resistor	2	.12
R2,4,6,8. 11,13	4.7K ¼W. Resistor	6	.12
R3,7,9,10	10K 1/4W. Resistor	4	.12
R12	10K Potentiometer	1	2.25
	Printed Circuit Board	1	1.50
	#26 Hookup Wire, 19 St	tr.,	.09
	1 each-20" White, 10"		
	Blue, 31/4" Green and 1	1/2"	
	Ped		



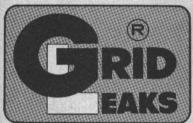
Send mecopy(s) of the New WORLD ENGINES CATALOG at 75¢ each postpaid.

Latest edition is ready. Contains info from over 100 manufacturers. With each catalog you receive a 24 page mid-66 supplement of new items and prices.

Street
City
State Zip



The United States of America's 1967 FAI team was chosen at the championship fly-offs in Oklahoma City on September 23, 24 and 25. Phil Kraft was first, Doug Spreng second, and Cliff Weireck third. Congratulations!



Radio Control World

VOL. 7

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CONTENTS

NO. 6

ANNOUNCEMENTI

As most of you know, Grid Leaks was begun as a side line for Ace R/C in 1957. For a number of years it was a house organ and was published in our own plant. Then with the help of Bill Winter and Wittich Hollway, we broadened our coverage. It worked well and GL filled its own particular niche in the R/C world.

When I assumed active editorship again recently, it was with great joy—for a while. In recent weeks, however, there has been forced upon me the realization that there are only 24 hours in a given day. Much as you might wish for more, it might not be in your best interests to get them. There simply is not enough time in a day to run Ace R/C and to edit Grid Leaks, and do an effective job with both.

So a decision had to be made. This will be the last issue of Grid Leaks you will receive in its present format. Beginning with the February 1967 issue, the NEW American Modeler, will assume our unfulfilled subscription list. You will receive from them enough copies to cover the number of copies you would have received from GL. If you are already an American Modeler subscriber your subscription will be extended.

American Modeler will publish some of the choice items Grid Leaks had in inven-Bud Atkinson's Corben Super Ace, some other planes, and some electronic goodies. Bill Winter, now editor of American Modeler, along with the publishers, know what Grid Leaks stood for and they will keep alive the GL tradition.

The new American Modeler has shown a great willingness to adapt to reader desires. We believe you will enjoy having the balance of your subscription filled by them, since you will get what GL had planned for the immediate future, and much more.

We will miss our regular contacts with you. We certainly appreciate the many

fine letters received and contributions many of you made to our pages. We wish for you happy tinkering, clear skies and glitchless R/Cing.

> Yours sincerely, Paul F. Runge, Publisher-Editor

PAUL RUNGE, Editor and Publisher-BUD ATKINSON, Editorial Assistant CARL LINDSEY, Art Assistant Contributing Editors: R. Jess Krieser—Phil Kraft Dick Jansson-John Worth-John Phelps-Norm Rosenstock

GRID LEAKS—RADIO CONTROL WORLD is a bi-monthly publication and is intended for the modeler who is interested in Radio Control modeling. It is published by Ace R/C, Inc., at 203 W. 19th Street, Higginsville, Mo. 64037. Copyright 1966 by Ace R/C, Inc. Subscription rate is 2.00 per 6-issue volume. For subscriptions outside the United States, add \$1.00 for postage. GRID LEAKS is a registered trademark.

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The Editor's OPEN CHANNEL



Winners of the FAI Championships

in Oklahoma City were:
Phil Kraft with 3853½ points
Doug Spreng with 3582 points
Cliff Weirick with 3436¾ points
The affair was held at the Cimarron

Airport west of Oklahoma City on September 23, 24 and 25. It was the smoothest operating contest of any kind these eyes have had the pleasure of seeing.

It was blessed with nice weather all three days, even though a bit gusty one afternoon. It just is not possible to describe the precision with which the flights were made. Each contestant who desired it, had a full six times up to fly. Yet contest ran only 12 minutes beyond the scheduled cut off time.

The 31 entrants were all winners of AMA sanctioned contests held throughout the U.S., this summer. Flying by all was superb, and only one prang was had during the FAI portion of the Tournament of Champions, and this was due to that contestant accidentally turning his transmitter off right after launch

To Maurice Woods, who served as Tournament Director, the members of the TORKS who pitched in with a lot of the detail work both prior and doing, to Maynard Hill who served as the FAI Coordinator for the AMA, to the 12 judges who served the two flight lines—to these, and many more must go the credit for an unparalleled success

Scoring by the judges was on a basis of 1 to 10 for the 18 maneuvers. In addition to the point scoring each maneuver had a K factor by which that particular maneuvers points were multiplied. Take off, for instance, had a K factor of 5, but for the more difficult inverted eight a K factor of 15 was used.

The winners will form our team for (Continued on next page)

THE COVER: Mazie Salerno of Orlando, Florida is the model with the model of John Reynold's Snipe Sailboat; construction details of which are in this issue.

The Open Channel

(Continued from page 1)



Maurice Woods, tournament director, looks on as Maynard Hill, FAI coordinator for the AMA makes an announcement over the PA.



Judges at an event of this kind—or any contest for that matter—deserve beaucoups of thank yous. This is a chore.

the FAI World Championships to be held in Corsiea, France in 1967.

Our man Bud Atkinson, along with Curtiss Brownlee, Norbert Dembinski, Ray Downs, Jack Josaitis, Bill Knost, Don Mathes, Howard McEntee, Randy McGee, Bill Northrup, Chuck Waas, and Dale Willoughby served as judges.

It was my pleasure, along with Howard Bonner and Maynard Hill, to serve on the jury. There were no protests of any consequence, so that task was a pleasure.

Those competing were Don Ballreich, Tiffin, Ohio (3058½); Tony Bonetti, Emerson, New Jersey (2011); Ralph Brooke, Seattle, Wash. (3247); Jack Butler, Salt Lake City, Utah (2291¾); Ron Chidgey, Pensacola, Fla. (2920¼); Harold Coleson, Atlanta, Ga. (3349¾); Harold De Bolt, Cheektowaga, N.Y. (3119¼); Curt Dimberg, Palatine, Ill. (2151¼); James Edwards, New Albany, Miss. (2947¼); Paul Ennis, Salisbury, Md. (2334¾); Gordon Gabbert, Dallas, Tex. (1262¾); Paul Good, Seattle, Wash. (3276½); Paul Good, Seattle, Wash. (3276½); Jim Grier, Chicago, Ill. (2267½); Chuck Hayes, Garden Grove, Calif. (2183); Maxey Hester, Des Moines, Iowa (2919); Ed Izzo, DeWitt, N.Y. (3165¼); Larry Jensen, Armstrong, Iowa (2912); Ed Keck, Webster, N.Y. (2951¼); Rob Kelly, Denver, Colo.

(Continued on page 26)

Readers Write

LARGE SCALE JOB

Please renew my "GRID LEAKS". (It's still "GRID LEAKS", regardless of new name).

I have undertaken a rather large project, and will need a few more months to finish it off. Went to Atlanta last August and saw a 9' Cub flyso impressed me that I decided I had to have a large, slow, scale airplane. After much deliberation, decided to try the old 1930 Stinson "5". Chet Lanzo has a 6' copy—mine is 9'. (1/4 scale). Mine favors Lanzo's, but there the resemblance ends. Structural problems get out of hand on these "monsters." Anyway, have it completed except for doping the wings. Am working on that now. Have an S.T. 60 for power and an Orbit 3 + 1 (with aileron) for control. The completed ship will weigh about 12-13 lbs. No problem for 16 sq. ft. of wing! Have replaced the wheels in the picture (4½") with scale size-6". A lot of time and research turned up a brand new pair in Brad-ford, England! Still having a problem with props. The prop in the pix is a hand carved 20" (scale) for show only. The wing is in two panels, they plug in to the fuselage and the struts are functional. Plan on finishing off the interior after a few test flights (have the instrument panel in now). color scheme is red and cream with a black pin stripe. (Like the original). Will send along a color picture when I get it finished.

CAPT. W. R. COOKSEY Robins AFB, Georgia

SEE COVER!

As to suggestions for GL:

1. Streamline the name, quickly, before it gets forgotten in the shuffle!

DAVID W. JONES Cave Creek, Arizona

LIKES SINGLE CHANNEL STUFF

"I certainly enjoy your magazine GRID LEAKS. When I first heard of it, I figured it would be a publication primarily for the expert and the radio technician. Since becoming a subscriber I have found as much or more of interest to the single channel modeler as any of the other magazines. Keep up the good work. Out here in the country away from the hobby shops and the R/C clubs, the magazines are about the only way we have of keeping in touch with our hobby."

EDWIN I. SIDEY Greenfield, Iowa

SINGLE CHANNEL PROPO COMING UP!

My main interest is in single channel proportional and I hope you will have many articles covering this subject as

I believe there are very few aids to help the beginner in this area.

I was impressed with my first issue of GRID LEAKS, and I am looking forward to my subscription.

JOHN KEITH Kansas City, Missouri



ANYONE REMEMBER THE MAYBE?

I enjoyed reading about the plane you and your son were flying. I thought you might like to see one I have been flying since 1954.

Do you recall a plane named "Maybe"? I forgot who designed it and even which magazine it was published in. The original was about 3 feet span, which I enlarged to 5 feet, and built two of them, one for a friend. I an still flying the original.

I hope you can use these pictures as planes to be remembered in your "Readers Write". Like your sail plane, this is beautiful to see.

Wonder if any of your readers remember who designed this plane, and I also wonder if there were very many built

JULIUS H. BARLEY Everett, Pennsylvania

WANTS CLASS III INFO

"Write" you say and write I will! Since you are interested in what your readers think, I thought you might be interested in what I think of "GRID LEAKS". Let me preface my remarks by telling you my interest lies in Class III planes as does the majority of people in R/C. Here in Evansville every acting R/Cer is in Class III equipment. No Class I or II at all!

I summarized your July-August issue to see how it was proportioned and found no pages for Class III R/C.

Paul, it seems that you are going overboard to avoid Class III material and make a beginners magazine out of GRID LEAKS. Very possibly you have very good reason for this that I do not see.

I certainly think that the beginner deserve a portion of the magazine but also believe that the more advanced R/C fan should have a larger share of GRID LEAKS devoted to his part of the hobby

I hope that my comments will be ac-

cepted in the way I intend them-that is as constructive criticism.

IACK MATHIAS

Evansville, Indiana Some of you Class III pilots, how about sharing some of your know how?

JANSSON COMMENTS

On the Adams actuator: If the dual coil is rewound with smaller wire (don't recall the proper size) and completely fill the bobbin, to a coil resistance of 90 to 100 ohms, it can be operated on a single ended 9.6 volt (eight 225 Mah cells) supply with a greatly

improved output torque. On Ed Gerhardt's additions to my transmitter: unijunction pulsers can be built and tailored for most any service. Consideration was given to the inclusion of his Q9 and the width trim pot but were not included for the sake of simplicity. The originally designed pulser was fine for G-G type applications where the slight rate-width interactions could be readily tolerated. These interactions are primarily due to the nonlinearity of the generated saw tooth waveform. Gerhardt's use of a collector junction as the UJ emitter charging source goes a long way in providing an ideal current source to linearize the waveform, and provide a more versatile rate trim adjustment. The use of the PNP transistor as a charging source leads to other multiple problems, though. I find that it is quite voltage sensitive, which may be OK if the mod-eler is aware of the problem. It is

also temperature and RF sensitive. (The RF problem is evident with the 2N3638 that I used, and may not be with the lower frequency response of the 2N404. Using 35 uh RF chokes and 0.001 mfd bypass capacitors on all control wires that lead off of the PC board in the pulser circuit will nearly eliminate the RF problem. I could go on and on about these problems but you should get the picture by now, the additions are useful but use with caution. Actually I'm a bit flattered that the transmitter is receiving the modeler modifications.

Keep up the good magazine work (GRID LEAKS, that is) you may even get to punching those ring binder holes (circles on cover) again.

DICK JANNSON Wellesley Hills, Mass.

EXCHANGE PROGRAM

Our American brothers (experimenters) are very lucky as they can get the required components and accessories to build R/C projects and gear there.

Here, the story is quite different! Components like relay, crystal, servos, escapements, special type of transistors, actuators, etc. are not available with even the largest radio and electronics spare parts dealers. Hence it becomes extremely difficult and in some cases impossible to try a R/C model construction work here.

Therefore, I am interested in getting such hard to obtain parts here as a gift from our friends—experimenters in U.S.A., in exchange for Indian novelties and curios which they would like to have.

K. B. TENDULKAR 94/3, Jaiprakash—Nagar Goregaon (East) Bombay No. 63 (NB) India



NOMAD CLUB

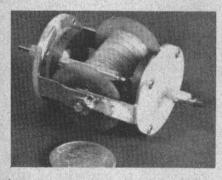
Noted the write-up about the Nomad. We have a Nomad club here. While the Multi jobs are cracking up, we fly our Nomads right on. The public seems to like them the best. They land so easy, and so easy to launch. When there is a little wind, I can take mine off and land it in the same spot that I took off from without turning it around. It just goes up about 300 ft. and comes down. Sure is a lotta fun. have about 300 flights on mine. Wearing out the third engine now.

A. M. (TINY) HARLEY N. Augusta, South Carolina

ADAMS MANUFACTURING COMPANY

Janesville, Wisconsin

NOW—FOUR ACTUATORS TO CHOOSE FROM



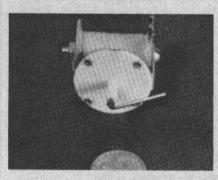
Adams Single, Standard	1R-HV \$ 6.95
Adams Single, 8.5 ohm colf	1R-LV 6.95
Adams Single with BOTH coils	1R-HVLV 7.95
Adams Twin, Standard coil	2R-HV 9.95
Adams Twin, 8.5 ohm coil	2R-LV 9.95
Adams Twin with BOTH coils	2R-LVHV 10.95
8.5 ohm coil separately to let you convert	C-LV 3.00
Replacement coil, Standard	C-HV 3.00
Delrin Torque links	1MTL ed25 3 for .50

Adams Actuators have been widely used for quite some time with 30 ohm coils. They have proven very versatile, allowing use in ships up to .19.

Now they are also available with an 8.5 ohm coil. This makes for four configurations to suit any need! On 2.4 volts, the resultant torque is nearly equal to the torque output of either 30 ohm stand-ard coil when used at 4.8 volts. On 2.4 the drain is 240 to 270 ma, so almost 2 hours of flying time can be had with two 500 mah nickel cads.

On 3.6 volts they are real stompers, but should be used with 750 or 1200 mah nickel cads.

Moulded delrin torque link is now furnished, but also available separately. When the link is installed on the actuator per instructions, and unit is properly oriented, a direct take off from the actuator into pushred is possible. Allows built-in steps to prevent overtravel; ability to change the total throw, yaw trim may be applied to allow rudder to swing further to one side than the other to make up for maladjustments, warps and so on.



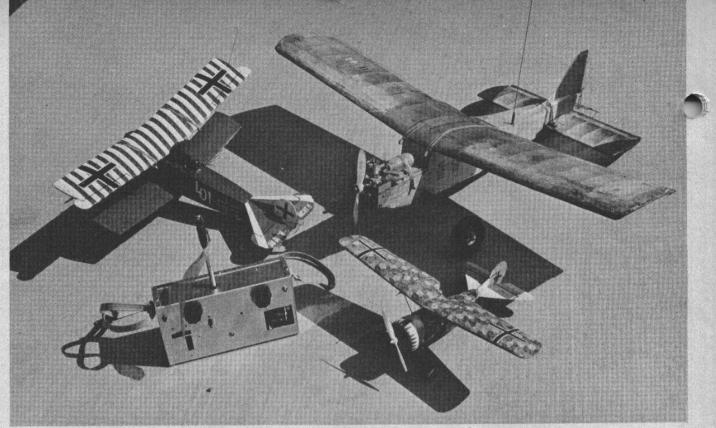
Adams Actuators allow you to go truly solid state control circuit without any attendant noise problems such as are caused by motors. The double coil action requires the use of either a double ended receiver or almost any single relayless receiver with an Add-On-Switcher and only one set of bat-teries, to avoid any unevenness in drain.

There is enough inductive kick to allow a high pulse rate detector to be used, and an elevator discriminator circuit for GG flying.

Distributed by

ACE R/C INC.203 West 19th St. Higginsville, Mo. 64037

WORLD ENGINES, INC. 8206 Blue Ash Rd. Cincinnati, Ohio 45236



Author's Proportional Models. Fokker D-VII is 24" Converted Free Flight, Fokker D-VIII is converted 18" span ukie. Li'l Tri Squire is 40" span modified. Bill says: "If it ain't scale, it ain't a model!" (Figure 6)

Some Thoughts On Simple Pulse Proportional

ive ghost a chance!

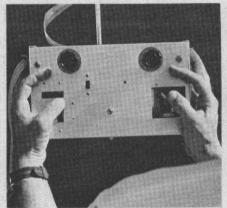
By WILLIAM J. SCHENKER, M.D.

Editor's Note: The author presents some well thought out ideas. Grid Leaks would be interested in having reader comments.

We tinkerers are finally having our day. Each month significant new magazine articles and commercial gear appear on the scene, giving us gallopless ghost specialists the respectability of first-class citizens. However, the profusion of new ideas and gadgets has yet to be treated as a unified sub-specialty, with its own characteristics and idiosyncracies defined and interrelated. (The following discussion does not live up to this noble preamble, but it's a start, anyway.) So here we go.

"Flying the Plane vs.

