RADIO CONTROL
MODELER
THE LEADING MAGAZINE FOR RADIO CONTROL • AUGUST 1966 50¢

JACKIE GARDNER'S
PENETRATOR

Proportional Brake Control
COL. HANK WALKER

R/C FOR AN OLD TIMER
PACEMAKER II

PART I: FOUR CHANNEL DIGITRIO MODIFICATIONS

A few words about me.

I am Electronic Engineer and this is my day job.

From tender age two things attracted my interest and I managed to have them in my life.

The first was electricity and the second the bluesky.

I´ve found the model airplanes hobby in October 1973.

I love the wooden structures from scratch airplanes and boats also.

I started collecting plans, articles, books and anything else that could help the hobby of many years ago and have created a very large personal collection of them.

Since 2004 I became involved with the digitization and restoration of them and started to share the plans from public domain with my fellow modelers.

Now after all this experience I have decided to digitize, to clean and to re publish in digital edition and free of all issues RC Modeler magazine from 1963 to 2005 and others books and magazines.

Certainly this will be a very long, difficult and tedious task but I believe with the help of all of you I will finish it in a short time.

I apologize in advance because my English is poor.
It is not my mother language because I am Greek.
I wish all of you who choose to collect and read this my work good enjoyment and enjoy your buildings.

My name is Elijah Efthimiopoulos. (H.E)
My nickname Hlsat.

My country is Greece, and the my city is Xanthi.

Λίγα λόγια για μένα.

Είμαι Μηχανικός Ηλεκτρονικός και αυτό είναι το αληθινό μου επάγγελμα εργασίας.
Από μικρός δυο πράγματα μου κέντρισαν το ενδιαφέρον και ασχολήθηκα με αυτά.
Πρώτον ο ηλεκτρισμός και δεύτερον το απέραντο γαλάζιο του ουρανού και ο αέρας αυτού.
Το χόμπι του αερομοντελισμού το πρωτογνώρισα τον Οκτώβριο του 1973.
Μου αρέσουν οι ξύλινες κατασκευές αεροπλάνων και σκαφών από το μηδέν.
Ξεκίνησα να συλλέγω σχέδια, άρθρα, βιβλία και ότι άλλο μπορούσε να με βοηθήσει στο χόμπι από τα πολύ παλιά χρόνια.
Έχω δημιουργήσει μια πολύ μεγάλη προσωπική συλλογή από αυτά.
Από το 2004 άρχισα να ασχολούμαι με την ψηφιοποίησης τους, τον καθαρισμό τους αλλά και να τα μοιράζομαι μαζί σας αφού τα δημοσιοποιώ στο διαδίκτυο (όσα από αυτά επιτρέπεται λόγο των πνευματικών δικαιωμάτων τους).
Σήμερα μετά από όλη αυτήν την εμπειρία που έχω αποκτήσει, αποφάσισα να ψηφιοποιήσω, να καθαρίσω και να ξαναδημοσιεύσω σε ψηφιακή έκδοση και ελεύθερα όλα τα τεύχη του περιοδικού RC Modeler από το 1963 μέχρι το 2005 και κάποια άλλα βιβλία και περιοδικά.
Σίγουρα είναι μια πολύ μεγάλη, δύσκολη και επίπονη εργασία αλλά πιστεύω με την βοήθεια όλων σας να την τελειώσω σε ένα καλό αλλά μεγάλο χρονικό διάστημα.
Ζητώ συγγνώμη εκ των προτέρων γιατί τα Αγγλικά μου είναι φτωχά.
Δεν είναι η μητρική μου γλώσσα γιατί είμαι Έλληνας.
Εύχομαι σε όλους εσάς που θα επιλέξετε να τα συλλέξετε και να τα διαβάσετε αυτήν την εργασία μου καλή απόλαυση και καλές κατασκευές.
Το όνομα μου είναι Ηλίας Ευθυμιόπουλος.(Η.Ε)
Το ψευδώνυμο μου Hlsat.
Η χώρα μου η Ελλάδα και η πολη μου η Ξάνθη.

Aeroporia Greek Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) The building plans of airplanes in full size can be found on websites listed in the table.

3) Articles building planes exist within and on the websites listed in the table.

4) Pages reordered.

5) Topics list added.

Now you can read these great issues and find the plans and building articles on multiple sites on the internet.

All Plans can be found here:

Hlsat Blog Free Plans and Articles.

http://www.rcgroups.com/forums/member.php?u=107085

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

http://www.hippocketaeronautics.com/hpa_plans/index.php

Contributors:

Scanning by Hlsat.

Editing by Hlsat.

Thanks Elijah from Greece.

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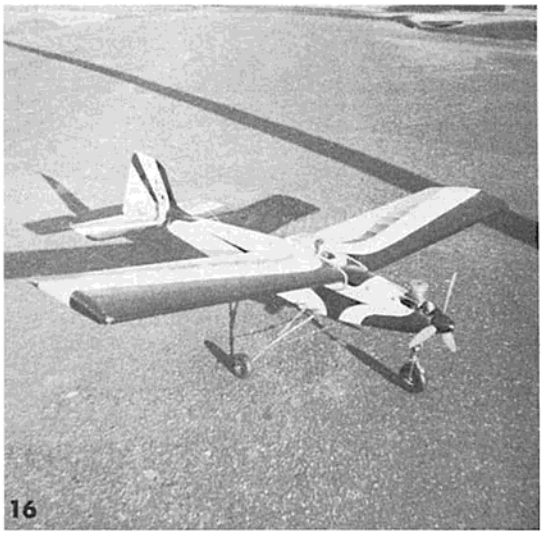
AUGUST 1966 VOL. 3 NO. 8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32

36

FEATURES

DEPARTMENTS

COVER

Enrique Velasco and Rafael Bolio discuss Velasco's Enya .60 powered Taurus at University of Mexico Location. Mural in background is of Industrial Progress. Mexican Nationals Extachrome by Jerry Kleinburg.

PART I. FOUR CHANNEL DIGITRIO MODIFICATIONS

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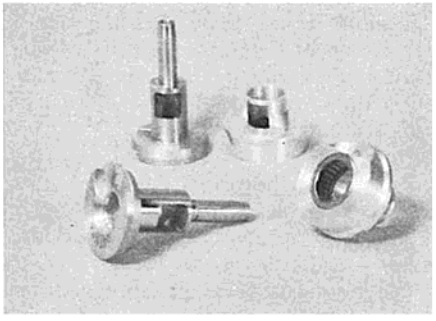
SHOWCASE 66

A high output rotary valve for O&R C-III compact industrial engines has been announced by **Octura Models**, P. O. Box 536, Park Ridge, Illinois. R/C model boaters using the popular mill in their boats can now increase its speed by installing a rotary valve offered by Octura Models. Designed to improve the output and speed of the C-III engine, no special tools, machining, or filing is required. Carburetor housing of engine is removed together with stock output shaft, reed housing, and thrust bearing. Thrust bearing and retaining ring are removed from output shaft. The Octura rotary valve/output shaft is inserted in the needle bearing housing and retained by above thrust bearing and retaining ring. The assembly is slipped into the stock carburetor housing using stock roller bearing assembly. Complete assembly is then installed in crankcase. The rotary valve unit consists of two parts, the hardened and ground steel rotary valve/output shaft, and the needle bearing/port housing of Dural. Price of conversion unit is $21.95 from Octura Models. **Circle #1 from Reader Service Card** for further information.



Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L.I., N. Y. 11791, announces the publication of its 1966 Summer catalog. Available free upon request, the new catalog offers 110 pages of exciting products for home, industry, and the hobbyists. Many items are sale priced below Lafayette's usually low prices. **Circle #2 on the Reader Service Card.**

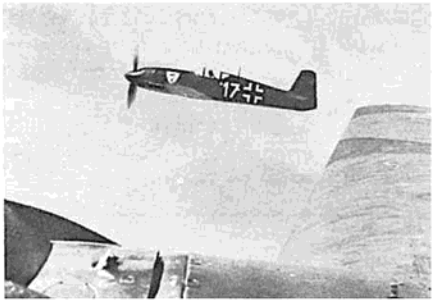
Bob Holman, P. O. Box 741, San Bernardino, Calif. 92402, has a selection of some of the finest scale plans we have seen to date. The latest releases include a .15 powered Sopwith Triplane which is fully scale, plus drawings of the full-size Eindecker E-III. Also available is the famous WW II Heinkel He 100D-1. Price of the latter is $4, while the Sopwith and Fokker are $3 each. For further information, **Circle #3 on the Reader Service Card.**

Crescent Industries, Inc., New Freedom, Pennsylvania, has produced a pushrod exit guide to eliminate unsightly pushrod guide slots in multi fuselages. Other fringe benefits include a smooth transfer of servo power, inasmuch as these guides are molded from Delrin. Dimensions are 1" x ¼" x ¼". Available from your local dealer or direct from Crescent at 50c per pair. **Circle #4 on the Reader Service Card.**

CHC Hobby World has released a line of United Models prefabricated wings for most popular designs, such as the Royal Coachman, Falcon Jr., and 56, and Sr. Falcon, Tauri, Skylark, Cherokee, Mambo Special, Taurus, Kwik Fli II. These foam

core wings are covered with a new "aerospace," hi-impact uni-cover material that make them virtually indestructible. White with either red, blue, or orange trim, according to your preference, these wings are shipped assembled and painted where shipping regulations allow, otherwise they are shipped painted but split at the center joint. Assembly time in the latter case is about three minutes. Prices start at $9.95. Matching stab and rudder prices will be $3.95 to $6.95. Tested and approved by RCM. **Circle #5 on the Reader Service Card.**

The Kurwi 33 hi-performance RC glider, has been up-dated and streamlined even more. The latest kit, offered by **Willoughby Enterprises**, is called the Kurwi 33 Mk V. Most of the kit is prefabbed with 85% of the work complete. The new Mark Five promises to outperform earlier Kurwi 33's

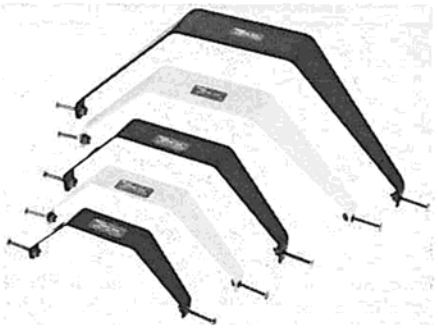


and will be an even better glider for thermal soaring. Weight has been reduced somewhat and a lower profile achieved. The new Kurwi kits now come in red/orange, turquoise, or yellow fibreglass fuselages with no painting required. Kit comes in a tube and is less sheet leading edges and covering material. Price is $45.

(Continued on Page 7)

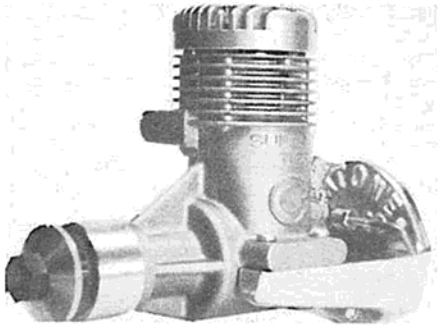
With the new Robbe Hi-start kit, available from Willoughby Enterprises at $13.25, the Kurwi 33 Mk 5 should provide hours of majestic thermal soaring this summer. **Circle #6 on the Reader Service Card.**

Recently received from **The Hall Company**, 420 E. Water Street, P. O. Box 45, Urbana, Ohio 43078, were samples of their most complete line of dural landing gears and "nerve center" printed circuit junction and servo mounting PC boards. With regard to the landing gear, these are formed from heat-treated aluminum alloy and anodized. Splined, self-locking nuts are factory press-fitted and clinched into the gear. Axles are included. Landing gears are available in eight sizes for models from under 1.7 lbs. to 8 pound ships. These landing gears, ranging in price from $2.95 to $4.75 have been tested and approved by RCM. They are, in fact, the finest kind of their type we have seen to date. The nerve center units were designed to simplify multi reed installations, and a unit is available for virtually any equipment installation combination. Also tested and



recommended. **Circle #7 on the Reader Service Card.**

Due to the increasing popularity of the rear rotor valve engines, **Tatone Products**, 1275 Geneva Avenue, San Francisco, California 94112, has recently made two entirely new radial-beam engine mounts especially for the Super Tigre .29 RV and .40 RV engines. These engine mounts will also accommodate all other rear rotor engines such as the K&B Series 61-64, McCoy .29 and Fox .29X. Mounts are cast of Tinsalloy metal and are polished to a mirror finish. Engine mounting holes are drilled for any of the above engines at no extra charge, or they may be obtained undrilled upon request. Self-tapping mounting screws are included. The price of the Class .29 mount is $2, and the class .40 at $2.50. Available at all dealers, or direct. **Circle #8 on the Reader Service Card.**



One of the newest entries in the Galloping Ghost field is **World Engines, Inc.** new 'Ghost' actuator. This unit has been designed for use in ships from the ½A class all the way up to the .35 powered machines. One of the outstanding features we noticed

EDITOR'S MEMO

BY DON DEWEY

JERRY KLEINBURG, GUEST EDITORIALIST . . .

"Cynicism is born easily — dies hard. And cynicism is the chief residue left after the furor raised by the news that 'AMA joined American Modeler' had died down to a slow burn. The opinion that the move signaled the end of AMA may be extreme, but it's not extreme to say AMA may not be the same from here on out. Fact is, it could even be a darned accurate forecast.

"For years the private slogan of AMA headshed, blazened on contest shirts, has advised 'Relax, It's Only a Hobby!' While this is sweet to contemplate — and it does have a relaxing effect — there are aspects of AMA's operation that deserve more attention than the slogan suggests. For instance, the $141,365.04 AMA budget for 1965 isn't exactly a figure to relax over — especially if the feeling comes that this pile is being managed with possible poor judgment. And poor judgment is the kindest verdict rendered so far over the secret action to give up AMA's independence for a mess of unproved porridge. Despite misplaced enthusiasm — and the possible legal latitude to act unilaterally — executives are expected to be right, not simply well-intentioned.

"The patriot's admonition that eternal vigilance is the price of freedom may be too strong a notion for the present circumstance but the other side of that coin bears considering. 'Apathy encourages arbitrary tendencies,' a sage once pointed out in explaining how an imbalance, caused by inaction, creates a 'power vacuum' and thus tempts acts that are 'against the nature of the many.' The 'many,' of course, may have 'it' coming — since in our own case history of an 8% national voting record might just breed an unconscious, but nevertheless reactionary contempt in those we off-handedly elect and expect to run things while we really concentrate on our fun! After all, we're told, it's only a hobby. . . .

"While model flying is indeed a hobby — or sport, for the more serious — what the current debacle brought about is an awareness that we can't relax 100% all of the time — hobby or not! A responsibility 'tithe' is now increasingly being recognized as a necessary part of our common interest, not only to find a way through the present dilemma, but to satisfy the desire to build our experience into a logical structure; one that draws broad based confidence and promotes a greater depth of satisfaction in our pastime.

"The current unhappy grass roots reaction is encouraging an effort to stem the tide of 'what-the-hell' cynicism and to substitute instead a positive force of watchful action. We suggest as the first order of business a demand to each AMA area Vice President for an end to secret actions and that AMA by-laws be made to make this clear! After that, action should be started to put a floor under elections to make them really meaningful. Elections for Executive Council members should not be valid without a minimum quorum, say of 25% of eligible members voting!

"If the Executive Council, and especially the AMA magazine negotiators in Washington, really desire a strong, alert — and participating — membership they can interpret current reaction as a challenge to undertake a program along the lines suggested above and to turn the present controversy into an act that sparked a genuine upturn in AMA history. Indifference, of course, to this call risks the label of self-seeking opportunists, among others, being tagged on the current group of administrators. It would also bring on the need to look for a new group who are in tune with the membership and contemporary needs."

. . . and a sampling of letters

"An Open Letter to Mr. John Worth"

"I have been an avid modeler since the age of twelve. These 24 years of modeling in all phases, but now primarily in R/C, have been the happiest hours of the day in many instances. I have always advocated the support of, and membership in, the A.M.A. My past experience includes almost every facet of the hobby from flying to organizing, to sponsoring, and other related activities, with the exception of manufacturing. In other words, I guess you could call me an all-around model airplane enthusiast (my wife calls it something else at times), like thousands of other modelers throughout the country.

"In the past, I have always encouraged a newcomer to our wonderful hobby to immediately join the A.M.A. Not *because of any of the "10 Reasons" listed in the December 1964 issue of RCM, but rather, because this would give him a sense of really* belonging *to an association that would give him the democratic privilege of voicing his opinions for the ultimate betterment of the hobby he loves. Not because he would be granted a 15% discount on his magazine subscriptions, but because it afforded him a direct communication with every other A.M.A. member, with whom he could share* his *ideas and opinions. Not because R/C modelers are in desperate need of new frequencies, but rather, because it would give him the assurance that he would* not *be denied official recognition for whatever merits or contributions were made in the progressiveness of our hobby. And, finally, it gave him a sense of accomplishment. Everyone wants to* belong. *Not all want to be actively associated, but are content in the knowledge that what they became a member of is just and in their best interest.*

"Now to the crux of the real intent of this letter. I do not *object to the end result you hope to accomplish with your sudden merger with a commercial magazine,* but I do vehemently object to the manner in which you directed this accomplishment. *I agree that the A.M.A. needs more exposure to more modelers, but isn't there a better way?*

"Let's digress a moment. In the 2½ years RCM has been in circulation, I find only four AMA advertisements out of a total of 27 issues. Is this a determined effort to 'sell' A.M.A. memberships? Surprisingly enough, even with such minimal advertising, the total AMA membership is comprised of more than 50% RC'ers. If a manufacturer advertised every seventh issue, do you think he would receive his share of exposure? Of course not. He'd be out of business within a short time. Okay! So you don't have funds to support monthly ads in every *magazine (Ed's note: AMA advertising space is donated by the publishers). I understand this fact, but what's wrong with a newsletter* instead *of an ad in every magazine? I think the publishers would welcome such an opportunity to print the AMA news. I feel that an exclusive magazine for 'members only' is a luxury and not a necessity. Your job to is sell the Academy. A magazine is an instrument used to reach a market for a sale. Why restrict your market to that of the present membership? Or to those who purchase one magazine and not the others?*

"Last but not least, let's look at what we're 'selling' to prospective members. Forget the psychology that 'something for nothing' gets members. Forget 'discounts' and 'deals.' Return to the philosophy that only through indisputable integity, respect, *and the feeling of wanting to belong, are the attributes to convey to prospective members.*

"In closing, I implore you to re-read Don Dewey's open appeal to join the A.M.A. in the December 1965 issue of RCM.

"I, personally, will no longer encourage or support the AMA until it is once again returned to the dignified status *of collectively working together for the common welfare of* all *modelers."*

Respectfully yours,
C. H. Pappe
Tempa, Arizona

Sir:

Year after year in the Roman senate, the great orator Cato ended each of his speeches, whatever the subject, with the thundering words, "Carthago delenda est! — Carthage must be destroyed!". The purpose of yet another statement on the vagaries and ineptitude of the Academy of Model Aeronautics, as presently constituted and led, is not to destroy, but to assist. This currently floundering organization has as its rightful place, the head of the growing body of radio control modelers in this country. As such, it carries, or carried, international stature. Dr. Samuel Johnson, in the 18th century stated, "It is not sufficiently considered that men require more often to be reminded than to be informed." It would seem obvious that we need not remind the reader that of the hundred odd thousand RC'ers in the nation, only 10% at best are members of this august body. This is true, as is the fact that as presently constituted and led, the AMA has been sadly lacking in organizational timber of sufficient quality or far-sightedness to understand the reasons therefore. Going back once again to Dr. Johnson, it would seem evident that the recent secretive and rather furtive thing with American Modeler magazine should serve to remind AMA members that indeed, it seems not necessary that we be informed prior to decisions affecting the entire membership.

If current patterns of dictatorial behavior are to continue, we feel that the AMA will soon require the assistance of people beyond the scope of our membership, if the organization is to survive. It is pertinent at this point in the evolution of our mutual sport and hobby that an advisory group be formed to aid and assist our national body during the troubled months ahead. We suggest that an RC Society, similar in scope and aims to the presently existing Free Flight and Indoor Societies be inaugurated with its purpose being primarily one of advice and assistance. We further propose that this society be composed of all interested RC'ers, be they currently AMA members or not. Only through a strong organization of RC flyers, including not only those interested in the competitive aspects of the sport, but also all those throughout the country who are primarily sport and fun-flying oriented, can we hope to regain the prestige and power which was once a part of the AMA. To paraphrase a good RC term, we think the AMA is in dire need of a little 'directional stability.' Inclusion of ALL RC'ers in the Society will assure the AMA of some new grass seed for its so-called 'grass roots' policy!

Sincerely
Robert C. Lien, M.D.

A Petition . . .

"The AMA members whose names appear below believe secret actions by the AMA Executive Council are contrary to the democratic process intended for development and control of AMA operation and its model flying programs. While it is recognized that restricted discussions are required as normal administrative procedure to explore new ideas and concepts, we deplore secret final actions by the Executive Council that commit the Academy of Model Aeronautics to binding contracts or alter long-standing policy without consultation or communication with the Academy's Contest Directors, Leader Members, or without previous announcement to the general membership. We believe any such secret acts to be arbitrary and dictatorial, regardless of intent otherwise, and as such will not serve the best interests of the membership or the Academy.

"Accordingly, we demand immediate Executive Council action to alter, by established procedure, current AMA By-Laws to specifically prohibit secret binding actions or policy changes by the present and all future executive councils of the Academy of Model Aeronautics."

Don Dewey . . .

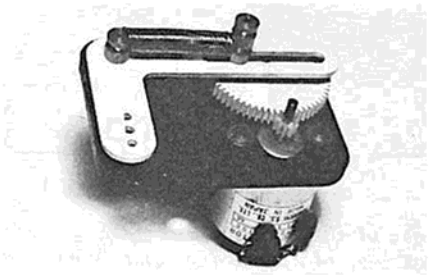
This is the status of things in 1966. What it will be like in years to come is up to you. The history of organizations and of governments, has clearly shown that when the individual does not protest the first loss of rights and principles afforded him under a democratic structure, then the unchallenged leadership seeks even greater opportunities of control, and weakened future protests come too late as only impudent distractions to a well-established dictatorial rule by the few that was spawned by the apathy of the majority.

It's up to you, now.

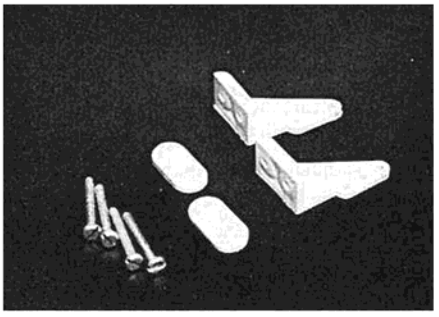
SHOWCASE '66

(*Continued from Page* **5**)

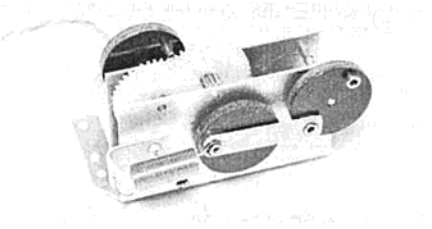
on our RCM test unit was the fact that the motor control can be attached to either side of the output arm for failsafe operation, and in addition, the servo can be installed so that the elevator takeoff can be on the top or bottom of the control surface. World Engines test ship was a Royal Coachman, built by Gary Trout, and powered by a Max .15 R/C. For further information on the 'Ghost' actuator, **Circle #9 on the Reader Service Card.**



Two new accessory items from **Rocket City R/C Specialties** include an extended length tiller arm for steerable nose gears and a control surface horn that requires no inset plywood mounting plate. The latter features a plate that fits beneath the rudder or elevator, providing the necessary rigidity for mounting the horn without insetting a ply mount. Both items tested and recommended by RCM. For further information, **Circle #10 on the Reader Service Card.**



The GG-MS Gallopless Ghost actuator from **Tomoser Electronics & Manufacturing Company,** Box 88, Kenmore 17, N.Y. is a rather unique design for a servo of this nature. The mechanical design of the actuator virtually eliminates the control interaction between rudder and elevator at the full down position. Power of the servo is excellent. Weight is under two ounces. An excellent switcher is built onto the servo that requires only a single 3.6 volt supply for the entire system, such as the Min-X superhet receiver plus the GG-MS actuator. Total airborne weight of our test unit was 6 ounces complete with switch, harness, actuator, batteries and receiver. Power is adequate for the larger models in the .19-23 size category. Price complete with switcher is $24.95, direct. **Circle #11 on the Reader Service Card.**



CUNNINGHAM ON R/C

WITHOUT a doubt one of the most interesting aspects of R/C is that you never quit learning. Just when you think that all of the answers are in someone comes along with a new idea and off we go again, trying to see if the new idea works as well as the old. It is a never ending series of changes. Some of the old timers have seen the pattern repeat itself several times now, and like the man said, "Nothing is really new, just an old idea in a new suit."

There are certain basic rules in the design of the standard type R/C ship. These rules have been hashed and rehashed several times, and they work, but after reading Byron Lakin's article on the "Deb-N-Air" I suddenly started thinking about his argument in favor of eliminating turbulence. This seems to hold water and a closer examination of this factor seems to be in order. We have tried all types of hinges for our aircraft, and by far, the best type hinge seems to be the ones made by Roy Klett. But, in all of our use of hinges (and by our, I mean the entire model fraternity) we have always started with the premise that we were hinging a barn door.

Since we are, in reality, hinging an aerodynamic surface, we should look into this problem. Sure enough, the hinges on a full-scale, high performance aircraft do not hinge like the garden gate! They use a membrane between the surfaces to eliminate the turbulence (see Dwg. #1). Byron took steps to emulate this in having the SURFACES form the membrane by leaving one edge square and beveling the other. Perhaps a better hinge system would be to use a continuous strip hinge the entire length of the elevator or rudder. Could be, only experimentation will be able to tell for sure. Perhaps we don't need to worry about the rudder hinge line as much as the elevator, or perhaps this really affects the ship's flight characteristics even more.

When we first moved into eight and ten channel aircraft the big discussion was how to hinge the ailerons. Some designers held that to hinge them like full scale aircraft was the answer. Others decided that a center line hinge was best. Gradually the hinge point evolved to hinging the top portion. Again, perhaps a continuous hinge would be better here.

It was really much simpler when our biggest problem was whether or not the radio would work. Now, instead of worrying about the crash problem, we have time and effort to spend in nit-picking, but since the best way to enjoy the hobby is to meet the challenges, well . . . we might as well pick a few nits.

There is no doubt about the elimination of all protuberances to make a cleaner flying ship. The new retractable gears will enhance both flyability as well as looks, and if it doesn't happen this year, it will in 1967 — the winning pattern ship at the Nationals will have a retractable landing gear. Removal of wing tie down dowels, hatch hold down catches and other bits of junk all go along toward cleaning up an aircraft.

Of course, if you are flying single channel, then you want all of these things hanging out in the breeze, as well as a lot of frontal area to help slow your ship down, but for a hot, fast multi ship, the thing to do is get rid of them.

Have you noticed the change in elevators in the past year-and-a-half? Just a short time ago every new design featured a built-up elevator section with a symmetrical airfoil. The biggest discussion was to make this section thicker or thinner. Many modelers got into the act, and some felt very strongly that a thicker elevator section made for a much smoother flying model. I believe that Doc Brooke was one of the earliest exponents of the flat board type of horizontal stabilizer. The Quick Fly II has made this section very popular, and if you look through more recent issues of this magazine you will find that almost all ships feature the "lazy man's elevator." I have used both kinds on my designs and have decided that either one works as well as the other. The only real test would be to build a ship with both types and then fly them interchangeably. This would have to be done with an amount of care to be sure that elevators were swapped on the same type of windy day and so on.

It's possible that a poor performing ship could be made to fly better by substituting a different elevator section. The next time you are in doubt, give this a try.

Now, for another thought on the lowly aft end of our ships — the cross section of the elevator itself. Some time ago Dale Root advanced the theory of making his elevator trailing edge almost square, with a slight bevel forward. This was to give him the same effect as more up elevator and less down. Not only does this idea have a lot of merit, but the use of a square trailing edge is not a bad idea. It looks like heck, but it just may give you better control. If we consider the airflow across the elevator we find that with a streamline cross section we have a smoothing-out of the air toward the trailing edge. If we have an elevator that tapers off to a knife edge this does not have to travel very far to displace the airstream and effect a change in the attitude of the aircraft. (See Dwg. #2.) If we square off the end of this surface we can move the flipper into this airstream in less time and get more net effect from the elevator travel. If we are using a flat plate airfoil section then the turbulence at the trailing edge is greater and a streamlined section will not work as well since it has to move a long way to deflect the air flow. A thick, square edge elevator may be best in this case. In my own design, the INSTRUCTOR, I used this idea in the elevator. Since this ship was to be mainly for the beginner, I wanted a slow elevator action, so I coupled a flat plate airfoil with a sharply tapered elevator section to give the desired slowness. For faster elevator action the answer is to use a blunt elevator section. (Dwg. #3.)

This argument for thick and thin can go on and on, however, the one factor that does throw it out of balance is whether you are flying reeds or proportional. I really believe that a blunt trailing edge on reeds is superior, and a square edge is even better. You can "feel" the elevator more over a wider range of speed and the elevator action is more nearly similar at high speed and at low. Proportional may be better with a streamlined section, but perhaps not.

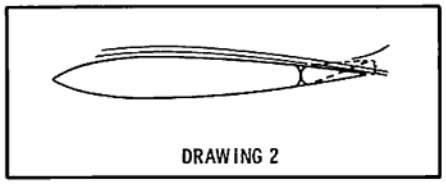
Several years ago, Jim Kirkland won the Nationals with his design, the

(*Continued on Page* **9**)

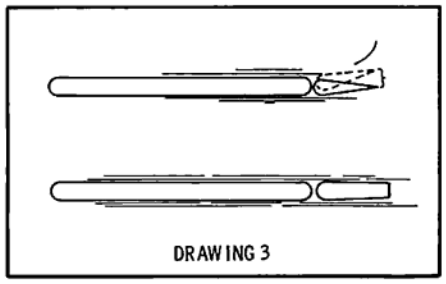
DRAWING 1
INTERNAL SEAL

CUNNINGHAM ON R/C

(*Continued from Page 8*)



DRAWING 2



DRAWING 3

BEACHCOMBER. If you have access to a set of plans I think that you will find that he made his full span ailerons from ¼" sheet and that they were rounded rather than fully tapered, possibly giving the same action on aileron as the blunt vs. sharply tapered elevator. On one of my designs I tried using normal trailing edge stock for the full span ailerons and then at the tips I set in a piece of ¼" sheet, so that the airfoil at the tips was much thicker. As a matter of fact, the first step in this program was to increase the area of the ailerons at the tips so that the balsa sheet was two and one half inches wide x 10 inches long. Only one flight was made like this. The vibration was so great under this setup that it sounded like seventeen million locusts all at once! I chopped off the excess area and left the trailing edge square. The aileron action was much better than it had been when they were sharply tapered.

It's entirely possible that a square trailing edge aileron is better than a sharp one. Why don't you try it and see. My next experimental ship will have leading edges of moveable surfaces like Lakin's and sharp thick trailing edges. Who knows, it might be ok. And, think of the fringe benefit — no more intensive sanding!

Have you ever noticed how some ships take off the ground in a sharp zoom. These models never seem to make a smooth even takeoff. Proportional gear can usually effect a better takeoff, but generally this is the fault of poor landing gear placement. If it is a trike geared ship then the main wheels are too far behind the center of gravity and you literally have to haul the ship off the ground. The ideal gear location is such that, with the fuel tank empty, you can tip the ship back on its main gear and it will remain with the tail resting on the ground. This point can usually be found if you locate the axle of the main wheels about 1" behind the center of gravity. If your ship is suddenly becoming hard to take off properly you may wish to inspect the landing gear. After many landings it may have become bent to the rear, therefore making it harder for the elevator to lift it off the ground.

In my opinion, too many modelers make the mistake of using excess negative in the attitude of their ships on the ground. Negative setting is necessary if you fly from a paved surface, and the reason for this attitude is to keep the ship on the ground after first touch down on landing. If you are not flying from pavement then you simply don't need the negative and it is actually a great detriment to your flying. On grass a zero setting is best. In some cases a slight positive is even better. This keeps the nose gear from digging into the grass, making a slow takeoff run and putting an undue load on your rudder servo. With positive (slightly that is), your ship will tend to take off at its own best flying speed. If you have been having takeoff trouble check the gear location with regard to the center of gravity or the positive or negative ground attitude. If your ship has a two-wheeled gear then make sure that the wheels are neither too far forward or rearward. The best location for the wheels is exactly under the leading edge of the wing.