Flying the Box" Some time ago an article in GL on pulse proportional noted that "we fly the airplane, not the box." Verily, around this particular problem revolves the entire technical challenge of remote control of model aircraft. The point is that if we're at the controls of a fullsize airplane, we are flying the planewith changes in G-forces registering pressure changes on our proprioceptor nerve endings, these in turn signaling the brain centers to send messages to our hands and feet on the stick and



Left thumb on elevator trim, right thumb on stick. Full on and off bang switches are at top right and top left. Repackaged Mule II and Phelps pulser. All trim and throw controls are calibrated. (Figure 3)

pedals-a wonderful closed loop feedback system which responds instantly and with minute increments. If on the other hand, we're flying one of our miniature monsters, our only connection to the craft is the box-and if we don't press the right button or push the right stick, right now, on the box, we'll never

pull von Richthofen's DR-I out of its suicidal spin. And, of course, what makes our problem even more difficult, is that there is no feedback from the Baron way up there, to our little box way down here, such as the big-time pilots have. All this puts an extra premium on the efficiency of our box, and rather than de-emphasize this factor we should better focus more than the usual attention to it, if we are to approach our ideal,

What then is our ideal? When viewed close up, it may be considered three-

fold:

1. A well-trimmed out ship, said trimming to be accomplished preferably before the third (and final fiery) crash. (The point here is that almost any plane, no matter how far out of trim or adjustment, can be made to fly under control, eventually, by a good pilot, but the number of crashes encountered along the way usually leaves the tamed bronco with an oil-soaked, multi-cracked and repaired nose section multi-warped wing from so many snapped and re-glued spars, and questionable operation of the radio-switchbattery-servo-linkage combo as a result of so much pranging). Thus, one criterion for effective control should be:

"Can you get it on the first flight?" 2. A ship that responds accurately and quickly to what the brain orders the fingers to do with all those buttons and sticks and switches arrayed on the ransmitter panel. To the majority of s, who haven't the finger dexterity and coordination of a concert pianist, it is no small feat (!) to get the right fingers of the left hand going in an upward direction in order to get the plane going in a downward direction, etc., etc. We must be able to achieve adequate control by using the finger movements and hand positions which are part of every day reflex and habit patternswith a minimum of awkwardness and unnaturalness. Thus, the second criterion for effective control should be: "Can you get it by using only 10 of your 11 fingers and two of your three

hands?" 3. Finally, having a ship that trims out fairly well on its initial voyages, and does so without resort to an unusual degree of manual dexterity, what of the reproducability of the above two criteria? If our first two flights were fairly successful, can we depend on the next ten being so? And if we pack the craft away for seven days and come out the following Sunday, can we again reproduce the trim and control we had the week before? And what of wind velocity changes? We know we have to change our trim for such a situation, but just how much of a change? Can we quantitate changes in wind velocity with changes in trim angle in a pre-'ictable way? Thus the final criterion for effective control should be, "Can you get today what you had yester-day?" Now let's see how we can achieve these goals.

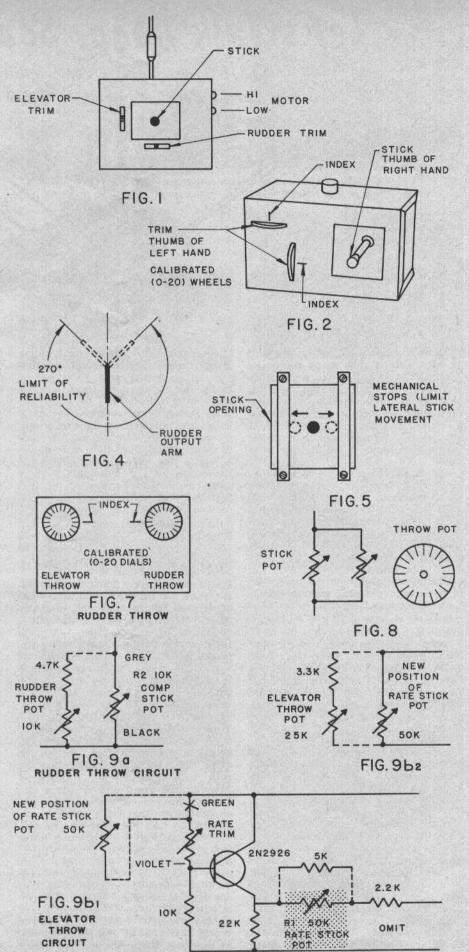
"The Box"

The typical pulser-transmitter front panel today looks like Fig. 1.

This arrangement in my opinion has the following major drawbacks: One hand must hold the transmitter from behind, leaving only one hand free to work both the stick and trim levers; this means that to change trim in flight we must release the stick. It also means that when we move the trim lever(s) to new settings, we have to "eyeball" the position—there is no calibration of the trim lever, and apart from a dead center setting, it becomes pretty difficult to reposition a trim setting exactly the way we had it last Sunday. (when we found just the right position of elevator trim for a 10-knot breeze and a ½ inch stab shim). The following sketch outlines a solution to these problems (Fig. 2 and Fig. 3):

This shows at a glance that we can have *simultaneous* control of both stick and trim—using bimanual control, with the palms of each hand supporting the transmitter, and the thumbs of each hand moving the controls.

Another problem associated with GG; as follows: one of the delicate adjustments required when using go-around servos (e.g., Go-Ac, Rand, Ghost, to name a few) is that of providing the proper stops to the rudder



Let's Talk About Scale

1966 NATS Winner Suggests Some Solutions to Help Scale as Far as Radio Control Meets are Concerned



THE WORD SCALE, according to Mr. Webster, has many meanings. To the aviation buff it means a smaller replica of the man-carrying machine. How much small depends on whether the builder intends on using a rebuilt VW 45 HP engine or a Veco 45 at about 1 HP. I'm sure the latter of the two is what most of you are interested in.

R/C scale has a unique position in this hobby of ours in that every magazine, newsletter and what have you, make a special effort to publish pictures, detailed information, and three views on drawings of scale models. There are many sources of information on scale; in other words, the interest is there! But with all this, R/C scale has a small turn-out at contests, even the Nats, compared to the pattern events. Let's take a long hard look to see why.

Scale in the past, be it F.F. U-control or R/C, has been for the true model technician, the craftsman of the hobby, so to speak. He had to be capable of building a replica of a Wright Cyclone, or a set of wire wheels and all the rest of the many details that go into a R/C scale, plus spend months, even years, digging up the three views

Here is a Spitfire the author built a few years back. His 1966 ship—Stits' Flutter Bug.

and necessary information for building a scale model. These are problems that are not so today, since there are so many fine scale items manufactured now—from scale wheels to scale fiber glass and plastic cowlings. The magazines are full of scale items to delight the scale builder. In the past, the lack of large reliable and powerful engines hampered the scale builder; this is not an excuse for not building scale any more, as we have many 45 to .61's that are both powerful and have good reliable throttles.

In the past, R/C gear was a problem. It was large, not too reliable, and lacked the extra channels we wanted for scale. Buddy, you can't say that now! The big break through in R/C gear such as proportional is a natural for scale. I believe proportional has made itself felt more in scale than any other category. At the 1965 Nats— 18 out of 20 scale models made good flights and a big percentage were using proportional. As I mentioned before, it used to be a long drawn out affair to obtain information on scale details, but now there are more scale plans being published. The home built people have several good magazines with a lot of information which we can use to build R/C scale. The Smithsonian Institution, Washington 25, D. C., is more than happy to assist modelers with scale information. I know—I have written them several times and obtained three views, pictures and data on airplanes that were almost impossible to find elsewhere. So no reason to complain on obtaining three views and information. So with all of this in our favor, why aren't there more R/C scale participants at contests? I believe the biggest obstacle is our R/C scale rules. Scale is complicated because it covers many types of airplanes from a World War I Spad to World War II P-51 and all in between to the latest twin and even 4 engine birds of today; and of course the per-formance will vary as much with the

model as it did with the full size prototype, but yet our rules throw all types in one flying category. It's like comparing a Class I bird to a Class III; the performance is as far apart as a 1910 Wright flyer to a P-63. In the past 4 years at the Nats 1st and 2nd, and in most cases to 5th place, R/C scale has been won with a low wing tricycle gear airplane, and all of these ships with the exception of appearance, of course, were pretty much the same configuration. So R/C scale is more or less being prototyped as in Class I, II, and III. Let me state, I am not opposed to the low wing tricycle gear scale ship, as my Mooney Mite at the 62-63 Nats, and also my Mooney MK 20 at the 65 Nats, fell into this type of scale. The Stits Flut-R-Bug also is tri-gear; it is a mid-wing, but to take advantage of the rules this is the type of scale it has taken to place.

Let's stop and think! How many of your R/C buddies have built, or are building, or have started a scale or so-called scale like airplane? I think you will be surprised how many. Now what percentage of them have or would fly scale in a contest? I would say 10% would be a very high percentage. O.K., let's do a bit of checking. Tail Spin Harry, why don't you fly scale? "Oh my old J-3 wouldn't stand a chance with those hot looking trike-gear jobs at the Nats." Or Air Hog Charlie, why dont' you fly scale? You could put a gallon tank in it and fly all afternoon and no one would say a thing if it was a nice scale job. "Well, I had a Spirit of St. Louis once, but what chance would I have with no retracting gear, flaps, lights, bomb or parachute drop or any of those things they always win the big contests with." How about you Sky King? "Scale!—no, not me. I like to see them and think they are pretty, but I'm really not interested in scale airplanes." So he goes over to his well equipped station wagon and pulls out this beautiful ship that looks like a Taurus Candy, Kwik Fli, Beachcomer,

and about all the other hot designs of the day with a paint job that looks like it just came off the Cessna assembly line at Wichita with a full instrument panel, pilot, with head rest, VHF an-tenna, a parabolic spinner, semi-cowled ngine, propo electric wheel brakes and with "U. S. Navy" across the wing! And you say you don't care for scale? "Well, I like a little realism but—I see what you mean!"

So you see, fellows, I think we all can't help ourselves in the quest for realism. But back to our rules. The rules as we have known them have more or less leaned to one type of air-

A scale J-3 should have as much chance as say a B-29 because the J-3 is a model of a full scale airplane, the same as a B-29 or what have you; so I think many a potential scale contestant has been discouraged because he did not want to build the more complex scale models and wouldn't stand much of a chance with the more simple type of scale airplane because of our

antiquated scale rules.

Let's break the rules down and see what we have. The scale judging section of the rules seems to be about right and comparable with other scale rules. Now to the bonus points section of the rules; this seems to be thorn in the side and there have been many changes here. In my opinion, the idea of multiplying points is not realistic at all. Of the 35 events we have today in the AMA, R/C scale is the only event where we multiply the scale points by the total of the flight points and bonus points. Let's take two P-51's the same in every respect; only Joe's lands just outside of the 100 foot circle, Tom's P-51 lands in the circle; in their flight score, Tom has 5 more flight points than Joe, but in the final tabulation Tom comes up with from 1000 to 2000 points more than Joe, and when the results appear in the magazine the scores are very deceiving and unrealistic. You can see what our friend flying the J-3, with no bonus points, will look like. He would get 5000 or more points less than the P-51's, although he has a nice scale and flying J-3. I believe to add all points would be much more realistic. I also believe there should be a breakdown and study of the points awarded under the term bonus.

Now, to the flying portion of the rules, this also is tough; as I stated before, now all types are thrown in one flying category. In some of the Euro-pean countries and England scale is broken into several categories, one that will stunt and those that have a possibility of large amounts of bonus points, also airplanes with more than one engine. I believe they are on the right track. This year we have an amendment to the R/C scale rules that permit some stunts to be substituted for pattern and ground maneuvers, which is working in the right direction but it still is a little one sided. For instance, the average true R/C scale model seen at the Nats will weigh between 10 and 13 pounds. I am very doubtful if many of them could do 3



Loren Tregalis' Deltair being flown at the NATS in Chicago. Flies nicely.



Here is Chuck Brannon of Sioux City, Iowa, and his Piper Commanche 250.



This Pitts Special is by Walter Burgin of Ottumwa, Iowa.



Part of the Scale flight line at the 1966 Omaha Meet. Spectator interest high.



rolls or loops, let alone a 3 turn spin. I would like to see one R/C scale event, but the builder will have the privilege of choosing from say 3 categories, each, if a perfect score were possible (which is not) would add up to the same end result.

1. Aircraft that do not have any bonus points possible, such as WW 1 type and even our old stand-by the J-3, would fall in this category, but this category would be allowed so many stunt possibilities.



Frank Sanders of St. Louis built this Tiger Moth. Also a NATS entry.



Ford 4AT by C. W. Smith of Chicago. Outboard props are dummy. Powered by one Supertirgre.



Mick Kruzieh of Springfield, Mo., and his Cessna Sky Lane.



Bob Carlise of Norfolk, Neb., and his Scale Bipe of the BE 12.

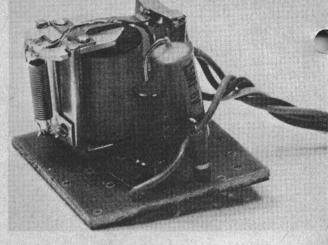
2. Single engine aircrafts that have the possibility of bonus points for lights, flaps, retracting landing gear, and any other unusual possibilities as crop dusting, bomb drop, etc., but no stunts, and of course you would not be able to overload on bonus points and not be compatible with the other cate-

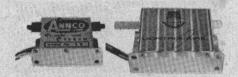
3. This would, of course, be multiengined aircraft; say a twin would be able to have lights, flaps, or a bomb (Continued on page 23)

Selectron

By OWEN S. BLACK

Converts Relay Type of Multi Servos Work With Relay Single Channel Receiver





The Selectron system is designed to use multi servos with single channel relay-type receivers. It is capable of giving right or left action to a control surface, going directly in the required direction without cycling through unwanted controls and returning to neutral when there is no signal being sent to the receiver.

If you've been wanting change from escapement to a rudder servo, this is well worth investigating. With so many of the R/Cers in the contest circuit flying proportional, the chances are very good that your dealer will have a used relay servo of the foregoing types, which can be had inexpensively.

An escapement type motor control may be added the installation of motor control lug on either the Annco or Controlaire if the instructions in this article are followed. The original article that appeared in Model Airplane News had instructions for the Bonner Duramite servo only. This will make the Selectron a more versatile unit, and allow you to use these powerful but small relay devices with your receiver.

The keying is the same as for the Bonner servo, signal on and hold for primary direction, pulse and hold for secondary direction, and two pulses for motor control.

The primary direction of control will be toward the left (wire bundle) end of both servos. The instructions are arranged in a recommended sequence to assist in putting your Selectron into operation.

The schematic and PC layout is shown for the basic Selectron circuit. This originally appeared in Model Airplane News, and is being reproduced here with the permission of Mr. Black, who is the patent holder on this circuit. **WIRING**

Let's get the unit to operating as soon as possible, so wire the Selectron unit, servo, receiver, batteries, and switches, as shown in the wiring diagrams. An important note is that the blue and orange wires from the Controlaire are reversed from the Bonner or Annco hookup. Orange goes to blue and vice versa on the Controlaire. Use the standard Bonner wiring for the Annco. The brown wire from the Selectron unit indicates a trim circuit and it is connected as shown in dotted brown line. A gray wire indicates a motor control circuit and it will be connected at a later point. The double pole switch is not needed for basic operation but will prevent a small transistor leakage current if trim or motor control circuits are used.

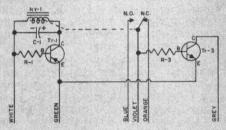
PRE CHECK

Turn on the servo power switch, the serve should run to neutral position if it is not already at neutral. Operate the receiver relay manually with re-ceiver power off. The servo should re-spond to pulses for primary or secondary control movement, the servo will not remain in the secondary posi-tion at this time however, and will cycle back to the primary limit if signal is held on, this action will be corrected by the printed circuit insulation at a later point. Adjust the centering adjustment on the Annco to a close center, the Controlaire is factory adjusted and should need no adjustment. Controlaire instructions tell how to adjust the centering should it be necessary later. Operate the servo through several cycles to both limits, this will establish the wiper paths on the printed circuit board.

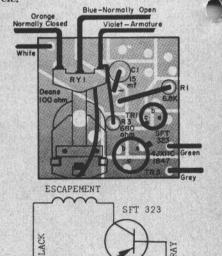
PRINTED CIRCUIT INSULATION

I know that you are having fun zipping the servo back and forth, but let's get on with the show. Remove the cover from the servo (top of Annco, bottom of Controlaire) and remove the printed circuit board from the Controlaire. Check the proper sketch and temporarily insulate the P/C with scotch tape. (Blue land-Controlaire, orange land-Annco). The basic insulation should cover 1/16" of the wiper track, thus insulating the wiper from the land when the servo is in the secondary limit position. This prevents the cycle back to primary end that we had before. A quick release and reap-

(Continued on page 22)



This is the Selectron circuitry which provides servo action with any relay type multi servo. Eliminates the rubber bands electronically for extra muscle

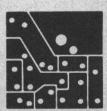


PACK SELECTRON
You probably won't need it, but if your
servo does take extra amplification,
this circuit will provide it.

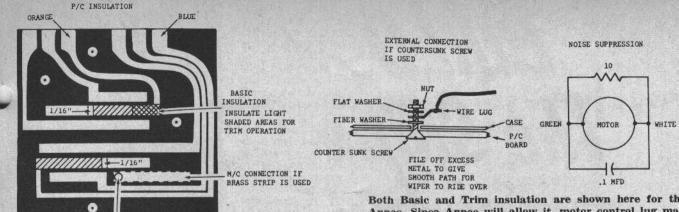
LUG (SERVO)

TO NEGATIVE

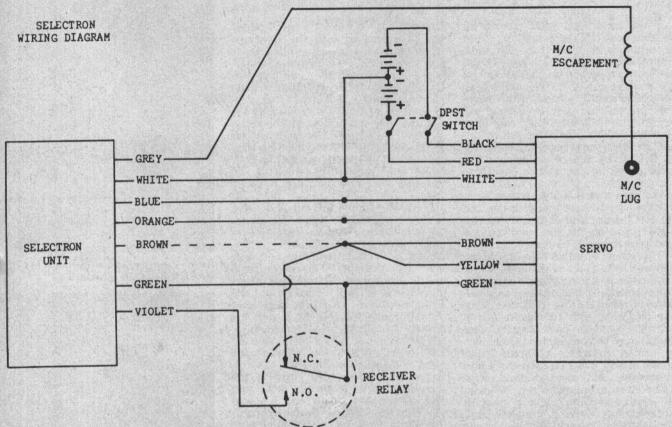
OF BATTERY



Full Size PC base for the Selectron.



Both Basic and Trim insulation are shown here for the Annco. Since Annco will allow it, motor control lug may be bolt and nut assembly as shown. Are suppression is desirable as an addition. Make these inside the servo case.

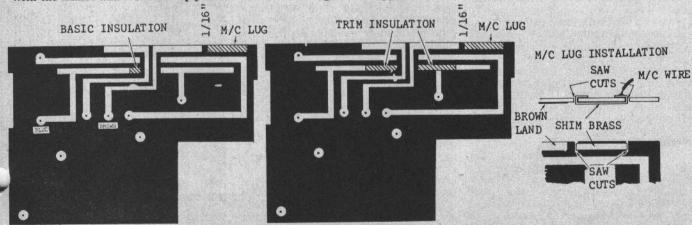


In this wiring diagram you will note two wires have not been color coded on the servo. This is deliberate since the Controlaire color coding is arbitrary and completely different from the Bonner and the Annco servos. For hookup with the Annco and Bonner simply extend the color coding

SELECTRON-ANNCO

M/C LUG

from Selectron to the servo and you are in business. For the Controlaire you will need to reverse the blue and orange wiring leads—with blue going to orange and orange going to blue. Power supply is 4.8 volts center tapped.



Controlaire servo boards are shown separately for basic and trim. Also shown is the shim brass M/C lug installa-

tion, since the Controlaire does not have room for the bolt and nut assembly. Are suppression is built in.