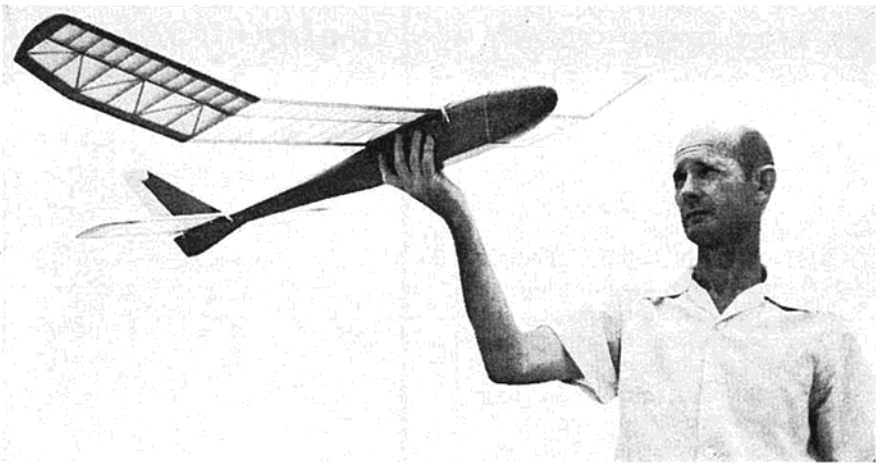
Another point to remember when taking off is not to pour on the coal too quickly! In full scale ships you generally ease the throttle forward. At one time, one model of the Stearman Trainer had such a powerful engine that if you fed it full throttle you would throw it into an immediate ground loop. The same is true of our R/C models. If you are flying a two wheel model your takeoffs will be much better if you go to full power in easy stages rather than cramming the lever all the way to high.

Perhaps one of the most overlooked design features is in the refusal to utilize tip plates. We demand more from our models than any full scale aircraft and yet we generally don't wish to make the one addition that will really give them an added boost of flyability. Ed Thompson, in his Digifly design, has used them to good advantage and I know that Ed is a tip-plate fan. It took me a long time to try them on radio ships, but when I was working on the design for my swept wing ship, the Scimitar, I decided to use tip plates to eliminate the spillage of air from off the end of the wings. The plates that I selected were large and ugly, but they worked far beyond any expectation! This ship can do more maneuvers at any speed range than any other that I have had. At a very low throttle setting you can fly it around your head in a circle of about fifty foot radius, on a wing tip, and not lose altitude. It is the only ship that I have seen that can maintain any flight attitude and not lose lift and fall out of the air. The reason? The tip plates. They can be just as effective on a straight wing ship as they are on a swept wing aircraft. The principle of operation is the same. If you can eliminate the loss of air at the tip and keep it flowing over the wing you have eliminated the tendency of the wing to stall out at the tips first. With tip plates you gain much better handling at low speed. The correct size for tip plates is anybody's guess, but as a beginning, try a tip plate that is ½" larger than the airfoil in all directions.

With each new copy of the magazine someone comes up with a new idea and this is really what makes it all interesting. It has always been my thought in this series of articles to try and present new ideas, or another way of looking at an old idea. If you like to experiment with some of these thoughts, all of us would like to share the results. Write in and tell me what you have found out and one of these issues we'll go into some of these results.

TOP OUT

JERRY KLEINBURG



GLENVIEW NAS

AS we did last year, here's a rundown on what may be expected in Chicago for Class I pattern competition:

RADIO. A big upsurge in propo gear is almost certain as dependability of this gear reaches or even surpasses reed equipment levels. This will be the major equipment change and attention to it will overshadow all other activity as those as yet uncommitted watch to see what works best and who has what.

BRAKES. Rudder ships will not have legal brakes or nose steering since Contest Board action was not taken on these items in spite of the need for increased safety and ground handling ability.

PLANES: Aircraft will be mainly of the "large" variety with some nifty designs and paint jobs being shown. Rudder ships are due for airframe design advances and some will be in evidence in the Windy City in July. As mentioned here a while back, rudder and vertical stab designs will be a focal point of design probings.

ENGINES. The 35's of previous years will give way to 45's and 60's this year. Merco and Super Tigre will lead the way as rudder-ites look for plenty of loop soup and steady idle.

FLIGHT LINE. Since the Dallas and Philly system of frequency allocation is not being followed in Chicago the desire for a pure flight line of Class I will not be used to afford the class a competitive framework to heighten interest, make the contest more meaningful. Nevertheless, airwork will reflect added experience and practice, and although scores will be bunched tighter, more real points will be scored than before. The limit of 5 flights is sure to rankle all flyers. . . .

PILOTS. It'll be a dog-fight for the top spot but since attendance will be questionable in view of the curtailed action as announced earlier, naming participants (in May) is awkward. Gardner (last year's winner), Gorden, Angus, Morgan, Reed, Ritter, and Cote, along with the Texas contingent of Brammer and Rhodes — if any of these make the scene, then the show'll be worth watching. To them all including the younger set like Leonard, Davis, Strong, Woods or Ritter, we wish well. . . .

THE CONTEST SCENE

Fred Duval and company, of Alexandria, La. territory, put on their annual monsoon buster and it was well attended. Jackie Gardner strengthened his claim as 1966's top rudder artist with an impressive 83½ point win. Lynton Younger and Buddy Brammer followed in 2nd and 3rd. An "Oily Bird" flown by Ron Riley took 2nd behind John McLellan in Class II while J. D. Alexander and his "famous" Snoopy broke into the winner's circle for a 3rd place. Jim Kirkland, Larry Beason, and Lou Penrod knocked down Class III Expert in that order, while Jack Sabine, Dick Buck, and Don Downing impressed Class III Novice judges in similar order. The contest clambake on Saturday night had an "open discussion" over creating a Southeastern R/C Society to spark and plug the area that is felt is the "great unknown" in R/C circles. State eliminations was another topic of interest to the 57 assembled RC'ers. As promised, Fred had 4 flight lines spread over the sweet runways they get to use and averaged 17 flights an hour to give the fliers 4 flights a day, despite wind and rain! Chicago, please note what six — yes, six — can do! Fred says the six who make up the Alexandria R/C Club meet in a phone booth to plan their contests, but knowing jolly Fred's belt dimension we know he's funning — or Louisiana phone booths aren't like others! In any case, keep gargling Fred (what an announcer), and give a deep bow to the rest of the Supreme Six while we tell folks to get their entries in early for your 1967 Labor Day meet where 6 lines and 3 days of Duval doin's among Alexandria honeysuckle and magnolia are promised!

We just returned from the Dallas meet — found no evidence of the recent floods but many, many fliers descended on big D for this early contest put on

(*Continued on Page* **11**)

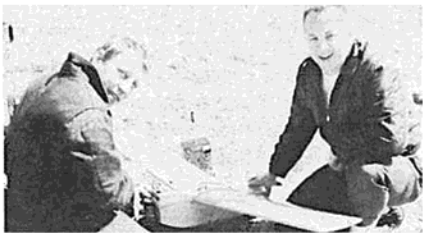
Don Downing, 3rd in Novice Class III at Alexandria contest, guides Phillip Morris, Oklahoma City Junior through Class I pattern. Pair also performed at Dallas meet.

J. D. Alexander and original Snoopy, took 3rd in Class II at Alexandria contest. Orbit 3+1, McCoy 35 at 5½ pounds.

Every club needs one. ARCS uninhibited innovator, Merle Converse, shows what can be done to a CG Jr. Falcon. Flies surprisingly well on escapements, Fox 15.

TOP OUT

(*Continued from Page* 10)



H. J. Corder, Ron Beard, crank up H. J.'s Jenny at Shreveport RC flying field. CitizenShip analog propo works well on vertical whip antenna.

by the Dallas R/C Club. Thirty-seven contestants had signed up by last count which opened some previously dubious eyes to contests in May. Here's the score card:

Class I Jr. — Bobby Woods, Oklahoma City
Phillip Morris, Oklahoma City
Class I Open — Buddy Brammer, Port Arthur
Phil Roy, Wichita Falls
Class II — Bill Knost, Tulsa
Ron Riley, Port Arthur
Bert Crowson, Dallas
Class III — Ted White, Albuquerque
John Jennings, Dallas
Hi-point Reed — Jack Esslinger, Dallas

The Dallas club had a helping boost from two other local R/C groups — the Golden Triangles and the Texins R/C Club. Chief contest yoemen were Ed Carr, Dwayne Brown, Joe McDaniels (watch for his son, Gary — he's a coming sr.), and Carl Summers, who CD'ed. The judges did a thorough, patient — and level — job and merit identification. RC'ers all, take a bow: Pat Darnel, Keith Farrel, Reed Brandenburg, Morris Duval (Dallas R/C Club Prexy), Ernie Hall, and Don Vieux. One item — to avoid the threatened blackmail of Gabbert and Knost I'll confess my PCS system doesn't work well with the receiver antenna stuffed between the servos! Sorry about that, Messers Weirick and Pullen — only got about 60 yards range that way but the new TOP OUT 55 showed it could take a stiff dork, sustained no damage! OK, Gorden? Now tell the folks about your fuel can fountain act. . . . Next month some pics of this meet. . . .

FAMILY RELATIONS HINT

Taken the little woman out lately? She deserves it, so how 'bout a movie while the last coat of dope dries and the house airs out? Just about everyone writing in magazines have raved over "Magnificent Men and Their Flying Machines" which, incidentally is a treat for the eyes besides being the kind of good entertainment your loyal gal will enjoy. For my turn, however, let me suggest "Flight of the Phoenix" which also is outstanding movie fare but is also a treat for a model builder's morale. The prettier half might even get a new slant on modeling. A perceptive Hollywood writer who understands what building and flying is all about took a lead theme from Elleston Trevor's book and screened the best relations pitch for modeling since Eddie Rickenbacker "invented" the Spad. As we said, it's an exciting piece of entertainment, too. . . .

CONTEST TECHNIQUE

High point of Class I pattern presentations is the Rolling Eight since it's the most complex maneuver of the series and since it comes at a time when it's still possible to impress judges so that a sagging score may be retrieved with the remaining pattern — especially if the Rolling Eight is pulled off in a credible manner. Lose this one and you may lose the judges. . . . Because this vertically stacked eight is a combination of aerobatic "pieces" many find it interesting to do and a lot of satisfaction in accomplishing well. Although the procedure given here has been developed for some time with Class I in mind, it is still highly recommended that Class II and III flyers also try it for possible improvement of their aerial figure. It was noted that Larry Beason in winning the Mexican R/C Nats used this approach in his Rolling Eight (and other maneuvers, too) to gain a nice trophy and the admiration of the Mexican flyers.

The Rolling Eight, to recap it, combines an inside loop with a half-roll, a split-S, then a half-loop finished with another half-roll. (This last bit after the split-S is an Immelman, of course, but it may help to have all elements sketched out.) The maneuver should be symmetrical with both sides of top and bottom loops even as well as both loops equal sized and fully round. Keeping your aircraft pointed in the correct direction is a good start — but be sure the ship's also leaving an even track through the sky if full satisfaction is desired.

As in all other maneuvers, placement is mighty important, both for viewing and control of the aircraft. For most symmetrical results a position directly upwind with the maneuver oriented crosswind is best but requires good wind condition — that is, 18 mph, or less. High wind (to 35 mph) flying makes it necessary to use the looping position 45° off-wind and about 75' upwind (see page 71, June 1966 RCM) and doing the Rolling Eight in line with the wind. Altitude? — a lot! Be sure to start high enough to clear the deck by at least 50'. This means the initial loop starts at about 150 to 200 feet to give enough leeway for usual size patterns.

One other item before peeling into the Rolling Eight — this matter of maneuvers between maneuvers, it's something to give more than passing thought to! A review of these chapters on Contest Technique will reveal what is recommended in this regard. (Incidently, RCM for July, 1965 is where this series started . . .) For best presentation, one maneuver must flow into the next separated by these 'tween jobs that in themselves must be efficient in establishing your starting positions and done gracefully without consuming excessive time. Don't rush them — judges need time to

(*Continued on Page* 12)

Secret weapon of San Antonio ARCS. Flying field sand pile works wonders at keeping fry busily engaged, mothers delighted, husbands at favorite pastime.

"set up" for your next offering. Don't kid yourself that "wandering around" the sky doesn't cost points! By showing you're in control at all times you'll retain attention and regard for your efforts from the point bestowers — and it adds up!

Now, back to the Rolling Eight. . . . At the end of the previous maneuver, the Spin, the ship was at about 100' altitude and heading into the wind at full throttle which is what's wanted. Keep the engine at full bore and bend the bird around in a medium banked climbing turn to the 150' starting level which should take about 1¼ turns. Since we'll be doing the maneuver cross-wind, time arrival at the starting altitude on that heading while simultaneously throttling back for level flight. Now that you're set, add throttle to raise the nose a bit and chop it to dip into the initial loop. Now! Call the maneuver and shoot full throttle in as the dip hits full momentum. (If your ship can't loop this way — and there are lots of times you can't — use the split-S method but start this whole maneuver 50' higher.) Tend the wings level and keep your heading with small, small — if any — corrections and enjoy yourself while she reaches top on a true course and reflexes past the peak and starts down.

Now! Chop the throttle! That's right, chop it and glide down through the remaining loop. This way you won't gain too much speed and the ship's path will more closely arc to match the going up side and a symmetrical loop should result. Also the half-roll — it's coming next — may be centered on the vertical centerline more easily at the slower speed. As the bottom is approached start this half-roll and roll so as to "dish" upwind (see June 1966 RCM) — and roll smoothly. Time it so that the roll is spaced evenly on either side of the imaginary vertical centerline. Stop the roll with the ship exactly inverted and on course and now she'll start down on the split-S. If the ship is nicely cross-wind you may watch for the next second and a half while it coasts around at retarded throttle.

Now! At the 135° point (¾ths the way down) pour on full throttle once again and guard your course up the other side of the loop. As the ship lays up fully inverted, roll steadily (using right rudder) to an upright position, chop the throttle to about ⅓ to catch and hold your altitude, and with a confident tilt of the chin look the judges each in the eye and tell 'em, "Maneuver's done, Bud!"

Next time we'll kick the Tail Slide around, so keep your batteries up. . . .

LAST ROUND

Hope the luaus and festivities of Kamahameha Day in Hawaii held on June 11th left time for a bit of R/C fun during the holiday. . . .

"Excuse Me, There's The Phone ---"

BY LOREN DIETRICH

"HELLO? . . . Yes, that's me . . . my R/C ship did take a little side trip this afternoon."

"The heck it did! Found it in your back yard about 5:00 this P.M., huh? Undamaged, you say. . . . Wonderful! Except for a small burn on the right wing."

"Say, how did the burn get there? . . ."

"It **could** have been from the power line? I hate to ask, but **what** power line?"

"Yes, well grass fires will sometimes burn clean through a power pole, I know. Well, that's life, as they . . ."

"Yes, alcohol does make a tremendous gas fire when ignited by a hot engine, but . . ."

"Yes, sir, I get your meaning . . . well, I'll be happy to pay for the damage to both you and the widow . . ."

"Yes, sir, I . . . just a minute — what widow is that, sir? . . . The father of six who was hit by a falling brick . . ."

"Excuse me, but do you have many brick power poles? . . . No, I'm not trying to be smart, but . . ."

"Oh! It was from a building which was blown down by the blast. Well, that certainly explains . . ."

"Well, now, I have to ask one small additional question: **What** blew up?"

"Well, aren't those electronic controls on blasting caps clever these days! To think that one little signal from an R/C could . . ."

"Oh! It **wasn't** the R/C that did it . . . well, thank goodness! It was the Titan missile you say . . . triggered by the R/C . . . !"

"I'll bet it **did,** sir . . . all to smithereens . . . how do you spell 'whammo'?"

"I see, like 'boom' but with two M's . . . got it . . . okay . . ."

"Say, do you think I could get the R/C back without really advertising that it caused this little incident? I mean, bad publicity for the hobby and all . . ."

"Yes, I have that straight. I go down Jones Avenue to the second stop sign, then right on Maple to an office building, up to the second floor and then . . ."

"Ask for who, sir? . . . Special Investigator Hansen of the F.B.I.?"

"Say, if you're looking for that middle-aged fella who flies model airplane toys in his spare time, he lives in Arizona. You see, my strong interest is in underwater basket weaving . . ."

F.C.C. APPROVES R C USE OF 72-76 MC BAND

WASHINGTON — The Federal Communications Commission has granted five new radio frequencies in the 72-76 mc band for the express use of radio controlled model aircraft. The frequencies will be available on June 20, 1966. They are 72.08 mc, 72-24 mc, 72.40 mc, 72.96 mc, and 75.64 mc.

The new frequencies are incorporated into the Class C Citizens Band, but reserved exclusively for modeler use. This is the same service under which radio controllers are now licensed. Therefore, no new licenses will be required. Current frequencies in the 27 mc band are not affected by the action.

Equipment on the new frequencies is limited to 1 watt input power, 0.75 watts output, and .005% frequency tolerance. Transmitters must be type-accepted by the FCC, meaning that both commercial and home-built equipment must be approved before use. The associated receiver must also be certificated for compliance with FCC Part 15 receiver radiation rules.

Use of the new frequencies will be subject to the condition that no interference be caused to adjacent television channels 4 and 5.

Also, the FCC does not guarantee interference-free reception on these frequencies, which are shared with some "flea power" industrial mobile users and a very few fixed circuit links.

In the opinion of AMA's communications counsel, the FCC action constitutes a special recognition of the public interest embraced in modeler frequency usage and is tantamount to the creation of a new radio service specifically for modeler use.

ARE YOU LICENSED?

A Federal Communications Commission Class C license is required for radio control operation on the 27 mc. and 72-76 mc. bands.

Applications for a Class C license may be obtained by contacting your local F.C.C. Field Office or by writing R/C Modeler Magazine.

ARE YOU COVERED?

by

CDR. LOU GUERRIERI, U.S.N.

Don't just write off that non-flying accident . . . you may have a helping hand coming under your homeowner insurance coverage . . .

HOW much is that month-old, Class III proportional job worth to you?

Not much, if it is involved in a crash during normal use. However, if it is stolen, run over by a car, or damaged or destroyed by fire, you may have a helping hand coming from your friendly insurance company. Naturally, several conditions apply.

Coverage

You must have an insurance policy protecting your personal property. Since a model airplane qualifies as personal property, several types of insurance policies provide coverage. These are the Standard Fire Policy with Contents Coverage, the Homeowners Policy (except for the Dwelling Special Form 3), and the Personal Property Policy. As an average RC'er, the odds are that you are a home-owner, a home-renter, or the son of a home-owner or home-renter, and, as such, have insurance providing coverage under one of these policies.

Kind of Loss

The loss must be covered by a peril specifically mentioned in the particular policy.

A model airplane damaged or destroyed by fire is protected under the provisions of all the policies mentioned above. The loss can result from your home or garage burning down (heaven forbid!), a fire in your car, or a fire out on the field. If the fire was caused by your carelessness or negligence, such as tipping over a soldering torch, you are still covered. You have what is known as First-Party Coverage in the insurance trade. Your policy is a contract between you and the company. You buy protection on your property and the company agrees to make payment for the actual loss, whether or not you were careless or negligent. But if you start the fire intentionally, forget it. The insurance company will refuse payment since our laws say that no one has the right to profit from his wrongdoing. Arson could hardly be considered doing right.

Theft is another peril insured against, but only under the Homeowners and Personal Property policies.

The plane is protected from loss due to theft if it is taken from your home or workshop, or from the flight line. But beware of leaving the big bird in the family car. To collect for a theft loss here, all windows and doors must have been closed and locked, or if the model was in the trunk, it too must have been closed and locked. In either case, there must be visible marks on the car indicating forced entry. Still, this is protection that will save "out of your own pocket" costs if someone does steal the model.

Damage to the model caused by any kind of vehicle is also covered under the Homeowners and Personal Property policies. If someone backs over the plane, or if, as a result of the model landing on a street or highway, it is run over, you have a recoverable loss.

Action by the Insured

If you suffer a loss to your plane through one of the perils mentioned above, payment will not be automatic. You have several responsibilities as an insured:

1. You must preserve the remains.

2. You must report the loss. Record the date, the time, and the location of the loss; the kind of loss (fire, theft, vehicle); a brief statement of how the loss occurred; the probable amount of the loss in dollars; a brief description of the damage; names and addresses of witnesses; and if a vehicle caused the loss, the year, make, license number, and name and address of the driver, if this information can be obtained.

If the model is stolen make a report to the police as soon as possible. Record the date and time of this report, and the name and location of the police agency to whom the report is made.

3. You must notify the insurance agent. Obtain your insurance policy number and call your insurance man. He will ask for the information you have already gathered and will have an adjuster contact you. Before the adjuster arrives, it would be well to write out the facts concerning the loss while they are fresh in your mind. The adjuster, an expert in his field, will assist you in filling out the required forms, recording the necessary information, and determining the amount of the loss.

How Much Can You Collect?

Total Loss of Plane and Equipment, or Plane Stolen

Here is where you can help the adjuster. You can expect to receive payment only for the actual value of the plane and its equipment at the time of the loss. To arrive at a satisfactory dollar settlement figure the adjuster needs to know when the items were purchased and their cost, when the model was completed, and the approximate cost of the kit, materials, accessories, and fittings used to put it in flyable condition. A picture of the model before the loss oc-

(*Continued on Page* 14)

ARE YOU COVERED?

(*Continued from Page* 13)

curred aids in determining the extent of the loss.

The actual value, also called the actual cash market value, is the amount of money it would take to purchase a plane and equipment and accessories of like age, style, and condition on the open market. To determine this value, the classified advertisements in R/C Modeler and other magazines should be brought to the attention of the adjuster. Used equipment price lists put out by hobby outlets such as Stanton R/C, Root's Hobby Hut, and Brown's Hobby Center also aid this determination. The prices listed for used engines, radio equipment, and accessories generally work out satisfactorily for determining actual cash market value. Let's look at a couple of examples:

1. Radio Equipment

Orbit 10 Transmitter/Pack/ Charger (new)	$158.45
Orbit 10 Receiver/Pack/ Charger (new)	114.90
Five Bonner Servos (4 Neutral, 1 Trim) (new)	147.75
System Cost (new)	$421.10
Actual Cash Value, Orbit 10 and Servos (Average price, based on classified ads)	
System Cost (used)	$245.00

But you could not expect to collect $245.00! Since the transmitter and two chargers were not involved in the loss of the model, you cannot be paid for them. To come up with a meaningful settlement we can figure the cost relationship of the airborne equipment to the total system by using a simple formula:

$$\frac{\text{Air Equipment Cost (new)}}{\text{System Cost (new)}} = \frac{\text{Air Equipment Cost (used)}}{\text{System Cost (used)}}$$

Here is how it works out in this particular example:

Orbit 10 Receiver/Pack/ Charger (new)	$114.90
Plus Servos (new)	147.75
Less Charger Cost (new)	— 6.95
Airborne Equipment Cost (new)	$255.70

Then plugging the formula above, we get:

$$\frac{\$255.70}{\$421.10} = \frac{\text{Air Equipment Cost (used)}}{\$245.00} = \$148.50$$

The actual cash market value of the airborne radio equipment stolen, or completely destroyed, is $148.50. You could expect to collect this amount from the company if the equipment was purchased more than six months previously. For equipment less than six months old, no depreciation (to be explained below) should be taken by the insurance company and the loss should be valued at $255.70, the cost of new airborne equipment.

2. Airplane

Since it is very unusual to see a model plane in the classified advertisements, special computation is required. Let us say that it was a Class III multi which was destroyed or stolen. You would figure replacement cost of a new plane, including accessories such as wheels, fuel tank, and other fittings. Then, apply depreciation to this replacement cost to get the actual cash value of the plane. Since the American Products "Tempest," advertised in R/C Modeler, appears to be representative of the typical Class III machine, we compute on this basis:

New Plane—American Products "Tempest"	$ 85.00
Fuel Tank	1.50
Three Wheels	4.78
Fittings	10.00
Trim Paint	2.00
Total Replacement Cost	$103.28

From this total replacement cost a fair amount for depreciation must be deducted. Depreciation, or decline in value due to wear and tear, usage, obsolescence, and the like, derives from a point of law which says that no one is entitled to realize a profit from an insured loss. The insured should be in no better nor worse financial condition than he was before the accident. You are not entitled to a brand new model for destruction, or theft, of an old war horse.

Depreciation is based on life span. All of us agree that a model is around for only a brief period. Assuming that the average life of a model airplane is two years, its value would decrease a bit more than four percent each month. In this example, the model would lose $4.30 of its replacement cost value every 30 days ($103.28 divided by 24 months). If the plane was eleven months old at the time of the loss, the actual cash value would be $55.98, figured as follows:

Total Replacement Cost, New Plane	$103.28
Less Depreciation (11 months at $4.30 per month)	— 47.30
Actual Cash Value at Time of Loss	$ 55.98

You could expect to collect $55.98 for the total loss of an average, eleven month old, Class III multi. If the plane is less than three months old, there should be no depreciation deduction from replacement cost. Regardless of age, any plane in operating condition should have a minimum value of about 20% of its replacement cost.

Depreciation on radio equipment should be based on a five year life. The depreciation deduction normally would be 20% of the replacement cost each year. In general though, once the equipment passes six months of age, its actual value drops to about one-half of purchase cost. It retains this value for close to two years, then the value drops again when the 20% per year depreciation takes over. Operating equipment of any age, however, should have a minimum value of about 20% of replacement cost. The best information on equipment cost is available from classified advertisements, and this is why we used Actual Cash Market Value in the radio equipment example above.

Partial Loss of Plane or Equipment

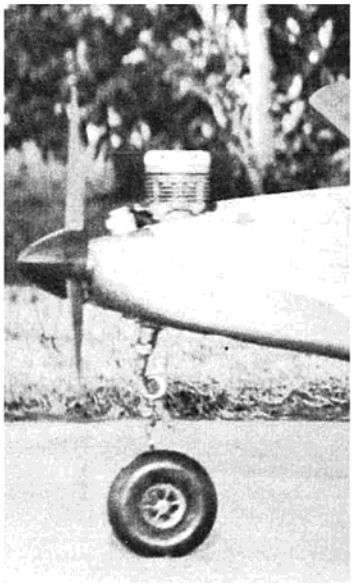
If the plane is not stolen, or destruction is not complete, the amount the insurance company will pay probably will be based on repair costs. Depreciation is taken on repair costs only if the repair of the particular item increases its value over what it was before the loss. In the case of an engine, radio equipment, or a plane, repair costs generally will be less than the actual cash value. The insurance company would pay for repairs rather than replace the item. Mention to the adjuster that engine or equipment repair is specialized work. More than likely, he will recommend that the items be sent to their manufacturers for repair estimates. Upon receipt of this information, the adjuster can approve the amount. In settling for the estimated repair cost, be sure to include postage or shipping costs both ways.

One item may reduce the overall payment though. If your policy contains a loss deductible provision, the settlement amount will be reduced by the amount stated in the deductible clause, if it is applicable. In most cases this is $50.

The final step in the process is to execute the "release." The release is a contract providing that for a certain sum of money, you give up your claim against the insurance company. The sum mentioned in the release will be the amount agreed upon by you and the adjuster. After you sign the release, the adjuster may write a check immediately, or the release will be sent to the insurance company and the check forwarded to you, depending on how the particular company operates.

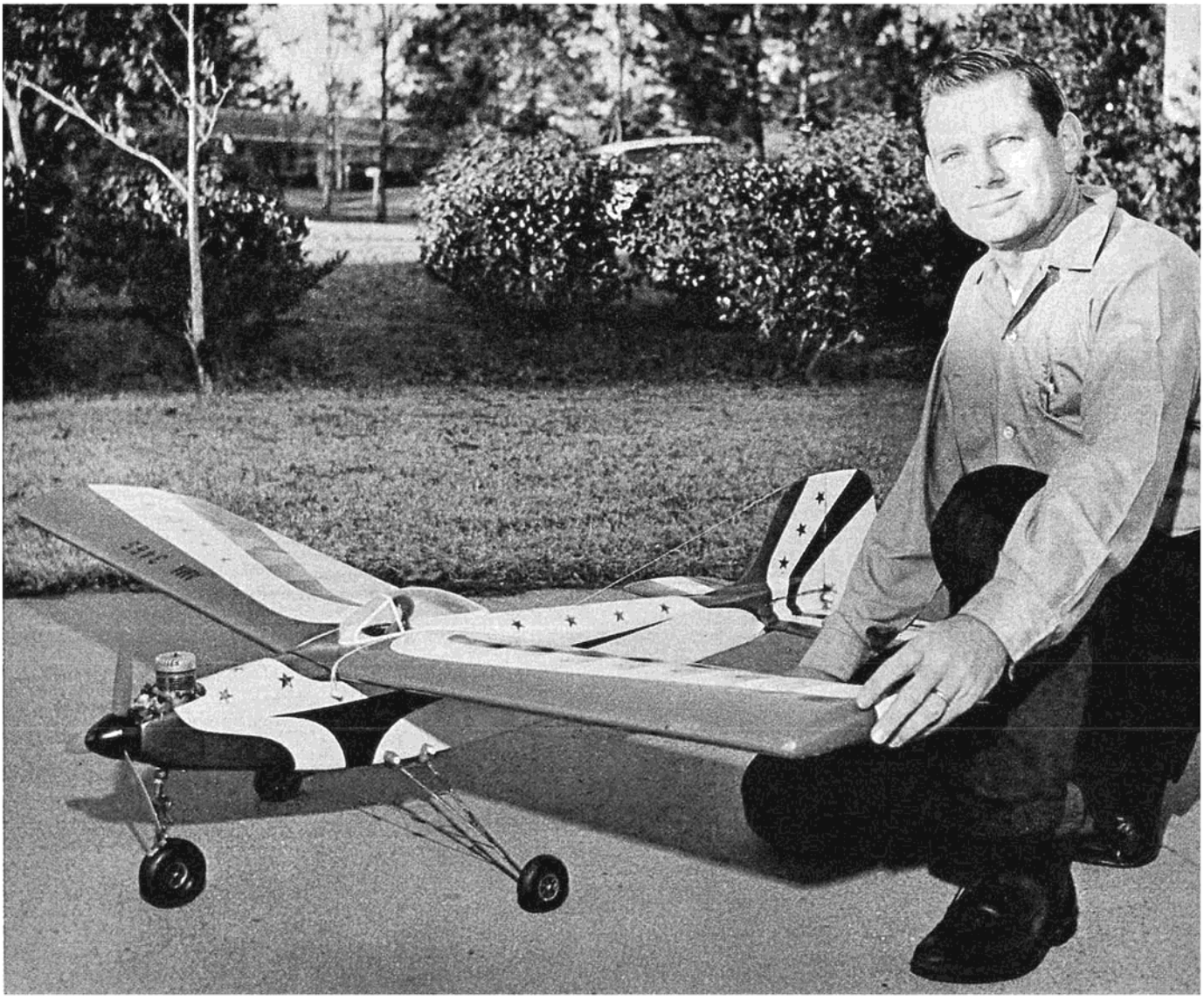
If your plane is stolen, or is involved in a fire, or is damaged by a vehicle, all may not be lost. Check that insurance policy. You may be paying for protection. If so, the insurance company can ease the financial burden of getting your wind machine back in the blue.

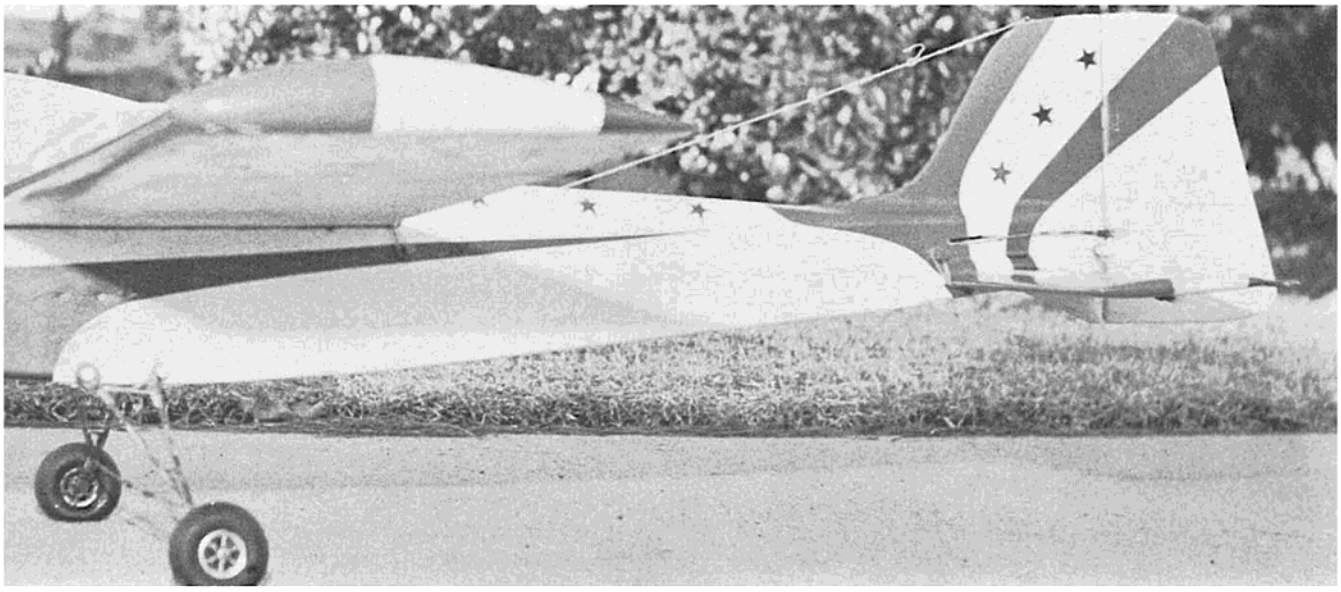
PENETRATOR



The first place winner of sixteen consecutive class I contests, including the 1965 Nationals, reveals the new look in class I . . .