BUILD The Snipe

John Reynolds Shows You How to Make A Scale Sailboat Suitable for R C

There are several good reasons for building and R/Cing a sailboat. Most important is the fact that your radio control equipment is worth more to you in direct proportion to the amount of use you get out of it. We feel safe in suggesting sailing because, with reasonable precautions, your equipment will be safe—so safe that you can hand your transmitter over to the wife or kids and let them experience enjoyable use of R/C. The fun of sailing and the sport of racing are reasons enough to try it.

try it.

We hope that this little boat will encourage you to take the challenge and try R/C sailing and R/C sailboat racing. If you do, we feel sure you will find your time was well spent.

This model is scaled from the Measurement Data Sheet of the Snipe Class, International Racing Association. The Snipe is one of the pioneers in small sailboat racing. It is 15½ feet long, five feet wide, with 100 square feet of sail area. Over the past 35 years, some 20,000 have been registered. Quite likely there is one within a 50-mile radius of where you live. To keep the model inexpensive and easy to build, it is scaled down to approximately 36" overall length and built primarily of sheet stock, plywood or balsa. Full size plans are available through Grid Leaks, and permit building a bare minimum, simple model or a precise scale show piece. If you want to build a sailboat other than a Snipe, the step by step procedures in this article will help you do that.

One marked difference in building a sailboat and airplane fuselage or wing, is that heavier materials are used. The heavier the material, the more difficult the fastening problems. This model was built of ½" plywood throughout. The rule to follow is to use plenty of waterproof fast drying glue and small nails or screws when necessary. I suggest ½" stock for frames and 1/16" stock for bottom, sides, and deck.

The step by step procedure is: a) Building the hull. b) Making the spars, rudder, and centerboard. c) Making the sails. d) Assembling the boat. Some points on sailing and R/C sailboat controls will be discussed later.

Building the Hull. You should have full size plans so that the keel and cen-

terboard box (a slot for a metal plate) can be assembled over the drawings, much the same as model airplane wings are constructed. If pivoting centerboard is to be used, the pivot bolt hole should be drilled after this assembly has been glued and is dry. If the centerboard is to simply slide through the slot and hang, no drilling will be necessary and the slot can be made shorter to accommodate the width of the centerboard. The centerboard can be bolted on after the hull is completed. In this case no centerboard box is necessary

Next, the frames are cut and fitted to the keel assembly. Again, the assembly is made over the drawing to assure that frames are glued in place perpendicular to the boat centerline and deck line. This assembly is done with parts upside down over the top view draw-ing. Wedge a stick of wood into the centerboard box to keep the sides from collapsing and leave it there until the bottom is on the boat. When glue has set, assembly is turned right side up and sheer strips are glued in place. Start at the transom and work forward, station by station, both strips at the same time until each is cut, fitted, and glued to the stem. Care must be taken to insure that frames remain perpendicular to the boat's centerline or keel. Two strips of wood are glued into notches provided at the top of frames 2, 3, 4, and 5. Chine strips are glued in place next in the same manner as the sheer strips. String may be used to hold these strips in place while glue dries. The completed assembly is then sanded and sheer and chine strips made flush with the plane of deck, sides, and bottom.

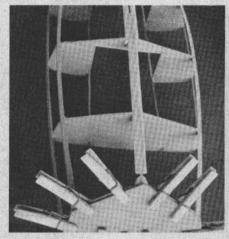
Side, bottom, and deck panels are roughed out from the plans allowing ½" material for fitting and sanding at the seams. Before these panels can be glued in place, glue strips must be installed along both sides of the keel and centerboard box, stem, and transom. If the transom is built up of two sheets, glue strips may not be needed. Laminate the facing (second piece) to the transom in place now and when glue dries sand the edges smooth to provide gluing surface for sides, bottom, and deck. One eighth inch gluing surface will be sufficient.



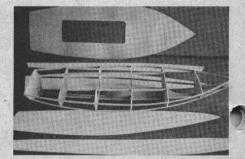
Frames and keel are of 36" sheet balsa or plywood. Assemble keel first.



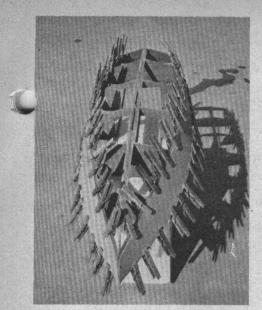
Ribs—sheer and chine—are held in place with string while glue dries.



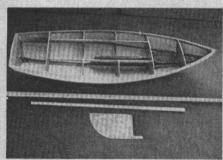
Transom (back end) is a double lamination for strength and glue surface.



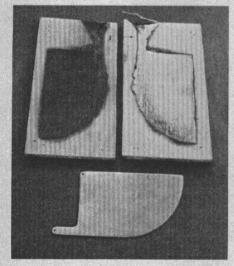
Rough out panels for sides, bottom and deck. Sides go on first.



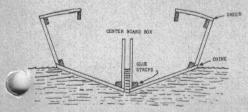
Never on Monday! Clothespins hold sheer and chine. Bow is fitted last.



Add glue to all joints for strength. Waterproof inside. Note flotation chambers.



Centerboard is of sheet metal, may be cut or molded from old print plates.



Cross section of hull showing centerboard box. Sanding angles to simplify gluing.

Side panels are glued on first. Spring clothespins serve as good clamps. Start at the center sections of the boat and work fore and aft, doing fastening at stem last. Both side panels should be fitted to the stem at the same time to assure proper fit and a tight seam. Small screws or nails will be required to secure the sides to the stem. After glue is set, sides are sanded flush at the chine and sheer to form additional glue surface for the bottom and deck.

The bottom panels are glued and nailed or screwed in place next. Care must be taken to insure that both bottom panels will butt against each other all along the keel, except at the bottom of the centerboard box where the slot is left open. The bottom is glued to the centerboard box sides and all frames, as well as to the chine and keel.

After glue is set, turn the boat over and work additional glue into all seams and joints. Glue a strip of wood from the stem to the center of #1 frame at the deck. This will form a firm base for a screw eye that is installed through the deck later.

The deck is installed the same as the bottom. If a single piece of plywood is used, this rough cut panel is secured at stem and stern center first. It is then glued and nailed in place, first one side then the other. All nails should be pressed in with plyers, not hammered. After glue sets, they can be countersunk and the holes filled in. The cockpit may be cut prior to or after installing the deck. It may be made no wider than the opening provided in frames 3 and 4, and no larger than shown on the plans.

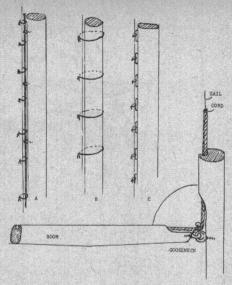
A ½" hole is cut into the deck directly over the keel where you wish the mast to enter the hull. If no centerboard box was constructed, it must be made longer or fitted to the deck. Bottom and deck edges are now sanded flush to sides and the hull is ready for filler and finish.

Spars, Rudder and Centerboard. The spars (mast, boom, and jib club) may be made of any lightweight, strong wood. The set for this model was made from 3/8" fir lath. The mast is 3/8" thick, 3/4"wide, 441/2" long, and tapered from approximate center up to about 3/8"x1/2" at top. Taper is along the leading or fore edge. The edge where the sail fits is left straight. Slot for the sail is not necessary and requires special tools and machinery. Sail may be stapled or lashed to mast and boom. Shaping is done with a small plane and sandpaper. The bottom of the mast is notched to fit the keel just forward of the centerboard box.

The boom is made of the same stock as the mast. It is 18½" long and ¾"x-¾" at widest part. It need not be tapered, but if it is, the edge where the sail fits must be left straight. Taper can start 6" from the mast end or gooseneck. The jib club must hold three small screw eyes, so should be approximately ¼" in diameter.

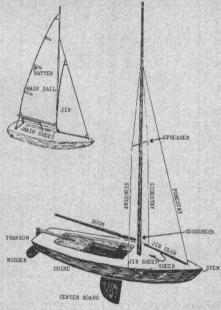
The rudder is made of the same stock as the frames and should be built up

(Continued on page 28)



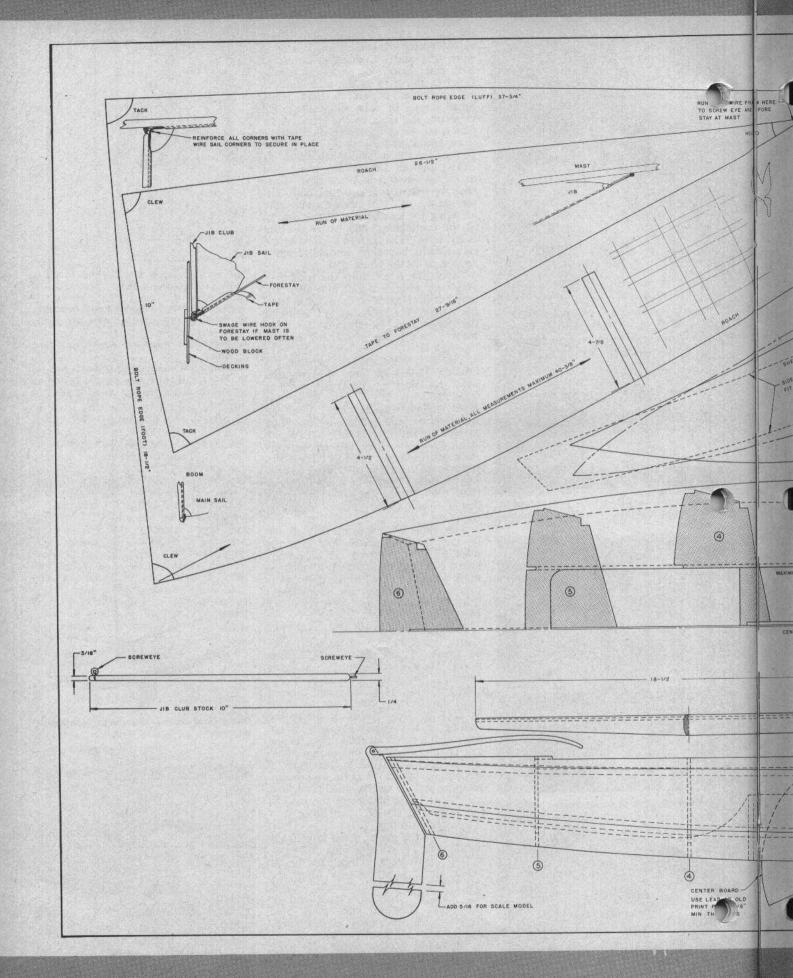
Some methods for lashing sail to mast: A. Small screw eyes. Loops are sewn on sail.

- B. Mast and boom are round, sail tied on.
- C. Staples along mast provide tie points.
- D. Mast and boom are slotted inside of slot is large enough to hold cord.

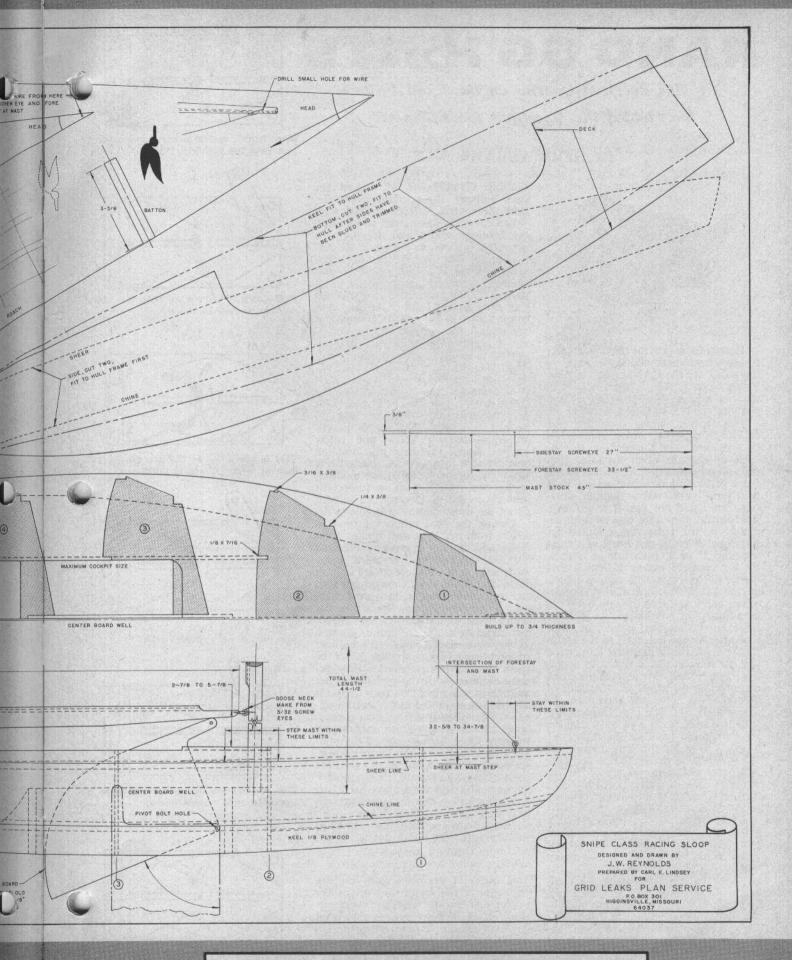


Basic boat shows the parts mentioned in text.





THE SNIPE SAILBOAT



FULL SIZE PLANS AVAILABLE - SEE PAGE 32

RAND GG HINTS

GL Has Received Queries on the Rand Units
We Fielded the Questions to an Expert

By HERB ABRAMS



Thanks for giving me the opportunity to answer questions about the set up of the pulser for the RAND LR-3 on Galloping Ghost. I've received letters from modeler asking about this subject and welcome the chance to help them.

This spring while attending the DCRC Symposium, I was approached by a modeler with the problem that he "gets up elevator when signalling rudder and no down elevator at all. Would I look at his equipment and see if I could help him?" This was a familiar situation, but I had not seen it so extreme. The neutral pulse rate was set approximately at the pulse rate required for full down. That is, the crank was moving only 2° or 3° each side of neutral. By the crank, I mean, the crank that drives the elevator and rudder plates, on the LR-3. We looked in the transmitter and found that the rate pot could be adjusted in relation to the stick by loosening the hex head screw (the screw that attaches the pot shaft to the quadrant). With the transmitter turned on and the receiver and actuator in operation, we adjusted the pot until the crank described an arc about 45° each side of neutral. This pulse rate should be approximately 51/2 to 6 pps. Incidentally, if he had been using a switcher and 3.6 volts we could have set the pulse rate a little higher for the same movement. We would have elected to use the same pulse rate obtaining an arc of 70° to 90° each side of neutral, which would further reduce the interaction between

rudder and elevator.

I pointed out to the modeler that a galloping ghost system requires compromises. That is why there is no one optimum position! There are so many variables in the system, including the airplane, that the modeler has the challenge of determining for himself the best adjustments for the most satisfying flying. I showed him that in selecting the pulse rate and width change, that he was trying to match the motion of the stick on the transmitter with the action of the actuator on a linear rela-

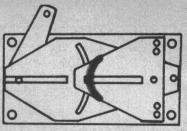
tionship. That is, if we moved the stick halfway, the actuator would deflect the controls effectively half way. When the stick was moved to its limit, the actuator would also approach its limit. A 70-30 width change is all that is required with the LR-3 and his transmitter provided 80-20, causing unwanted motor control when the stick moved to the extremes. I explained that since he could not change the electronic pulser to provide 70-30, he could accomplish the same thing by attaching a plywood mask to the stick assembly to limit the stick motion. I have had to do this on my Min-X transmitter when using 3.6 V on the actuator.

After making the appropriate adjustments to the transmitter, the elevator pushrod was readjusted so that on neutral pulse rate, the elevator moved an equal amount above and below neutral. About this time my attention was diverted to my own airplane being flown by Jack Lemon. So the modeler, on his own, buttoned up his equipment and proceeded to become all excited about the flying he now was able to do.

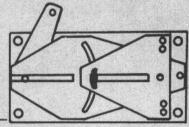
During the past summer I received letters from modelers with similar questions and, in addition, letters asking for my recommendation about using switchers with the actuator. I have flown extensively with switchers with two cells and three cells. Using three cells I find that higher voltage does not alter flying characteristics very much but does give faster motor control. However, it does increase the number of problems. I suggest that 3.6 V be used by modelers only after they become familiar with the system. Higher voltage causes higher battery drain. It also causes unwanted motor control unless stick motion is limited with a mask. Two cells have not given satisfactory motor control, because use of the voltage drop inherent in the use of transistor switches. The resulting two volts are not sufficient for reliable motor control. The simplest and most universal flying has been with center-tapped, four cells providing 2.4 V to the actuator.

I find many modelers have stretched the spring of the LR-3 hoping to get (Continued on page 23)

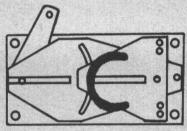
This series of drawings show the arc segments of the crank that drives the rudder and elevator plates. To get this same effect, do not focus too closely on the LR3 crank, but simply let the pin motion blur—focus your eyes generally so the blur effect looks like a scope



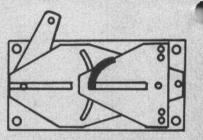
Here is the arc at neutral pulse width and rate for straight flight.



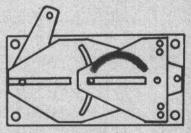
Full down is shown on this arc trace, no turn is had in this trace.



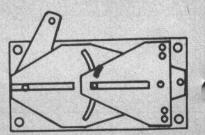
This is the view of the arc giving you full up. Again no side motion.



Here is a full turn arc. For opposite turn arc is on opposite side.



This arc depicts full up and a full turn. Opposite turn opposite side.



This is the view of the arc giving you a full down and turn.

FLIPPER

By VIC SMEED

This Spritely .020 Job is Shown for Escapement Use But it Would Make a Honey for R O Proportional



Photo of Flipper shows pleasing semi-scale biplane lines. Identical wings make for simplicity of building. Spring loaded T05 Actuator will work for proportional with relayless receiver with two batteries.

For compact size the biplane is a natural—this little model is only 18 inches in span, but packs in practically one square foot of wing area, slightly over if the tail plane is added, for a total weight of 9½ ounces. Nearly 50% of the weight is for the radio.

The proto-type gets quite a hustle on with the .020, and an .010 would fly it reasonably, especially if the radio weight could be trimmed a fraction. The large tail plane is adequate for safe free flight, Flipper having been designed as a dual purpose originally. **CONSTRUCTION**

The construction offers no problems. First cut and laminate where necessary all formers, also fuselage sides, cementing doublers in place, and bend under carriage to shape. Make up the centersection struts and cement securely in place, taking care to align accurately. Sew the under carriage F2, then assemble fuselage sides to the front group of bulkheads, i.e., the parallel section. When dry draw the tail ends together and insert remaining formers.

INSTALLATION

At this stage install the radio gear. You may care to build the escapement in or arrange it so that it can be inserted and removed through the hatch

in the fuselage bottom. Cut, sand and fit the tail plane and rudder and complete linkage and all wiring. (The foregoing is also true if you are going to use an actuator.) The fuselage bottom is now sheeted and the top planked. The planking can be carried down to fair the fin/tail plane junction neatly. Add inside nose pieces and sand completed body. Cover with tissue, dope and fuel proof as required, then add the windshield. It is easier to cover the fuselage if the center-section dowels and the wing platform are added after covering.

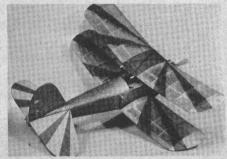
The wings are straight forward, but use hard ½" square for dihedral basis and cement them well. Sheet centersection, cover with tissue, then add low wing fairing box.

Fit wheels and motor, free all fuselage hatches, insert the escapement rubber, receiver and batteries and check for all up weight and balance point as shown on the drawing. It may be possible to re-stow equipment to correct C. G. position, though it should not be too far out. The model tends to turn left without side thrust, so include the side thrust shown. It is quite sensitive on the rudder, but stable enough to fly itself back out of trouble, provided you have a few feet of altitude. **RADIO**

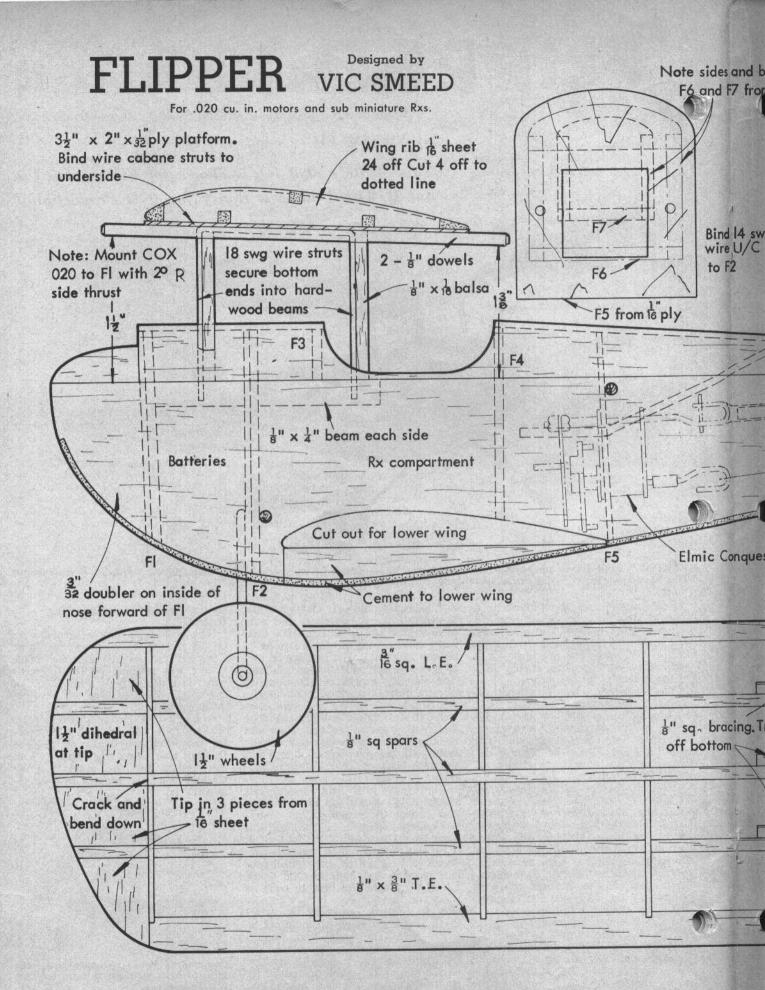
The proto-type Flipper carried a relayless receiver. This drove an Elmic Conquest escapement and the whole system was powered by two U7 cells wired in series to get 3 volts. Most of the small relayless type of receivers available will fit.

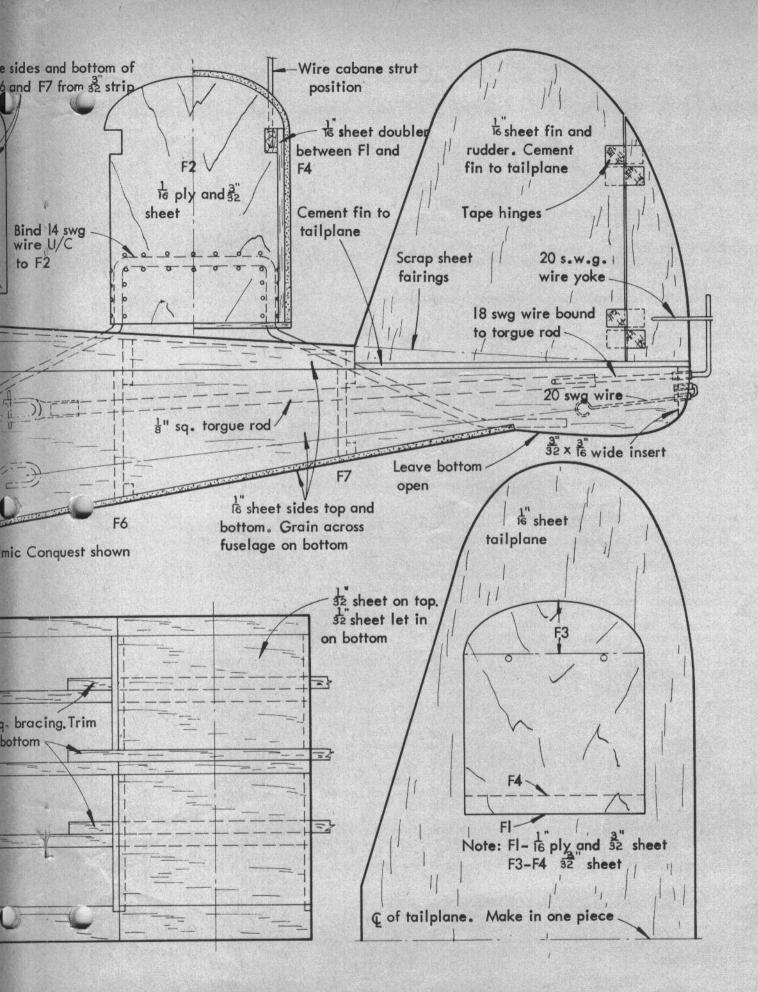
Courtesy Radio Control Models and Electronics

On the next two pages we present the full size plans for Flipper. You can gently lift the pages out or slightly bend the staples to help removal.



Use colored tissue to cover and clear dope to help save on weight for this $\frac{1}{2}A$ fun ship.





Bits and PIECES

FLAPERON AND RUDDERVATOR

Enclosed find sketch of linkage required for "Flaperon" and "Rudder-

vator" setup.

You will find that this sketch clearly defines actuating arms. Part "A" is one straight arm 2½" LG x 516" wide x 1/16" thick. Link holes are on 2" centers. The aileron servo is connected to this arm at 1st hole in board of left hand side. Flap servos not connected to this arm in any way. The center output of flap servo is the Pivot Point of the pair of scissor arms. The Kwik-Links to the rear of this arm are usually connected near the ½ way point from Pivot and aileron. Arm links the center line of flap servo and Pivot Point of arm "A" should be approximately the same to avoid differential action and binding.

Make arms from 1/16" aluminum and use nylon U-control bellcranks cut

down to size.

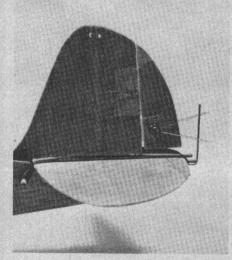
Use of DuBro Kwik Links makes ad-

justment very easy.

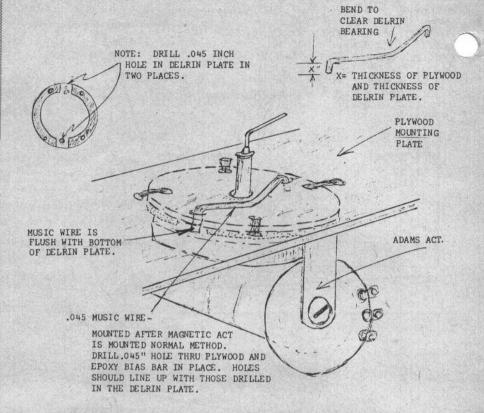
Link holes on part "B" are on 1" centers with a series of 1/16" diameter holes for adjustment.

The closer that rear arms are moved toward Pivot "B" will increase flap action and decrease aileron action. Moving outboard will provide opposite, etc.

Do not make arms shorter than 2" on Pivot Points such as "A" because servo travel will then cause extreme angularity. Keep distance from "A" to



Double exposed shot shows adjustment.



Dick Adams provides simple magnetic bias by adding a piece of .045" music wire.

"B" Pivots as wide as possible for same

This setup can be used on practically any servo with a little thinking.
Pivot "A" is usually mounted on a

block forward of flap servo-although it has been mounted right on forward end of digimite servo.

When using Bellamatic II's the arms are mounted directly on top of the yellow bellcranks.

Ron Sands Temple, Pennsylvania

LUBRICANT

General Cement manufacturers and electronic contact lubricant called Lube-Rex. While putting some Mighty Midget motors in a nylon housing, we experienced difficulty with friction and noise. Putting in a small drop of Lube-Rex at each of the armature ends the noise completely disappeared and the milliamp drain dropped from 250 to

This should also prove very helpful on proportional servos that have wire wound pots such as the Kraft, etc., since it is a contact lubricant as well.

ADJUSTABLE RUDDER

It is easy for old timers to assume that beginners can pick up the little tricks of the trade by themselves. The fact that we do assume this quite a lot was brought to mind the other day when we received a letter from an R/C

modeler in the boondocks who said he was having difficulty with the rudder yoke breaking off because he had to bend it for the adjustment of the throw on his torque rod output shaft.

The photograph shows a very simple yoke which is mounted with a 2/56 bolt and nut. The double exposure shows how easily this may be adjusted to achieve less or more rudder control from the torque rod. This is applicable for any torque rod installation, whether it be from an escapement or an actu-

While this has appeared on many planes, we must remember that there are always newcomers in the art of radio control, and so GL-RCW is presenting this here for them.

MANUAL MOTOR CONTROL

Here is a manual control for motor, which can be a big help in starting your engine. Before starting the engine, close throttle with the servo. If more or less throttle is required, it can then be done with the finger. The side of the nose is slotted for manual control. After the engine starts, you can gun it up and down until it gets to running temperature. When control is released it goes to idle. This has no effect on the servo setting, since the rod slides in and outof the brass tubing. This works real wel for me, and it saves from turning on the transmitter to give more or less throttle.

Tiny Harley North Augusta, South Carolina

MAGNETIC BIAS FOR ACTUATOR

Dick Adams, the Adams actuator designer, has come up with a magnetic bias for the Adams actuator. While this does not show any appreciable help on the bench, when it is connected in the airplane to the rudder, it will result in more positive and easier centering at neutral, and also gives you more precise movements in smaller increments of the control surface at smaller stick movement. This little gadget, Dick says, offers much for the single channel R/O proportional flyer.

SIMPLIFIED GG ACTUATOR

Here is a variation on a simplified GG actuator by Dave Robelen, which was originally published in RADIO CONTROL MODELER. I think it fills a real need, and it is at best a simplification. It is not an improvement on Robelen's work, and at worst is a corruption or degradation. I suspect, however, it works just as well as Dave's original.

There are many who would like to go to GG in small ships but do not have the machine shop facilities, or like me, may be too lazy to use these facilities to build Dave's actuator. This version mounts the T0-5 motor in a hole in a wood block, while the brass tube countershaft bearing is epoxied to the top of the block after moving the tube laterally to the point of best gear mesh.

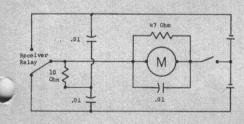
The most difficult part of the whole job is to remove the pinion which comes mounted on the shaft of the T0-5 motor. I eventually found that applying pressure parallel to the teeth with a pair of diagonal cutting pliers, split the pinion off the shaft.

I have shown arc and RF suppression on the wiring diagram, however, I did make a number of flights with no suppression and no ill effects. I eventually had "glitches," so added the suppression components, but the trouble was actually in the receiver and not motor noise.

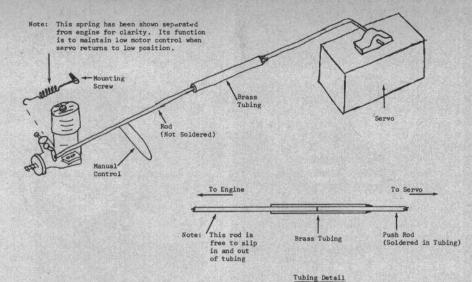
The actuator is currently flown in a 30" span, .020 job, which is a bit heavy with its load of SH-100 receiver, 2 pen cells, two 250 mah nickel cads, and the actuator. The ship originally had a double-ended relayless receiver driving a POU-VOIR magnetic actuator with stops set at 170°, so that it could be used for GG.

Ed Gerhardt Basking Ridge, New Jersey

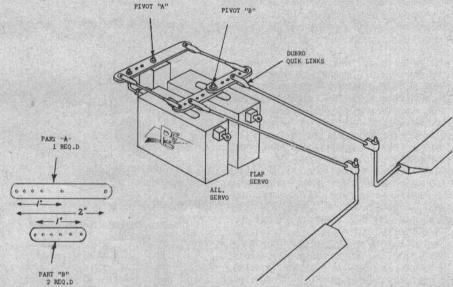
(Continued on page 27)



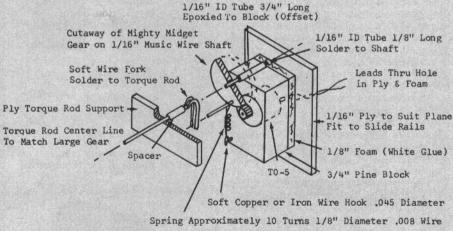
Arc suppression used on servo right.



Hartley's adjustable motor control lets you advance and retard engine manually.

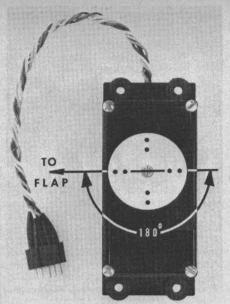


Ron Sands hookup with PCS proportional gives Ruddervator and Flaperons.



T0-5 motor stock pinion split off shaft with diagonal cutting pliers. Slip 1/16 OD tubing over shaft. Solder outer end only. MM pinion is tight fit. File tubing with motor running for fit. Drill 19/32" hole for motor in pine block. Cut top edge of block so gear mesh is too tight, then offset countershaft tubing sideways for free-running mesh and epoxy countershaft tubing and motor. Spring hook to line up with L of large gear—not motor. Drill 1/16" hole in large gear ¼" from center and solder in ½" long piece of 1/16" wire. This arrangement allows easy removal of actuator from ship.

SEE



New Enya .45 BB TV

RCS DIGIFIVE AVAILABLE IN U.S.

The DigiFive is the first British design digital control system to be marketed there. Now also they are offering it available in this country, airmailed to your address for \$275.00 less the servos. Either the Digimite or Orbit servos may be used to complete your

package.

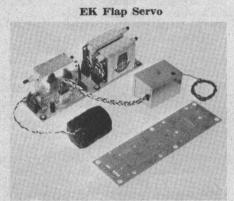
According to the writeup in Radio Control Models and Electronics, who gave this an editorial review and test, and their test figures showed this to be not only very well constructed, but performance to be excellent. Resolution was stated to be 1%, so that the servos move in 1% increments from extreme position to opposite extreme position. They state, "Equipment performs effectively and is well constructed. This is really the principal requirement for competition work. Accuracy of resolu-tion is excellent, although in actual fact not quite so important from the pilots point of view. Complete system is most accurate in resolution. It seems less affected by electrical noise, but careful installation is necessary.'

The manufacturer's instructions are very clearly written and informative from both an electronic and installation point of view. They do stress that no metal to metal linkages be used on the model in spite of RCM&E's findings on a practical test the effect of this interference was not as marked as one

might suppose for a digital system.

The transmitter measures 7½" high, with a carrying handle protruding $1\frac{1}{8}$ " beyond this. It is $6\frac{1}{2}$ " wide, and depth of the case is $2\frac{7}{8}$ ". It has a snap ring on the front cover so that a neck strap may be used for comfort in handling.

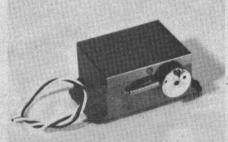
Receiver is superhet with an IF on the 470 kilocycles. The logic circuitry is built on a separate board in the same case. Physical data measures $3x2\frac{1}{8}$ x 15/8", and weighs 6 ounces. This is completely assembled, and ready to go, and includes batteries, Deans connectors, built in 110 volt charger, wir-



Hallco Digitrio Servo Board



KP6B Single Stick Transmitter



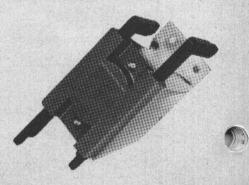
Reynolds Engineering Analog Servo



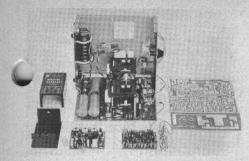
G. E. M. Thunderbolt I



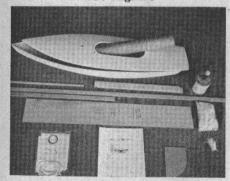
KP6B Receiver Package 18 ounces



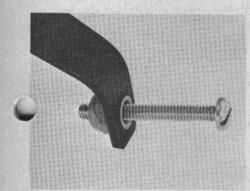
Rand's Ailerand



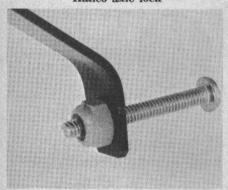
RCS Digifive



Reynolds Snipe Boat Kit



Hallco axle lock



Hallco axle nut



H & B PROPO 6

(Continued on page 30)

ing harness, and everything except servos.

For more details write to Radio Control Specialists Ltd. National Works, Bath Road, Hounslow, Middlesex, England.

HALLCO DIGITRIO BOARD

The Hallco #3MSD Nerve Center and Servo Mounting board for Digitrio helps make a neat, compact installation, and at the same time allows you to reduce the number of wire leads from the receiver/decoder from four to one.

The board mounts three servos, for rudder, elevator and motor and the circuitry interconnects 4 servos to allow for an aileron (CAR) servo if desired, the powerpack, power switch and receiver connector. The only wires are those from the powerpack, receiver and short servo leads to the board. The switch opens all four power leads. Provision is made on the board for a battery charging connector, which is connected only when the switch is in the "OFF" position.

The board itself is made of the highest quality glass/epoxy, and circuits are precision photo-etched, then tin plated for solderability. The board is 1/16" thick by 2.1 x 7.3".

Provision is included on the board for 3+1 (CAR) operation if desired, by using an 8 pin motor servo connector, with the two extra pins for the 3+1 switch leads.