By Jackie Gardner





HE Penetrator, designed to fly as a Class I plane, should also make an ɛellent Class II model for the Sun-y, or the contest flyer. It has a wing ın of 61½ inches, overall area of 738 inches, and a length 45¼ inches. It ighs 6 lbs. and takes a .45 to .61 gine. The Penetrator that I am now ing is powered by a Merco 61, the ɪra power of the big mill needed for ntest flying.

I designed the Penetrator mainly to ɔvide a stable ship for the average nday flyer as well as a contest ship · the experienced pilot. I also had in nd a ship that would match the auty and sleek lines of many of the ass III models.

The Penetrator is a large ship. This, ɔng with the overall design, makes a ıble ship for the inexperienced RC'er. any flyers have found that some of ɛ smaller designs are actually harder r the inexperienced flyer to handle.

In its intended field, the Penetrator s proven to be an outstanding Class I ntest ship. It is a ship that performs ceptionally well on reeds or propor-ɔnal. I won the Class I event at the ng Orange on reeds; however, since en I have changed to Orbit propor-ɔnal. The wing design has proven to ideal for contest flying, and has minated the excessive ballooning tend-cy found in most Class I ships. With e Penetrator properly trimmed, you ll find that it pulls out of maneuvers ·aight and level, and does all maneu-rs exceptionally well, including the ins. You will be happy to know that ɔu can get a spin every time, and with a little practice, will find that it pulls out on the proper heading, straight and level. As you know, most model designing is nothing more than trial and error plus past experience. That is what I put into the design of the Penetrator, and believe me, it paid off! The Penetrator flys better than any of my previous Class I models, including the one I used at the 65 NATS.

It is my belief that getting away from the old "box-type" planes will create more interest in Class I. Many flyers want a ship with the lines and beauty of the sleek looking multi jobs. This is another feature that was included in the design of The Penetrator. It is a shoulder wing job that is sure to catch the eye of the spectators.

I'm also hoping that, by designing a plane that can match the features of the Multi, we can create more interest in Class I from all concerned, *especially* the officials of AMA. We have suffered, due to the continued suggestions from some, that we change the Class I event. An AMA council member made this statement and I quote: "Perhaps some of the single channel enthusiasts could come up with a category that could catch on; perhaps they could think in terms such as a weight lifting plane on a slalom course."

Another AMA director made this statement: "Perhaps Class I needs some fresh thinking to make it more distinctive from Class III, an event worthy of itself rather than by comparison to something else."

We don't hear any suggestions from AMA that Class III be turned into a slalom event! I'm sure that all Class I flyers are aware of the fact that Class I has "caught on," even though certain AMA officials may not think so! Last year's Class I event at the NATS was the largest ever! The thing that we Class I flyers are trying to get over to AMA is that we are not looking for some sort of a kite flying contest, that we like the event as it is and that we merely want the same consideration for all Classes. Class I is experiencing continued growth, and with proper support, could grow by leaps and bounds. Most everyone is aware of the fact that there is more of a challenge to flying Class I than any other Class. It is my belief that better looking and better performing Class I planes will create more interest, meaning, and an even more rapid growth than we are now experiencing.

CONSTRUCTION

FUSELAGE AND FIN: The fuselage sides are cut from 3/32" balsa. Be sure to follow plans so as to have approximately 5/16 inch incidence under the front of the wing. The sides extend approximately 1/8" in front of the forward firewall. Mark the location of the 1/8" plywood former before gluing in place the two 3/16" nose doublers on each side of the fuselage. Glue in place the 1/16" fuselage side doublers. Note that the side doublers butt against the 3/16" nose doublers. Mark the location of firewall, the 1/4" balsa former behind the wing, and the 1/4" sq. braces on the fuselage. Glue in place the 1/4" sq. vertical braces on the fuselage, the dowel supports, and the 1/16" landing gear support. Line up

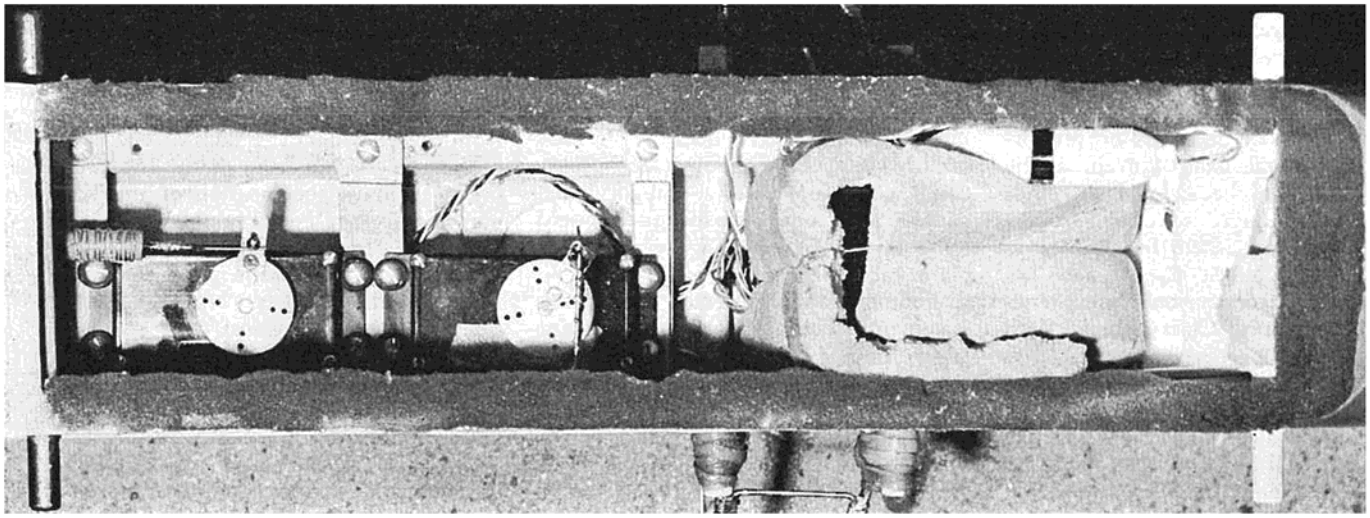
motor mounts with firewall and ⅛" plywood former. Be sure and check to see that an 8 oz. tank will fit between the mounts. After installing mounts assemble the fuselage sides, and glue in place the ¼" balsa former behind the wing. Pull the fuselage sides together and glue at rear, checking for alignment.

Glue in place ¼" sq. braces across the top and bottom of fuselage. Be sure to leave space for ⅜" sq. triangle at the top and bottom of the fuselage. After adding the ⅜" sq. triangle at top and bottom, glue in place ¼" x ½" wing supports. The 3/16" balsa fuselage bottom can then be added between the firewall and plywood former. Add braces behind the firewall and along the fuselage sides. Glue in place the nose block and fuselage nose. Be sure to fiberglass around the nose block for stress. Add the hollow fuselage block and 3/32" balsa for rudder base. Glue the rudder fin in place, but before doing so, draw a line down the center of the fuselage to insure proper alignment. Add ¼" balsa along the sides of the fin for support. Glue braces in front and back of the firewall and at the front of the fuselage. Glue the hollow nose block in place along with the 1/16" plywood. Glue the ⅛" plywood landing gear braces in position. Cover the bottom of the fuselage.

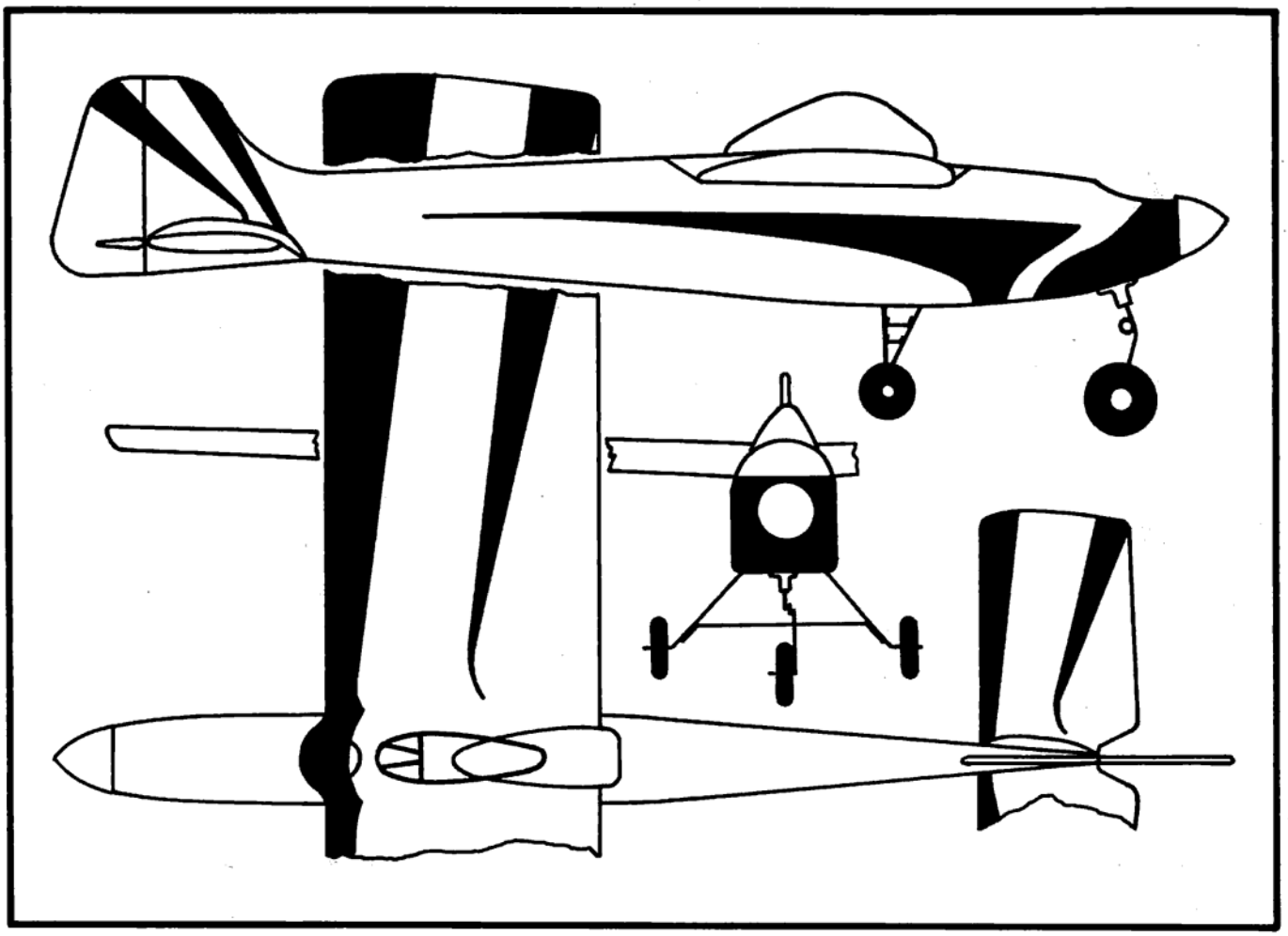
STAB: Very little need be said about the stab, as it is easy to build. The length of the stab (before tips are added) is 21½". Use 1/16" balsa for cap strips and sheeting. The elevator is shown for Class II or III construction. However, I use it as a trim adjustment on my Class I. For a true elevator, build in one piece, add wire, and then cut out the center section. Add the 5/16" balsa stab support to fuselage. The stab should be glued in place. On the original the stab was held on with dowels in the event that it was necessary to make trim adjustments; although none were necessary. Therefore I would suggest eliminating the dowels and glue the stab in place at the time of construction.

WING: The wing construction is also quite simple. Be sure to follow the plans in forming the leading edge, as this has a definite effect on the flying characteristics of the plane. Cut 22 ribs from 3/32" balsa. Space the ribs 3" apart and install 3/16" x ½" spar front and back. Cut three 12" dihedral braces, and one 6"

(*Continued on Page* **22**)



PENETRATOR DATA SHEET



ENGINE

.45 to .60. Prototype used a Merco .60 for contest performance.

DIMENSIONS

Wingspan: 61½"
Total Wing Area: 738 Square inches
Fuselage length: 45¼"
Flying Weight: 5¾ to 6 pounds

RC EQUIPMENT

Reed or proportional equipment for either sports Class II flying or competition Class I.

FLIGHT CHARACTERISTICS

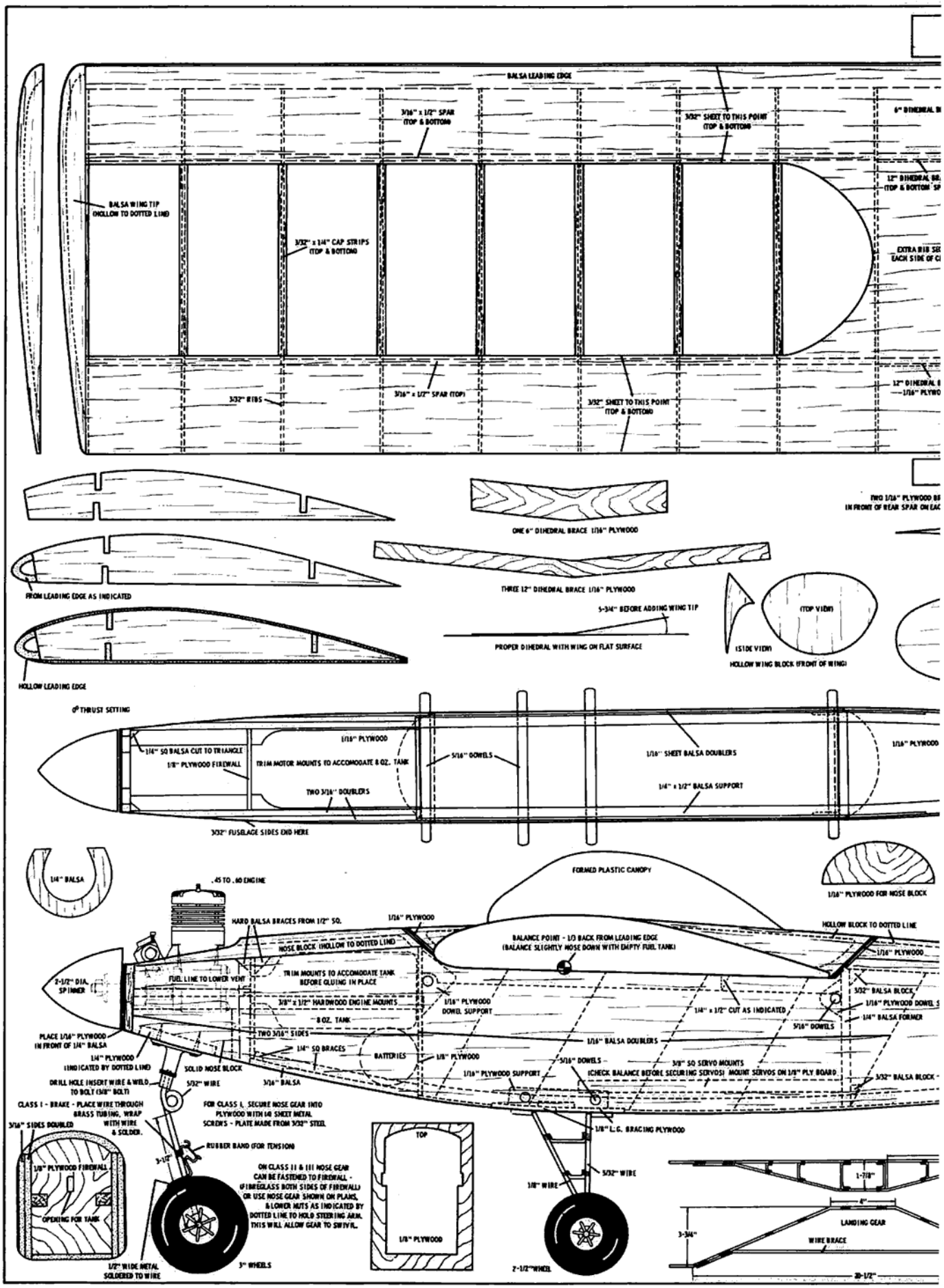
Fast, excellent penetration characteristics, extremely responsive.

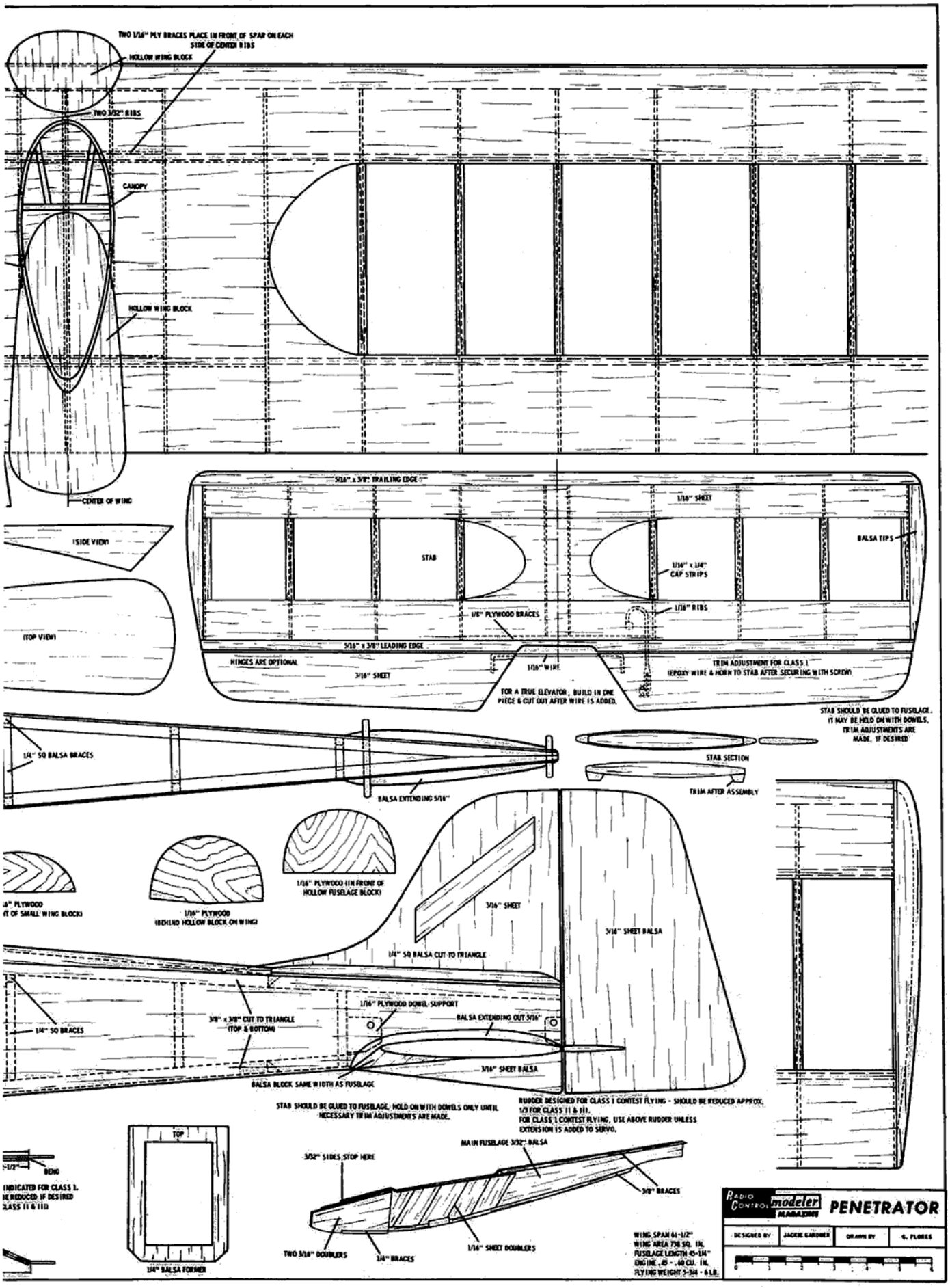
MATERIAL LIST

Wings:
- (6) 3/16" x ½" x 36"
- (2) ¾" x 1" x 36"
- (1) 1" x 2" x 36"
- (10) 3/32" x 3" x 36"
- (5) 3/32" x ¼" x 36"
- (3) 3/32" x 3" x 36"
- (1) 6" x 12" x 1/16" ply

Tail Group:
- (1) 1/16" x ¼" x 36"
- (1) 1/16" x 3" x 36"
- (2) 5/16" x ⅜" x 36"
- (1) ½" x 5/8" x 12"
- (1) 3/16" x 2" x 36"
- (1) 3/16" x 6" x 24"

Fuselage:
- (2) 3/32" x 6" x 48"
- (1) 3/16" x 6" x 36"
- (1) ¼" x ¼" x 36"
- (4) ⅜" triangular stock
- (2) 1/16" x 3" x 36"
- (1) 1/16" x 4" x 36" plywood
- (2) ⅜" x ½" x 12" hardwood MM stock
- (2) ⅜" x ⅜" x 12" hardwood servo mounts
- (1) ⅛" x 6" x 12" plywood
- (1) ¼" x 6" x 12" plywood
- (1) 2" x 4" x 12"
- (1) 1" x 4" x 36"
- (1) 5/16" dowel
- (1) ⅛" dowel

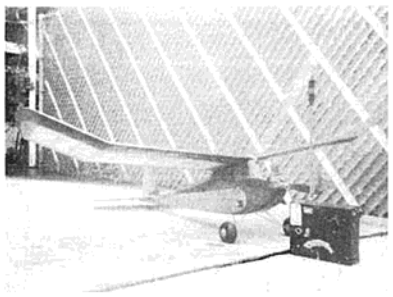

BALSA LEADING EDGE
3/16" x 1/2" SPAR (TOP & BOTTOM)
3/32" SHEET TO THIS POINT (TOP & BOTTOM)
BALSA WING TIP (HOLLOW TO DOTTED LINE)
3/32" x 1/4" CAP STRIPS (TOP & BOTTOM)
3/32" RIBS
3/16" x 1/2" SPAR (TOP)
3/32" SHEET TO THIS POINT (TOP & BOTTOM)
FROM LEADING EDGE AS INDICATED
HOLLOW LEADING EDGE
ONE 6" DIHEDRAL BRACE 1/16" PLYWOOD
THREE 12" DIHEDRAL BRACE 1/16" PLYWOOD
5-3/4" BEFORE ADDING WING TIP
PROPER DIHEDRAL WITH WING ON FLAT SURFACE
(TOP VIEW)
(SIDE VIEW)
HOLLOW WING BLOCK (FRONT OF WING)
0° THRUST SETTING
1/16" PLYWOOD
1/4" SQ BALSA CUT TO TRIANGLE
1/8" PLYWOOD FIREWALL
TRIM MOTOR MOUNTS TO ACCOMODATE 8 OZ. TANK
5/16" DOWELS
1/16" SHEET BALSA DOUBLERS
1/4" x 1/2" BALSA SUPPORT
TWO 3/16" DOUBLERS
3/32" FUSELAGE SIDES END HERE
1/16" PLYWOOD
1/4" BALSA
.45 TO .60 ENGINE
FORMED PLASTIC CANOPY
1/16" PLYWOOD FOR NOSE BLOCK
HARD BALSA BRACES FROM 1/2" SQ.
1/16" PLYWOOD
NOSE BLOCK (HOLLOW TO DOTTED LINE)
BALANCE POINT - 1/3 BACK FROM LEADING EDGE (BALANCE SLIGHTLY NOSE DOWN WITH EMPTY FUEL TANK)
HOLLOW BLOCK TO DOTTED LINE
1/16" PLYWOOD
2-1/2" DIA. SPINNER
FUEL LINE TO LOWER VENT
TRIM MOUNTS TO ACCOMODATE TANK BEFORE GLUING IN PLACE
3/8" x 1/2" HARDWOOD ENGINE MOUNTS
8 OZ. TANK
1/16" PLYWOOD DOWEL SUPPORT
1/4" x 1/2" CUT AS INDICATED
3/32" BALSA BLOCK
1/16" PLYWOOD DOWEL
1/4" BALSA FORMER
5/16" DOWELS
PLACE 1/16" PLYWOOD IN FRONT OF 1/4" BALSA
1/4" PLYWOOD (INDICATED BY DOTTED LINE)
TWO 3/16" SIDES
1/4" SQ BRACES
BATTERIES
1/16" BALSA DOUBLERS
1/8" PLYWOOD
5/16" DOWELS
3/8" SQ SERVO MOUNTS (CHECK BALANCE BEFORE SECURING SERVOS) MOUNT SERVOS ON 1/8" PLY BOARD
3/32" BALSA BLOCK
SOLID NOSE BLOCK
3/16" BALSA
1/16" PLYWOOD SUPPORT
DRILL HOLE INSERT WIRE & WELD TO BOLT (5/8" BOLT)
5/32" WIRE
CLASS I - BRAKE - PLACE WIRE THROUGH BRASS TUBING, WRAP WITH WIRE & SOLDER.
FOR CLASS I, SECURE NOSE GEAR INTO PLYWOOD WITH #8 SHEET METAL SCREWS - PLATE MADE FROM 3/32" STEEL
1/8" L.G. BRACING PLYWOOD
3/16" SIDES DOUBLED
RUBBER BAND (FOR TENSION)
1/8" PLYWOOD FIREWALL
OPENING FOR TANK
ON CLASS II & III NOSE GEAR CAN BE FASTENED TO FIREWALL - (FIBREGLASS BOTH SIDES OF FIREWALL) OR USE NOSE GEAR SHOWN ON PLANS, & LOWER NUTS AS INDICATED BY DOTTED LINE TO HOLD STEERING ARM. THIS WILL ALLOW GEAR TO SWIVEL.
TOP
1/8" PLYWOOD
1/8" WIRE
5/32" WIRE
1/2" WIDE METAL SOLDERED TO WIRE
3" WHEELS
2-1/2" WHEEL
1-7/8"
4"
LANDING GEAR
3-3/4"
WIRE BRACE
20-1/2"


TWO 1/16" PLY BRACES PLACE IN FRONT OF SPAR ON EACH SIDE OF CENTER RIBS
HOLLOW WING BLOCK
TWO 3/32" RIBS
CANOPY
HOLLOW WING BLOCK
CENTER OF WING
(SIDE VIEW)
(TOP VIEW)
5/16" x 3/8" TRAILING EDGE
1/16" SHEET
STAB
BALSA TIPS
1/16" x 1/4" CAP STRIPS
1/16" RIBS
1/8" PLYWOOD BRACES
5/16" x 3/8" LEADING EDGE
HINGES ARE OPTIONAL
3/16" SHEET
1/16" WIRE
TRIM ADJUSTMENT FOR CLASS 1 (EPOXY WIRE & HORN TO STAB AFTER SECURING WITH SCREW)
FOR A TRUE ELEVATOR, BUILD IN ONE PIECE & CUT OUT AFTER WIRE IS ADDED.
STAB SHOULD BE GLUED TO FUSELAGE. IT MAY BE HELD ON WITH DOWELS. TRIM ADJUSTMENTS ARE MADE, IF DESIRED
1/4" SQ BALSA BRACES
BALSA EXTENDING 5/16"
STAB SECTION
TRIM AFTER ASSEMBLY
1/16" PLYWOOD (IN FRONT OF HOLLOW FUSELAGE BLOCK)
1/16" PLYWOOD (BEHIND HOLLOW BLOCK ON WING)
3/16" SHEET
3/16" SHEET BALSA
1/4" SQ BALSA CUT TO TRIANGLE
1/16" PLYWOOD DOWEL SUPPORT
3/8" x 3/8" CUT TO TRIANGLE (TOP & BOTTOM)
BALSA EXTENDING OUT 5/16"
1/4" SQ BRACES
3/16" SHEET BALSA
BALSA BLOCK SAME WIDTH AS FUSELAGE
STAB SHOULD BE GLUED TO FUSELAGE, HOLD ON WITH DOWELS ONLY UNTIL NECESSARY TRIM ADJUSTMENTS ARE MADE.
RUDDER DESIGNED FOR CLASS 1 CONTEST FLYING - SHOULD BE REDUCED APPROX. 1/3 FOR CLASS II & III.
FOR CLASS 1 CONTEST FLYING, USE ABOVE RUDDER UNLESS EXTENSION IS ADDED TO SERVO.
TOP
1/4" BALSA FORMER
MAIN FUSELAGE 3/32" BALSA
3/32" SIDES STOP HERE
3/8" BRACES
TWO 3/16" DOUBLERS
1/4" BRACES
1/16" SHEET DOUBLERS
WING SPAN 61-1/2"
WING AREA 738 SQ. IN.
FUSELAGE LENGTH 45-1/4"
ENGINE .45 - .60 CU. IN.
FLYING WEIGHT 5-3/4 - 6 LB.
Radio Control modeler MAGAZINE
PENETRATOR
DESIGNED BY
JACKIE GARDNER
DRAWN BY
G. FLORES

It all began with a bombshell

An exciting new phase of radio control . . . RC'ing the 'old timer' free flights of the '30's and '40's

BOB LIEN
STAN JOHN



New life for an old Buzzard . . . the famous Buzzard Bombshell, winner of the 1940 Nat's. Timer cuts in Orbit proportional servo on rudder tab at end of motor run.

IT has been a full 25 years since this peculiar love-affair with model airplanes first started for the authors. We both have vivid memories of long bike trips into the countryside in order that we might first observe, and later fly, the models of that era. Brown Juniors, Bombshells, the Quaker Flash, all these and more make up the memory mosaic. Since those early days, many different engines and models have come and gone, but the recollections remain. We are certain that many others now actively engaged in R/C have had a similar experience. Throughout the country, the recent upsurge of interest in Old-Timer events attests to this early exposure to models, particularly the early gas-powered variety. In recent lunch-hour discussions, the authors, while reliving these so-called early days, decided to give the Old-Timer thing a try, but with a slightly different twist. We both are past the time when we can safely chase an errant free-flight, no matter how ancient and underpowered! We both are, of course, actively and deeply involved in present-day R/C activities, and it seemed only proper that we apply this R/C experience to the Old-Timers.

It would seem from the foregoing that in order to enjoy RCing an O.T., one must have followed a tenuous and poorly marked pathway through three decades of modeling in order to qualify for admission to this aspect of the sport. Most of those active in the non-radio Old-Timer movement can rightfully trace this lineage. These are the purists, and they are necessary in order that proper controls may be practised in the purely competitive aspects.

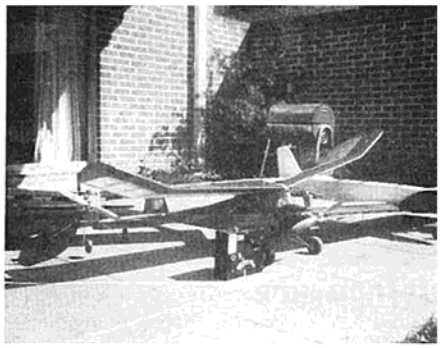
As RC'ers, all that is really necessary is the desire to see one of these old birds fly in as authentic a manner as possible. It is perhaps true that in order to derive the keenest degree of pleasure from the sound of an ignition engine of the forties, one must have some associated memories of either the period or the particular engine involved; however it is not essential. Our use of the radio is in such a manner that the flight of the Old-Timer is interfered with as little as possible. It is used only as an asset in preventing the usual chase over fences and through the woods which has till now been an indivisible part of free-flighting, whether Old-Timer or hot contest ship. Our O.T. ships are built and flown exactly as they were twenty or thirty years ago, and the fun lies in re-creating those old power and glide patterns as closely as possible. Only after a good pattern has been demonstrated and watched is the radio brought into play to return the ship to the owners' feet —don't tell us that this doesn't beat chasing the thing into the next county! Using the radio, we have found a totally unexpected thrill in thermal placement — it is not unusual to be able to jump from one thermal to another, ascending or descending almost at will. The sight of silk covered wings against a blue sky quickens most any true modelers' heart, but with the power to really chase thermals as a built-in feature, the fun is trebled. Using the radio in this manner, and as a rather expensive and non-expendable dethermalizer, one can almost choose the length of his flight, DEPENDING on thermal conditions.