The circuitry is arranged so all servo connectors are compatible—for check-

ing purposes, the six pin connectors can be plugged into the eight pin motor connector, or the 8 pin motor connector can be plugged into the six pin connectors

The Hallco board is available in threeways: the board only with holes drilled, mounting grommets, eyelets and instructions; the board only with separate switch, receiver connector, servo and power connectors; and the factory assembled board, which includes the switch and all connectors, soldered and assembled, ready for mounting the servos

NEW BOAT SERIES FROM G.E.M.

G. E. M. Models proudly presents its latest entry in the fibre-glass model boat field, the Thunderbolt I. It is a model of the Glen L. ski-boat. The prototype is designed for super stock V-8 engines for racing and sport running.

engines for racing and sport running. The first available model from G.E.M. will be a 34" long two-piece fibre-glass hull with a 14" beam which gives you plenty of room for radio and engine installation. The bottom of the hull is of molded white fibre-glass as is the deck. It is just necessary for the modeler to join the bottom and the deck with fibre-glass cloth and resin, install the drive train and radio and trim with epoxy paint as desired. Hardware will also be available for an adjustable ride plate. The boat comes with easy-to-follow full size plans and complete in-

(Continued on page 30)

BACK ISSUES AVAILABLE!

We receive inquiries regularly for back issues of Grid Leaks. These are generally available going back for five years. They are 35¢ each.

For a limited time, order any four copies for \$1.00.

Beside the electronic goodies contained in every issue, here is a listing of the airplane plans that have been published.

The Wild One, September-October 1966.

Stit's Sky Coupe, July-August 1966.

The Ugly Stik, May-June 1966.

Sky Squire, March-April, 1966.

Long Midget, Mustang, January-February 1966.

The Dobbin, November-December 1965.

Curtis Robin, September-October 1965.

Morane Salnier, July-August 1965.

Pietenpol Air Camper, March-April 1965.

Tokie Dokie Sail Plane, January-February 1965.

OX 5 Challenger, September-October 1964 White Heat 60 (Boat), July-August 1964.

R/C Jay, May-June 1964.

GRID LEAKS

Box 301

Higginsville, Mo. 64037

Selectron

(Continued from page 8)

plication of signal while at the secondary limit should cause the servo to drive toward the primary limit. If the servo only moves a very short distance and holds again, it indicates that you have insulated a bit too much of the land. Check the wiper tracks to insure that the wipers are running flat and are not cutting or scratching the R/C land. Make sure that your Selectron is equipped for the type of control you wish to use. Basic for basic operation, basic plus motor control for 2-pulse motor control and Trim unit for 5position or trim operation. The motor control add-on will operate with any of

the control types.

NOISE SUPPRESSION

The Controlaire servo has a suppression system included and no extra is required. The Annco should have a .1 mfd capacitor and a 10 ohm resistor paralleled across the motor brushes (green and white wires). The added resistance also gives braking action to the servo motor and reduces the hunting action at neutral.

M/C LUG The adjustable M/C lug is not easily used on these servos. A system that still allows a degree of adjustment is shown in the Controlaire sketches. The piece of thin shim brass is bent to shape and epoxied in place, 1/16 inch away from the neutralizing land. The lead wire should be identified and routed out with the wire handle. Solder the wire to the brass before gluing in place. The new land can now be insulated to leave the desired width of M/C opera-

A similar system could be used on the Annco by extending the brass shim beyond the wiper limit and routing the wire out. The countersunk screw as used in the original Bonner system will also work out. Use a smaller screw, drill through the P/C and case. If you do not wish the lug to touch the case, remove the P/C and enlarge the hole in the case. Countersink the P/C board and file the screw to give a slightly rounded surface for the wipers to ride over. Be sure that the screw is 1/16" away from the neutralizing land.

That takes care of the servo rework, reinstall the P/C board and servo cover. The servo should now respond to signals and stay at either limit as long as signal is held.

MOTOR CONTROL ESCAPEMENT Connect the M/C escapement as shown in the wiring diagram. The low

voltage types such as the Bonner (2-3 volts) will work directly from the M/C trigger. If higher voltage escapements are to be used try adding a transistor and connecting as shown in the sketch. I am using an OS with the push-pull linkage with this circuit and it gives fine operation. Most escapements fall into the 2 to 4.5 volt range.

GENERAL NOTES

Due to the tiny size of the gears, there is usually some backlash in the Annco gear train. If this is excessive, it can prevent fast pulses from con-trolling properly. A simple fix is to lightly spring load the output arm toward the primary direction. While pure theory says that this will not work because the wipers are also on the output arm, don't tell the servo, because it does work, so if you have any trouble hitting the secondary direction, give it The Annco is light and small and will control a mighty small airplane.

FINAL OPERATION

If operation of the Selectron system is now satisfactory, disassemble the servo one more time and replace the temporary insulation with fiber glass resin or epoxy glue. Now let's get out there and tear up the sky (or lake)

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With Steerable Gear Ailerons Optional

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Length 44". Area 770 sq. in. \$24.50

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Instruction manual giving all details available separately—\$1.50. Matched pairs crystals-\$11.00. All price include insured Air freight-Servicing facilities availabie. All O.K. modelers requisites stocked.

REMCON ELECTRONICS

40 Broadway, Bexley Heath, Kent, England

Let's Talk About Scale

(Continued from page 7)

drop, but a tri-motor would be allowed less bonus equipment than the twin; and a 4 engine airplane would not be llowed any other than the bonus for le engine so that the twin, 3 and 4 engine aircraft would be equal from a bonus standpoint. No stunts of course!

I am sure that we would have to get

out the old slide rule to set down a set of evenly equal points, but I believe it can be done and will have to be done if R/C scale is to survive as a contest

event.

O.K. I'll lay down my protest banner and get down off my soap box, and

let's talk about scale.

In our pattern events we are more or less in a rut. At most pattern contests there are only about four people interested in flying—the two judges, the guy doing the flying and the guy who is about 2 points ahead of you. But in scale, regardless how simple or complex the model is, there is an air of excitement about it and every one is interested; many people have made the remark: "I can't make the entire week of the Nats, but I'm sure going to fly up to see the scale on the week

The future of R/C scale is unlimited —you have only seen the beginning, folks! So let's move forward with our rules as our technology has far surpassed our antiquated rules. Keep also in mind some time in the near future we will see International scale in the 7.A.I. so we here in the States should we ready in this category as we have met the challenge in Class III pattern.

Let G/L hear from you, whether it be pro or con on scale rules or with new ideas and methods you have found on scale construction. If you have any questions about R/C scale we will try our best to help you out so "Let's talk about Scale.

Rand GG Hints

(Continued from page 14)

faster motor control. The following information should help them have even more flying fun with the RAND LR-3
—just as I have had this past summer.

RAND actuators are checked for reliable motor control down to 2 V. Their normal operating range is 2.2 to 2.4 V. Therefore, check the voltage at the actuator motor terminals while signal-

ing motor control. We "shudder" everytime someone tells us he has stretched the spring on the LR-3 trying to get throttle control. We carefully calibrate the tension on each spring and check the linear relationship between the actuator output and control stick motion.

During motor control go-around, the clevator moves to an extra up position. Check your installation to be sure freedom for this motion has been allowed.

All connections to the actuator must be free enough not to hinder its motion. The actuator should work as well with surfaces connected as without.

This is a flea-powered device. Look for these areas of possible friction: Hinges on the surfaces should be free enough to allow them to flop of their own weight. I suggest thread which has not been doped or otherwise stiffened. I prefer nylon tubing and wire hingepin hinges as the most reliable. Thread hinges have a habit of shrinking and becoming tight without your realizing it. Do not use nylon strip hinges. They fight the actuator.

Kwik links are another source of friction. The holes in the control horns should be drilled out to .067" or .070", because the pins are several thousands larger than the 1/16 hole provided. The link should be spread carefully, so it does not grip the horn even with the rubber safety tubes in place. This can be accomplished after installing the kwik link on the horn by twisting a screw driver in the link to spread it. The link should flop freely on the horn, if it disconnected from the pushrod. The rest of the pushrod must, of course be routed through the fuselage to

avoid rubbing or binding.
Galloping Ghost flying is a compromise, but if you approach it with this in mind, it can afford you the fun of the exotic and expensive systems

with a minimum of cost.

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Give Ghost A Chance!

(Continued from page 5)

output action: the rudder output arm can't swing much further than 270 degrees total (135° to either side of dead center). An arc any larger tends to cause go-around (i.e., a 360 degree arc), which has two unintended effects: 1. loss of rudder and elevator control (because go-around causes a "fail-safe" average neutral control surface effect, and 2. a change in throttle trim (to hi motor if the go-around is clockwise, and to lo motor if counterclockwise). (See Fig. 4):

To solve this problem in the past we have resorted to mechanical stops applied to the stick movement (See Fig. 5), which limits lateral movement of the stick, and thus also limits overswing of the rudder output arm in either direction.

However, this is a somewhat cumbersome and difficult solution to our problem: it requires loosening screws, resetting the stops, then resetting the screws, for each change in adjustment. It takes time, makes accurate and symmetrical positioning difficult, and tends to chew up the aluminum front panel.

Our problems are further compounded when we find that if we fly more than one type of servo (e.g., one plane with Go-Ac, one with an Adams, one with a home-made actuator—see Fig. 6) we find that each servo has its own

characteristic inertia and torque combination giving different rudder output arcs for a given rudder stick movement (from full left to full right stick). Therefore to change from one place to another, we must change the settings of the stops.

A further, related problem: suppose your plane is up on high on its maiden voyage, and you find that you've got too much rudder control—the stick is too sensitive (or the reverse, i.e., not enough rudder movement—the plane takes forever to come around even with full stick). With present-day systems you're stuck with what you've got in the way of rudder throw until your plane is back on the ground and you can re-adjust the linkage.

This same problem exists, by the way, for elevator movement. As a matter of fact, here the control surface movement is much more critical: if you've got too much throw you're in for a pip of a roller-coaster ride—too much up, followed by too much down, etc., etc., and BLAM! (you know the English translation of that last word). Or, the reverse: full up or full down stick and nothing happens to the plane's attitude—not enough elevator throw.

Well, how do we vanquish this three-headed monster? We do so by setting up on the panel separate controls for amount of rudder throw and amount of elevator throw. (See Fig. 3 and Fig. 7)

With this setup you will find that

the equivalent of mechanical stops is provided by *limiting the amount of rudder throw* (& same for the elevator throw). Because it is done electrically and with a calibrated dial, the limits of the stops can be set to a fine degree unobtainable heretofore.

The basic circuitry necessary to achieve these results is rather simple: the throw pots are placed in shunt across the stick pots to dilute out the stick pot action. (See Fig. 8)

By the way, neutral stick position is not affected by changes in throw pot setting enough to make any noticeable effect when flying the plane, unless you make large changes in throw settings. (In the latter case, do it on the ground first!)

The circuits below are the application of the basic idea to a Phelps pulser. (These values were found empirically; they give good control range. Other pulser circuits will require different values, but the *proportions* of the various pots and resistors should be the same.) (Fig. 9a)

The author experienced interaction problems with his Phelps pulser, *prior to* installing the throw pots. To minimize this problem, the following circuit changes were made *before* adding the throw pot. (If you don't have interaction troubles, *don't* make this change.) (Fig. 9b1)

By the way, a construction note. By far the best bargain in the stick field is the Pro-trol in kit form. Just two changes need be made, and it's a natura for modern GG: 1. cut down the stick length so that control can be had by one finger (the thumb), by placing it on the end of the stick—this is better than with the full-size stick which requires thumb on one side and forefinger on the other to properly control the stick motion; 2. replace the kit centering springs with lighter gauge piano wire, using originals to pattern the substitutes—takes 5 minutes—this gives much more effortless thumb movement.

A final note on the transmitter front panel layout: the motor controls. GG systems provide for two controls, diametrically opposed. One is high motor, the other low motor. Neurologically speaking, it is better to split this type of function into left and right parts of the body (namely, those things dangling at your sides—your two hands). It is easier for the reflex paths to learn this new task if you slice the responsibility for high and low, down the midline. If on the other hand, you assign the decision to two adjacent fingers of the same hand, what may happen (and did happen to your author, on numerous occasions, he hastens to assure you) is that, in the inevitable moment of truth when something goes wrong, and you find your Sopwith Camel with pilot, heading for a premature burial a breaknose speed, you press the button. for low motor, and presto!, in an Augenblick your plane has doubled its velocity (now near terminal) and a split second later you're asking the immediate family for permission to per-



form an autopsy.

And if the aforementioned turns your toupee gray, contemplate for a moment that the problem that arises in flying an Adams Actuator a la Woody Blanchord's U-All-2, as the author did in the cokker DVII pictured in this article. With these magnetic actuators, high motor gives you instead, a full right, and low motor full left (or vice versa, if you switch leads). This setup is handy for stunting, or if you get into trouble pulsing. When the author first started flying with the Phelps pulser, with both throttle buttons lined up on one side of the box, he invariably corrected a hard left with a harder left, a hard right with a

He decided then and there that there must be a gooder way than that— the buttons were placed on opposite sides of the box, with the left button on the left side, and the right button on the right side; and ever since, no more left

and right troubles.

And thus we bring to a close that epic era of World War I Aero combat, when men were men and machines were biplanes. And if you were a doughboy slogging about in the mud down in the trenches below, you couldn't even tell that every last one of those daring Fokkers, Spads, Albatrosses, Camels, and Nieuports, firing their deadly tracers thru the Flanders skies—that every last one of their rudder and elevator surfaces were flapping at 4 to 12 cycles per second, with nary a gallop. You did know that, didn't you?

HINTS FROM DEYE

Grid Leaks had some inquiries on Neil S. Deye's Micro Proportional Two Axis Control, and so we wrote Neil for answers.

Neil wrote that the material had been clearly labeled "experimental circuit," and that this inadvertently had gotten left out of the particular issue of Grid Leaks in which the circuitry appeared.

Following comments from Neil may be of help to other experimenters with this particular circuit.

"The pulse rate for neutral on the

rate output was quite high, about 20

PPS.
"The best approach to working on this circuit would be to remove both servo motors and install 10 ohm resistors in their place. With no signal input Q1 should be saturated and its collector should measure about -0.5 VDC relative to the + terminal. Q2 should be off and its collector should measure about -3VDC. Both outputs should measure about -1.2 VDC to the battery center tap (ground). When the base of Q1 is jumpered to the + terminal the rate output should read about +1.2 VDC, Q1 collector should read -3VDC and Q2 collector about -0.5-VDC. With the jumper removed the receiver should be connected and the transmitter turned on and pulsed at the desired neutral rate. Adjust the "zero set" on your voltmeter to move the needle off zero and as near mid range as you can. With the voltmeter across the 10 ohm resistor in the rate output adjust C2 and R5 for a neutral reading on the voltmeter (neutral being the newly adjusted zero position on the voltmeter). A 50 mf capacitor across the voltmeter will reduce the flickering. Capacitor C2 should be increased to about 10 mf for neutral rates below 12 PPS. With C2 at 10 mf, R5 can then be selected (probably increased) to provide the proper neutral output. With the neutral properly selected a rate increase should cause the rate output to swing positive and a rate decrease should cause the output to swing neg-

"The transmitter pulser width must be adjusted for a neutral voltmeter reading at the symmetry output. Next the 10 ohm resistors are removed and the servos connected and checked one

at a time.
"More or better noise suppression may be required on the servo motors if trouble develops when they are connected. Be sure to use fresh batteries.

'The servo motors used should not draw more than 200 ma.

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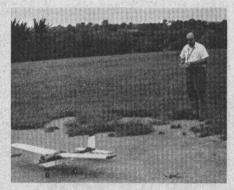
(Continued from page 2)

(2655½); Neal Kilby, Decatur, Ga. (2382¼); Phil Kraft, Monterey Park, Calif. (3853½); Jerry Krause, Fountain Valley, Calif. (3108½); Larry Leonard, Northridge, Calif. (3212¼); Don Lowe, Dayton, Ohio (3014¼); Jerry Nelson, Garden Grove, Calif. (2811); Zel Ritchie, El Monte, Calif. (3040); Leonard Roe, Jenison, Mich. (3040); Leonard Roe, Jenison, Mich. (2359³4); Doug Spreng, Pasadena, Calif. (3582); Loren Tregalis, Wichita, Kans. (2359¹4); Cliff Weirick, Los Angeles, Calif. (3436³4); Ted White, Albuquerque, New Mexico (2759¹4); Jim Whitley, Decatur, Ala. (3291¹⁄₂).

It was Sunday afternoon. The phone rang. Carl Lindsey was on the horn. He had completed his Lanier Go-Go and wanted to know if son Tom and I wanted to put in some stick time on the KP-4B that he had installed.

Off we went to the Lake Jacomo KC/RC flying site, after a swing by Carl's house to pick him up in Blue

Springs.



At the field Carl was pleased as punch because the Go-Go had performed beautifully earlier, and as he went to take off it gave every promise of doing it again. For a prefab kit, the Lanier Go-Go cavorted through the sky executing every AMA maneuver beauti-

Carl mentioned that he had been skeptical about what appeared to be a rather flimsy tail section. However no evidence of any flutter or deterioration was visible. Performance was not affected as Carl pushed it, through its

paces.



Tom then got in some stick time too, and since this was his first experience

with full house proportional, Carl stood by him to take over if problems did develop. None did, and the afternoon was very pleasurably spent.

The Go-Go and the entire Lanier line seemed to be just what the doctor ordered, if you lack the time to build from scratch. Performance is not sacrificed in the prefabrication.

Have had the pleasure of having visits from Dick Adams of actuator fame, and Herb and Ruth Abrams of Rand actuator fame. We'll report fully on their visits in subsequent issues. However, you can see an article from Herb on the LR-3 which should go a long way to help zero these in for GG systems. Dick Adams has added quite a bit of power to his double coil magnetic actuators by going to the 8.5 ohm coils, construction of which GL reported on several issues ago. Dick also has worked out a simple rudder and elevator approach ala GG which we will detail in the next issue. This beats anything on this we have seen to date on the gadget front.

Went flying several times during the visit and must say that the simple approach offers a great deal of fun-and with the smaller airplanes you can survive the some times hard landings much easier than you can with the bigger and heavier-and more expensive-aircraft.

Both manufacturers have several very exciting things up their sleeves. We'll be reporting in detail in a few issues.



On page 4 we begin what we hope will be a long series of GG articles by Bill Schenker. Also this marks the beginning of a question and answer series on Ghost and Proportional generally.

Bill is a scale and proportional buff and while he lives out at the Lake Tahoe area (to indulge another hobby -ski instructor at Squaw Valley) says he will drive 11/2 hours to beat the thin air, no lift, high temperature his present location presents.

Hooked on R/C on proportional, he has added to his skill especially since he and his son's ukie attempts amounted to 29 consecutive one point landings. Early experience with escapement jobs returned the planes to kit form too fast.

Rudder only propo, and then GG, Bill will be glad to try to answer any questions you may have in GL columns

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438 Gatewood Drive Winston Salem, North Carolina 27104 for the help of all propo fans. And interest in single channel propo is growing by leaps and bounds, judging from mail we have been receiving lately.

We look forward to helping Bud tkinson in a very short space of time test fly his Corben Super Ace, which is scheduled for an early Grid Leaks possibly January-February, 1967. We also will have a high resolution

analog feed back proportional servo by designer Don Dickerson, which uses the Kraft mechanicals, and is a very precise

device.

Send us your ideas. We'd like to hear from you.

Bits & Pieces

(Continued from page 19)

WAG BRAKE NOTES

Tony Bonetti is using the nose wheel brake successfully with a switch on low engine and a switch on down elevator and a separate brake battery—all with digital. I recommend this double switch arrangement. Tony says that without the low engine switch some fellows noticing "kicks" during outside loops when the down elevator switch was activating the brakes.

With any inductive device like the electric brake there will be a voltage kick at the moment of closing or opening the switch. The opening of the

switch causes the biggest voltage kick because the magnetic energy stored in the coil collapses into an open circuit. This appears as a voltage across the switch which may are momentarily as it opens. I cannot see how an energized brake can cause steady erratic radio operation. Perhaps an occasional kick but not wholesale failure.

One cure, which I am using on my brakes, is to place a 0.01 MFD disc capacitor across the normally open contacts of the brake switch. The capacitor is a good RF bypass and kills the RF radiation from the arcing switch. It also

keeps the RF length of the brake circuit constant so there's no "antenna" length change effect when the brake switch closes. This cure is needed only on brake circuits with switches and is not necessary on auxiliary brake controls such as the DB—CL5 and the Logictrol

The running of any auxiliary circuit wires near the receiver is undesirable. It is possible that twisting the wires would help but routing them away from the receiver would be better.

Walt Good BETHESDA 14, MARYLAND

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BATTERY BUSINESS SECTION GAINESVILLE, FLORIDA



Build the Snipe

(Continued from page 11)

along that portion that meets the transom so that two screw eyes can be put into its edge.

The tiller is made up of laminations

of sheet, then sanded round.

The centerboard serves two functions, ballast and prevention of the boat slipping sideways on the water. Therefore, it should be made of lead or heavy sheet metal. The pictures show an open mold made of three boards and a poured lead centerboard. A completed pivot-type lead centerboard is in the foreground. If you are a good scrounger, go to the local newspaper printing room with a pattern of the centerboard and ask for an old printing plate. This print metal is heavy, stronger than lead, and easy to work. The printing surface can be sanded or scraped smooth.

There are several advantages to having a pivot-type board. It provides another item to be radio controlled, may give you a faster boat, and provide you with a more authentic sail-

boat.

Making the Sails. Several materials may be used for the sails. Heavy plastic such as builders use, cotton, nylon dress material, or light weight sail cloth. If nylon or dacron are used, the material can be cut with a hot soldering iron to eliminate the need for hems to prevent raveling. If the mast and boom are slotted, a cord, called a bolt rope, is sewn to the edge of the mainsail to pro-

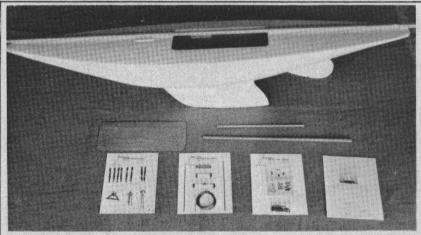
vide a means of fastening the sail to the mast and boom. It can be sewn on or hemmed in. If sail is stapled or lashed on, it should be reinforced at these edges with hem or adhesive tape. The mainsail will need battens because the reach of the mainsail is curved. The battens hold the curved portion flat and prevent flapping in the wind. Cut strips from a plastic bottle, iron the curl out, and stick them to the sail with adhesive tape. Thin strips can be put on both sides of the sail cloth but normally one side is sufficient. Tape is used to reinforce all sail corners. The jib is taped or hemmed to a piece of leader wire, 36" long, at the leading edge. This wire is called the "forestay" or "jib stay" and will be covered further under assembly of the boat.

Assembling the Mast, Mainsail, and Boom. The mainsail should come within one inch of the top of the mast and be secured so it won't slip down. This will position the boom which must be hinged to the mast with screw eyes. This hinge is called a gooseneck. Bin each corner of the sail with cord or finewire so it won't shake loose or tear.

Insert the mast and boom assembly into the hull so that the bottom of the mast rests on the keel at the front edge of the centerboard box. Approximately 33½" up from the deck, and in the leading edge of the mast, put a screw eye for the forestay. Two and quarter inches from the bow, or 10¼" from the leading edge of the mast, and centered on the deck, secure another screw eye for the forestay. Put another screw eye

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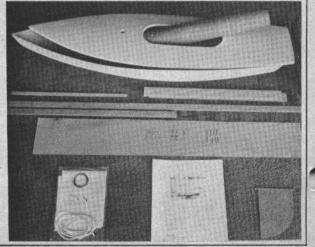


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in the end of the jib club. The leader wire (forestay) extending from the top of the jib sail is now fastened to the screw eye on the mast and the lower end passed through the screw eye on the jib club. The forestay is then fasned to the screw eye on the deck and djusted to keep the mast perpendicular to the boat deck.

Put another screw eye at the other (aft) end of the jib club and secure the lower corners of the jib to the jib club. The upper corner of the jib should be tied to the screw eye in the mast to prevent it from slipping down the forestay. Two more lines, called shrouds or sidestays, will be necessary to hold the mast perpendicular to the deck and add strength. Secure two screw eyes one inch behind the mast and on the

deck at each sheer. About 27" from the deck and on both sides of the mast secure two more screw eyes. shrouds run from these screw eyes on the mast to those on the deck at the sheer and should be adjusted to hold the mast perpendicular and securely in

If pivoting centerboard is used, the bolt holding it in place must be glued to prevent leaks. The rudder is held in place using four screw eyes, two on the transom vertical centerline and two on the rudder's leading edge. A wire threaded through the screw eyes forms a hinge.

That's it. Now we suggest you reread the article on free sailing and R/C installation in the previous issue of Grid Leaks (September-October). This will give you the bits you need to get your Snipe scale sailboat ready in time for that first nice ice-free spring day and lots of R/C fun your entire family will This is relaxed R/C-try it. enjoy. It's fun!

SCALE PLANES COMING FROM LANIER

Word has it that Lanier will have some of their Ready-To-Fly series in scale and semi scale ships-including one good year-available shortly after the first of the year. These will be smaller than the very popular and ex-cellently performing ships in their stables now. Watch for announcements

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Seen These?

(Continued from page 21)

stallation details.

This boat presently holds I.M.P.B.A. closed-course record with a Super Tigre .60, so it is safe to assume that its performance is not lacking. This boat is a natural for the new I.M.P.B.A. Sportsman's event which allows up to a stock .46 R/C engine and complies with all of the necessary rules without modification.

Not only will it be an exciting performer with the larger engines and more experienced modelers, but it is an ideal boat for use with a .35, due to the simplicity in its construction and its

fine running characteristics.

In the near future the Thunderbolt will also be available in a larger form -40" long for Tas, O&R and .60 engines. The Thunderbolt I will be priced competitively with wood boat kits at \$29.95.

For more information write to G.E.M. Models, P. O. Box 342, Broadview, Illinois, 60153.

ANALOG PROPO SERVO

A new analog proportional servo has been announced by Reynolds Engineering, 438 Gatewood Drive, Winston Salem, N. C. 27104. Built around the precision Micro Mo T03 Motor, this is a small device that requires only 4.8 volts center tapped for both the motor

and reference voltage-does not require two separate batteries.

With an input signal of .04 volts, the servo will move from center 80 degrees either way. Power output is about 4 inch pounds more than anything required. Comes back to dead neutral center without seeking. Price has been set at \$29.95 completely assembled. If you wish further information write to Reynolds Engineering at the foregoing address.

HALLCO TEMPER-LOCK LANDING GEAR

Several issues ago Grid Leaks mentioned the Hallco Temper-Lock Landing Gear. In this particular issue we want to show you the Axle Nuts with the nylon insert, which locks the axle into position. Also, note that the nut is splined, press-fitted and clinched.

This unusual feature is shown in the photographs for greater detail. Manufactured by The Hall Company, 420 East Water Street, P. O. Box 45, Ur-

bana, Ohio, 43078.

KRAFT SERIES "B" PROPORTIONAL

Kraft Systems, Inc., of 2466 Seaman, South El Monte, California, 91733, is delivering the new "B" series in both the four channel and the six channel. The price of the KP-4B is \$419.95 and the KP-6B is \$469.95.

The receivers and transmitters for both the KP-4B and the KP-6B are identical, only on the KP-4B the parts not required for the extra two servos are left out.

The four channel can be converted to five or six channel at a later dat at a factory cost of \$30.00 per channel. Additional servos cost \$39.95.

The receiver size now makes it the smallest and lightest on the market, according to Kraft Systems. The size is $2\frac{1}{8} \times 2\frac{1}{2} \times 1^n$, and total airborne weight is about 18 ounces.

AILERAND

In the previous issue of Grid Leaks we mentioned the Ailer-Rand. Since that time Bud Atkinson, our consultant, has had the opportunity of evaluating these units, and he states these are absolutely tops for flap aileron linkage. Precision made, the picture that appeared in the advertising did not do it justice, so we are showing a photo-graph of it this time in "Seen These." This sells for \$4.00. Manufactured by Rand Manufacturing Co., Inc., 8909 Hubbell Avenue, Detroit 28, Michigan.

NEW PROPORTIONAL 6

H & B Products, P. O. Box 241, Burns Flat, Oklahoma, 73624, an-nounce their Flight Director System, which is a six channel digital. four servos, nickel cadmium batteries and a dual purpose charger, the price

OOK TO MIDWEST FOR LEADERSHIP



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CLASS II WINNER at the 1965 NATIONALS

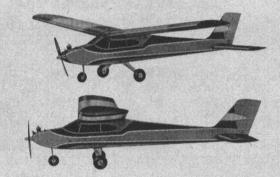
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Tri-Squire Kit No. TS 106 R.C. Intermediate for .09 to .19 engines. This stable flyer is an ideal multi trainer—4, 6 or 8 channels. . . the perfect step up from rudder only models . . wing span 51½", length 38". Prefab construction . . the Midwest way . . "drop-out" die-cut balsa, complete, full size plans and construction tips.



LIL TRI SQUIRE

Clean, functional lines, simplicity of construction. Top quality material and prefabrication. Light enough for escapement flying with .049. Roomy enough for servos with .099. Don't miss this one. It will perform. Vincent Micchia's latest design.

Span 40" Class 1 or 2

Area 320 sq. in. Engine .049 to .099

KIT NO. 109 _____\$7.95

DWEST PRODUCTS Co., Inc.

400 So. Indiana, Hobart, Ind.

direct from H & B Products will be \$250.00.

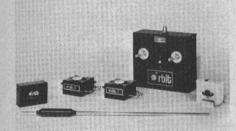
The unit features electronic trim on the motor control, on both the stick with an addition on the trim pot for the Bonner digimite sticks. The digite sticks are used exclusively.

The digitrio servos are used in the Flight Director System, since they are available and make a nice compact unit.

For further details write to H & B at the foregoing address.

NEW ENYA .45

The new Enya Throttle Valve Ball Bearing Engine has been released. It looks just like a scaled down version of the Enya 60. Just in, with no time for checks, but if this one performs as good as the 60, or as good as it looks, the R/Cer has another good engine. Price tag is \$36.50.



NEW ORBIT 4-8 DIGITAL IN PRODUCTION

Orbit's 4-8 digital proportional is now production in both single-stick and two-stick models. The compact, new vinyl-clad transmitter covers the four primary controls: aileron, elevator, rudder and throttle with variable trim for each function.

Tight, precise control results from Orbit's binary transmission circuitry and high torque servos. Smooth control action on the single-stick model is delivered through Orbit's precision machined gimbal system. The two-stick model is available in two modes of operation: Mode 1—elevator and rudder left stick, throttle and ailerons right stick; Mode 2—elevator and ailerons right stick, throttle and rudder left stick.

The superhet receiver measures only 2½ x 3-1/16 x 1". A 4-cell nickel-cadmium power-pack supplies both the receiver and high-torque linear and/or

disc output servos. Total airborne weight is 25 oz.

The complete Orbit 4-8 system, in all standard frequencies, including transmitter, receiver, 4 servos, airborne power-pack and charger, transmitter power-pack and charger, cables and connectors, and switch is priced at \$450.00.

EK PRODUCTS FLAP SERVO

EK has announced the availability of a Flap Servo that is designed to effectively lock the control surfaces in their extreme position, thus preventing excessive current drain. This is the same physical size as the standard servo. Linear output feature has been eliminated to allow 180° output arm travel. May also be used for landing gears where 180° movement and locking feature is desirable. Weight is 3 ounces, and 180° travel.

The price is \$45.00. EK Products, 14875 Dillow St., Westminster, California, 92683.

SNIPE SPECIAL—This is a GRID LEAKS special. Offered through Ace Radio Control the SSH Receiver by Citizenship, which is the smallest relayless superhet receiver available, along with the Futaba FT5C Transmitter, which has been praised in Britain as the most powerful transmitter available for single channel equipment, is being offered to GRID LEAKS readers in conjunction with the article on John Reynold's Snipe, for a limited time at \$34.95. This is limited to GRID LEAKS readers, and the offer has been made through Ace R/C at \$39.95. If you will, however, send us the label from your GRID LEAKS, along with your order, we'll see that this bargain is passed on to you at the exceptionally low price of \$34.95. Figure it out for yourself, this is only \$5.00 more than you would normally pay for the receiver by itself. When this supply is exhausted, that's At this low price there is no frequency choice.

Send your orders to Ace R/C, Box 301, Higginsville, Mo., 64037. Sorry, but no phone orders or COD orders

can be accepted.

(Continued on page 32)

R.C.S. DIGIFIVE PROPORTIONAL EQUIPMENT

Now Available World Wide

This renowned British five channel equipment uses Bonner Stick assemblies and either Digimites or Orbit Proportional Servos.

The unit is supplied complete with Nicad Cells, built in mains charger, wiring harness and sockets for your choice of servo which you obtain locally.

Price \$275 for a magnificent British outfit fully guaranteed and superbly made. Airmailed direct to you post free.

Only obtainable direct from:

RADIO CONTROL SPECIALISTS LIMITED
NATIONAL WORKS, BATH ROAD, HOUNSLOW,
LONDON, ENGLAND

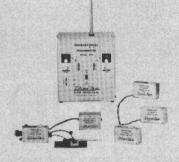




R/C EQUIPMENT

for BEGINNERS TO EXPERTS
TOPS OUT the line with

FULL HOUSE DIGITAL PROPORTIONAL



Five Completely Independent Proportional Simultaneous Channels. Completely wired and ready to use. Field-proven reliability.

Suggested List Price \$349.95

DP SYSTEM INCLUDES:

DPT TRANSMITTER:

Type AER (aileron and elevator on right

Type AMR (aileron and motor on right stick)
PLEASE SPECIFY WHICH TYPE

DPR RECEIVER:

4 DPC SERVOS:

NEW LINE of powerful servos. Thrust 4 pounds plus.

Purchased separately\$39.95 ea RECEIVER AND SERVOS WIRED READY TO OPERATE.

WIRING BOARD:

BATTERIES:

Rechargeable nicads supplied for ALL UNITS.

CHARGER:

Built into transmitter. Includes plugs and harness to charge BOTH Transmitter and Receiver Batteries. Light indicates when charging.

AIRBORNE WEIGHT OF SYSTEM LESS THAN 22 OUNCES.

SEND FOR FREE CATALOG describing the above system and other equipment for ALL CLASSES OF FLYING.



GRID LEAKS FULL SIZE PLAN SERVICE

ACCURATE INDIVIDUAL CONTACT PRINTS FROM THE ORIGINAL DRAWINGS

Featured in This Issue: SNIPE—SCALE SAIL BOAT\$3.00

OTHER FINE R/C PLANS FROM PREVIOUS ISSUES:

MIDGET MUSTANG\$3.00 CURTISS ROBBIN \$2.00

PIETENPOL AIRCAMPER\$2.00 OX-5 CHALLENGER\$2.00

SKY SQUIRE\$3.00

R/C DATA PLAN SERVICE BOX 301 DOBBIN\$3.00

MORANE SAULNIER TYPE L \$2.00 R/C JAY\$2.00 TOKI DOKI\$2.00

DAS UGLY STICK \$3.00 SKY COUPE\$3.00

HIGGINSVILLE, MO. 64037

FOUR ACES!

FOR FLYABILITY YOU CAN'T BEAT A MAMBO!

Mighty Mambo



ENGINES .29 to .45 SPAN: 68 in. FOR: Single, intermediate, or full-house R/C trainer. PRICE: \$21.95

Mambo Special



ENGINES: .09 to .19 SPAN: 52 in. FOR-One to 6 channels. PRICE: \$12.95

Mambo Trainer



ENGINES: .09 to .19 SPAN: 48 in. FOR: Single-channel trainer. PRICE: \$8.95

Minnie Mambo



ENGINES: Half-A SPAN: 36 in. FOR: Single-channel trainer. PRICE: \$4.95

NEW 1966 CATALOG ON REQUEST: Contains more than 100 items. Send 10^{ℓ} in coin to cover mailing and handling. PROFESSIONAL SECRETS OF MODEL AIRPLANE BUILDING: 15^{ℓ} . PROFESSIONAL SECRETS OF CONTROL-LINE AND CARRIER FLYING: 15¢: WRITE TO ▼

STERLING MODELS, Belfield & Wister St., Philadelphia, Pa. 19144

Seen These?

(Continued from page 31)

ADAMS LOW VOLTAGE ACTUATORS

Adams Manufacturing announces the availability of an 8.5 ohm coil for th single and dual magnetic actuators which gives up to 25 to 40% more power on 2.4 volts. At 2.4 volts the power is roughly equivalent to the power formerly possible by over-excitation. Drain is correspondingly higher, but at 2.4 volts about a one and threequarter hour of flying time may be had on 500 mah nickel cadmium batteries. When used on 3.6 volts you have real stomper, but battery complement should be changed to 750 mah or even 1.2 ah.

Price for either the single or the twin with the low voltage coils remains the same — \$6.95 and \$9.95 respectively. Both models will be available in either coil configuration. The single and twin actuator with standard coils, will also be furnished with an extra low voltage coil for only \$1.00 additional.

The 8.5 ohm coils are available separately for replacement at \$3.00.

With the magnetic type actuators used with a relayless receiver and an Add On Switcher unit, you have true solid state circuitry that does NOT produce any noise such as brushes from a motor might. Solid state circuitry means no relay adjustment problems and arc suppression is also not required.

With the low voltage 8.5 ohm coils, the Adams actuators—either single or twin-are quite capable of being flow in ships more than .19 power.