The happy combination of model, engine and radio required to fully enjoy this new aspect of the sport is simply obtained. It is not necessary that one use on old ignition engine — a modern .35 is about equivalent in power to one of the old ignition sixties. As to choice of plane, one has indeed many designs to choose from. To us, the Buzzard Bombshell, winner of the 1940 Nats, has always been a favorite and we chose this as our Old-Timer. Plans for building practically any powered model of the thirties and forties are available from John Pond, 2162 43rd Ave., San Francisco, Calif. 94116. Write him directly for a listing of available plans. Engines of this era are occasionally hard to find, and sometimes impossible to place in reliable running order due to lack of parts. Many are in the hands of engine collectors, and thus unavailable to us. Many times however, they are in the hands of your R/C buddies and can be borrowed for the ocassion. We obtained our Super Cyclone from a unique organization, PESCO, P. O. Box 417, Redwood City, Calif. These folks specialize in providing Super Cyclone and Anderson Spitfires fabricated from factory parts, plus service on these two engine brands. Whichever route is followed, persistence and/or money will soon provide an answer, enginewise.

As to radios, we have used the Orbit analog proportional shown. It has worked well, with absolutely no detectable interference from the engine ignition system. The only control function utilized has been a rudder tab — anything else would be cheating! We utilized one of the newer and smaller Orbit 3 plus 1 power packs in order to save as much weight as possible. If any other radio than that mentioned is used, better run a tank or two through your Brown Jr., or Super Cyke to make certain that no interference occurs between radio and engine ignition. If such does occur, a micro switch must be used to turn on the radio after the engine timer cuts the ignition.

With proper care in the placement of components, the original CG position can be preserved in the O.T. bird. First flights are made as in the old days, short timer run and slow engine, with a good straight hand-launch. Don't forget to also turn on the radio — remember, it

(*Continued on Page* **22**)



The Buzzard rests nonchalantly among her modern day offspring.

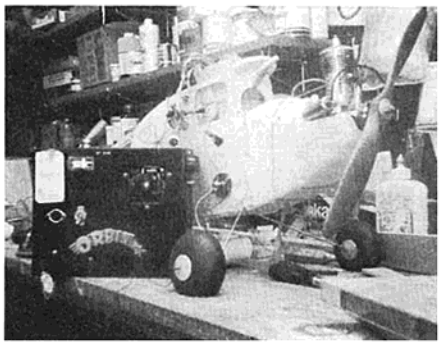
BUZZARD BOMBSHELL

(*Continued from Page* 21)

can save an otherwise uncontrollable spiral dive! Build up confidence and engine power gradually on subsequent flights, with the engine run being correspondingly lengthened. On the full-powered launches, make any needed rudder corrections very gingerly since these Old-Timers are usually very sensitive to rudder, especially under a full head of steam. Remember, these things go up fast — this is an entirely different breed of cat under full power. We prefer to not interfere with the power pattern unless needed to head off a crash or bad spiral. Once the power has been properly controlled, the real fun begins since now you have a built-in thermal hunter, namely you! While we are not by nature soothsayers or prophets, we are willing to bet that this is the free-flight of the future, not the past, and that events designed for this type of R/C and free-flight will be forthcoming. At the present, it is just great fun, but with the rapidly dwindling supply of flying sites, combined with the gradual aging of our expert class of free-flighters, it is bound to become popular. Using R/C, free flight meets can be run from no larger a field than a football field, the only limit now being the number of channels presently available.

Y'all try it!

Bob Lien, M.D. is noted for his surgical technique . . . not RC installations!



Hisat H.E Plans

THE PENETRATOR

(*Continued from Page* 17)

dihedral brace, all from 1/16" plywood. Also cut two small dihedral braces to place behind the rear spar. Use 3/32" sheeting on the wing. Form the two hollow wing blocks, being sure that all blocks are hollowed out as much as possible in order to eliminate excess weight. Use 1/16" plywood on both front and rear wing blocks.

I built two wings for the Penetrator, one of balsa and one from styrofoam. One definite advantage to the styrofoam wing is the fact that you don't worry about warps, which is *very* important in contest flying.

COVERING: We have stressed the point of alignment in the rudder. Of equal importance is the covering. Be sure that the silk, or similar covering, is applied dry to the fin, stab and wing. Silk that is applied wet or stretched will eventually warp the surface. Steam ironing of covering material will make it easy to apply.

LANDING GEAR: The main landing gear is made from 5/32" and 1/8" wire. Be sure to reinforce the gear as shown on the plans to prevent it from bending. For the nose gear, have a welding shop build the plate from at least 3/32" steel. The plate is mounted into 1/4" plywood with sheet metal screws. Thread the plate for a 3/8" bolt, and hold in place with two nuts. Drill a hole in the bolt to accommodate a 5/32" wire. The brake consists of a drag on the nose wheel. A steerable nose gear can be used for Class II.

TRIMMING: Balance slightly nose down, 1/3 back from the leading edge of the wing. The engine should be set straight ahead. Only a slight amount of up thrust should be used until the Penetrator is trimmed to glide properly. My first step in trimming a Class I plane is to cut the engine and adjust until I have a glide that is slightly steep, so that it is necessary to use a little throttle before touching down. I then add washers under the engine until I get the proper amount of up thrust for the maneuvers.

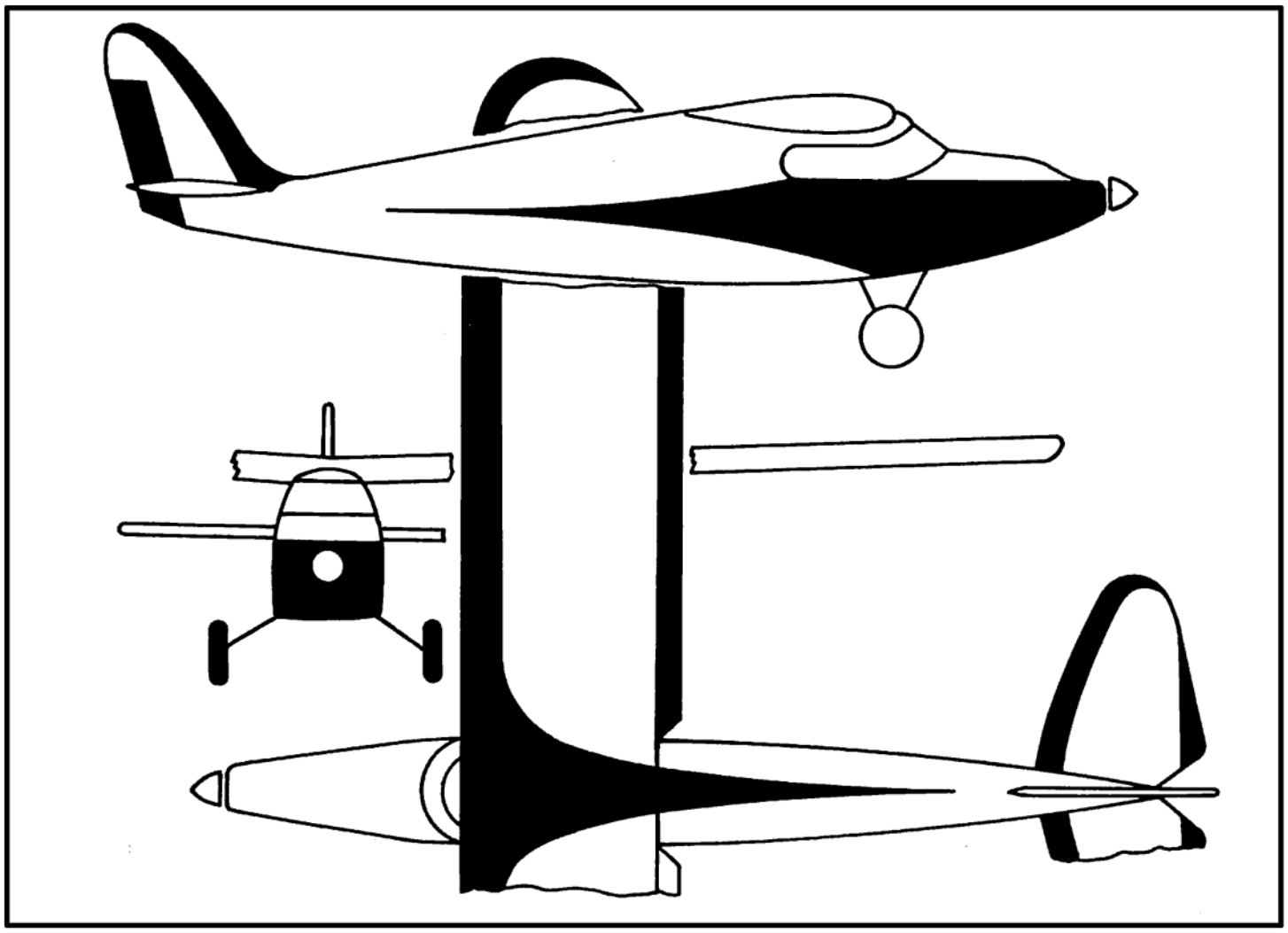
A lot of sandpapering, along with a fancy paint job, and you can be assured that you will have one of the finest looking models in any Class. Your Penetrator will receive many favorable comments as a result of its airborne performance.

PACEMAKER II

Irwin Ohlsson's famed Pacemaker, designed by Ted Woolsey in the 1930's, is brought out of retirement by Brother Ken. The grand old lady of free flight is all decked out with full proportional control and rarin' to go . . .

THE Pacemaker II is a most unusual ship by current R/C standards and configuration. Old-time free-flighters among the RC fraternity will recognize it as Ted Woolsey's design for Irwin Ohlsson in the 1930's. A renowned flighter in its day, Ted's brother, Ken Woolsey, an airlines pilot and competent RC'er, modified the famous old design for radio control in 1963. More recently, additional modifications were made, and the ship is currently flying with a Bonner Digimite proportional system, as shown on the plans.

As presented, this is not a construction article, inasmuch as we do *not* expect the inexperienced RC'er to tackle this project. The plans are completely detailed, and the proficient RC'er will



have little difficulty in reproducing the Pacemaker. It does, however, follow the construction methods of the early free-flight models, and as such, is a departure from the current slab-sided designs that can be put together in a few evenings. One note of caution — when constructing the Pacemaker II use a liberal amount of cement, particularly where longerons and uprights are joined. Ken found Ambroid to be the best for this purpose inasmuch as it has excellent body residue and is fast drying. Another recommended bonding agent for this type of construction would be the newer Franklin Titebond.

Truly, this plane is an aerodynamic beauty, and will undoubtedly bring back many nostalgic reminiscences to the free-flighter of the 1930's and '40's. But, in addition to these attributes, the Pacemaker II is an excellent performing aircraft with modern radio equipment. It will perform the AMA pattern with the exception of the proto taxi and braking maneuver. The flat wing with 1½ degrees dihedral provides good inverted performance. For the first outside loops, however, use plenty of altitude — this is *not* an 80 mph modern-day multi! By far the most spectacular maneuvers that Ken has been able to accomplish with the Pacemaker II are the rolls, which are started with plenty of speed vertically, which then become momentarily horizontal, then end up in a power spin at full throttle. Recovery is very prompt with opposite rudder and neutral elevator applied at about one-and one-half turns and all controls returned to neutral and 2½ to three turns. The stalling characteristics are most favorable with no tendency to spin out.

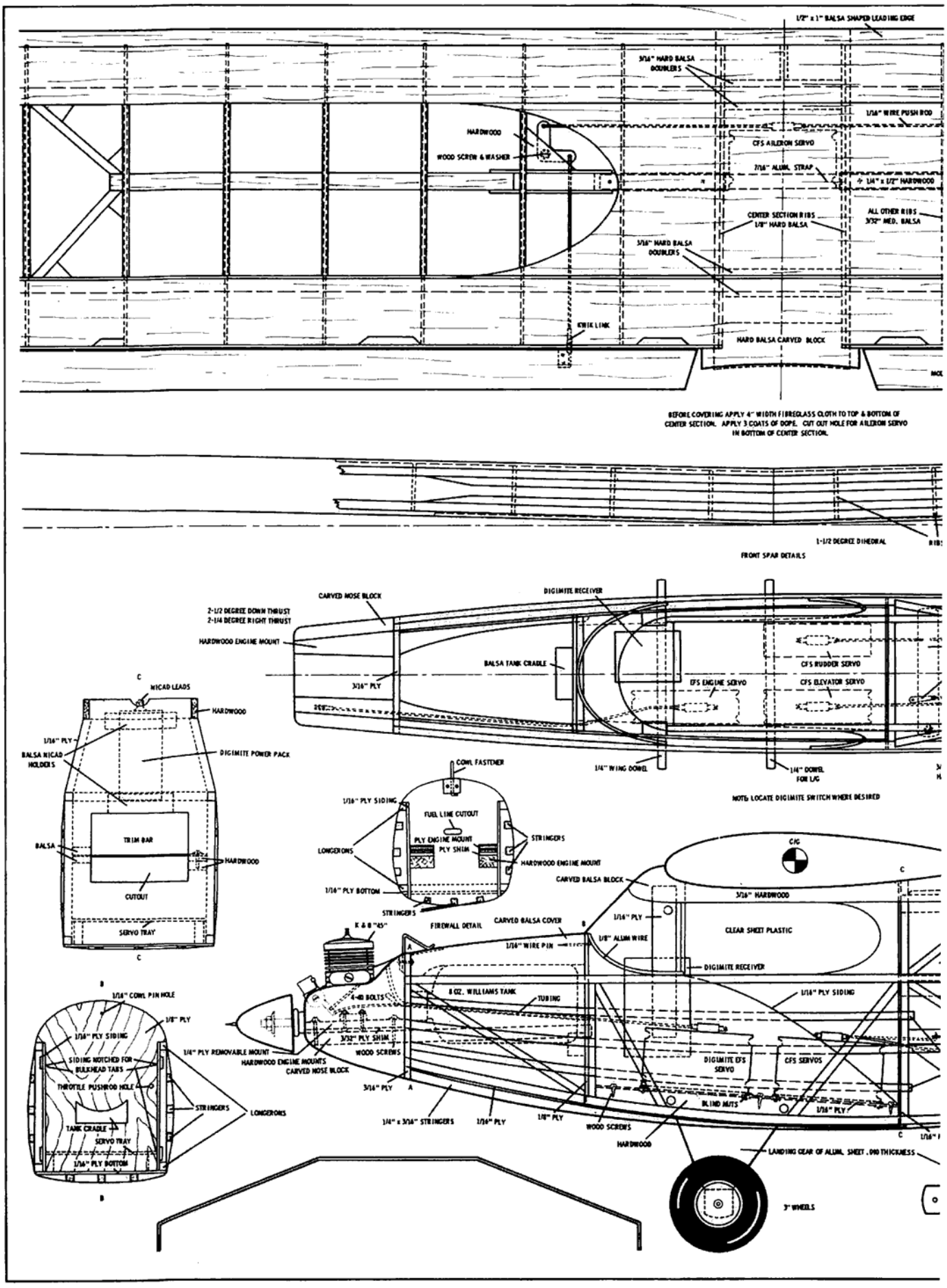
Vital statistics for the Pacemaker II are as follows: Span 70", Length 71", Wing Area 756 square inches; all-up weight 7 lbs. 3 oz., Wing loading 22 oz./sq. ft.

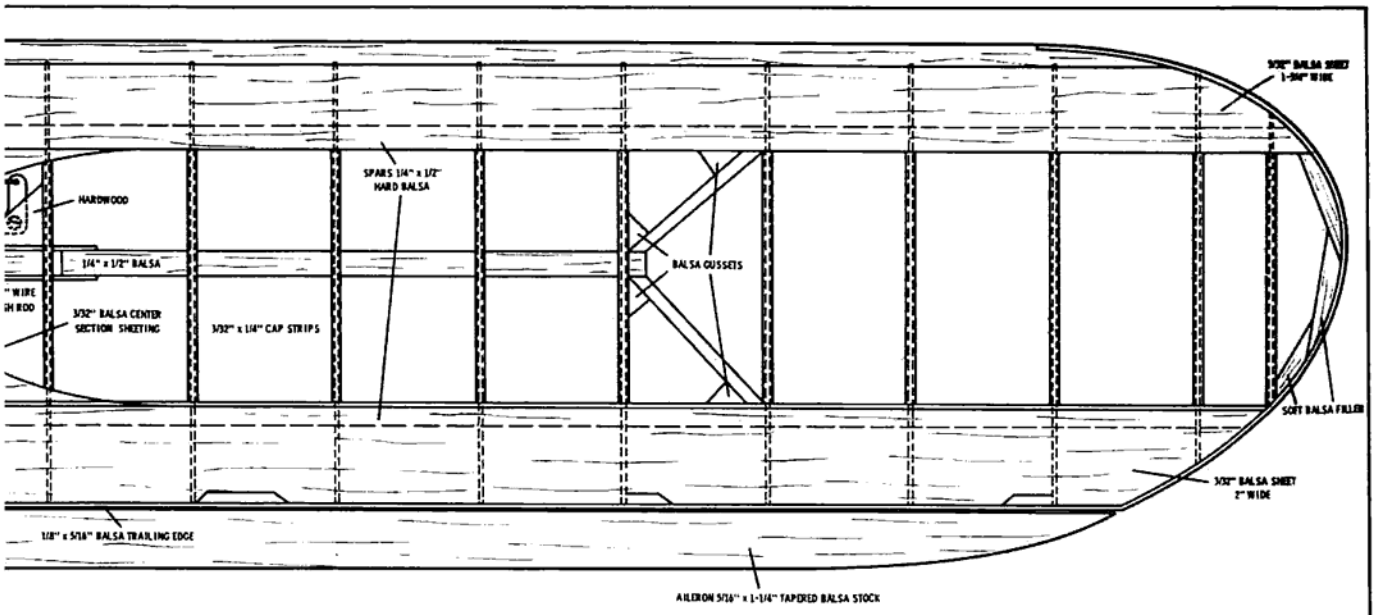
For the hot competition pilots, and alternately, for the "purists" among old-timer free flights, this design will have little appeal. But for the slightly graying, just-a-little-paunchy group, this plane will bring back a lot of memories. And a lot of flying hours in the months to come!

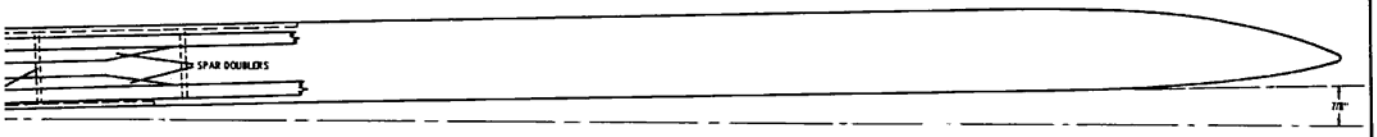
Full size plans are available from Hobby House Plans Service. Ken Woolsey may be contacted by writing him at 2350 Oak Knoll Drive, Santa Rosa, California.

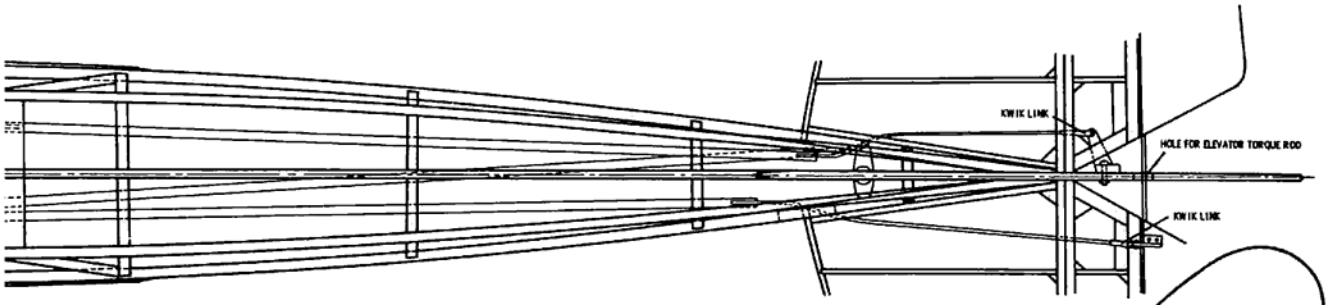
Build the Pacemaker II . . . and relax for a change!

Ken's 36-year-old lady comes in for a graceful touch-down. Takes more time to construct than modern day multi's, but . . .

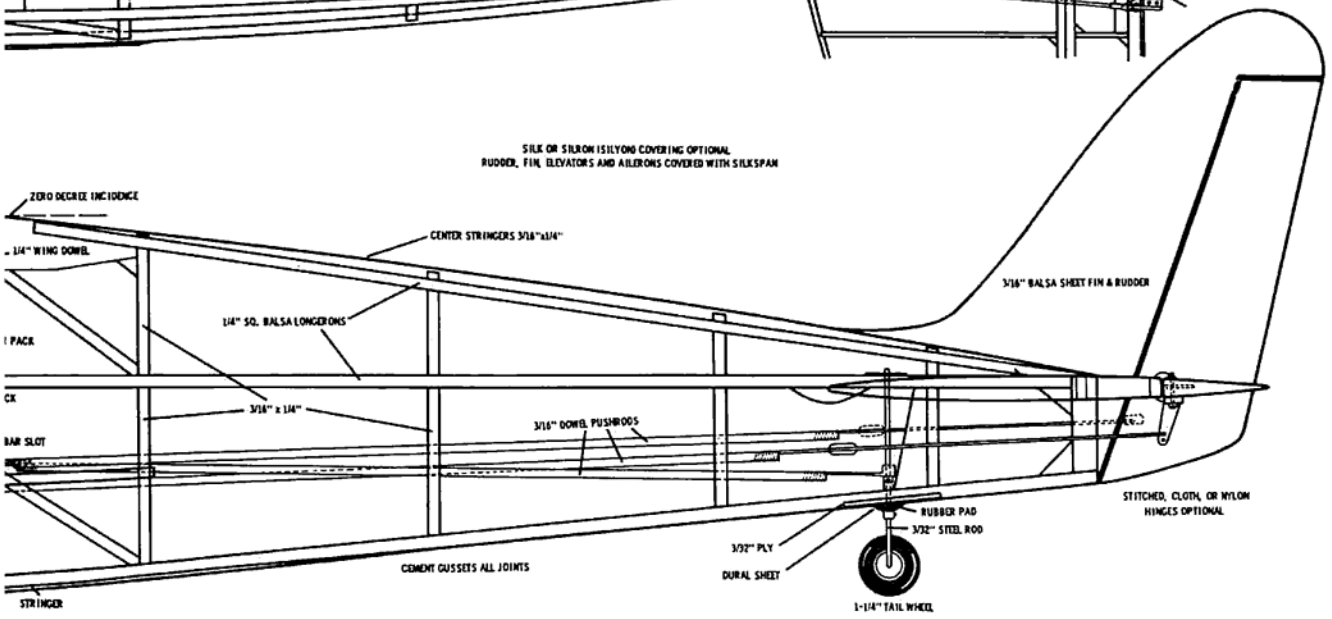

1/2" x 1" BALSA SHAPED LEADING EDGE
3/16" HARD BALSA DOUBLERS
1/16" WIRE PUSH ROD
HARDWOOD
WOOD SCREW & WASHER
CFS AILERON SERVO
7/16" ALUM. STRAP
1/4" x 1/2" HARDWOOD
CENTER SECTION RIBS 1/8" HARD BALSA
ALL OTHER RIBS 3/32" MED. BALSA
3/16" HARD BALSA DOUBLERS
KWIK LINK
HARD BALSA CARVED BLOCK
BACK
BEFORE COVERING APPLY 4" WIDTH FIBREGLASS CLOTH TO TOP & BOTTOM OF CENTER SECTION. APPLY 3 COATS OF DOPE. CUT OUT HOLE FOR AILERON SERVO IN BOTTOM OF CENTER SECTION.
1-1/2 DEGREE DIHEDRAL
RIB
FRONT SPAR DETAILS
CARVED NOSE BLOCK
DIGIMITE RECEIVER
2-1/2 DEGREE DOWN THRUST
2-1/4 DEGREE RIGHT THRUST
HARDWOOD ENGINE MOUNT
BALSA TANK CRADLE
3/16" PLY
CFS RUDDER SERVO
CFS ENGINE SERVO
CFS ELEVATOR SERVO
1/4" WING DOWEL
1/4" DOWEL FOR L/G
NOTE: LOCATE DIGIMITE SWITCH WHERE DESIRED
C
NICAD LEADS
HARDWOOD
1/16" PLY
BALSA NICAD HOLDERS
DIGIMITE POWER PACK
TRIM BAR
BALSA
HARDWOOD
CUTOUT
SERVO TRAY
C
COWL FASTENER
1/16" PLY SIDING
FUEL LINE CUTOUT
PLY ENGINE MOUNT
PLY SHIM
STRINGERS
LONGERONS
HARDWOOD ENGINE MOUNT
1/16" PLY BOTTOM
STRINGERS
C/G
C
CARVED BALSA BLOCK
3/16" HARDWOOD
K & B "45"
FIREWALL DETAIL
CARVED BALSA COVER
1/16" PLY
1/16" WIRE PIN
1/8" ALUM WIRE
CLEAR SHEET PLASTIC
DIGIMITE RECEIVER
8 OZ. WILLIAMS TANK
TUBING
1/16" PLY SIDING
4-40 BOLTS
3/32" PLY SHIM
WOOD SCREWS
1/4" PLY REMOVABLE MOUNT
HARDWOOD ENGINE MOUNTS
CARVED NOSE BLOCK
3/16" PLY
DIGIMITE EFS SERVO
CFS SERVOS
BLIND NUTS
1/16" PLY
1/4" x 3/16" STRINGERS
1/16" PLY
1/8" PLY
WOOD SCREWS
HARDWOOD
LANDING GEAR OF ALUM. SHEET .090 THICKNESS
3" WHEELS
B
1/16" COWL PIN HOLE
1/8" PLY
1/16" PLY SIDING
SIDING NOTCHED FOR BULKHEAD TABS
THROTTLE PUSHROD HOLE
STRINGERS
LONGERONS
TANK CRADLE
SERVO TRAY
1/16" PLY BOTTOM
B

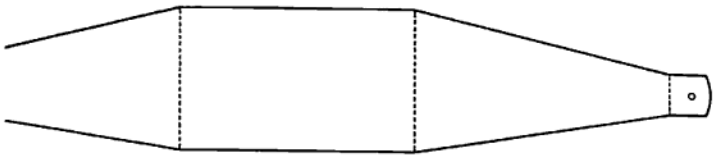






SILK OR SILRON (SILYON) COVERING OPTIONAL
RUDDER, FIN, ELEVATORS AND AILERONS COVERED WITH SILKSPAN





PACEMAKER

- MODIFIED FOR R/C FROM IRWIN OHLSSON'S ORIGINAL BY KEN WOOLSEY - 1963. ORIGINALLY DESIGNED FOR OHLSSON BY TED WOOLSEY IN THE 1930'S.

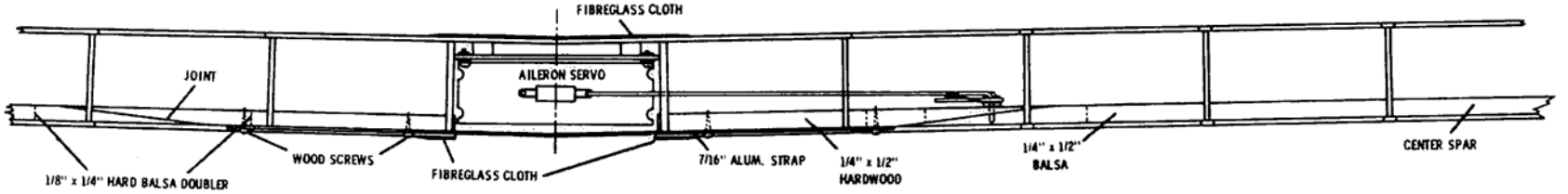
SPAN 70" - LENGTH 51" - WING AREA 756 SQ. IN.
TARGET WEIGHT COMPLETE 7 LB 3 OZ.
WING LOADING 22 OZ/SQ FT

PLATE 1 OF 2

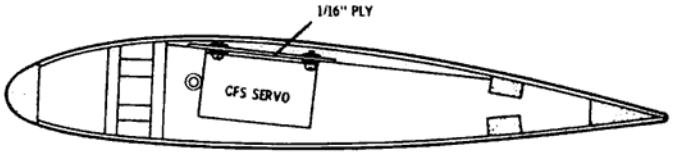
Radio Control modeler MAGAZINE

PACEMAKER

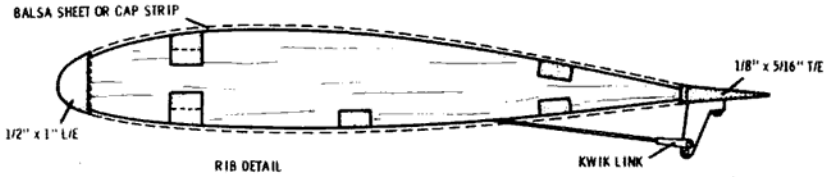
MODIFIED FOR R/C BY	KEN WOOLSEY	DRAWN BY	G. FLORES



CENTER SPAR DETAIL

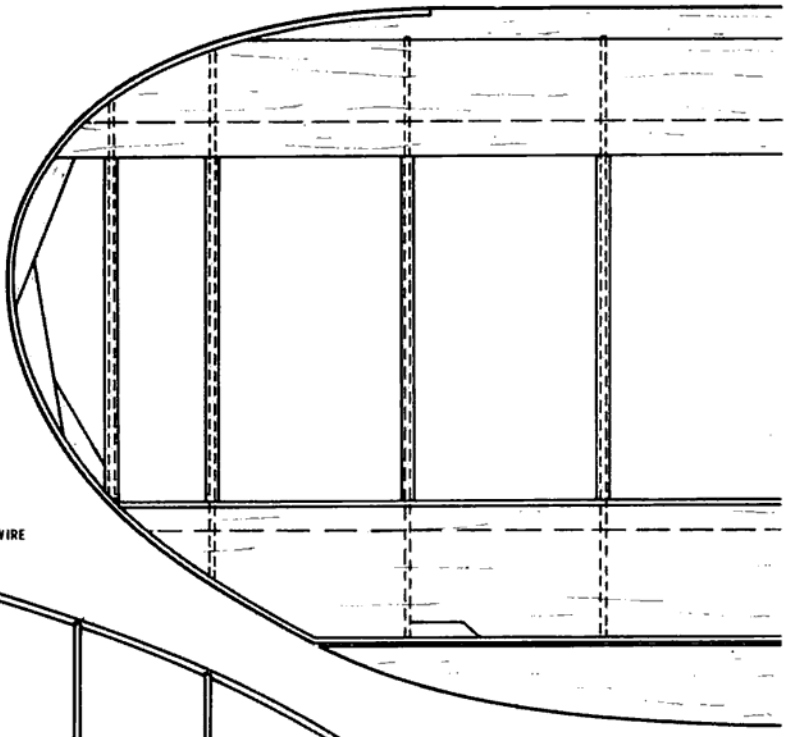


15% CHORD DEPTH AIRFOIL



RIB DETAIL

6 REQD WITH 1/2" DEEP NOTCHES FOR FRONT SPARS. (2 RIBS OF 1/8" BALSA STOCK)
8 REQD WITH 1/4" DEEP NOTCHES FOR FRONT SPARS.
6 REQD WITH 1/4" DEEP NOTCHES FOR FRONT SPARS BUT WITHOUT CENTER SPAR NOTCH.
4 TIP RIBS (INTERPOLATED)



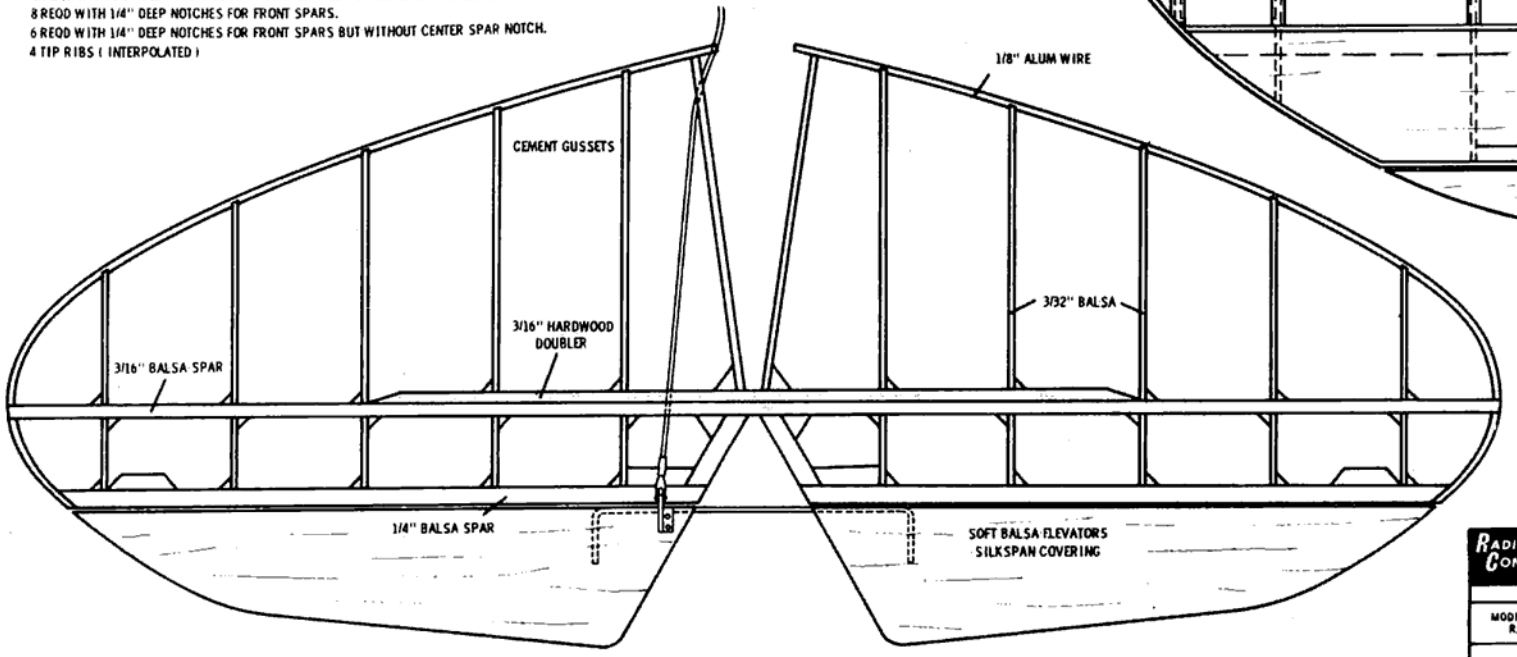


PLATE 2 OF 2

RADIO CONTROL modeler MAGAZINE

PACEMAKER

MODIFIED FOR R/C BY	KEN WOOLSEY	DRAWN BY	G. FLORES

0 1 2 3 4 5 6

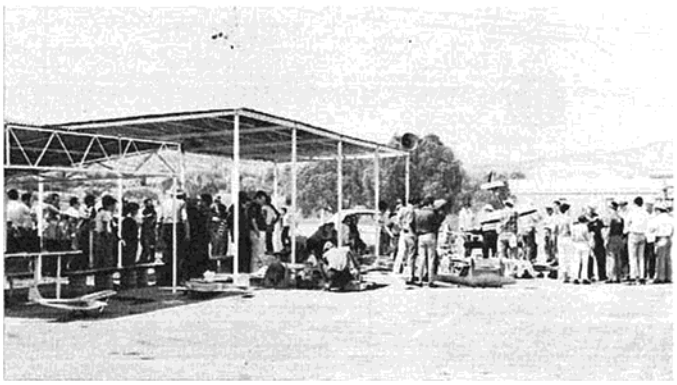
MEXICAN R/C NATIONALS

MEXICO CITY, APRIL 11, 1966. Major Larry Beason of Shreveport, Louisiana, flying a ST 60 powered Sultan took top honors at the Concurso Internacional Mexico, the 4th Annual Mexican R/C Nats. Placing 2nd and 3rd were Feliciano Prat and Dr. Alex Elizondo, both of Mexico City who flew a Quick-Fli and Taurus respectively. All three winners used Orbit 7-14D propo radio equipment in the four day contest flown at Pistas Paraiso, the 7200 foot high flying field of the Asociacion Mexicana de Radiocontrol who sponsored the meet. Weather and wind were ideal during 3 days of elimination rounds using FAI rules and the final AMA pattern day of the contest which was a highlight of the Easter week holiday in this historic Mexican capital.