The Adams line is being distributed

to jobbers through World Engines and Ace R/C.

EASY POXY REPAIR KIT

By Conap here is an epoxy that stays where you put it-does not run and drop off of your spatula. Kit comes with both tubes of A and B, which are squeezed out, on a supplied mixing board, in the quantities you need and then applied to whatever you wish to bond—wood, metal, glass, foam or what have you. Hardens in two hours at room temperature. Kit sells for \$1.95 for the double sized tubes, mixing boards and spatulas. Bee Line, Box 353, Grandview, Missouri.

ROCKET CITY

Pushrod retainers are the newest item from Rocket City. These add to the line of very excellent products that this firm has been putting on the market. Package of 4 go for 59¢. Available from your dealer.

FREE BROCHURE FROM MICRO AVIONICS

Micro Avionics has prepared a nice four page folder which lists the details on the Micro Avionics 5 channel proportional digital radio control system, It contains complete specifications, a well as prices for each of the individua components. A postal card dropped to Micro Avionics, Inc., at 346 East Foothill Blvd., Arcadia, California, will get you your copy without cost.

SIG FIRST IN BALSA AND MODEL

R/C SCALE

my Sig modelers are scale is, and Jim Bonanno (Des Moines, Iowa) is one of the most. His 70" Hawker Hurricane (Feb. 65 RC Modeler) is powered by a Super Tigre 56 and weighs 11 pounds, Kraft KP-6 proportional. "She flew beatifully the first time up," writes Jim, "and won a first place in its first two contests." SIG balsa is a natural for fine scale ships like this.



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Man and the					

SIG 'AAA'	BALSA - NEW	PRICE LIST	
CHIPPER	CTRIBO	-	

SIG 'AAA' I	BALSA - NEW	PRICE LIST
SHEETS	STRIPS	BLOCKS
36" LENGTHS	36" LENGTHS	3" LENGTHS
1/32 × 2 15c 1/32 × 2 15c 1/32 × 2 15c 1/32 × 3 15c 1/32 × 3 16c 1/32	## 1/16 SQL 26 1/16 1/3/16 1/16 1/3/16 1/6 1	■ 1 5G. 6c 1 x2 14c 2 x3 21c 2 x3 21c 3 x3 34c 8"LENGTHS ■ 1 5G. 12c 1/2 x2 13c 1/2 x3 18c 1/2 x4 23c 1/2 x4 23c 1/2 x4 23c 1/2 x4 23c 1/2 x4 36c 3 x4 1.15 3 x4 1.05
36" LENGTHS	# 3/16 SQ. 9c 3/16x1/2 15c 3/16x3/4 20c	1-1/2×6 1.50 2 ×6 1.68
CONTEST 4-6 LB. STOCK	*# 1/4 5Q. 14c 1/4 x1/2 20c	1/2 x 8 B5c
1/99-1 324	1/4 x3/4 23c # 5/16 SQ. 16c	3/4 ×8 1.10 1 ×8 1.25 1-1/2×8 1.65
3/32×3 38c 1/8 ×3 44c	# 3/8 SQ. 21c 3/8 x1/2 24c 3/8 x3/4 31c	2 x8 1.95 3 x8 2.90
3/16×3 52c 1/4 ×3 65c 3/8 ×3 82c	3/8 x3/4 31¢ = 1/2 5Q, 30¢	18" LENGTHS
C-GRAIN	1/2 x 3/4 40¢	# 1 SQ. 30c
8-12 LB. STOCK	36" LENGTHS	2 x2 80c

1/32×3 27¢ 1/16×3 27¢	1/10×1 10¢	B" LENGTHS
3/32 x 3 34c	8'3/32 SQ. 4c 3/32×3/16 4c	# 1 5Q. 12c
1/8 ×3 39c 3/16×3 46c	3/32×1/4 5c	1/2 ×2 12c
1/4 x3 58¢	3/32×3/8 6c 3/32×1/2 7c	3/4 x2 15c 1 x2 19c
3/8 x3 75¢	3/32 x 3/4 10e	1-1/2×2 24c
1/32×4 40c 1/16×4 40c	3/32×1 12¢	2 ×2 28¢
3/32 x 4 44c	1/8 sQ. 4c 1/8 x3/16 5c	1/2 x3 18c 3/4 x3 23c
1/8 x4 51c 3/16x4 60c	1/8 x1/4 6c	1 ×3 28c
1/4 x4 70c	1/8 x3/8 7c 1/8 x1/2 8c	1-1/2×3 35c 2 ×3 42c
3/8 ×4 94¢	1/8 x3/4 11c	3 ×3 68c
1/32×8 80c 1/16×6 80c	1/8 x1 14c	1/2 ×4 23¢
3/32×6 87c	3/16 SQ. 6c 3/16 x 1/4 7c	3/4 x4 30c 1 x4 36c
1/8 x6 92c 3/16x6 1.00	3/16×3/8 9¢	1-1/2×4 48c
1/4 x6 1.12	3/16×1/2 12c 3/16×3/4 15c	2 x4 59c 3 x4 85c
3/8 x6 1.42 1/32x8 1.08	3/16×1 18¢	1/2 vB 35c
1/16x8 1.08	■ 1/4 SQ. 10c	3/4 ×6 44c
3/32×8 1.15 1/8 ×8 1.20	1/4 x3/8 12c 1/4 x1/2 15c	1 ×6 55c 1-1/2×6 76c
1/8 x8 1.20 3/16×8 1.38	1/4 x3/4 17c	2 x6 85c
1.56	1/4 x1 21c	3 x6 1.15
1.75	5/16 5Q, 12c 5/16x3/8 14c	12"LENGTHS
AGTHS	5/16×1/2 16c	■ 1 SQ. 22¢
1/32×3 40c 1/16×3 40c	5/16×5/8 20¢ 5/16×1 25¢	1/2 x2 22¢ 3/4 x2 22¢
3/32 x 3 47c	■ 3/8 SQ. 16c	1 ×2 29¢
1/8 x3 55c 3/16x3 66c	3/8 x 1/2 18c 3/8 x 3/4 23c	1-1/2×2 36c 2 ×2 45c
1/4 x3 80c	3/8 x1 28c	1/2 ×3 35c
3/8 ×3 1.02	# 1/2 SQ. 22c	3/4 x3 45c
1/16×4 56c 3/32×4 58c	1/2 ×3/4 30¢ 1/2 ×1 38¢	1 x3 55c 1-1/2x3 60c
1/8 x4 70c	₩ 5/8 SQ. 30c	2 x3 84c
3/16×4 81c	5/8 x1 40¢	3 x3 1.30
3/8 x4 1.15	# 3/4 5Q. 39¢	1/2 x4 47c 3/4 x4 59c
1/16x 1.00	3/4 x1 48¢	1 x4 70c
3/32×6 1.10	48" LENGTHS	1-1/2x4 94c 2 x4 1.15
3/16×6 1.35 1/4 ×6 1.48	# 1/8 SQ. 5¢	3 ×4 1.65
3/8 x6 1.80	1/8 x1/4 8c 1/8 x1/2 10c	1/2 x 6 68c 3/4 x 6 86c
	■ 3/16 SQ. 9c	1 ×6 1.05
36" LENGTHS	3/16x1/2 15c	1-1/2×6 1.50
	3/16 x 3/4 20c	2 ×6 1.68

1/32×3 27¢	1/16×1 10¢	6" LENGTHS
3/32×3 34¢	3/32×3/16 4c	# 1 5Q. 12¢
1/32×3 27c 1/16×3 27c 3/32×3 34c 1/8 ×3 39c 3/16×3 46c 1/4 ×3 58c 3/6 ×3 75c	3/32×1/4 5c 3/32×3/8 6c	1/2 xZ 12c 3/4 x2 15c
3/8 x3 75¢	3/32×3/4 10¢	1 ×2 19¢ 1-1/2×2 24¢
1/32×4 40c 1/16×4 40c	3/32×1 12¢	2 ×2 28¢
3/32×4 44c 1/8 ×4 51c	1/8 ×3/16 5c	3/4 ×3 23c
3/16×4 60c 1/4 ×4 70c	1/8 ×3/8 7c	1-1/2×3 35c
3/8 x4 94c	1/8 x3/4 11c	3 ×3 68c
1/32 x 4 40c 1/16 x 4 40c 3/32 x 4 44c 1/8 x 4 51c 3/16 x 4 60c 1/4 x 4 70c 3/8 x 4 94c 1/32 x 8 80c 1/16 x 6 90c 3/32 x 6 87c 1/8 x 6 92c 3/16 x 6 1.02 3/8 x 6 1.42	■ 3/16 SQ. 6¢	1/2 x4 23c 3/4 x4 30c
1/8 x6 92c	3/16×1/4 7c 3/16×3/8 9c	1-1/2×4 36c
1/4 =6 1.12	3/16×1/2 12c 3/16×3/4 15c	2 x4 59c 3 x4 85c
792 x 8 40c 1/16x 4 40c 1/16x 4 44c 1/8 x 4 51c 1/16x 6 10c 1/3 x 6 92c 3/16x 6 1.02 1/3 x 6 92c 3/16x 6 1.02 1/4 x 6 1.42 1/2 x 8 1.53 1/4 x 6 1.42 1/2 x 8 1.53 1/4 x 6 1.42 1/2 x 8 1.53 1/4 x 6 1.42	3/16×1 18¢	1/2 x8 35c
1/16×8 1.08 3/32×8 1.15	1/4 ×3/8 12¢	1 ×6 55c
1/8 x8 1.20 3/16x8 1.38	1/4 ×3/4 17¢	2 x6 85c
1.56	# 5/16 SQ. 12c	12"LENGTHS
IGTHS	5/16×3/8 14c 5/16×1/2 16c	■ 1 SQ. 22¢
1/32×3 40c	5/16×5/8 20¢ 5/16×1 25¢	1/2 x2 22c
3/32×3 47c	■ 3/8 SQ. 16¢	1 ×2 2%
3/16x3 66c	3/8 ×3/4 23¢	2 x2 45¢
3/8 x 3 1.02	■ 1/2 SQ. 22¢	3/4 x3 45c
3/32×4 58c	1/2 ×3/4 30¢ 1/2 ×1 38c	1-1/2×3 50¢
3/16×4 81c	■ 5/8 SQ. 30¢ 5/8 x1 40¢	2 x3 84c 3 x3 1.30
7/22×8 1.08 1/32×8 1.08 1/32×8 1.29 1/32×8 1.29 1/32×8 1.29 1.75 1	■ 3/4 5Q. 39¢	1/2 x4 47c
1/32 x 3 40; 1/16 x 3 40; 1/16 x 3 40; 1/32 x 3 47; 1/36 x 3 56; 1/4 x 3 56; 1/4 x 4 56; 1/6 x 4 70; 1/6 x 4 56; 1/6 x 4 10; 1/6 x 6 1.15 1/16 x 6 1.23 1/4 x 6 1.43 1/4 x 6 1.43	3/4 x1 48¢	1 x4 70¢
1/8 x6 1.22 3/16x6 1.35	# 1/8 SQ 54	2 x4 1.15 3 x4 1.45
1/4 x6 1.48 3/8 x6 1.80	1/8 x 1/4 8c	1/2 ×8 68¢
	# 3/16 5Q. 9c	1 ×6 1.05
36" LENGTHS	3/16×1/2 15¢ 3/16×3/4 20¢	1-1/2×6 1.50 2 ×6 1.68
CONTEST 44 LA STOCK 1/20:33 32c 1/16:33 32c 1/16:33 32c 1/26:33 32	'm 1/4 50. 14c	**************************************
1/32×3 32¢	1/4 x3/4 23c	3/4 x8 1.10 1 x8 1.25
3/32×3 38c	= 3/8 SQ. 21c	1-1/2×8 1.65 2 ×8 1.95
3/16×3 52¢	3/8 x 1/2 24c 3/8 x 3/4 31c	3 x8 2.90
1/4 ×3 65c 3/8 ×3 82c	# 1/2 5Q. 30c	N 1 SO 304
C-GRAIN	72 x 3/4 4/5	1 ×2 54c
1/32 × 7 184	36 LENGTHS	2 x2 80c
1/16×2 21c	LE.	2 x3 1.28 3 x3 1.92
1/8 x2 29c	3/8 ×1/2 24c	1 ×4 1.05
1/4 x2 43c 3/8 x2 50+	3/4 ×3/4 42c	3 x4 2.50
1/32×3 31¢	SNAPED TE	1 x6 1.58 2 x6 2.50
3/32×3 38¢		3 x6 3.50
3/16×3 48¢	1/8 × 1/2 13c	2 x8 2.95
3/8 x3 79¢	1/4 x1 20c 5/16x1-1/4 25	24" LENGTHS
V-H STOCK	TRIANGU- A	m 1 SQ. 40¢
12 LB. OR MORE 1/16×3 29¢ 3/32×3 34¢ 1/8×3 41¢ 3/16×3 48¢ 1/4×3 60¢ 3/8×3 77¢	LAR CUT	24" LENGTHS 1 SQ. 40c 1 x2 70c 2 x2 1.10 2 x3 1.65 3 x3 2.68
1/16×3 29¢ 3/32×3 36¢ 1/8 ×3 41¢ 3/16×3 48¢ 1/4 ×3 60¢ 3/8 ×3 77¢	1/4 SIDES(X) 13¢ 3/8 SIDES(X) 184	1 - 23 1.10
3/16×3 48c 1/4 ×3 60e	1/2 SIDES(X) 20c 3/4 SIDES(X) 31c	3 ×3 2.68
3/8 ×3 77¢	1/16 100	24" LENGTHS 1 SQ. 40c 1 x2 70c 2 x2 1.10 1 x3 1.65 3 x3 2.68 1 x4 1.38 2 x4 2.25 3 x4 3.25
* SECOND	GRADE SHEETS	
36" LENGTHS	1/8 ×3 21c	1 x8 2.05 2 x6 3.25 3 x6 4.55
1/32×3 16c 1/16×3 16c 3/32×3 19c	1/8 x3 21c 3/16x3 26c 1/4 x3 35c 3/8 x3 46c	1 x8 2.45 2 x8 3.85 3 x8 5.75
		3 x8 5.75
NKS NGTHS 0 50. 56c 1/2 ×2 65c 3/4 ×2 85c 1 ×2 1.04 1-1/2×2 1.32 2 ×2 1.59	1 x3 1.63	3/4 x 8 2.60
NGTHS	1 x3 1.63 1-1/2x3 2.10 2 x3 2.52 3 x3 3.85 1/2 x4 1.40 3/4 x4 1.75 1 x4 2.75 2 x4 3.40 3 x4 4.90 1/2 x8 2.00	3/4 x8 2.60 1 x6 3.15 1-1/2x6 4.95 2 x6 4.95 3 x6 6.50 1/2 x8 2.40 3/4 x8 3.40 1 x8 4.10 1-1/2x8 4.85 2 x8 5.90 3 x8 8.65
# 1 5Q. 58e 1/2 x2 65e 3/4 x2 85e 1 x2 1.04 1-1/2x2 1.32 2 x2 1.39 1/2 x3 1.00 3/4 x3 1.35	3 x3 3.85	2 x6 4.95 3 x6 6.50
3/4 ×2 85c	3/4 ×4 1.75	1/2 x8 2.40
1/2 x2 65c 3/4 x2 85c 1 x2 1.04 1-1/2x2 1.32 2 x2 1.59	1/2 x4 1.40 3/4 x4 1.75 1 x4 2.05 1-1/2x4 2.75 2 x4 3.40 3 x4 4.90	1 x8 4.10
1/2 x3 1.00 3/4 x3 1.35	3 x4 4.90 1/2 x8 2.00	1/2 x8 2.40 3/4 x8 3.20 1 x8 4.10 1-1/2x8 4.85 2 x8 5.90 3 x8 8.65

iG	BAG	OF	BAL	SA
BAG	- ALL E	LOCKS		89

1 BAG - ALL BLOCKS 12 BAG - BLOCK, STRIP, SHEET	85
CELLOPHANE-WRAPPED PACKET	
STRIPS AND SHEETS.	60

SIG SF	RUCE	
36" LENGTHS	48" LENG	THS
1/16×1/8 3c 1/16×3/16 3-1/2c 1/16×1/4 4c	3/32 x 3/32 3/32 x 1/8 3/32 x 3/16 3/32 x 1/4	4¢ 5¢
3/32×3/32 3c 3/32×1/8 3c 3/32×3/16 4c 3/32×1/4 5c	1/8 × 1/8 1/8 × 3/16 1/8 × 1/4	4-1/2¢ 6¢ 8¢
1/8 × 1/8 3-1/2¢ 1/8 × 3/16 4-1/2¢ 1/8 × 1/4 6¢	1/8 × 3/8 1/8 × 1/2 1/8 × 3/4	11¢ 15¢ 20¢
1/8 x 3/8 8-1/2¢ 1/8 x 1/2 12¢ 1/8 x 3/4 16¢	3/16×3/16 3/16×3/8 3/16×1/2	8c 16c 20c
3/16×3/16 6c 3/16×3/8 12c 3/16×1/2 16c	1/4 ×1/4 1/4 ×3/8 1/4 ×1/2	14¢ 20¢ 28¢
1/4 ×1/4 11c 1/4 ×3/8 16c	3/8 ×3/8	29¢
1/4 ×1/2 21¢	24" LENG	
3/8 x 3/8 22c	3/16×3/4	
- "SHORTS" AND		

DIDCH DIVWOOD

4	DIKCI	1 LF	1 4400	_
	FINEST G - FLAT SI 12* LENG	HEETS	24" LENG 1/32 x 12 1/16 x 12	3THS 1.20
	1/32×6 1/16×6 3/32×6 1/8 ×6 3/16×6 1/4 ×6	30e 35e 35c 40e 40e 45e	3/32×12 1/8 ×12 3/16×12 1/4 ×12 48" LENG	1.40 1.60 1.60 1.80
	1/32×12 1/16×12 3/32×12 1/8 ×12 3/16×12 1/4 ×12	60c 70c 70c 80c 80c 90c	1/32×12 1/16×12 3/32×12 1/8 ×12 3/16×12 1/4 ×12	2,40 2,80 2,80 3,20 3,20 3,60

SIG BASS WOOD

18" LENGTH SHEETS			
1/16×2-1/2	15¢	3/16×2-1/2	23ç
3/32×2-1/2	17¢	1/4 ×2-1/2	28ç
1/8 ×2-1/2	19¢	3/8 ×2-1/2	35ç
200	BLO	CKS	
1/2×3/4×6	6¢	3/4×2×6	14¢
1/2×3/4×12	11¢	3/4×2×12	27¢
1/2×3/4×18	16¢	3/4×2×18	40¢
3/4×3/4×6	7¢	3/4×3×6	19¢
3/4×3/4×12	14¢	3/4×3×12	37¢
3/4×3/4×18	20¢	3/4×3×18	55¢
3/4×1 ×6	9¢	3/4×4×6	24¢
3/4×1 ×12	17¢	3/4×4×12	47¢
3/4×1 ×18	26¢	3/4×4×18	70¢
SIG BI	RCH	DOWE	LS
12" LENGT	HS	36" LENG	THS,