The Mexican R/C Nats — or more

RCM visits the Concurso Internacion

Above: Part of large daily crowd admires Dr. Elizondo's red Taurus. Below: Operations center. Meet was well managed, had good PA system and spectator control. Upper Rt: Jose "Chato" Sadurni gives lowdown on his Viper-winged Taurus to visitor Edie Downs. Lower Rt: Salo Feiner and daughter, Rita, show Salo's durable 4th place Taurus. Vertical fin was lost on a too-low maneuver but Salo flew on with stub and made finals by 30 points!



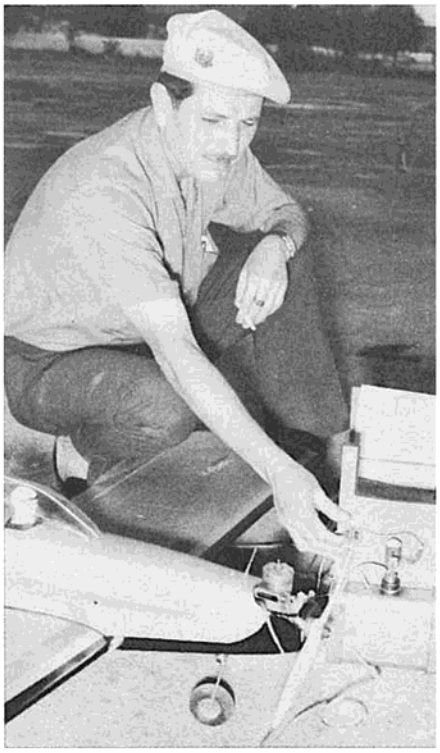
precisely, Concurso Internacional Mexico — combined a 4-day R/C contest with almost a week of holiday and fiesta in old Mexico City. The contest, held each year during Easter Week, results from the efforts of the Asociacion Mexicana de Radiocontrol, a 27 member club headed this year by Roberto Guzman with Paco Gallegos as corresponding secretary. The 1966 contest saw fliers from the U. S. match maneuvers with Mexican RC'ers from 3 cities at "Pistas Paraiso" — paradise strip — the club's 7200' high park-like field nested in green "hills" northwest of the city where breezes were light and temperatures mild during the exciting 4 day affair.

Competition was not only spirited but close as 30 contestants, including 5 from the U. S., sought the five top scores during the first three days of pattern flying using FAI maneuvers and scoring. Jerry Nelson of California took an early lead and was followed closely by Feliciano Prat, Paco Gallegos, Salo Feiner, Alex Elizondo, Enrique Velasco, as well as Gorden Gabbert and Major Larry Beason. As succeeding rounds went by Nelson maintained his edge but received added competitive pressures from Ray Downs and Joe Martin along with Max Bettancourt, Sandro Padilla, Luis Castaneda, and Angel Taboada as the groups from Puebla and Monterey began to score.

Early receiver troubles caused Beto Esteves to lose his blue Interceptor into a chicken house costing him three chickens as well as his R/C bird! Only two other major losses occurred during the meet where 115 official flights were logged. The FAI patterns eliminations ended with Nelson, Prat, Beason, Elizondo, and Feiner qualifying for the 5 man pattern fly-off.

During the finals Nelson lost ground while getting acquainted with an alternate airplane since his new Cherokee had come out second best in tangling with a road boundary post on an earlier flight by Joe Martin. Beason took the lead at this point with Prat close behind, followed by Feiner and Elizondo. Scores were close as the set of five judges scored tight on these final rounds. As it developed, first through fourth place finally hinged on Feiner's flight in the last round. He was fourth up and all eyes watched as he gave his needle valve a last adjustment and taxied out into a smooth take-off and flat pattern. Tension mounted as the touch and go came up and a smooth approach was made

lexico, situated in the historic capital city.



Upper Lt: Salo Feiner makes engine fuel adjustment on last round. Mill quit on T & G, cost Salo 2nd or 3rd place. Left: Rafael Padilla's Beachcomber has slot racer motor driven fuel pump to load tank. Above: Puebla Aeromodeling club was represented by large contingent. Below Lt: Paco Gallegos, AMRC secretary, shows proper propo form during 2nd round. Paco, with wife Elsa, hosted fiesta. Below Rt: Enrique Velasco's Taurus used Enya 60, Orbit Analog, Zeus fuselage.

and a soft touch down was executed. Then, as Salo gave a throttle command the engine coughed dead! Too rich on that fatal last setting, Salo admitted later as he settled for fourth place.

Larry Beason was last to fly and since he had undisputed first place flew a free-form demonstration flight that had the added plus and inspiration that comes from being motivated with a well earned win. The flight brought an ovation from the admiring spectators and flyers as Larry zoomed the Sultan into a 10 second deck level pitch-out feather-light landing.

Besides the silver trophies awarded to the top three, the following flyers received RCM subscription awards: Salo Feiner, Enrique Velasco, Max Betancourt, Sandro Padilla, and Roberto Guzman.

Attending the meet was an opportunity to obtain a profile of Mexican R/C activity and it was readily evident that a larger than ever base of flying and operating ability exists among Mexican flyers. To your observer it appeared that this ability matches U. S. talent levels and that the Mexicans could therefore give challenge to flyers north of the border and to acquit themselves with honor at any time. The seriousness of Mexican R/C effort is also reflected in the growing investment and development of an R/C industry in Mexico with kitting and prefabrication as well as component manufacture being seen at increasing rates. Design and development of original aircraft was not noted however, but is something expected soon.

It was noted however that the greatest desire of RC'ers below the border is to have more U. S. flyers come and compete — not only because of the genuinely generous nature of these flyers and their families, but to make it possible to enlarge on their own flying experience and to therefore excel even more. So, to the R/C fraternity in Mexico we say, "Les damos nuestras mas calorrozas gracias por sus bondadosas y amigables hospetilidad. Traemos recurdos de su cultura y la tradicion historica de su paiz. Asta lluego, Amigos, que todo sus vuellos sean libre de corida de motor con mistura lenta!"

Upper Lt: Finalists line up for first round of pattern fly-off. L to R: Beason, Feiner, Nelson, Prat, and Elizondo. Above: Gatson Mathelin readies ST .23 powered Mambo Special for lunch period demonstration. Left: Evenings were busy, too. Highlight of entertainment was full-fledged fiesta at home of Elsa and Paco Gallegos. Traditional Mexican hospitality and food abounded at this and other parties during Easter Week Holiday. Below: Abrasos were in order for the winners — a quaint Mexican custom! Major Larry Beason and Senora Martha Guzman admire the 1st place silver urn. Feliciano Prat received congratulations and a silver flower bowl from Senora Carmen Elizondo for 2nd place win. Dr. Alex Elizondo gets the traditional hug from Senora Prat along with a silver bud vase for 3rd honors.

Above Lt: Dr. Alex Elizondo, congenial co-host, and his well finished 3rd place Taurus. Merco 61 and Orbit 7-14. Above Rt: Guitarist Arechiga entertained between rounds on final day. An outstanding musician, he also performed at the Saturday night dinner at home of Beto Esteves. Below: Bob Guzman and daughter Martha with 9th place Sultan. Bob is 1966 President of Mexico City RC Association. Lower: Monterrey, another RC center, had an avid group at Nats. Leading scorer was Angel Taboada on the left with his Citation. Right: U. S. Visitor to RC Nat's pauses at University of Mexico statue of past president, Miguel Aleman. Viva Mexico!

R/C MODELER

TECHNICAL FEATURE

PROPORTIONAL BRAKE CONTROL

BY COL. HANK WALKER

THIS brake control unit was designed to obtain proportional and linear braking action from the new electric brakes which have recently been introduced. It was designed by Charles Call of the Austin R/C Association with PC board design and Digimite flight tests by Hank Walker. Al Jekel provided the testing for the Orbit 7-14.

The control is obtained from an auxiliary channel of a digital proportional transmitter. When constructed on the printed circuit board shown, the unit fits in a plastic box measuring 1" x 1" x ¾". By using Tantalum electrolytic capacitors, which are smaller but more expensive, the unit fits a box 1" x 1" x ⅝". Total cost of the electronic parts is $6.45 for the Bonner Digimite and $5.95 for the Orbit 7-14. In addition to providing brake control, this unit may also be used to control other devices, even though proportional control is not necessary. The elimination of one resistor (R7) gives non-linear action to permit the device to function as an on-off switch. Due to its low cost and simplicity, it provides an ideal method for obtaining control for lights, bomb and parachute dropping mechanisms, and other similar devices from an auxiliary channel.

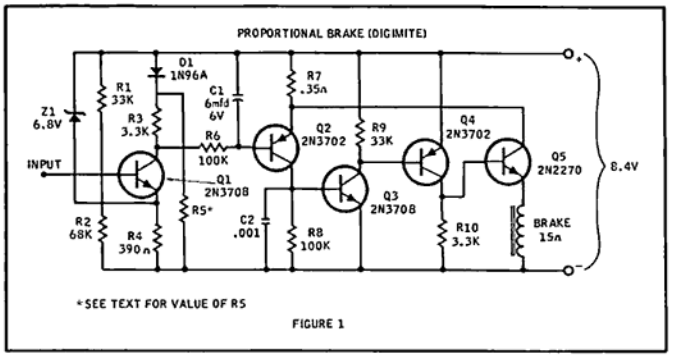


FIGURE 1

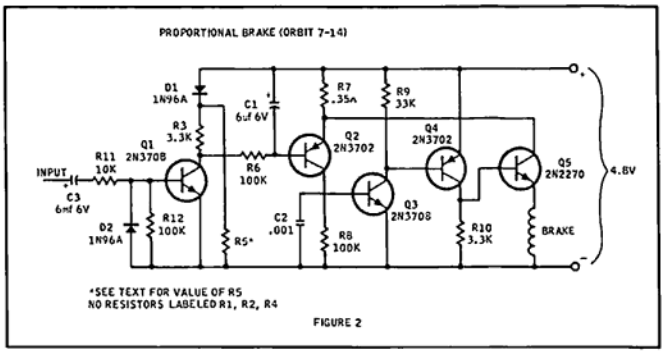


FIGURE 2

The control unit draws only 2-3 milliamperes at idle. It uses the receiver power supply, precluding the requirement for additional batteries. The added drain during normal operation is so small that it does not appreciably reduce the receiver "switch-on" time. The most obvious advantage of this brake control over using a micro-switch actuated by a servo is that the brake is not turned on in flight during maneuvers requiring use of that servo, hence no unnecessary brake current is drawn. In addition, the control is proportional and the voltage applied to the brake is linear, as opposed to the full-on or full-off control obtained with the conventional switching arrangement. It does not interact with other functions and may be used simultaneously with all other controls. The unit is simple and straightforward, using inexpensive components available from a single source. It has no critical adjustments and is temperature stable to above 130 degrees F. It can be used to power a single brake or two brakes simultaneously. It is "fail-safe" in that, when the transmitter is off, the brakes are automatically released, so no unnecessary current is drawn.

Although most of the testing has been done with the WAG electric brake and a Bonner Digimite system, the control has also been modified for the Orbit 7-14 and proved equally successful. It has been used with the Digimite to control a single brake and to control two brakes in series with no modifications to the circuit. It is capable of varying the voltage from 0 to 7 volts in either configuration. It has completed several hundred flights with no trouble whatever. Similarly, with the Orbit, which has only 4.8 volts available, the unit has been used in both the single and two-brake configuration. With a single brake control, 0 to 4 volts is available and with two brakes, 0 to 3.7 volts per brake is available. With the Orbit system it may be necessary to reduce the value of resistor R7 when using two brakes in parallel in order to obtain maximum braking voltage. (See Operation and Adjustment). Testing with the Orbit has been limited, but no difficulties have been encountered.

In addition to the tests mentioned above, the unit has been used to power a small electric motor for a bomb drop mechanism and, similarly, has been used to control lights for night flying.

Since, at the time of this writing, no other electric brakes were available, the tests have been restricted to the Ace WAG units. However, the control can handle any load with a DC resistance of 15 ohms or higher on the Bonner, and any load with a DC resistance of 7 ohms or higher on the Orbit 7-14. Lower DC resistance loads can be handled if a suitable dropping resistor is used in series.

The basic circuit is adaptable to other digital proportional units on the market by making appropriate changes in the input circuit. No other such units were available for testing, however.

Theory Of Operation

The following applies specifically to the Digimite. The principle of operation for the Orbit unit is similar. There is a difference in the signal supplied by the receiver in these two units, necessitating a different input circuit. The remainder of the amplifier is the same for both units. In addition, the Digimite uses an 8.4 volt power supply while the Orbit uses 4.8 volts. All voltage references and formulae apply to the Digimite.

The brake control circuit is basically a stabilized DC amplifier. (See Fig. 1 and 2.) Q1 amplifies and inverts the incoming pulse signal from the receiver. The output of Q1 is then coupled through R6 to the base of Q2 which is the first stage of a four stage direct coupled DC amplifier consisting of Q2 through Q5. The capacitor C1, across the plus 8.4 volt supply and the base of Q2, is a pulse width averaging, or integrating, capacitor. The average (or DC) voltage from the output of Q1 appears across C1 and is amplified to provide brake drive voltage.

The output from the receiver serves to clamp the base of Q1 such that this transistor is turned off during the frame rate except when the auxiliary channel pulse is present to operate the brake. While Q1 is turned off, its collector voltage is equal to the supply voltage minus the forward voltage drop across D1 (approximately 8.0 volts). During the auxiliary pulse, the base is released and Q1 turns on for 1.1 MS to 2.3 MS, depending on the position of the transmitter control. The collector of Q1 is released by the receiver control circuitry. The lower voltage swing is maintained constant and independent of the supply voltage due to the action of the Zener diode Z1. The DC voltage which appears across C1 is dependent upon the pulse width as given by the following formula:

$$V_{C1} = \frac{\text{Pulse width (ms)} \times 6.7 \text{ volts}}{\text{Frame width (ms)}}$$

For a pulse width of 1.1 ms:

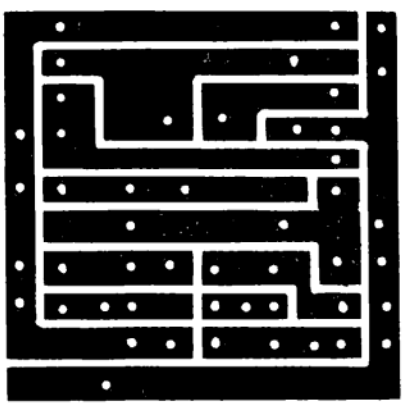
$$V_{C1} = \frac{1.1 \times 6.7}{35} = 210 \text{ mv.}$$

For a pulse width of 2.3 ms:

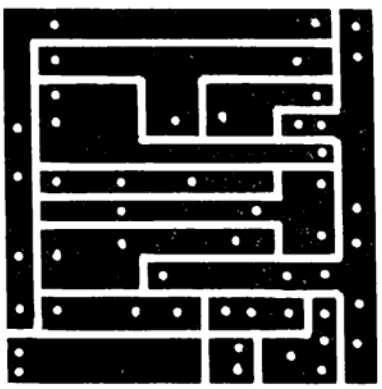
$$V_{C1} = \frac{2.3 \times 6.7}{35} = 440 \text{ mv.}$$

Thus, the total DC signal input to

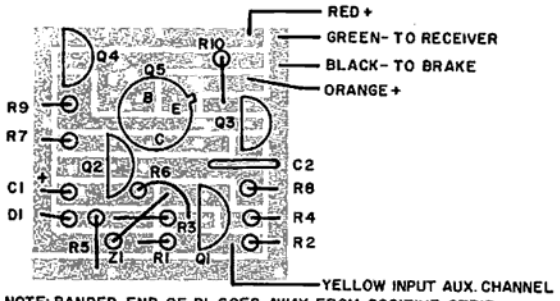
Twice actual size printed circuit board for Bonner Digimite proportional brake.



Twice actual size printed circuit board for Orbit 7-14 proportional brake.



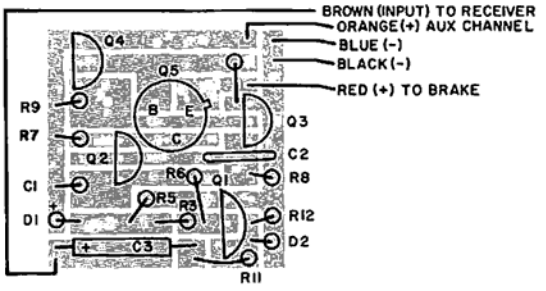
PROPORTIONAL BRAKE (DIGIMITE)
PRINTED CIRCUIT BOARD AND COMPONENT LOCATION



NOTE: BANDED END OF D1 GOES AWAY FROM POSITIVE STRIP
BANDED END OF Z1 GOES TOWARD POSITIVE STRIP

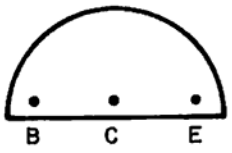
FIGURE 3

PROPORTIONAL BRAKE (ORBIT 7-14)
PRINTED CIRCUIT BOARD AND COMPONENT LOCATION

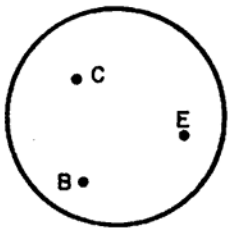


NOTE: BANDED END OF D1 GOES AWAY FROM POSITIVE STRIP
BANDED END OF D2 GOES AWAY FROM NEGATIVE STRIP
THERE ARE NO RESISTORS LABELED R1, R2 OR R4.

FIGURE 4



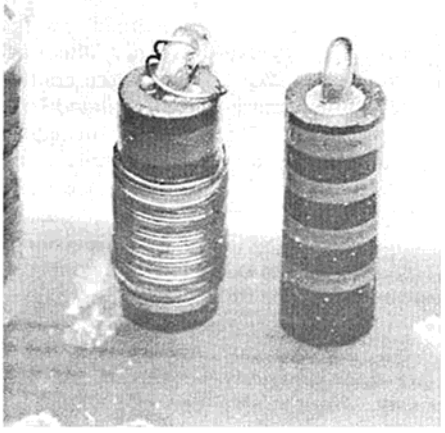
2N3702
2N3708



2N2270

BOTTOM VIEW

FIGURE 5



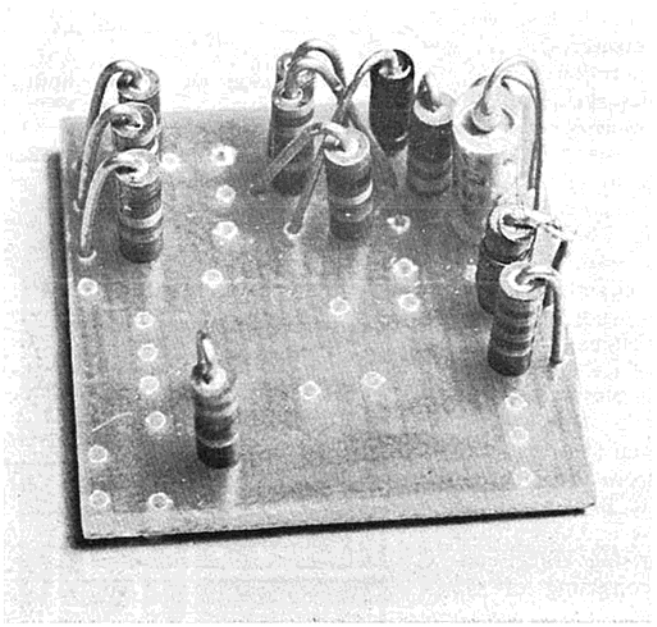
Close up of winding on R7.

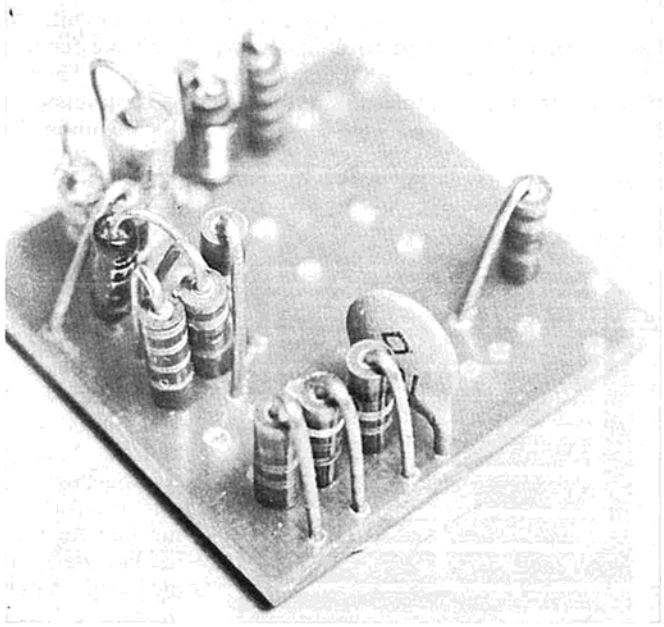
Q2's base varies from 210 mv at full off to 440 mv at full on.

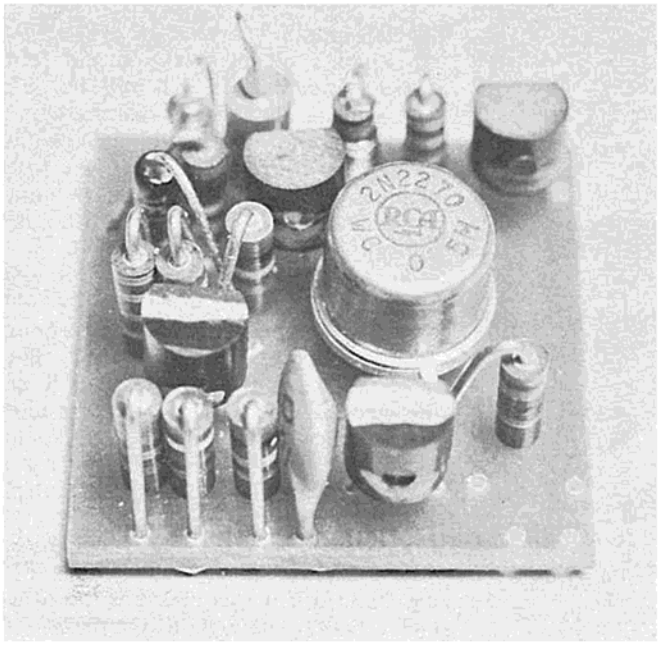
The signal voltage is then amplified by Q2, Q3, Q4, and Q5 to provide a 0 to 7 volt output voltage which is applied to the brake. The amplifier gain is made linear and stable by negative voltage feedback across resistor R7.

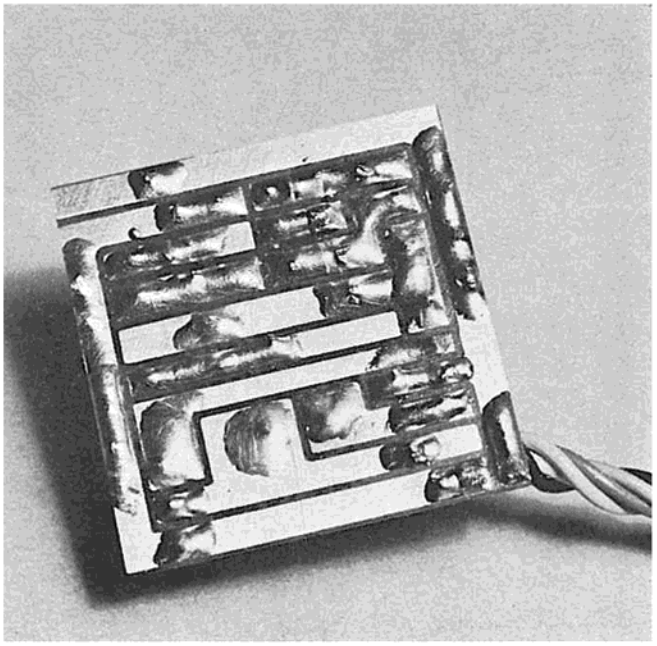
Construction

The prototypes were photo-etched on glass-epoxy printed circuit board. The full scale printed circuit layout is shown in Figure 3 for the Digimite and Figure 4 for the Orbit. The board is small, but the lands are wide enough so that the soldering job is not too tedious. A superior method of preparing the printed circuit board is to trace the diagram directly onto a small piece of window glass with India ink. This glass is used as a negative (ink side toward board) to expose photo-sensitive board. Be sure to include the dots for component location to make centerpunching the copper unnecessary. This method of board preparation was suggested by Al Jekel, and the procedure results in a quick,









simple, and professional piece of work. Other methods of preparing the board may be used. Of course, the printed circuit board may be scaled up to any size desired if the builder does not require the unit to be the small size shown. A #67 drill is preferable for drilling the holes for component mounting, but a #60 may be used. When mounting the components on the board, install the transistors last. This will prevent possible damage from repeated applications of heat during soldering and will also permit slight shifting of their position in order that all components fit. Do not install resistor R5 until the procedure outlined under Operation and Adjustment is completed. Observe polarities of the diodes and electrolytic capacitors. These are indicated in Figures 3 and 4. When constructing the Digimite board install Zener diode Z1 before mounting resistor R3. The lead of Z1 should pass under the lead of R3. All diodes are glass encased and somewhat fragile. Use care to prevent breakage while installing them. All the small transistors are mounted with the flat side to the left when the board is viewed as in Figures 3 and 4 (Emitter toward top). See Figure 5 for transistor lead identification. Figures 3 and 4 indicate the location of the leads for Q5.

Use a small soldering iron with a pointed or small chisel tip and apply heat only long enough to obtain a good bond and drive the flux from the solder. Remove the iron by rapidly sliding it up the lead of the component being soldered. A proper solder joint should be shiny and should completely surround the lead of the component.

After all components except R5 are installed, recheck for wiring errors. Then clean the bottom of the board with

(*Continued on page* **43**)

PARTS LIST

Ref. Designator	Description	Manuf. & Part No.
*R1	33K	
*R2	68K	
R3	3.3K	
*R4	390 Ohms	
R5	See instructions	
R6	100K	
R7	See below	
R8	100K	
R9	33K	
R10	3.3K	
**R11	10K	
**R12	100K	
(All resistors are carbon ¼ watt, 10%)		
C1	6 Mfd. 6V	
C2	.001 Mfd. 1000V	Sprague 5HK-D10
**C3	6 Mfd. 6V	Sprague TE 1085
D1	Germanium Diode 1N96A	
**D2	Germanium Diode 1N96A	
*Z1	Zener Diode, Silicon 6.8V 1N957A	International Rectifier
Q1	2N3708	Texas Instruments
Q2	2N3702	" "
Q3	2N3708	" "
Q4	2N3702	" "
Q5	2N2270	RCA
	Plastic Box	Ace R/C #21K1 PB#1A

R7 Wind 9 inches of #38 copper wire around a ¼ watt resistor with a value of 10 ohms or more. Solder the wire to the resistor leads at each end. Do not use a large size of copper wire with more turns as this may induce instability into the circuit.

** Indicates part is for Orbit 7-14 only
* Indicates part is for Bonner Digimite only

R/C MODELER

TECHNICAL FEATURE

DIGITRIO DASH-FOUR

Part I of modifying the RCM DIGITRIO To Four Channel Operation

By ED THOMPSON, RCM TECHNICAL EDITOR

THIS month I have been able to do quite a bit of work on the four channel modification and will be able to complete the articles within about two or three weeks from the date of this writing. A brief discussion of the four channel version may help relieve some of the anxiety for those of you who are patiently waiting.

First of all, these modifications will allow present Digitrio owners to add another channel without performing "major surgery" on their units. The largest and most tedious task will be the mechanical changes to the transmitter in order to provide the additional control function. With this month's article we have included a three-control stick designed by Warren Thomas and Jim Holman of Jonesboro, Arkansas. This stick can be used with your existing Digitrio if it was built per the original article. Although this unit is not the easiest stick to duplicate, it does a good job. Warren and Jim built the prototype on the kitchen table with a minimum of assistance from the machine shop. I have logged well over a hundred flights with this stick, as presented here, and am convinced that a three control stick is the answer to improved flying over the more conventional two-stick arrangement. This is not to imply that you will be able to fly circles around Cliff Weirick simply because you have a three control stick, or that the three control stick is even superior to a two-stick transmitter. This, of course, depends on the individual. But — if you are an average flyer, like myself, you will note an immediate improvement in your flying abilities with the added confidence this type of contol unit affords.

On the other side of the ledger, the three-control stick has been played down by certain flyers with the implication that coordination of the various motions required are physically impossible to accomplish with any degree of proficiency. This is simply not true, and if you haven't tried it — do so! I think a better reason for the lack of popularity of this method of control are as follows:

1. Manufacturers have not come up with a good CLOSED FACE three control stick and the two stick arrangement is better for them from both a production and cost basis.

2. The average flier has not flown a digital system with a three control stick and has no basis of comparison. They are used to BOUNCING a stick from stop to stop and are prejudiced.

3. A lot of fliers are impressed more with the looks of a transmitter than how it operates. They simply can't live with a gaping hole in the front of their LITTLE JEWEL.

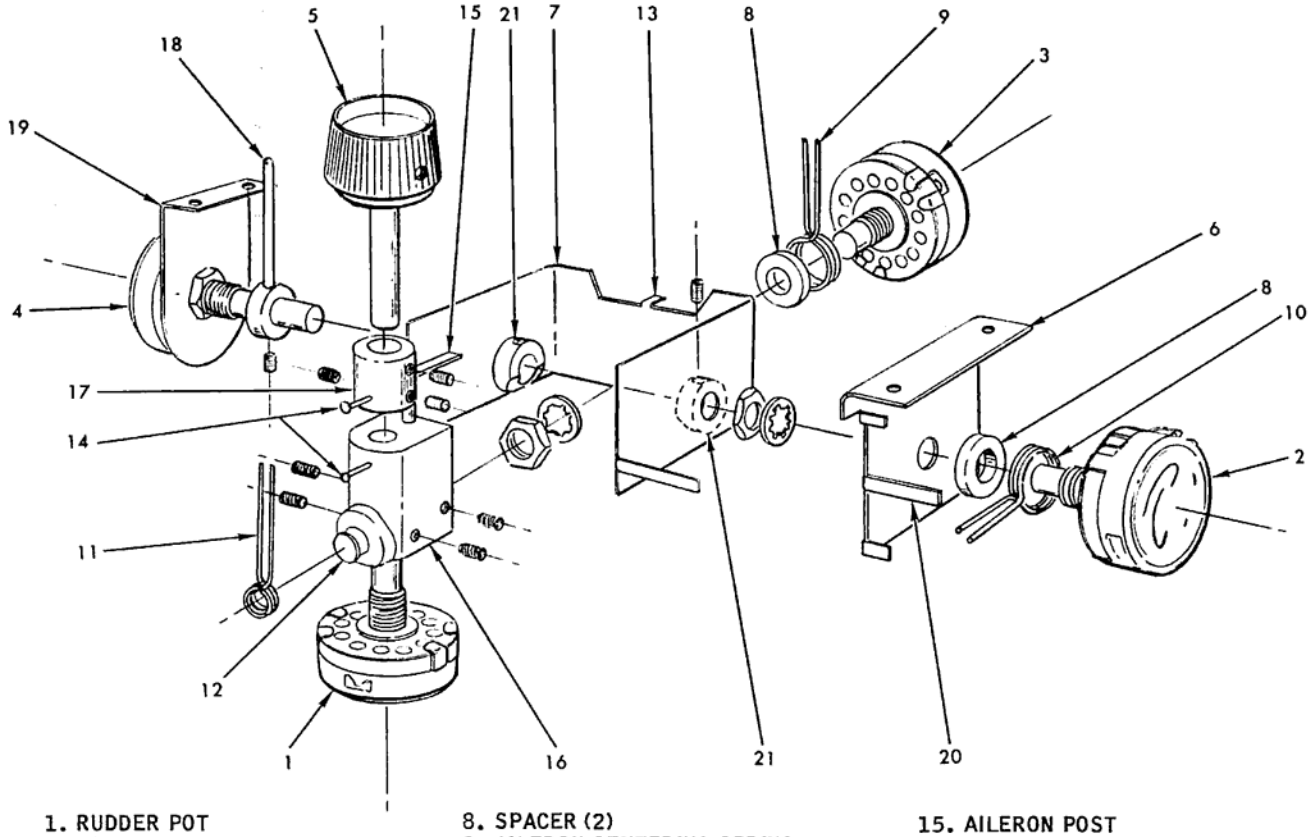
I will make the prediction that, if and when a good commercial, closed-face three-control stick is made available to the R/C modeling public, it will be

warmly accepted and gain widespread acceptance.

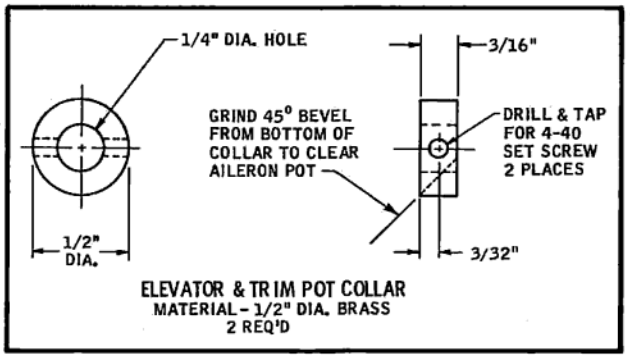
There are two Bonner stick versions of the RCM Digitrio-4. On one version, a single Bonner stick is used with the addition of a pot with a spring centering lever control for rudder added just below the meter. The two stick deluxe version, shown with this article, utilizes two Bonner sticks and conforms to the currently accepted transmitter layout.

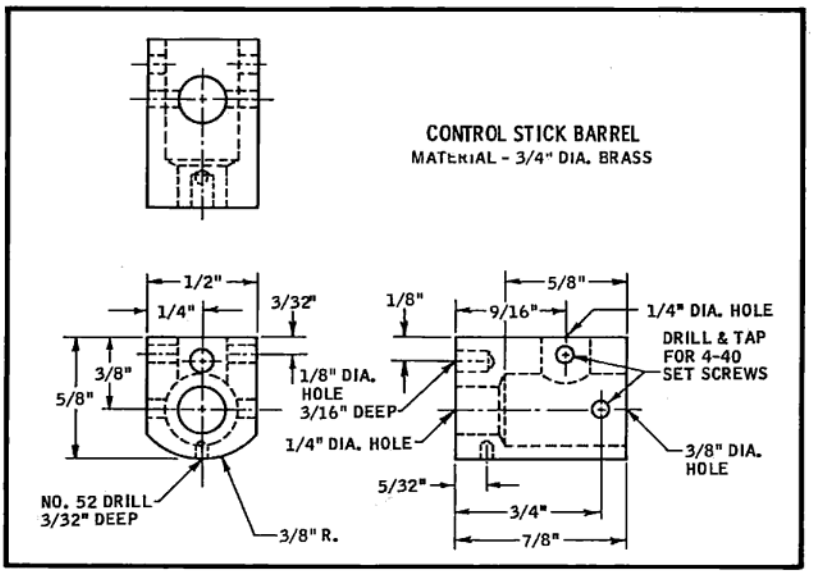
The electronic changes to the transmitter are simple, requiring an auxiliary board containing two more one-shots. After the modification you will use five pulses to obtain four channels. The reason for the **extra** pulse will be apparent after you read about the new decoder. There will be a minor change to the unijunction circuit, eliminating this stage as a control function. It will be retained only as a "clock." I don't particularly like that term — it tends to exaggerate its lowly function of providing a sync pause, and is one of several terms bantered about in advertisements to make products sound like a cross between a Gemini control system and an electronic brain that has been blessed with Holy Water.

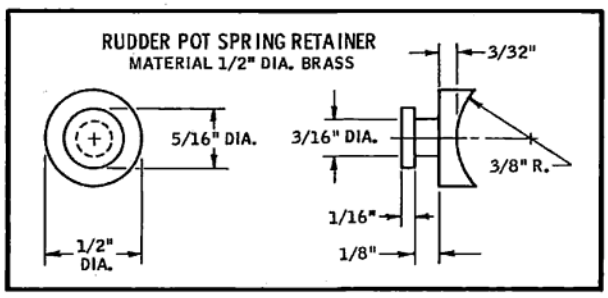
EXPLODED VIEW - COMPLETE DIGITRIO 4 STICK

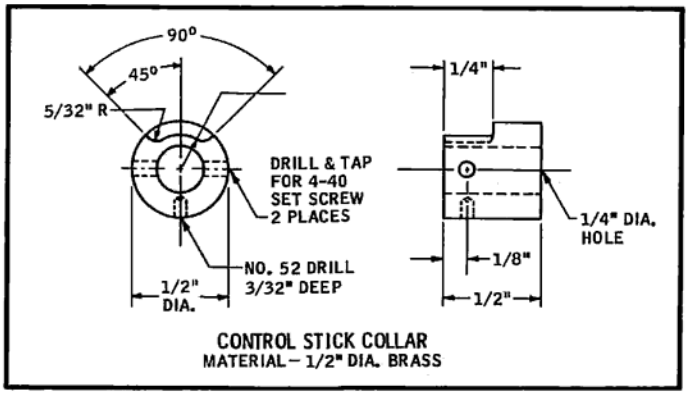


1. RUDDER POT
2. ELEVATOR POT
3. AILERON POT
4. ELEVATOR TRIM POT
5. CONTROL STICK
6. PART "A"
7. MAIN "U" FRAME
8. SPACER (2)
9. AILERON CENTERING SPRING
10. ELEVATOR CENTERING SPRING
11. RUDDER CENTERING SPRING
12. RUDDER SPRING RETAINER
13. AILERON CENTERING STOP
14. RUDDER POST (2)
15. AILERON POST
16. CONTROL STICK BARREL
17. CONTROL STICK COLLAR
18. TRIM POT LEVER
19. TRIM POT BRACKET
20. ELEVATOR CENTERING STOP
21. COLLAR (2) NOTE: COLLARS ARE SOLDERED TO MAIN "U" FRAME







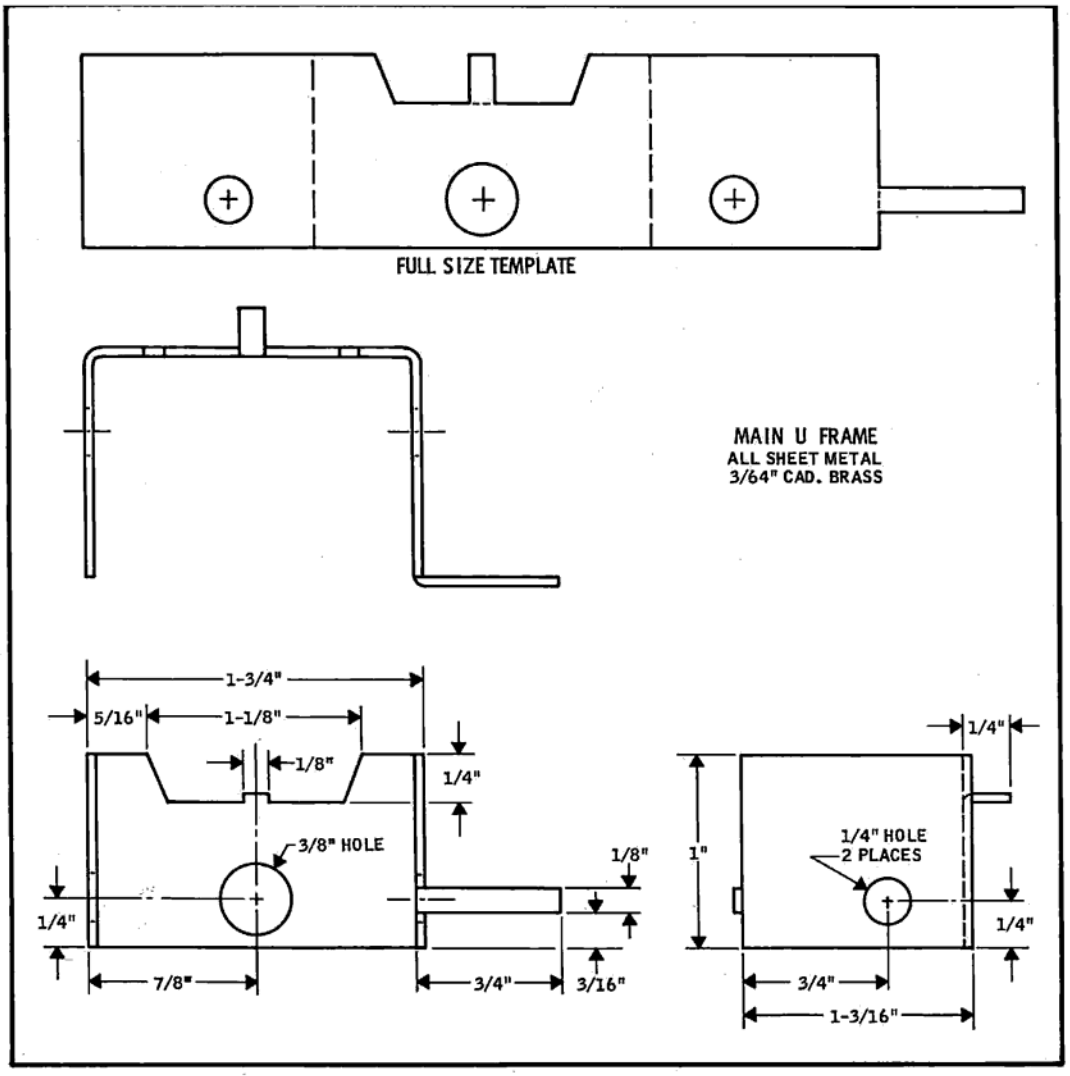


The decoder will be entirely new, and as stated before, will use silicon controlled switches. This will not be a "breakthrough" (another one of those terms I abhor), but what I consider to be a common sense usage of these so-called **new** devices. I say "so-called" new devices because they have been around for some time. This decoder is basically the same as I first used in 1960. At that time I used 3C30's (trigistor) which were anything but inexpensive! Recently, General Electric introduced a low-cost line of these devices, making their use practical. I am using the 3N84 in my decoder, and it might be a good idea to round up four of these before the supply dwindles. The only hobby distributor handling these units at the present time is World Engines. Allied Radio should have them, and any electronic parts distributor should be able to obtain them for you if they want your low-volume business.

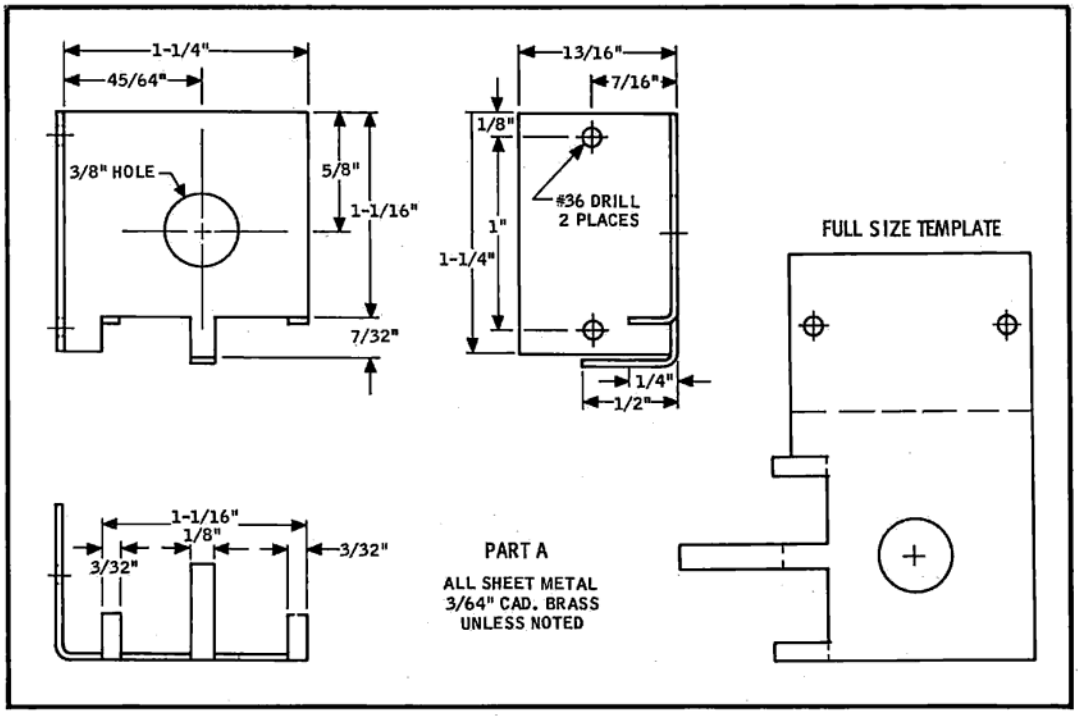
And — before the letters start rolling in about how I sold you out by not extending the present decoding method used on the original Digitrio, let me get **my** licks in. There are many reasons for going to the SCS's. As I said before, I have used this system before, and the only reason I didn't use it on the original Digitrio was because I wasn't aware of a low-cost SCS. The SCS decoder is superior to the original method and this should be enough reason for you not to fret. If you are harboring fears about wasted expense of the present decoder — forget them. Most of the parts on the present decoder can be used for the modification — it was planned this way. Let me say at this point, however, that I don't recomend that the unexperienced Einstein with a 250-watt instant heat soldering gun try it! Care should be taken when parts are transferred from one PC board to another unless you are proficient at salvaging parts or have a local technician handy.

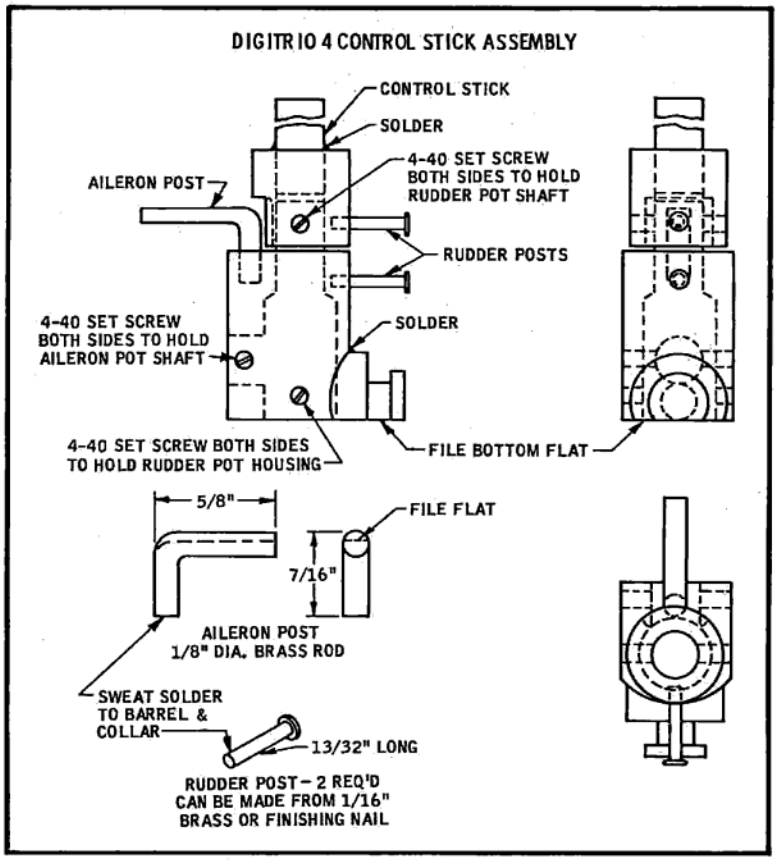
To start with, the new decoder is usable with as many channels as you wish to use with only minor considerations. In other words, it is easily expandable and can be used with one channel, or as many as you can find a use for. It will require one SCS per channel and all channels are operated in series. This eliminates complicated circuit inter-connections, timing circuits, gates, etc. So far, in addition to the four channel versions of this decoder that are currently flying, there are several five, six, and two eight-channel versions performing flawlessly. In order to obtain independence from timing problems, no one-shots are used in the new decoder, or any other type of circuit that is self-completing, except the method of sync, which is more of a passive type and completely non-critical, within reason. This is also why five pulses are used instead of four to obtain four channels. Instead of a one-shot sampling the sync pause for the additional channel, we will turn off the last stage with a pulse from the transmitter. Therefore, the decoder is commanded from the transmitter for all channels, rather than the decoder deciding the length of the additional channel pulse. This will come as a pleasant change to some of you who might be cussing the motor control on the original Digitrio. Also, since no requirements for timing are demanded of the decoder, there is no point where the servos will chatter to warn you of battery discharge. The new decoder will operate smoothly until the batteries are discharged down to their end point voltage and beyond! This increases the flying time per charge on the receiver pack considerably, and it seems as though they will never run down. So, "beware, lest these sintered-plate monsters do you in."

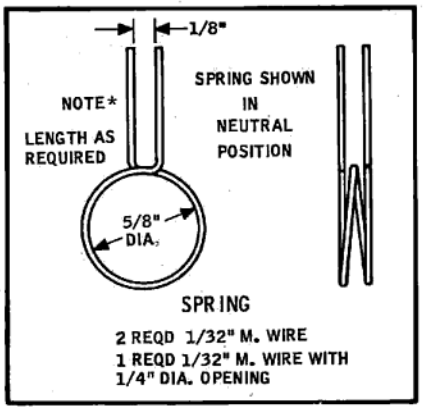
All-in-all, the new decoder is a superior design as compared to the original. It is also a better decoder when used for three channels. Before I am bombarded with letters from all the prophets possessing mystic powers of hindsight, let me say that I consider it as a normal improvement in circuitry that evolves from testing, evaluation, and plain ole' hard work! I don't care to hear all the, "I knew there was a better way" and associated cliches from the latter-day digital experts! If I sound bitter this month, it's because I am! I remember the time that I couldn't find anyone to discuss digital R/C circuits with, but since the Digitrio was introduced I find that some people have be-



ALL STICK PARTS SHOWN FULL SIZE

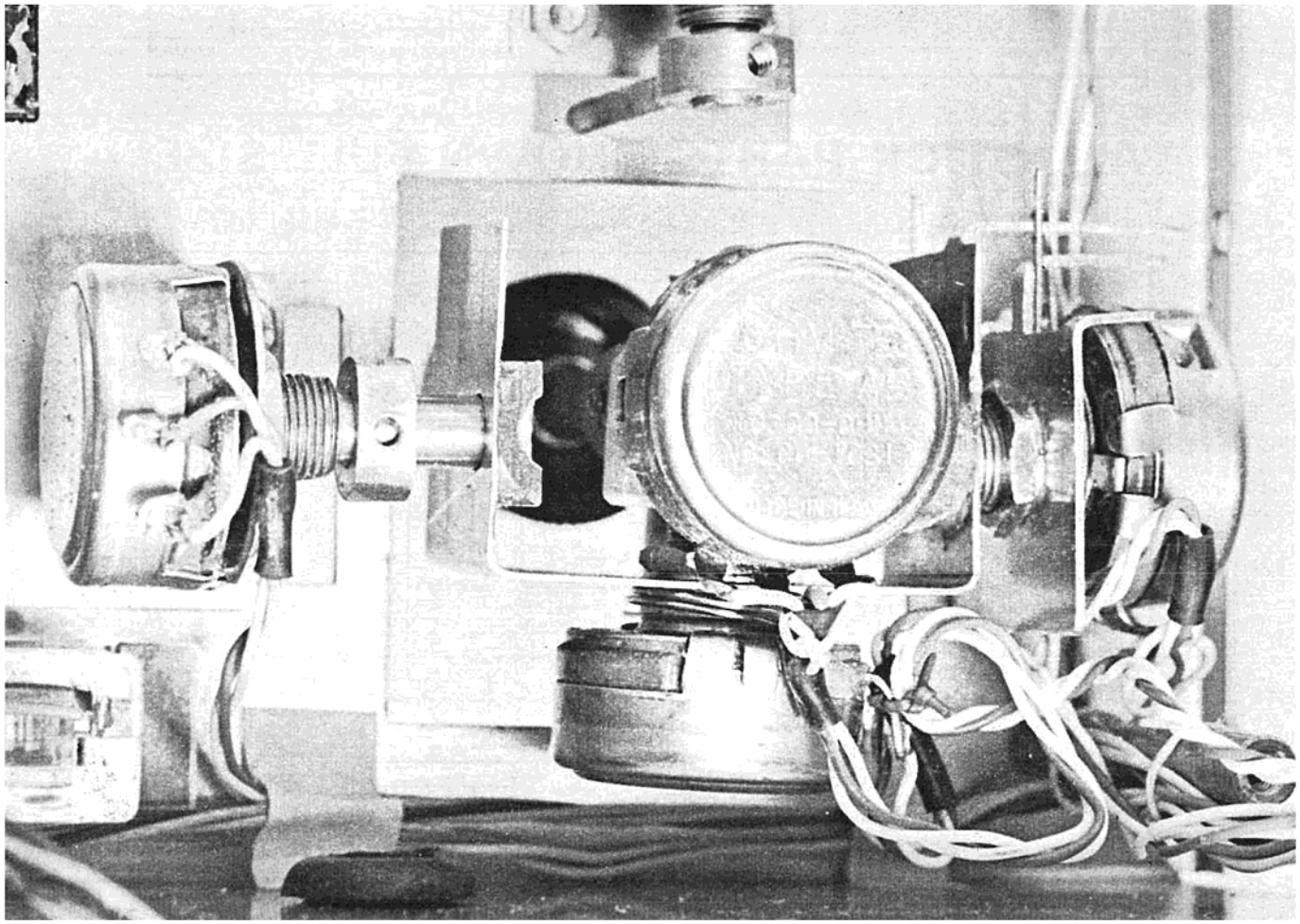






come experts overnight and feel that they can modify my circuitry to their own liking and still hold me responsible for the results. As long as their modifications work the system takes on a new name and a magical air of detachment from the Digitrio. Of course when it doesn't work it is simply a lowly Digitrio. All I can say to this is (and I've said it before) if you want to modify, don't call it a Digitrio — give it a new name like the MICKEY MOUSE-ITRIO. This is not to imply that improvements cannot be made to the Digi-

(Continued on Page 41)



(*Continued from Page* **40**)

trio — far from it! We encourage originality and hope that we have aroused the experimentors to come up with newer and better systems.

Digital systems are now at the point where they are becoming simpler, both in concept and parts count, than their predecessor ANALOG. They are, in fact, becoming simpler than the MICKEY MOUSE systems that wiggle and wag (except the servos). This, plus the fact that reliability has increased to what we had been accustomed to previously, is going to change a lot of design concepts and the R/C modeler as a whole is going to benefit. R/C radio equipment is starting to emerge from the hold that a certain few had on its advancement. This is due to several things. Number one — I think — is that the R/C modeler of today is not as easy to satisfy as he used to be. He demands higher quality and is fed up with being treated with disregard and having to make do with what is on hand. In the past this was the modelers own fault. Let's take a clear look at why digital came into being. It wasn't because the R/C modelers as a whole demanded a better system, it was simply because a handful of people worked like hell to come up with a better method of control. These same people sunk a lot of money into its development not knowing whether it would pay off or not. Fortunately it was a winner. As a result, a lot of manufacturers jumped on the band wagon. Then, and only then, did you, the modelers, start demanding better reliability of this new system. Right now you have the manufacturers trying to outdo each other for your dollar. Don't lose this advantage by becoming complacent again. Demand even better systems at reduced prices. Tell them what you want and I'll guarantee they will like it. When they can find out ways to please you and give you what you want it puts smiles on their faces and dollars in their pockets.

Now, for the first phase in converting the Digitrio to a Digitrio-4, Jim Holman and Warren Thomas describe their Digitrio experiences and three-control stick fabrication as follows:

"Hey! Did you hear that? Well, if you didn't, it was two fellows in Arkansas yelling shouts of joy at making two discoveries — one a long time ago when RCM magazine was first published, and the other when we were introduced to Ed Thompson and a thing called the Digitrio.

"Digitrio . . . this name was to be in our minds from September 1965 to March 1966, and you know, I don't think now it will ever be off our minds. Here is how it all started.

"Everyone around here was flying reeds — and there's a lot to be said for reeds — but if you haven't flown proportional . . . well, you ain't never flown! So one day my hand was lucky enough to get hold of the only proportional stick in Jonesboro, and a desire was nailed in my mind right then! I had to have a propo system somehow! Jim Holman was already nailed, so I sold my reeds, hocked my wife and kids, and sold the truck! Boy! They nearly sheared the sneeze pin right out of the mud valve! (Tech. Ed's Note: Boy, they sure talk funny 'down in the sticks!') But, before I had a chance to order the monster, the telephone rang. It was my close friend, Jim Holman, and he said — 'Warren, let's build a Digitrio!'

"I said, 'A Digit-what?' I was sure the kickapoo juice had him, but what **had** gotten to him was his copy of RCM.

"Well, you and several thousand other fellows know what ensued. I blasted out to the nearest mag stand, plunked down 50¢ and began looking for an article on a Digi-what! I found it. After several days of wondering whether Ed Thompson knew what he was talking about, and whether we had enough gray matter to build it, off went an order to World Engines.

"World Engines . . . there is another bunch of wonderful people who handle and make it possible for the American model hobbyist to secure just about everything from all four corners of the world. Well, to make a long story short, on a month-to-month basis we constructed the Digitrio while all the skeptics stood around and murmured soft remarks of skepticism every weekend. Every month when a new little pack of black-eyed peas with wires sticking out of them would arrive, we (Jim and I) energetically began the construction of one more digit. Finally, the systems were constructed, and I might add, with ease because of Ed's simple step-by-step method of construction.

"The only thing which gave me any trouble was those damn diodes. Finding anyone who knew how to determine polarity of a diode was murder — all local Einsteins gave us a different answer. Jim and I are not exactly electronic experts so you can see where this left us.

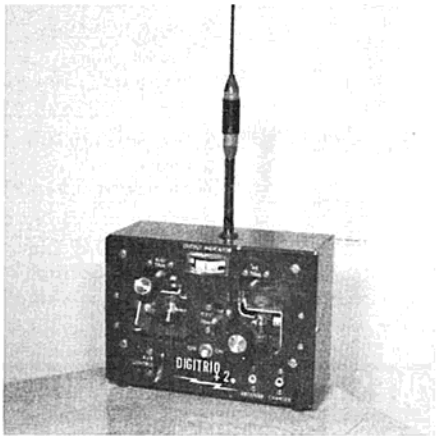
"We had never met Ed Thompson, but we decided now was the time to meet! So we picked up the phone and called him. We still have not formally **met** him, but we feel that we have made another good friend in the R/C world!

"Well, the systems were ready, nicads up, and naturally, rain, sleet, and snow. You name it, we had it! But with Jim Holman, a muddy runway and near gale winds don't mean a thing! So, naturally, a test flight was about to occur. With his engine firewalled, down the runway went the Falcon 56 with a completely new system! Jim flew it magnificently, topping it off with a beautiful landing even though his tiger stopped at 100 feet on a downwind turn. The next flight proved that proportional motor control was to keep Jim on the runway and out of the bean field — an experience that, up to now, we had not enjoyed.

"The weather finally let up on the following Tuesday and the phone rang. You guessed it — Jim, saying 'Let's go digit.' That was for me, so my test flight was to occur . . . and after nearly seven months without flying, I had some apprehensions as to whether I could even find the motor control! But my own system was 'go,' and in another few minutes, we were to see another Digitrio perform flawlessly. Well, Ed — you really did it, and as per your instructions concerning epoxying the components in the receiver and servos — well, came home and epoxied my transmitter! It, by far, took more shaking than the airborne components. We have now turned the skeptics into jello, and we are hearing from one, then another, this phrase — 'Boy, I have to build one of those!' Digitrios, that is!

"We hope you have enjoyed listening to our gab, which brings us to why we are gabbing in the first place. The Digitrio is going dash-four, and Ed threw a challenge at Jim and me concerning a stick assembly that would fit the present case opening. Ed didn't know what he had started, and neither did we when we said, 'Sure, Ed — we'll design one for you!'

5-channel by Don Graves, Pittsfield, Mass.



"Plenty of midnight oil was burned over one idea, then another. Finally Jim picked up a small piece of brass and said — 'What would you say if I said we had the whole thing right here?'

"We had been kicking the idea around, but I thought Jim had a diode in series with his horse and buggy! But

(*Continued on Page* **42**)

RCM DIGITRIO

(*Continued from Page* **41**)

as the night wore on, and the sun finally came up, we saw the idea jell until we could finally get the entire assembly in the Digitrio's 1 15/16" case opening.

"Before we begin, let's say a word or three about the construction of the stick. Nothing about it is very complicated. The prototype was constructed on a kitchen table with drill, razor saw, hand tools, and minor machine shop help. One item of concern is the rudder barrel. Your rudder pot is housed in it, and to insure freedom of the rudder pot shaft, some minor polishing and adjustments are necessary, but it won't present any difficulty. (Tech. Editor Note: Here is where the local machine shop will come in handy.) Take care not to tighten the set screws on the rudder pot too tightly. Care must also be taken to insure that all holes for pots and bearings are in line with all their respective centering posts, or your stick will be slightly off center in the transmitter case. (Tech Editor Note: Actually the rudder control shaft will be slightly below center due to the barrel design.) If you have a Digitrio now, you are already on the road, for part "A" of original Digitrio stick (stationary pot mount and elevator centering post) is used in this stick with the exception of possibly slotting or relocating the mounting holes. Well, enough of the chatter. Brew up a pot of coffee, and let's get on with it. You fellows with Digitrios going now will have the necessary spacers and aileron and elevator springs.