1/8		2¢	1/8	dia.	5
3/16	dia.	3¢	3/16	dia.	7
1/4	dia.	4¢	1/4	dia.	Be
5/16	dia.	5¢	5/16	dia.	100
3/8	dia.	5¢	3/8	dia.	120
1/2	dia.	6¢	1/2	dia.	150
***			-	-	
286	• 60	MRC	36.3	CIP	150

1/16x15 4¢ 1/8x15 5¢ 1/4x15 6¢ MOTOR MOUNTS

H/WOOD, 12" long 3/8 x 1/2 12¢ 3/8 x 3/8 10¢ 3/8 x 3/4 15¢

SIG METAL PRIMER NEW ITEM REQUESTED BY BUILDERS 4 oz. 60c 8 oz. \$1.00 Pint \$1.65

SIG MODEL PINS #8 1/2 Long #20 1-1/4 Long #14 7/8 Long #24 1-3/8 Long #24 1-3/8 Long #15 1-5/8 Long #17 1-1/8-Long #27 2 Long #17 1-1/8-Long #27 2 Long Pkt. 15c 1/4 lb. \$1.00 1 lb. \$3.50 MODEL MAKER'S *** PINS Pkt. 15c 1/2 lb. box (1000) \$3.95

SIG RUBBER BANDS "30 1/8 x2 "107 5/8x7 "32 1/8 x3 PACKETS 15¢ ALL SIZES AVAILABLE IN BULK AT: 1/4 1b. Pkg. \$1.10 1 ib. Pkg. \$3.95 SIG DOPE BRUSHES

SURGICAL KNIVES

WITH PLASTIC HANDLES. IDEAL FOR CUTTING LIGHTWEIGHT BALSA AND TRIMMING PLASTIC MODELS ETC., No. 10 STRAIGHT BLADE, No. 11 ROUND BLADE. 35¢ each

RAZOR PLANE

R/C FUEL TANKS

NEW SIG DESIGN HAS TWO-FIECE PLUG & LEAK-PROOF SCREW-CAP / PLASTIC CONTAINER AND FLEXIBLE PICK-UP / NON-CORROSTVE BRASS TUBING: 2 oz. 95 4 4 oz. \$1.05 6 oz. \$1.15 8 oz. \$1.25 12 oz. \$1.40

SIG PIANO WIRE

1/32 dia.	6c	3/32 dla.	1
3/64 dia.		1/8 dio.	2
1/16 dia.	9¢	5/32 dia.	4
36" LEN	GTHS	3/16 dla.	5
00 557	Ollis	4 10 0101	t G

COPPER WIRE

FOR BINDING C/LINES, L/GEAR 150

SIG I GEAR RIANKS ALCLAD - TEMPERED SPRING ALUM 1/32x3/4x8 20c 1/16xH/2x12 45c 1/32x1x10 25c 3/32xH/2x12 75c 1/16x1x10 35c 3/32xH/2x15 1.00 1/16x1x12 40c 3/32 x 2 x 18 1.50

SIG ALCLAD SHEET TEMPERED SPRING ALUM., FOR R/C & TEAM RACING LANDING GEARS (4" × 12" SHEETS). 1/32" Thick 65¢ 1/16" Thick \$1.25 3/32" Thick \$1.85

SHEET ALUMINUM .012x4 x12 25c .012x12x12 55c .012x12x24 1.00 .020x12x24 1.45

.020x4 x12 35¢ .054x4 x12 75¢ .064x4 x12 75¢

BRASS SHEET

FINEST QUALITY - 6 x 12 SHEETS .001 60¢ .003 65¢ .010 80¢ .002 62¢ .005 70¢ .015 1.10 NEW! HARD BRASS SHEETS (4" x 6") 1/32" Thick \$1.00 / 1/16" Thick \$1.65

BRASS SHIM

SIX SEPARATE SIZES, 2-1/2×8 each, .001 .002 .003 .005 .010 .015 Pkt. 85c

SIG NYLON SHEET .010 THICK NYLON, MAKES 16 R/C OR C/L HINGES (3 x 4 SHEET). 250

SIG FOAM RUBBER 1/2×8 ×12 45¢ 1 ×30×60 6.90 1 ×8 ×12 69¢ 1/2×36×60 8.95 1/2×30×36 4.80 1 ×36×60 12.50

SIG CELLULOID .008×8×10 12¢ .015×8×10 30¢

FLITE-FOAM

WHITE EXPANDED BEAD FOAM (1 IL 1x12 35c 1x36 90c 1x48 \$1.20 2x12 69c 2x36 \$1.80 2x48 \$2.40 3x12 89c 3x36 \$2.70 3x48 \$3.60 FOAM WING CORES

SOLID CORE (1 B./CUBIC FOOT)
FEATURE DIHEDRAL PRE-CUT / SPAR
SLOT PRE-CUT / SPARS PRE-CUT / SPARS
SLOT PRE-CUT / SPARS PRE-CUT /
LANDING BLOCKS AND CUT-CUT /
LANDING BLOCKS AND CUT-CUT /
AVAILABLE IN 12 STYLES TAJBUS,
CANDY, CITATION, RAIDER 10, VK
CHEROKEE, SMOG HOG, ORION,
JENNY, SENIOR FALCON, BEACHCOMBER, VISCOUNT 8 STORMER,
PER SET (With Instructions) \$12,00

SIG FOAM BOND NEW CONTACT TYPE CEMENT FOR BONDING BALSA TO EXPANDED POLYSTYRENE / WILL NOT ATTACK FORM / COLORLESS & STAINLESS PINT Con \$1.25 QUART Con \$1.95 THINNER: PINT Con 89¢

R/C WINDER SPECIAL NEW "SMALL WINDER" FOR R/C ESCAPEMENT RUBBER. \$2.00

R/C HOOK-UP WIRE 3-FT TWIN CONDUCTORS, pkt. 20¢ 8 3-FT LENGTHS, 8 COLORS, pkt. 55¢

SIG D/T FUSE

D/T FUSE BANDS 1/4 LB. OF 6 RUBBER BANDS (BEST SIZE FOR MOST MODELS). \$1.10

GLIDER TOWLINE 73 NYLON 20 Ib. TEST, 175 ft. 50¢

SURGICAL TUBING THIN WALL, FOR FUEL LINE & USE WITH CLOCKWORK TIMERS 15¢ FT

SIG CONTEST RUBBER NEW "HIGH POWER" RUBBER STRIP: 1 LB. of 1/8" \$5 1 LB. of 1/4" \$5

SIG POWERSTRIP

NEW 1/24" SQ. RUBBER STRIP WITH AMAZING POWER/WEIGHT RATIO: 50 ft 45¢ 100 ft 85¢ 1 LB. \$4.95

SIG FLIGHT RUBBER 1/8 x 23 ft. 30¢ 3/16 x 50 ft. 85¢ 1/8 x 50 ft. 55¢ 1/4 x 25 ft. 60¢ 3/16 x 25 ft. 45¢ 1/4 x 50 ft. \$1.15 1 LB. CANS \$4.50: (570 FT. OF 1/8") (375 FT. OF 3/16") (285 FT. OF 1/4")

PIRELLI RUBBER IN 1 POUND CANS ONLY \$5.50: (475 FT. OF 5/32") (285 FT. OF 1/4")

RUBBER LUBRICANT

SIG FOLDING PROP HAND-CARVED, LACQUERED BALSA PROPS, WITH BRASS BEARING PLATES 12 diameter 2.00 20 diameter 3.25 16 diameter 2.25 24 diameter 4.25

THRUST WASHERS BALL BEARING WASHERS FOR UP TO 1/16" DIA. SHAFTS. each 15¢

SIG EPOXOLITE

NEW 2-PART EPOXY PUTTY / LIGHT AS BALSA & STRONG AS EPOXY / QUICK SETTING / EASY TO WORK / LONG SHELF LIFE / EXCELLENT BUTYBATE DOPE ADHESION / CAN BE CARVED, SAWN AND SANDED. 4 ox. Set \$1.69. 8 ox. Set \$2.95

SIG JAP TISSUE

PRE-WAR QUALITY JAPANESE TISSUE IN ORANGE, YELLOW, RED, WHITE, BLUE OR BLACK. 18×20 sheet 7¢ BAMBOO PAPER

TER THAN OUR REGULAR
JE - IN YELLOW, RED, WH
OR BLACK, 21 x 31 shoel

SILKSPAN

00 WHITE: 19-1/2 x 24-1/2 sheet 5c GM WHITE: 24 x 36 sheet 10c SGM WHITE: 26-1/2 x 33-1/2 sheet 15c

SIGRAY

NEW SIG COVERING MATERIAL — A BLEND OF RAYON AND SILK, IN WHITE, BLACK, RED, YELLOW AND BLUE (36" WIDTH). Per Yord \$1.10

SIG NYLON

SIG SILK

FOR R/C MODELS — IN RED, I WHITE, GOLD OR GREEN (36" x HEAVY \$1.35 EXTRA-HEAVY" — "EXTRA-HEAVY IN WHITE O

JAP SILK

LIGHT-WEIGHT, FOR SMALL GAS, RUBBER, GLIDER ETC. — IN RED, WHITE, BLUE, GREEN, SILVER OR GOLD. 36" x 36" sheet, \$1.15

SIG SUPERCOAT FUEL PROOF DOPE

PLUS 5 NEW SUPERCOAT COLORS -GOLD, COPPER, METALLIC GREEN, METALLIC BLUE, METALLIC MAROON

COLOR CLEAR THINNER
4 oz. 59c 4 oz. 50c 8 oz. 97c
8 oz. 95c 8 oz. 97c 8 oz. 97c
Plat 1.49 Plat 1.39 Plat
Qrt. 2.79 Gal. 6.59 Gal. 4.39
Gal. 7.95 Gal. 6.59 Gal. 4.39

SIG SUPERCOAT IN NEW SPRAY CANS

ALL 19 SUPERCOAT COLORS, PLUS CLEAR, NOW AVAILABLE IN THESE HANDY, LOW-COST SPRAY CANS 3 oz. 49c 6 oz. 79c Pint 1.39

SIG DOPE RETARDER SLOWS DRYING — WHEN ONE PART IS ADDED TO SIX PARTS OF DOPE 4 oz 45c 8 oz 69c Pt 1, 25 Qt 2, 25

SIG FUEL-RESISTANT **DECAL SHEETS**

BRAND NEW LINE OF 44 DIFFERENT SIG MODEL PLANE DECAL SHEETS * SOLID COLORS (CHOICE OF 91; RED, WHITE, BLUE, BLACK, YELLOW, ORANGE, GREEN, GOLD OR SILVER ORANGE, GREEN, GOLD OR SILVER
CHEKCREROADB (1/4" AND 1/2"
SQUARES): RED, BLUE, GREEN (ON
WHITE) - RED, WHITE, BLUE, BLUCK,
YELLOW, ORANGE, GREEN, GOLD
OR SILVER (ON CLEAR) - ORANGE
(ON BLACK) - RED (ON YELLOW)
STRIPES (1/4", 3/4" & 1/2" WIDTH
ON EACH SHEET): RED, WHITE, BLUE,
YELLOW, ORANGE, BLACK, GREEN,
GOLD OR SILVER (ALL ON CLEAR)

STARES/GREEN, GREEN,
GOLD OR SILVER (ALL ON CLEAR) *STARS (5-PT.): RED, BLUE OR BLACK (ON WHITE) * RED, WHITE, BLUE, YELLOW, ORANGE, BLACK, GREEN, GOLD OR SILVER (ON CLEAR) TWO 4-1,4"×11" DECAL SHEETS 35¢

MASKING TAPE

1/8, 1/4, 3/8 or 1/2 - 12 ft. rolls 15¢ ALSO AVAILABLE IN 180 FT. ROLLS! 1/8 55¢ 1/4 65¢ 3/8 75¢ 1/2 90¢ 3/4 \$1.00 1° \$1.25

SIG "MYLAR" TRIM

ADD DECORATIVE, FLASHING TRIM TO MODELS, WITH METAL-PLATED SELF-ADHESIVE "MYLAR" (4" × 10" SHEETS). CHROME 35¢ / GOLD 40¢

SIG-MENT

CONTACT CEMENT

ONE COAT INSTANT BONDING FOR ALL WOODS, METAL, CLOTH ETC. 4 oz. 55¢ 8 oz. 95¢ Pint 1.50

SIG SUPERWELD LIQUID RESIN MODEL PLANE GLUE

— IN PLASTIC DISPENSER BOTTLES.

4-1/2 Quincies 59¢ 9 Quincies 89. SIG SUPERFOAM

AMAZING POLYUKETHANE 2-PART CHEMICAL — WHICH EXPANDS 25 TIMES WHEN COMBINED. DRIES IN 10 MINUTES INTO LIGHT, DURABLE FOAM THAT CAN BE SAWN, CAS', IN MOLDS, CARYED, SANDED AND DOPED. COMES IN PARTS "A" AND "B", IN TWO B OZ. CANS. \$1.23

SIG GLASS KIT

FOR MOULDING COMINGS; WHEEL PANTS; FUSELAGES; BOAT HULLS. CONTAINS 8 OZ. CAN OF RESIN AND HARDENER — 28" ×38" GLASS CLOTH — 1 OZ. CAN OF RELASE AGENT — MIXING RODS — MIXING CUPS — FULL DIRECTIONS. \$2.65

SIG GLASS RESIN 8 oz. CAN 95¢ Fint CAN \$1.50 (HARDENER NOT INC. WITH RESIN)

SIG HARDENER

SIG GLASS CLOTH

SIG RELEASE AGENT STOPS MOULDED PARTS STICKING TO PATTERNS, 1 OZ. CAN 29c

SANDING SEALER LIGHTWEIGHT; TRANSPARENT; WILL NOT FILL GRAIN LIKE "SUPERFILL"

8 oz. 1.00 SIG SUPERMOLD

BALSA IN PLASTIC FORM

POWDERED BALSA

RUBBING COMPOUND FAST CUTTING. GIVES A PERFECT FINISH ON ANY DOPED SURFACE 4 oz. 59¢ 8 oz. 1.00 Pint 1.75

NEW CELASTIC

FATASTIC NEW PLASTIC MATERIAL BECOMES SOFT AND PLIABLE WHEN DIPPED IN THINNER. MOLDS TO ANY SHAPE – CAN BE SANDED & DOPED. PERFECT FOR COWLINGS, FILLETING & REINPORCING USES. 9x18 SHEETS: Light 85¢/ Heory \$1.00

WING CUSHION

SANDPAPER TEN 4-1/2 x 5-1/2 ASS. SHEETS 150

GARNET PAPER FIVE 4-1/2 x 5-1/2 FINE SHEETS 150

SIG SUPERSOLV NEW CEMENT SOLVENT, REMOVES CEMENT FROM HANDS & CLOTHES 4 oz. 35¢ B oz. 49¢ Pint 89¢

1966 SIG CATALOG SEND OF KITS, ENGINES, BALSA WOUD AND HARD-TO-GET ACCESSORIES

THIS COUPON IS VOID IF PROHIBITED, TAXED OR RESTRICTED **≒Sig**≢ free dope coupon!

* CLIP OUT THIS COUPON AND MAIL IN WITH YOUR ORDER (\$3.00 MINIMUM) FOR ANY SIG MERCHANDISE — AND WE WILL SEND YOU, AT NO EXTRA CHARGE: - AND WE WILL SEND YOU, AT NO EARN CHARGE.
AN B OZ. CAN OF NEW SIG SUPERCOAT DOPE (STATE
"CLEAR" OR "COLOR" CHOICE, PLUS TWO SIG DECALS. HURRY, THIS OFFER IS LIMITED!

ADD POSTAGE (SEE BELOW) WHEN USING THIS REEE COUPON A

IF YOUR LOCAL DEALER IS UNABLE TO SUPPLY YOUR NEEDS, ORDER DIRECT - ADDING 25¢ POSTAGE (OR 75¢ FOR CANADA) . MINIMUM ORDER \$1.00

THE SMALLEST MULTI SERVO ON THE MARKET THE ROYAL PUSH-PULL CUSTOM

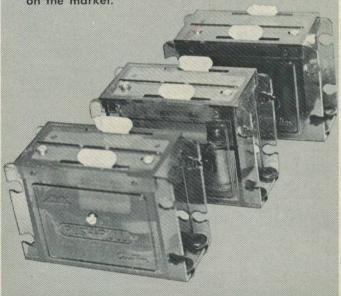
Royal Products ANNOUNCES A COMPLETE SET OF REVOLUTIONARY MULTI CHANNEL REED SERVOS

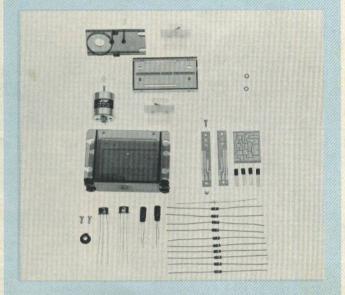
Although just slightly larger than the smallest production servos, the new Royal Push-Pull Custom Servo utilizes a much smaller operating space due to the unique push-pull out-puts. The overall size of 2%" x 134" x 116" is more than 1" shorter than the Transmite, 56" shorter than the Digimite, and 16" shorter than the new Orbit proportional servo.

Servo output direction may be accomplished by merely switching from one output arm to another, eliminating the need for reversing the servo electrically or physically.

The servo motor is the finest available in both power and efficiency. The transparent plastic case which houses the servo has twice the strength of any plastic molded case and is virtually unbreakable.

The amplifiers used are of the most advanced designs. They consist of the smallest useable, quality components in existence. This assures the user a completely vibration-proof servo, so important with the large engines of today. Add to this the versatile selection of mounting, positive centering, more than adequate torque, and coupled with our new gear arrangement for greater speed, quick centering, and fast response; you have the most advanced servo, in every respect, on the market.





PUSH-PULL CUSTOM KIT - \$17.98

A complete kit for the Royal Push-Pull Custom is now available and includes the same high quality components as used in the assembled versions. Complete, easy-to-follow assembly instructions with diagrams and pictures are included. Available in SN type only in kit form.

ASSEMBLED SERVOS

RMK-SNPP		SN TYPE
422 DD	Size:	2%" x 1%" x 1"
\$22.98	Weight:	2.25 oz.
	Color:	GREEN
RMK-TPP		TRIM TYPE
621.00	Size:	2%" x 134" x 1"
\$21.98	Weight:	2.25 oz.
	Color:	RED
RMK-RPP		RELAY-TYPE
è12 00	Size:	2%" x 134" x 1"
\$12.98	Weight:	2.0 oz.
	Color:	BLUE

Royal Products Corporation

P.O. BOX 22186 DENVER, COLORADO 80222