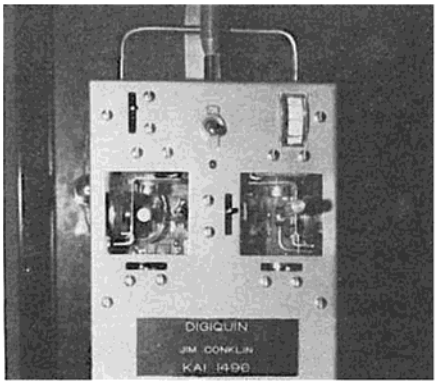
INSTRUCTIONS

( ) First make two collars 1/2" OD, 1/4" ID, 3/16" thick and drill and tap one of them for set screw as per drawing. Next make two 9/16" OD by 3/8" ID by 3/32" spacers. Now make centering springs for aileron and elevator and rudder as per drawings.

( ) Let's make the rudder barrel next. Take a piece of brass round stock 3/4" diameter and 7/8" long. Care should be taken to square the ends in relation to the sides. Scribe a line exactly through the center of one end. Measure in 1/4" and center-punch on the center line. Drill a pilot hole 1/8" diameter completely through the block. (NOTE: If you have a drill press or access to one, this operation is like shooting fish in a rain barrel. Otherwise, care should be taken to keep the holes straight.) Next, drill with 3/8" drill to within 3/8" of other end (Approx.). Next, continue this hole with 1/4" drill. Using the scribed center line as a guide, flat the sides parallel to the line equally to a total width of 9/16". Flat the top side furthest from the center hole until it becomes square with the two sides. You should end up with a total of 1/2" flat surface on each side.

( ) Now let's locate the aileron pot shaft hole. Do this by scribing a center line full length down the top of the rudder barrel. (NOTE: See drawing defining top, bottom, sides, etc., of rudder barrel.) Starting at back of rudder barrel (end with 3/8" hole), come in 5/16" and center punch on this line. Drill a 1/4" hole perpendicular to the 3/8" hole. (NOTE: This hole is only drilled through one side of the barrel — don't go all the way through.) Drill and tap for aileron shaft set screws now as per drawing. Set screws used were 4/40 by 1/8".

5-channel Digitrio by Jim Conklin of Owensboro, Kentucky.



( ) Now let's go to the front of the rudder barrel, or the end with the 1/4" hole. From the center of the 1/4" hole towards top of the rudder barrel, measure 1/4" and center punch. Drill a 1/8" hole approximately 3/16" deep. This hole is for the aileron centering post. Now let's scribe a line down the rounded portion of the rudder barrel, being careful to keep this line in center of 1/4" hole at one end and 3/8" hole at the other. Down this center line from the front (1/4" hole end) come down 5/32" and center punch, now drill a 1/16" diameter hole 3/32" deep. Don't drill into hole through center of barrel.

( ) This completes the basic rudder barrel, so lay it aside for now and let's make the other goodies. Construct the rudder spring retaining collar (this is best made on a lathe and the bottom filed flat), rudder centering post and the aileron centering post as directed in the drawing. The way we made the original aileron centering post was to take a piece of 1/8" brass welding rod, put it in the vise and heat it so we could get a good sharp bend (90 degrees). Then we filed a nice flat edge as noted so we could retain as much as possible inside the rudder centering collar. Silver braze the rudder spring retaining collar, the rudder centering post and aileron centering post on to the rudder barrel being careful to keep these in line. (Note drawings.)

( ) Next let's make the combination rudder centering collar and shaft extension as per drawing and silver braze the other rudder centering post into the collar as shown. (NOTE: Just a word of caution. The location of all the various components on the rudder barrel need to be centered for correct movement right and left.) Silver braze the 1/4" diameter rudder shaft extension to the collar — its length is up to you — 1 3/8" was used on prototype. Drill and tap the collar for the two 4-40 set screws.

( ) Lay the rudder assembly aside and pour another cup of coffee. Now let's make the main U frame. Take a piece of 3/64" sheet brass, 1" x 4 7/8", and lay out the main U frame as per drawing. (NOTE: All holes are centered 1/4" up from bottom of sheet and center of aileron hole extends through center of elevator centering tab.) Now drill two 1/4" holes and one 3/8" hole as noted on the drawing. These holes should be located and drilled as accurately as possible (this is important). Bevel the collars as shown in drawing. Next silver braze the collars (NOTE: Collars are 1/2" x 3/16" with 1/4" hole) to U frame as noted in drawing. Now fold main U frame as per drawing.

If you are starting from scratch, and do not have a Digitrio already built, drill holes in part A as per drawing — do not drill any holes in transmitter case at this time — fit the completed stick in its relative position in the transmitter case and drill the holes to correspond with holes in part A.

If you do own a Digitrio—and intend to use the original part A — you can elongate the holes in part A to allow proper positioning of the stick assembly. (It will be necessary to move part A to the right approximately 1/8".)

( ) Assemble stick as per exploded view drawing. The rudder pot is Ohmite part #CU1031 (the same as recommended in the original article). After installing this pot, cut the shaft off 9/32" from the rudder barrel. (Tech Editor's Note: Solder joints on the prototype stick were "sweated" with ordinary solder and have adequate strength.)

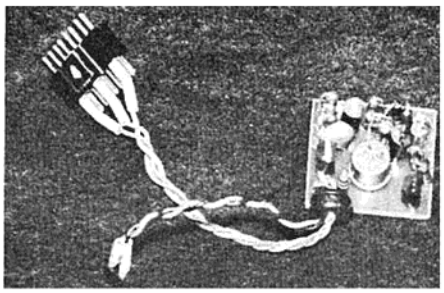
INSTALLING STICK ASSEMBLY

( ) Remove batteries completely to prevent damage and arrange transmitter for maximum accessibility. Remove old stick assembly completely and clip wires at pot terminals.

( ) Remove vertical (elevator), trim pot and clip wires at terminals.

( ) Install new 10K pot in elevator trim bracket with shaft cut to 3/4". This shaft is used as pivot for stick assembly and "burrs," etc., should be removed. (Tech Editor Note: The

(*Continued on Page* **43**)



PROPORTIONAL BRAKE

(*Continued from Page* **35**)

a suitable solvent to remove the flux. Place the input and output leads where indicated and proceed with adjustment.

Operation And Adjustment

These notes apply to the Digimite. See last paragraph of this section for Orbit adjustment. Transmitter and receiver batteries should be fully charged before making adjustments.

Connect the brake control to the receiver and brake. Install a voltmeter across brake winding. Avoid short circuits as this will result in failure of transistor Q5 as soon as the brake is actuated. In place of resistor R5 temporarily install either a resistor substitution box set at 47K, or a 100K variable resistor set at approximately 47K, or temporarily install a 47K resistor. With the receiver turned on, transmitter off, and the brake in the circuit, there should be no voltage across the brake. Set the brake control "off" (this is with the control knob rotated toward the top of the transmitter), and turn the transmitter on. There should still be no voltage across the brake. If the brake comes on partially when the transmitter is turned on, raise the value of R5 until there is no voltage. R5 is for the purpose of adjusting the "turn on" point of the brake. Decreasing R5 tends to turn the brake on sooner, while increasing R5 requires more control knob rotation to turn the brake on. This resistor is not critical and may vary from as low as 2.2K to as high as 470K. Do not lower R5 below 2.2K as this will tend to draw excessive current through CR1. If the circuit will not come on properly at a value between 2.2K and 470K for R5, check for wiring errors or a defective component. The nominal value for R5 is about 47K. The proper value of R5 will allow the brake to begin to turn on with about 10% or more of control knob rotation. Once the proper value for R5 has been determined, install a resistor of that value permanently.

The value of resistor R7 determines the amount of control knob rotation required to obtain a given voltage on the brake. In addition, it provides linearity. The value indicated will probably be correct for most applications. If the brake voltage does not reach 7 volts with the control at maximum setting, lower the value of R7 slightly by removing a few turns of wire. Conversely, if the brake voltage reaches maximum too soon, increase the value of R7 slightly by adding a few turns. If maximum voltage of lower than 7 volts is desired, increase R7 until the desired maximum voltage is reached when the control is at maximum setting. To use the control as a switch, such as for actuating a bomb drop mechanism, shorting R7 out will result in a more positive switching action. Note that changing the value of R7 does not change the "turn on" point established by R5.

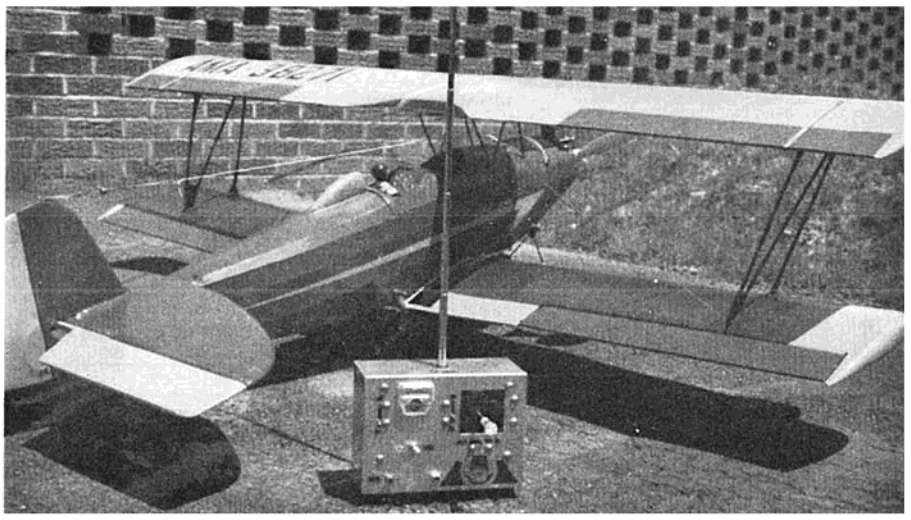
Some instability may occur during testing if test wires are too long or if the transmitter signal is too strong. It may be necessary to provide RF decoupling of the test equipment and watch lead dress and/or remove the transmitter antenna when making the above adjustments. Once the unit is installed in the airplane, it is stable with the transmitter antenna installed and held only a few inches from the receiver antenna.

For adjustment of the Orbit, the same procedures are followed except that the nominal value for R5 is 3.9K and may vary between 2.2K and 68K. In addition, the maximum voltage obtainable from the Orbit is about 4 volts. The off position of the transmitter control will depend on which channel is being used to control the brake.

Installation

Once the adjustments outlined above have been carried out, no further adjustments should ever be necessary. Clean the printed circuit board and spray with clear Krylon or paint with clear dope to prevent high resistance shorts from developing and to protect the copper from tarnishing. Insert input and output leads through a rubber grommet (a servo mounting grommet is ideal) and install suitable plugs and sockets, keeping leads reasonably short. Mount the control in the plastic box, making a half moon cutout in both the bottom and the lid to accept the grommet. Foam rubber or polyurethane padding should be used in the box to prevent the control from rattling about. The completed unit can be placed in any convenient place in the airplane, but, as with other electronic devices, it should be surrounded on all sides by foam rubber or other suitable padding for maximum protection from vibration.

Please feel free to write me through RCM if you have any questions.



Warren Thomas, Jonesboro, Arkansas, claims his bipe is a real performer with Digitrio.

RCM DIGITRIO

(*Continued from Page* **42**)

bushing on main U frame can be soldered on side facing trim pot to prevent buying a new pot if your present shaft is too short.)

( ) Install stick assembly. This will be a cut and try job depending on the original stick configuration. If your original stick was as per Digitrio articles only minor adjustments will be necessary. If properly made and installed this new stick will give smooth trouble-free service. So take your time.

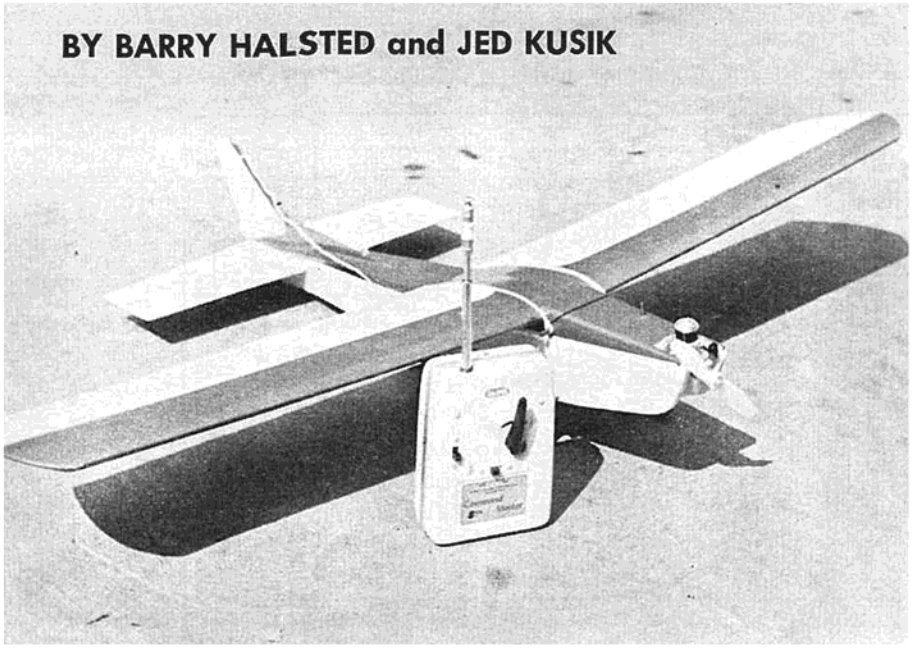
( ) Make necessary adjustments for smoothness, etc., if elevator trim pot moves while manipulating the stick. Center punch the threaded portion of the pot to stiffen it up.

( ) Rewire pots so that elevator wires go to vertical pot and rudder wires go to horizontal pot. If necessary, install new wires and tie off these wires to convenient places on the stick assembly to prevent strain and possible breakage.

You can continue to fly the Digitrio in this manner until you complete the modification to four channels. At which time you will wire the rudder pot.

Check your stick for proper throw by "eyeballing" the servos in operation. If you need more throw get out the file and remove excess material. This may require removal and reinstallation of the stick a couple of times until it is right. Take your time here and do a good job. You can also, at this time, temporarily wire the rudder pot for adjustment purposes.

BY BARRY HALSTED and JED KUSIK



PADDY'S PIG

.09 sport trainer for single channel action . . .

"SOMEDAY they'll make an R/C unit that even a beginner can just strap in and fly . . . one that will eliminate confusing button pushing and let's me steer naturally. They'll make it so dependable that it works every time I go out to fly. It will be so rugged that it will be practically crash-proof. It'll be one I won't have to replace when I advance to more sophisticated flying. They'll make a low-cost R/C that comes with built in nickel cadmium batteries and charger, with a receiver so perfect that even if it crashes the factory will replace it instead of repair it!"

This is the Someday that Sterling Models said is here now, when they released their Command Master R/C System, designed to fill these "someday requirements" of the beginner and sport flyer. When the first production models came off the line, we asked for a unit to test, and one for which we could design —a simple to build, easy to fly and repair model which this same beginner or sport flier could build and fly with almost the same degree of built-in success.

Paddy's Pig is the result. The first part of the name was our Editor, and Fearless Leader's attempt to give it an Irish flavor, while the second part was his expression of its overall appearance! Needless to say, graceful lines and an ethereal look was not part of the design program for this model. Rather, it was designed as a simple, functional rudder-only airplane that would give the beginner a fighting chance to get his new equipment airborne in a minimum amount of time, and once there, keep him upstairs despite his own attempts to crash! The design is completely straightforward, with slab sides forming a "box," a simple, silkspan covered Clark Y airfoil, and a maximum amount of ruggedness in the areas generally affected by not-so-gentle contacts with the ground.

Flight characteristics can be summed up in one word — stable. There is very little tendency to drop a nose in the turn and no immediate tendency to go into a spiral dive when full command is held on the Command Master transmitter.

In other words — an extremely stable trainer that will allow you to get airborne and put in enough flying time in which to build up your confidence to a degree where you will feel comfortable with a more maneuverable ship. This same design, however, can be modified for increased performance by adding elevators, and using anything from a galloping ghost servo up to six channel reeds. There is even enough room for a couple of smaller proportional servos. If you up the weight by using a heavier radio system, substitute a .10 or .15 mill for the Cox Medallion .09. These modifications are not recommended for the beginner nor for initial use with the Command Master system.

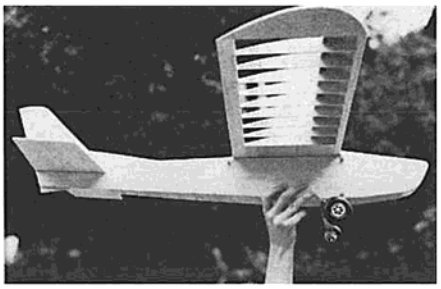
A word or two about the equipment itself. This pulse proportional, rudder-only system with its three position escapement throttle control, fulfills all of the claims made for it by the manufacturer. It had ample power for the control surface, plenty of range, and no interference problems were encountered. It was simply a matter of plugging it together and installing it in the plane — about a 30 minute job at the most. It works — and will continue to work and provide you with many, many hours of flying pleasure if — and we stress this point — if you don't take it apart or attempt to modify it to some way-out schematic you found in the pages of a model magazine. Leave it alone, and it will serve you well. Leave it alone, and take advantage of Sterling's unconditional 5-year guarantee. Enough said.

Construction

We're not going to go into extensive construction details, since for the experienced sport flier, the plans are completely self-explanatory, and for the beginner, we strongly suggest that he enlist the aid of a more experienced builder to help him out with this project.

Wing. The wing consists of 16 ribs from 3/32" sheet plus two center ribs from 1/4" sheet. Leading edge is 1/2" square with standard 1/4" x 1" tapered stock for the trailing edge. Upper leading edge sheeting is 1/16" x 2" with 1/16" sheeting in the center section. The single spar is hard 1/4" x 1/8" balsa stock. There is 2 1/2" dihedral under each wingtip. When completed, sand well, brush on a couple of coats of dope, and cover with heavy grade silkspan. Two coats of clear, plus two coats of sprayed Aero-Gloss balsa fillercoat with intermittent sanding will give you an acceptable surface for final color. Color scheme on the prototype was Sig yellow and green with white trim.

Fuselage. The fuselage is a "basic box" of 3/32" sides, top, and bottom, with the exception of the 3/32" ply doublers forward, the 1/16" balsa doublers aft, and the 1/8" forward bottom sheeting and 1/2" forward top sheeting. Contact cement is used for the doublers. 1/16" x 1/4" truss bracing is glued to the sides prior to assembly with the bulkheads. Join the bulkheads to the side with Franklin Titebond glue, and check with a triangle to assure that the sides are assembled in a true manner. Top and bottom sheeting is applied cross-grain for maximum strength and rigidity. For the Cox Medallion .09, a standard Tatone mount can be used. For the O.S. Max .10, mount the engine to a ply-



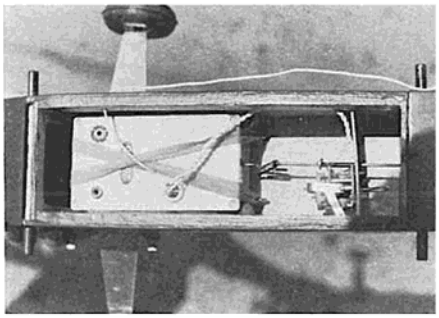
wood plate, then mount this plate, in turn, to the firewall, using rubber grommets or other spacers to achieve the required thrust adjustments.

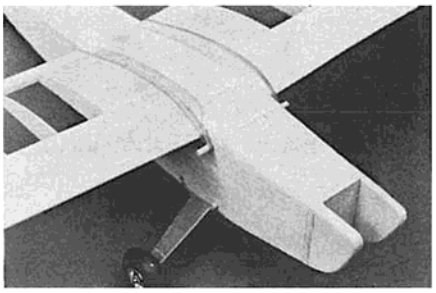
Tail group. The tail surfaces are fabricated from ⅛" sheet stock and glued to the fuselage. When the entire fuselage-tail structure is completed, sand well, apply several coats of dope and sanding sealer, then cover with silkspan. Apply several additional coats of AeroGloss balsa fillercoat, sanding between each, then finish off the undercoating with a coat of sprayed clear dope. Finish with color dope to suit.

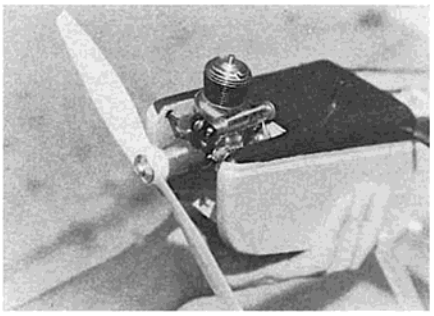
Radio installation. Be sure there are no binds anywhere in the system linkages. Follow the manufacturer's instructions for installation and operation of the system, including vibration and range checks. Be sure to break-in your engine on the bench before flying. Check to make sure that your wing and stab incidences are correct, and that both are parallel to each other on the horizontal plane.

Paddy's Pig can be simply hand launched. Allow the model to gain sufficient altitude before trying out the Command Master Control Stick. Apply gentle pressure to the stick to correct any turning tendencies. Remember — this is proportional control, and you don't need to slam the stick to its extreme positions in order to obtain response from the aircraft.

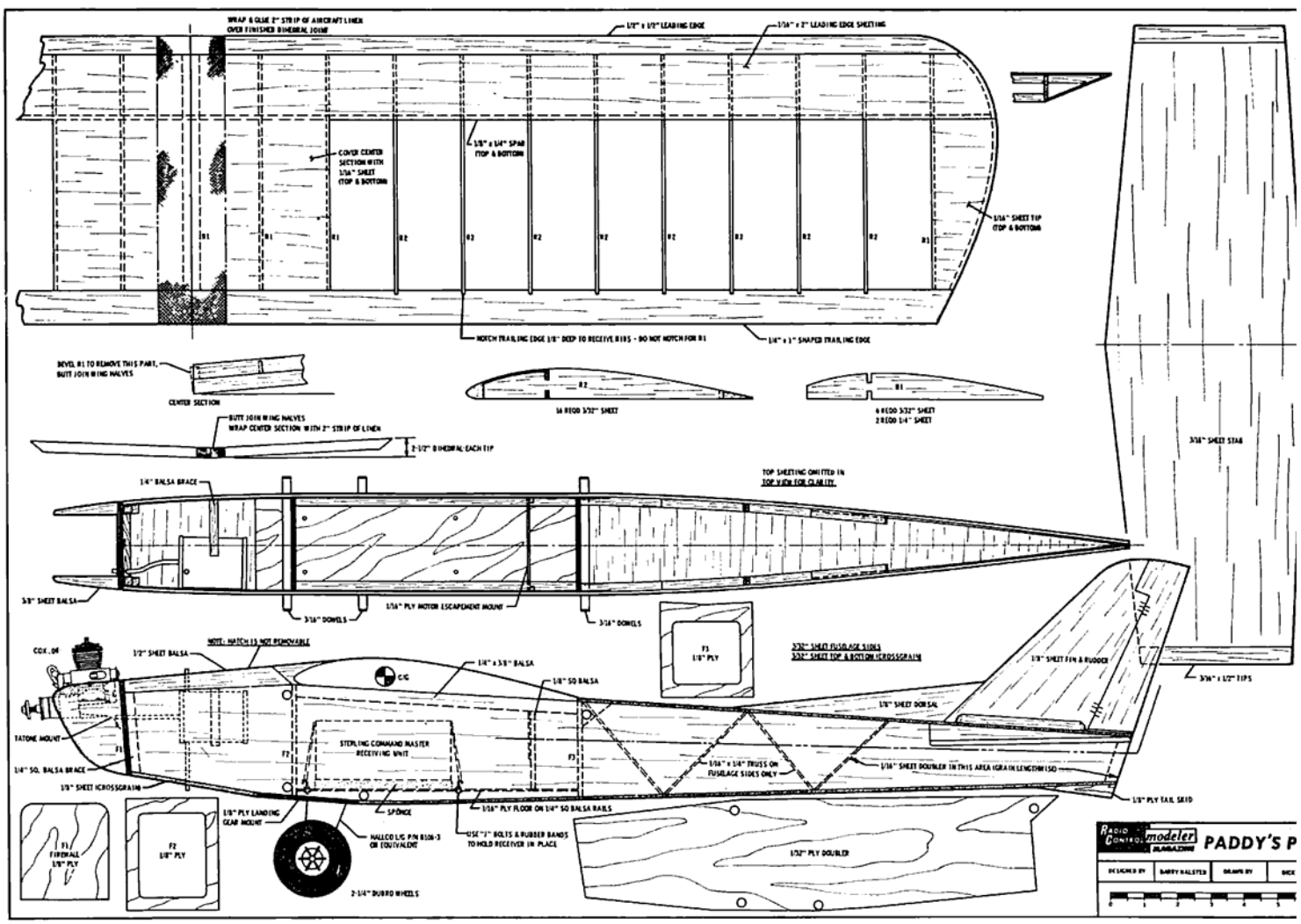
Paddy's Pig — it's simple, functional, relaxing, and fun to fly. Along with your Sterling Command Master System, you and the entire family will be in for many hours of pure flying pleasure.







A minimum expenditure of both time and money will produce a fine flying sport machine. Addition of elevators for GG poses no problem.



ANALOG FEEDBACK SERVO

By JOHN PHELPS

Step-by-step construction of an analog feedback servo adaptable for use with commercial analog systems—easily built from scratch or currently available in kit form.

SINCE the first digital control systems began to appear 3 or 4 years ago, inevitable comparison with analog systems indicated digital superiority in most areas, particularly resolution and reset accuracy. Further study showed that the "digital" servo was and is an analog servo with the same limitations and a bit more complication. A better name for the Digital Servo is a pulse width feedback servo.

Could a D.C. feedback servo be made as good as a pulse width feedback servo? Just a bit more than a year ago I had the chance to compare the two approaches on as nearly equal footing as is practically possible. Both servos used the same mechanical parts with both amplifiers pruned for peak performance.

As analysis predicted, there was **no** discernible difference. The difference in performance lay in the circuit design of the amplifiers. Beginning at the motor driver transistor, the first important difference appeared. It is imperative that these transistor switches have very little voltage drop when they are in the conducting state. This in turn means that they must be saturated and that they must be overdriven. In practice saturation requires that the load be placed in the collector or that the base be "pulled" above the collector if the load is placed in the emitter of the output unit. Figure one illustrates the basic circuits most often used. Figure 1(a) substitutes

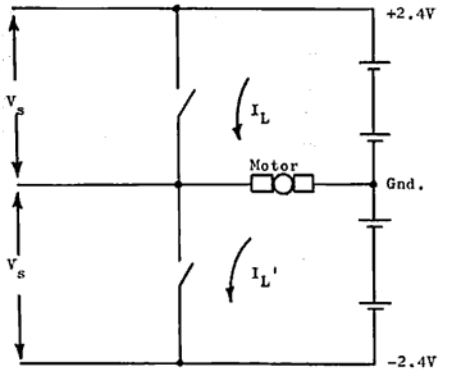


Fig. 1A: Two switch equivalent of a transistor output stage.

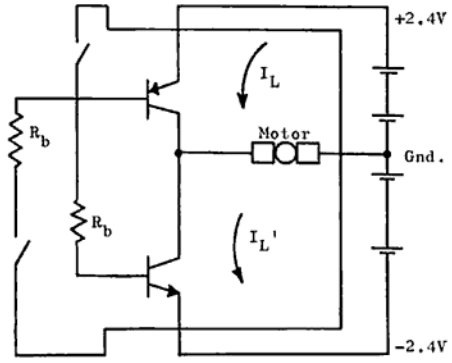


Fig. 1B: Complementary (NPN & PNP) output with 4-cell battery supply.

switches for the transistors. Ideally I^L should be equal to $I^{L'}$. The motors of most servos demand currents between 0.5 and 1.0 amperes with the motor not running (armature blocked). No-load current can run between 1% and 80% of the blocked current, depending on the motor losses. Running current is seldom less than 0.1 amperes in actual service with a useful load. The saturated voltage drop, v^s, should be less than 0.3 v. with a battery voltage of 2.4 v. (nominal). Higher drop reduces speed, resolution and torque.

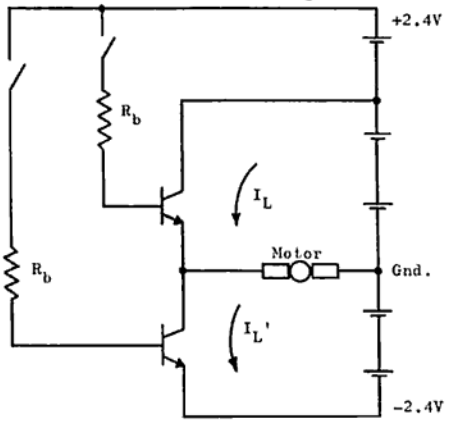
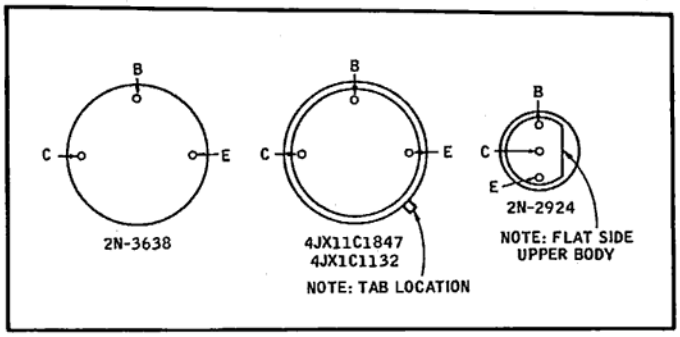
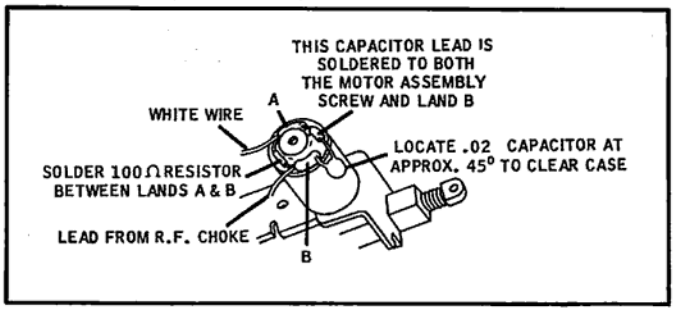


Fig. 1C: "Totem pole" connection using transistors of the same polarity and an extra cell to saturate the top transistor.

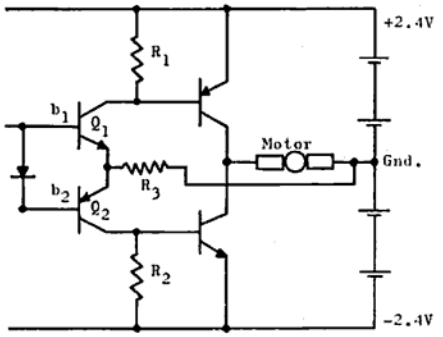
The Totem pole connection, see Fig. 1c, widely used in reed and pulse-width servo design was devised to sidestep the need for similar NPN & PNP transistors. Historically, PNP transistors with the required "guts" and low cost were available first and so were used first. The extra battery required was, and is, no particular burden, since it eases receiver design and as many as seven batteries are used in well designed systems. The current availability of good NPN & PNP transistors allows more freedom in design and also eases the battery weight problem, since only 4 cells (4.8 v.) are necessary (see Fig. 1b). In any case, the output transistors must never be al-

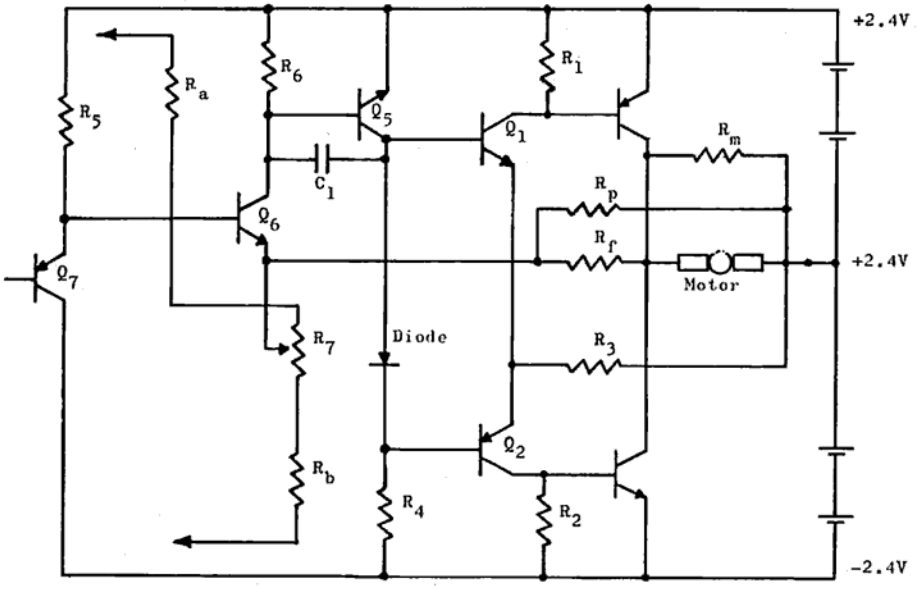
Technical Editor's Note: *The author's opinions, stated in this article, do not necessarily reflect those of R/C Modeler Magazine's Technical Staff. The construction material presented herein is based on a proprietary design of World Engines, Inc. and was reprinted with their permission for the benefit of the R/C constructor interested in analog servo design.*





lowed to conduct simultaneously. If they do, Pow! Tremendous current flows from +2.4 to −2.4 battery taps, limited only by the transistor's bulk resistance (for the short time it's around). Figure 2a adds the driver transistors. Note that

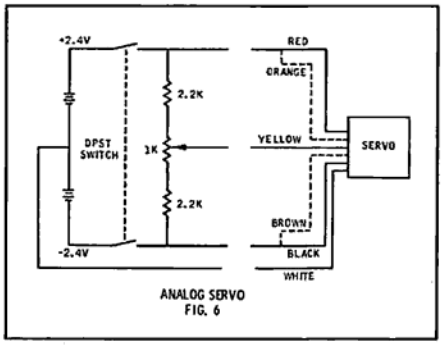




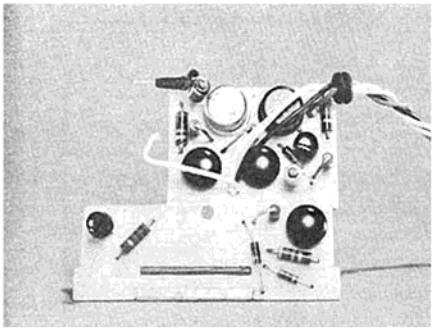
Above: Fig. 2A. Right: Fig. 2B.

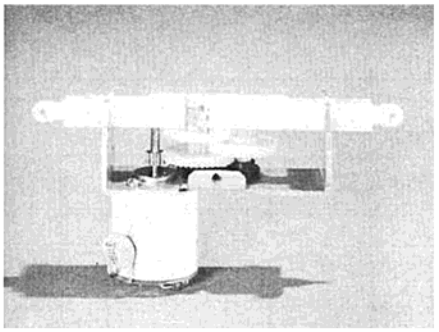
their emitters are tied together and returned through a common resistor R_3 to the supply side of the load. R_3 is chosen to limit driver current to a safe value and assure generous drive current to the switch transistors. R_1 and R_2 divert collector base leakage current and prevent unwanted transistor turn on at elevated temperatures. This is essential for all types of output transistors, particularly germanium. The use of hermetically sealed (metal can) transistors is advisable for long life in the output units. R_1 and R_2 also speed transistor turn off so that switching time overlap (period during which both output transistors are on) is held to a safe value. This period must be less than 10% of the thermal time constant of the chosen transistor and can be reduced to zero as will be shown. If b_1 and b_2 are tied together, Q_1 will conduct if their juncture is made positive by several tenths of a volt (.2 for germanium drivers, .5 for silicon) with respect to ground (battery center-top) or Q_2 will conduct if the polarity is negative. Note that 0.4 volts dead-band exists for germanium drivers, 1.0 volt for silicon and 0.7 v. for a mixed pair. Any voltage within this range will not turn on either and so it

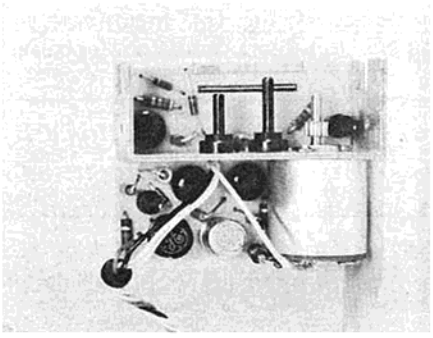
(Continued on Page 49)

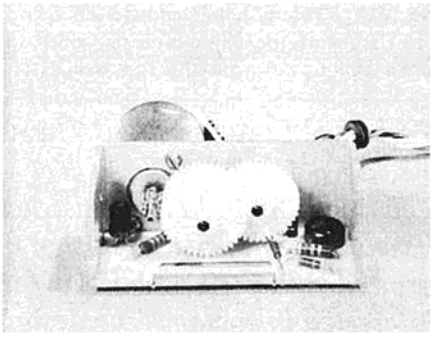


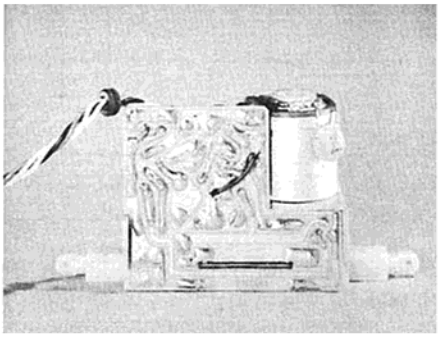
ANALOG SERVO
FIG. 6











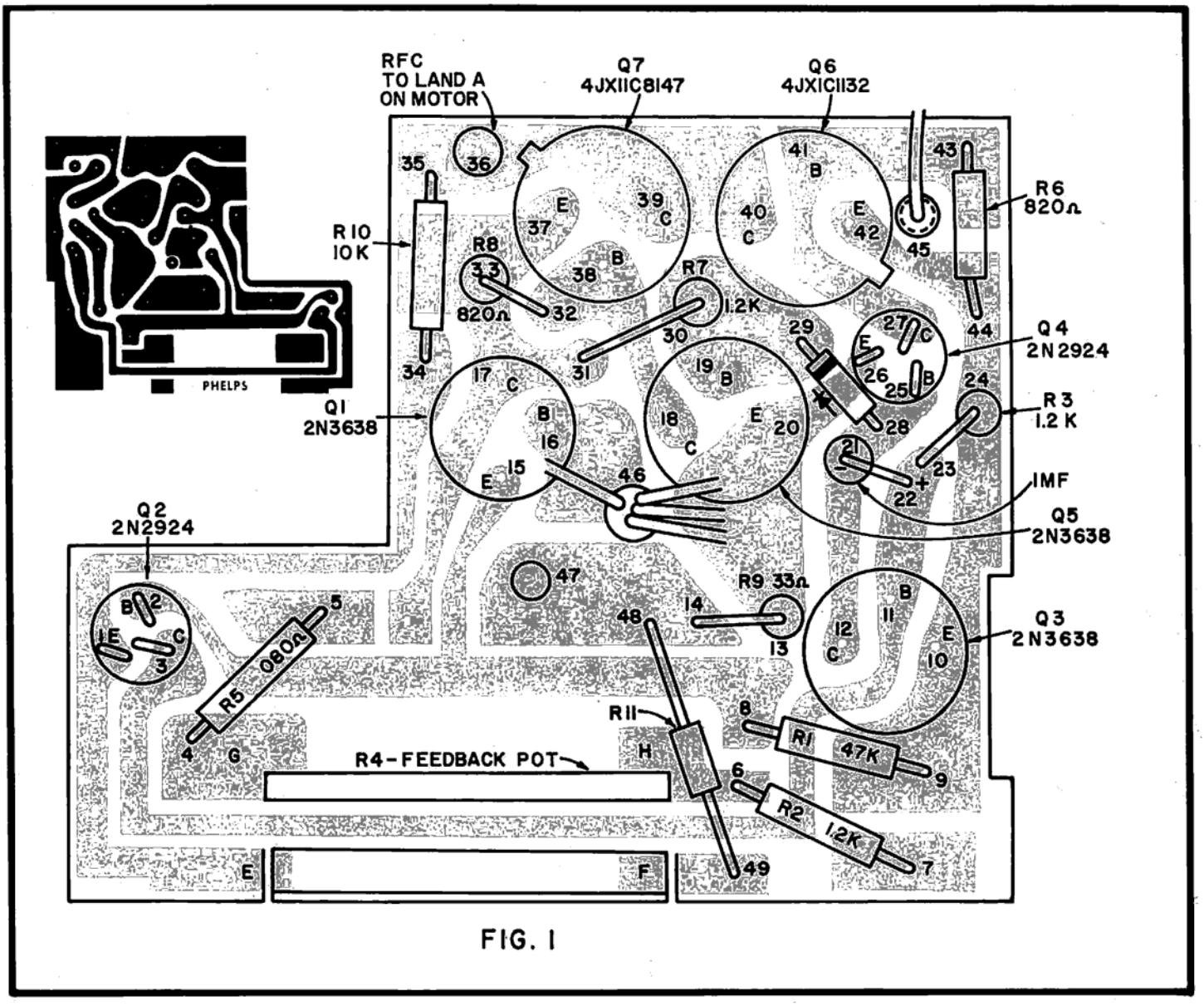
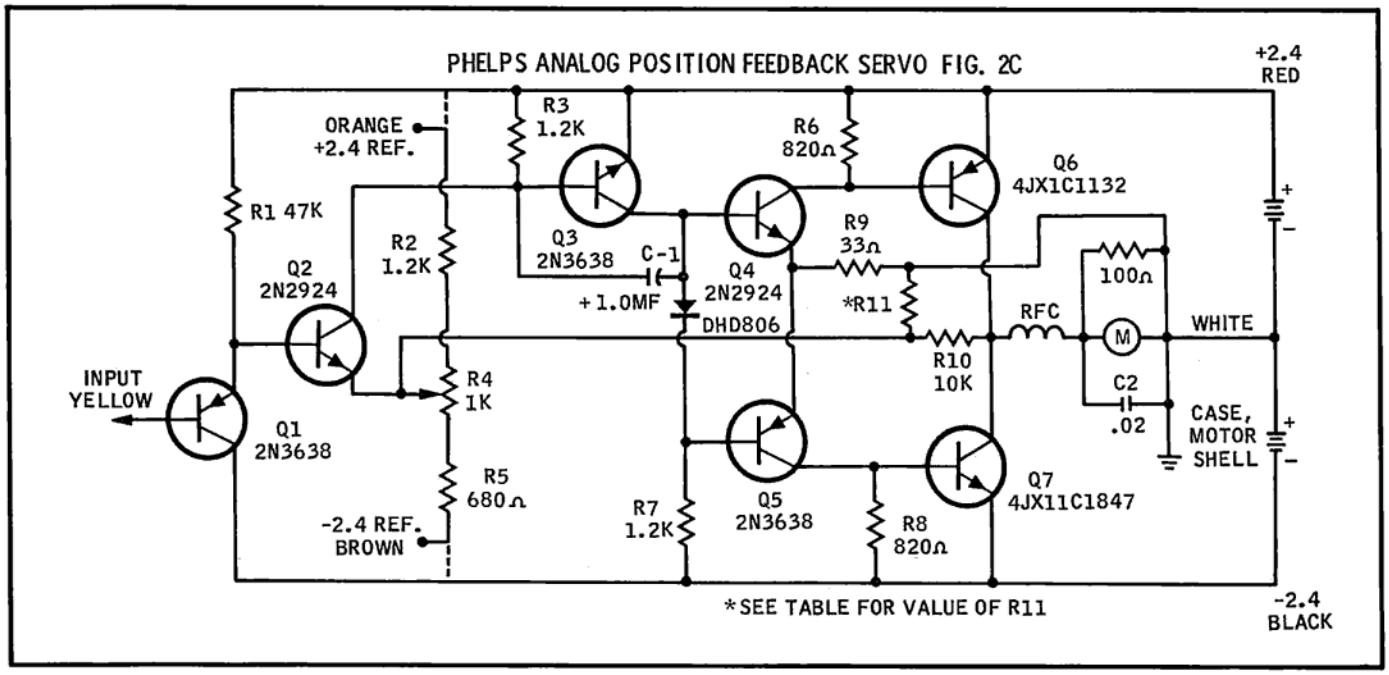

RFC
TO LAND A
ON MOTOR
Q7
4JX11C8147
Q6
4JX1C1132
R10
10K
R8
33
820Ω
R7
1.2K
R6
820Ω
Q4
2N2924
R3
1.2 K
IMF
Q5
2N3638
Q1
2N3638
Q2
2N2924
R5 680Ω
R4-FEEDBACK POT
R9 33Ω
R11
R1 47K
R2 1.2K
Q3
2N3638
PHELPS

FIG. 1


PHELPS ANALOG POSITION FEEDBACK SERVO FIG. 2C
+2.4
RED
ORANGE
+2.4 REF.
R3
1.2K
R6
820Ω
Q6
4JX1C1132
R1 47K
R2
1.2K
Q3
2N3638
C-1
+1.0MF
Q4
2N2924
DHD806
R9
33Ω
*R11
100Ω
Q2
2N2924
RFC
WHITE
M
R10
10K
INPUT
YELLOW
R4
1K
C2
.02
CASE,
MOTOR
SHELL
Q1
2N3638
R5
680Ω
R7
1.2K
Q5
2N3638
R8
820Ω
Q7
4JX11C1847
-2.4 REF.
BROWN
*SEE TABLE FOR VALUE OF R11
-2.4
BLACK

(*Continued from Page* **47**)

represents a region of no response, thus the term dead-band. One or more diodes (depending on their type), can be connected, as shown, between b_1 and b_2 to offset this dead-band and improve resolution. One silicon diode is sufficient and allows a voltage margin which can be converted to a time delay to prevent any conduction overlap in the output transistors, with the addition of C_1 in Fig. 2b.

Fig. 2b adds a resistor R_4 and transistor to provide voltage gain. The value of R_4 is chosen to be approximately equal to the product of the current gains of the output and driver transistors and the blocked armature resistance of the motor. The voltage gain of the stage is $=\frac{R_4}{hib}=$ 10. Dead-band is now only 20 millivolts or 2% in a system furnishing ±.5 v. of error signal. If the collector current of Q_5 is just enough to set the drop across R_4 at 2.4 volts, both output transistors will be off. More or less collector current will cause either Q_1 or Q_2 to conduct. Q_6 compares the voltage at its base and the voltage at its emitter and meters current flow in Q_5 accordingly. R_6 protects Q_5 & R_7 if R_7 goes to the −2.4 v. end of travel. If a voltage is set at the base of Q_6 say .2 v. then Q_1 or Q_2 will conduct and run R_7 (connected to the motor shaft until it reaches (0.2-0.5) v. or −0.3 volts. The 0.5 volt figure represents the base emitter drop of Q_6, the silicon input transistor. Unfortunately, the .5 v. figure is nominal and temperature sensitive. For any given error voltage there can be any number of servo positions satisfying the balance condition depending on ambient temperature.

The drift rate is 2mv/o^c. A change of 25° C. will move the neutral 50 millivolts in a ±500 mv system or represent a drift of 5% in neutral setting. One additional transistor can offset this variation and provide drift-free performance. The base emitter junction of the PNP emitter follower has a drop equal but opposite to that of Q_6. Its base tracks the divider arm of R_7 and its drift rate of −2 mv/o^c compensates for the drift rate of Q_6. Although a diode could have been used, there is usefulness in the current gain afforded by Q_7. The required error current is typically less than **one microampere.**

The feedback resistor (Rf) reduces and stabilizes the overall power gain, and is selected in conjunction with servo motor and gear train to balance between resolution and fast settling time. R^a and R^b determine the shaft rotation for a given input error voltage change.

With closure of the feedback loop by Rf comes the danger of high frequency oscillation. Use of a capacitor across the motor brushes provides a convenient way of reducing brush arcing noise but virtually guarantees oscillation in the 50 to 500 kc frequency range. If allowed to exist, this oscillation will destroy the output transistors in short order. A 100 ohm resistor, Rm, across the motor brushes and reduction in high frequency gain of the amplifier through gain "break" networks effectively removes the oscillation threat.

Returning to the resistors R^a and R^b, their value is determined by the value of the feedback pot and the desired output arm travel for a given maximum change in error voltage. If the servo is to be at mid-position for an error voltage of +2.4 volts, relative to ground, then R^a and R^b cannot be equal because of the extra drop in R^b caused by the several hundred microamperes of emitter current flowing through R^b from Q_6. This imbalance complicates setting the values of R^a and R^b needed for replacement of servos in several existing, popular systems. A further complication is the interaction of the values of R^a, R^b and R^f. Because of the foregoing mess a simple scheme was sought which would solve the complication of optimizing the servo for several applications. The resistor R^p does this neatly.

	Value of R^p for equivalent push-rod travel
Airborne Control labs (MK II)	**Omit**
Citizenship	**Omit** to 4700
Sampey (404 and Starlight series)	**470 ohms**
Space Control	**Omit** to 4700 ohms
Orbit	**1200 ohms**

If, in any application, additional servo travel is desired, R^p can be decreased with **no sacrifice in performance.** Resolution which is **better** than most digital servos is preserved. R^p may be reduced to 100 ohms — at this value full servo travel is had with **±100 millivolts** — again, the resolution is not even slightly compromised.

CONSTRUCTION

The printed circuit board can be duplicated by the standard photo process. Your local blueprint shop can produce an actual size negative from the P.C. board artwork included with this article. All electronic parts are available from major electronic suppliers. A complete kit of the analog servo is available from Controlaire, division of World Engines.

ASSEMBLY INSTRUCTIONS

( ) 1. During installation of components to board, refer to illustrations for component locations and hole numbers.

( ) 2. Install R — 1, a 47 K ohm ¼ watt resistor (yellow, violet, orange) in holes 8 and 9, lying flat.

( ) 3. Install R — 2, a 1.2 K ohm ⅛ watt resistor (brown, red, red) in holes 6 and 7, lying flat.

( ) 4. Two identical 1.2 K ohm ¼ watt resistors (brown, red, red) are installed in this step. Install R — 7 in holes 30 and 31. Stand vertically over hole 30. Install R — 3 in holes 23 and 24. Stand vertically over hole 24.

( ) 5. Install R — 5, a 680 ohm ¼ watt resistor (blue, grey, brown) in holes 4 and 5, lying flat.

( ) 6. Two identical 820 ohm ¼ watt resistors (grey, red, brown) are installed in this step. Install R — 8 in holes 32 and 33. Stand vertically over hole 33. Install R — 6 in holes 43 and 44, lying flat.

( ) 7. Install R — 9, a 33 ohm ¼ watt resistor (orange, orange, black) in holes 13 and 14. Stand vertically over hole 13.

( ) 8. Install R — 10, a 10K ohm ¼ watt resistor (brown, black, orange) in holes 34 and 35, lying flat.

( ) 9. R — 11 is installed next. Its value is determined by what brand of equipment the servo is to be used with, and in many cases, R — 11 is omitted entirely. If R — 11 is required, it is installed in holes 48 and 49, lying flat.

A 1.2 K (brown, red, red) ⅛ watt resistor is furnished as a representative nominal value for R — 11. If after experimentation, some other value is determined to be more desirable, it could be obtained from your local electronic parts dealer.

( ) 10. The next step is the installation of the DHD 806 diode. Examine the diode closely and notice on one end there is a band encircling it. The band indicates the cathode end of the diode. Insert the cathode lead in hole 29 and lay it flat with the other lead (the anode) in hole 28.

( ) 11. Examine C — 1, the 1 mf capacitor. Notice that on one end there is a plus sign indicating the positive lead. The unmarked lead is negative. Install the negative lead in hole 21 and stand vertically. Install the positive lead in hole 22.

( ) 12. Next is the installation of the 1.3 MH RF choke. Install one lead in hole 36 and stand vertically. Do not cut the lead short on the other end as it is later soldered to the motor.

( ) 13. The transistors are installed in the next steps.

( ) 14. Install Q — 2, a 2N2924 transistor in holes 1 (emitter), 2 (base), and 3 (collector). Stand ⅛" above the circuit board.

( ) 15. Install Q — 4, a 2N2924 transistor in holes 26 (emitter), 27 (collector) and 25 (base). Stand ⅛" above the circuit board.

( ) 16. Install Q — 3, a 2N3638 transistor flush with circuit board in holes 12 (collector), 11 (base), and 10 (emitter).

(*Continued on Page* **50**)

( ) 17. Install Q — 1, a 2N3638 transistor flush with circuit board in holes 17 (collector), 16 (base), and 15 (emitter).

( ) 18. Install Q — 5, a 2N3638 transistor flush with circuit board in holes 18 (collector), 19 (base), and 20 (emitter).

( ) 19. Install Q — 7, a 4JX11C1847 transistor in holes 37 (emitter), 38 (base), and 39 (collector). Install flush with circuit board.

( ) 20. Install Q — 6, a 4JX1C1132 transistor in holes 40 (collector), 41 (base), and 42 (emitter). Install flush with circuit board.

( ) 21. Refer to Fig. (1) and locate the two small slots cut into copper lands E and F on the circuit board. Bend the 5/64" x 1¼" x .006 brass wiper strip as illustrated and fit to slots in circuit board. Solder to lands E and F.

( ) 22. The 1 K ohm wirewound feedback potentiometer (R — 4) is installed next. Care should be exercised in the handling and soldering of this component. Its position in relation to the circuit board is important. If it is installed too high or too low in the slot on the circuit board, the wiper finger on the traverse rack will not contact it correctly.

( ) 23. Locate the slot in the circuit board that the potentiometer is installed in. Check the slot for correct size by attempting to slide the pot into it. If it requires more than light pressure to achieve a firm fit, do not force it in. Remove it and file or cut the slot until the pot will seat snugly with light pressure applied.

( ) 24. After insuring the slot is the correct size, notice the copper tabs at each end of the pot. One will be soldered to copper land G, the other to land H. Insert the potentiometer into the circuit board slot with the tabs facing the copper lands they will be soldered to. Position the potentiometer so that it is exactly even with the under side of the circuit board. This will allow the correct amount of protrusion on the component side of the board. Using as little heat as possible, solder one tab to land G, the other to land H.

( ) 25. Strip ⅛" from the ends of the four 9" wires and one 3" wire provided and tin them. Thread the yellow, black, and two white wires through hole 46 from the component side of the circuit board. Solder the two white wires to the copper land containing hole 48 and the yellow wire to the land containing hole 16 and the black wire to the land containing hole 17. Thread the red wire through hole 45 from the component side of the circuit board and solder it to the land containing hole 44.

( ) 26. Notice that the lands containing holes 5 and 7 are shown jumpered to adjacent lands with short pieces of resistor leads. In the event the system this servo is to be used with has a separate reference voltage supply, these jumpers are omitted and the 9" orange and brown wires are stripped, tinned and soldered in place, the brown wire (negative reference voltage) going to the land containing hole 5 and the orange wire (positive reference voltage) to the land containing hole 7. Route these wires through hole 45. If the servo is to be used in an experimental circuit and there is some question of the need for a separate reference source, in general, the requirements are: If you are using more than two Analog servos in an installation and are not using 1.2 amp-hr capacity servo supply cells, you will need a separate reference voltage source to prevent interaction among the servos.

( ) 27. At this point, check all of your work for improper component installation and bad solder joints.

( ) 28. Inspect the "C" frame and motor for proper assembly. Place the "C" frame on a table with the slots for the traverse rack down and the straight edge of the frame to your right. Notice that there are a red and a blue lead cut flush with the rear surface of the motor. Insure that the red lead is to your left. If not, remove the motor and reinstall it correctly. Check the tightness of the screws holding the motor to the "C" frame, then proceed to install the 100 ohm (brown, black, brown) ½ watt resistor to the rear of the motor. Prebend and form the resistor leads and solder them to the motor terminals "A" and "B" as shown. Locate the .02 mf capacitor on the motor. Notice that one side of it is soldered to both a motor case screw and motor terminal "B." Remove all the paint from the motor case screw to insure a good solder connection. Prebend and form the capacitor leads and solder one lead to motor terminal "B" and the case screw. Solder the other lead to motor terminal 'A" and bend both leads so that the capacitor is against the side of the motor case.

( ) 29. Using the following procedure, install the circuit board to the "C" frame. Place the "C" frame on its flat edge with the traverse rack notches toward you and lay the circuit board on top (foil side up) in its approximate location. Fit the notched portion of the circuit board to the "C" frame tab on the left side with the board trapped under the small metal finger at the front. At this point, the right hand side of the circuit board is prevented from going into place by the small metal finger on the right side of the "C" frame. Pull the right side of the circuit board forward till it clears the finger. Spread the "C" frame slightly and press the circuit board down into position and back under the metal finger. The circuit board should be a good fit with the "C" frame, that is, the "C" frame should not be sprung out of shape and the front of the circuit board should be even with the "C" frame on the left and right side. If you are not satisfied with the fit, remove material from the circuit board in the problem areas with a small file, being careful not to overdo it and produce a sloppy fit or file into the copper land areas causing shorts after assembly. Use a No. 2 x 3/16 sheet metal screw to secure the circuit board to the "C" frame.

( ) 30. Place insulated sleeving on the remaining lead on the RF choke and solder to motor terminal "A". The short, white wire coming from the circuit board is now soldered to motor terminal "B."

( ) 31. Inspect the brass wiper strip on the top of the circuit board for dirt or corrosion. If dirt or corrosion is found, scrub the wiper with a common pencil eraser until bright and shiny.

( ) 32. Install the plastic gears. As each gear is installed, check it for free running clearance. If any gear binds or has excessive mesh clearance, remedy, using the following procedure: Examine the riveted idler shafts and note that by bending them closer or farther away from one another, gear clearance will be increased or decreased accordingly. Normally, no adjustment should be required, however, if a case of binding or excessive clearance exists, bend the idler shafts until the condition is eliminated.

( ) 33. Inspect the contact fingers located on the plastic traverse rack. These are prebent to the proper angles. Do not alter them unless one of the fingers is twisted or bent out of shape in relation to the others. Inspect the portion of the wiper fingers that contact the copper land and potentiometer and remove any burrs with a small file.

( ) 34. Align the traverse rack with the rack slots on the front of the "C" frame, but do not install it. Note that the contact arms extend down close to the bottom surface of the circuit board. The point here is to adjust contact finger preload. All fingers should extend even with the bottom surface of the circuit board. If they do not, extend them to the correct position. With the arms correctly adjusted, installation of the traverse rack in the "C" frame will compress the fingers the thickness of the circuit board or about .045".

(*Continued on Page* 51)

ANALOG SERVO

(*Continued from Page* **50**)

( ) 35. To install the traverse rack, use the black phenolic insulator board as a "Shoe Horn" to prevent damage to the arms. Place the board on the component side of the circuit board. Place the rack into position compressing the fingers against the surface of the insulator board and carefully slide the traverse rack into the notches in "C" frame and then remove the insulator board. Always use this procedure when removing or installing the traverse rack.

( ) 36. At this point, the servo is ready for operational testing. Refer to the illustration for a suggested test hook-up. It is also possible to install the servo into your system to test its operation. Neutral position of the servo is set by adjusting trim on your transmitter. If the suggested check-out circuit is used, full rotation on the pot shaft will correspond to limit operation of the servo. Initially, set the test pot somewhere near its mid-point position before applying power to the servo.

( ) 37. Using the insulator board as a "Shoe Horn," remove the traverse rack and all gears. Check mechanical orientation of "C" frame into top case as shown. Grouping all wires together, slide the ¼" rubber grommet onto them aligning all wires and grommet into case slot as pictured. Next, align the front edge of the "C" frame to the front edge of the side panels of the top case. Secure "C" frame to top case with two #2 x 3/16" sheet metal screws. If the screw holes on the "C" frame do not align properly with those of the case, an X-Acto knife can be used to elongate the case holes. Insure that the "C" frame remains aligned with the front edge of the top case side panels.

( ) 38. Inspect the traverse rack slots now that the top cover is installed. In some cases, the rack slots in the top case do not align properly with the rack slots in the "C" frame. This could cause the traverse rack to bind. Again, using an X-Acto knife, trim away any part of the top case slot that could cause interference. Do not allow any metal chips to get into the servo case.

( ) 39. Re-install all gears and, using the "Shoe Horn," re-install traverse rack. Be careful not to damage, misalign, or reduce tension of the contact fingers. After rack is installed, inspect the contact of the fingers to the brass wiper and potentiometer.
Contact should be even and not riding on the twisted edge of the finger.

( ) 40. Use "Plio-Bond" or similar contact cement to cement the black insulator board to the inside of the bottom case cover. Using the cement lightly, cement the insulator board to the center of the case bottom.

( ) 41. Install the bottom cover to the assembly. Use four #2 x 1/8" sheet metal screws to secure cover.

( ) 42. Insure that the addition of the bottom cover does not cause the rack to bind. Misalignment of the front edge of the "C" frame in reference to the top cover can also cause the rack to bind against the bottom cover. Minor correction can be obtained by loosening "C" frame attachment screws, pressing on the front section of case at the traverse rack and retightening screws.

( ) 43. This completes assembly of the servo. An operational test should be carried out with the case installed in the same manner as step 37.

KITS & PIECES

BERNIE MURPHY

Left: RCM's prototype of AAMCO's forthcoming Sportmaster. Center: "Pushbutton Bill's" (Northrop) Big John OMT. Yoga Bear at stick. Hight: Hank Spielman and racy original at DC/RC.

SORRY we missed you last month!

It would appear that the U. S. Post Office tries unusually hard to reduce their normally poor service into nothingness where publications are concerned. We have become accustomed to having bundles of RCM set on a railroad siding for days (and on several occasions, weeks) at a time to be delivered (possibly) to a subscriber at a late date. Last month's column has apparently received the same swift service to some far end of the earth, for it never arrived at the RCM office.

Unfortunately, I did not keep a copy of the text or photos. This service, however, is not unique with RCM. Magazine subscribers of virtually every publication have been crying the blues about their copies arriving later than newsstand editions, or two subscribers living in the same city on the same block, in fact, receiving their copies of the same publication two weeks apart! The May 1966 issue of "Flying" magazine carried an excellent Publishers Memo on this very subject.

Anyway, I would like to fill you in on the contents of last month's message to Garcia. We covered, in detail, the construction of Brand X Models kit of their 24 foot, full-scale, Boeing DC-6, using four Farce .63 engines, and any single channel, rudder-only equipment.

Would you believe a 3 ft. Piper J-3?

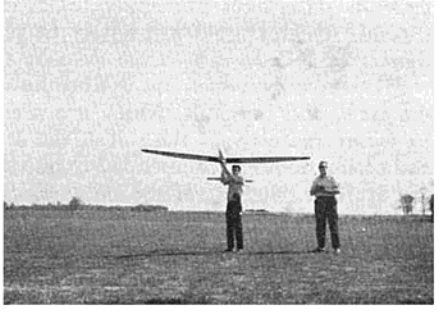
Seriously, we did discuss Williams Bros. "La Jollita" scale Goodyear pylon racer, as well as the excellent Norman D field box. The "La Jollita" has a wingspan of 45 inches, with an area of 460 square inches, a length of 41 inches, and is designed for .29 to .40 engines. The kit includes all necessary control and mounting hardware, in addition to many weight and time-saving, high-impact plastic parts. Due to the use of the latter, different techniques are required in building. The instructions recommend the use of contact cement or epoxy glue for all plastic-to-wood joints (we feel that the contact cement is superior in this application), with styrene plastic cement (Testor's liquid) on the plastic to plastic, and model or white glue on wood-to-wood (we strongly recommend Franklin's Titebond).

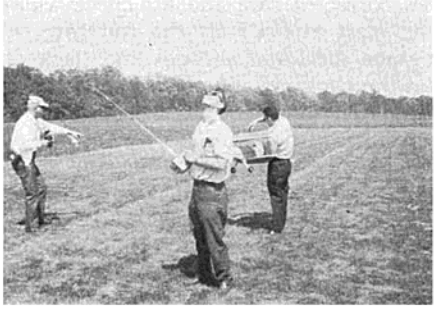
Since the wing ribs are of symmetrical section, both panels are built identically and become left and right only when the aileron fittings are installed. Except for the use of plastic ribs, the wing construction is similar to most ships. The spars are laid over the plans and the ribs installed. Contact cement was used here, but all joints were made "wet," allowing the ribs to seat firmly on the spars. The contact cement is applied to both mating surfaces and allowed to dry, then a thin coat is applied to the rib just prior to installing the spar. No problems were encountered in the wing construction, and the building instructions supplied are unusually clear and complete.

The horizontal stabilizer and vertical fin are built up from a framework of ⅛"

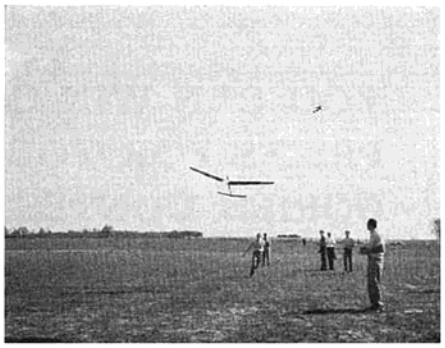
(Continued on Page **53***)*

Left: Ed Manulkin and Milt Miller giving 5-year-old son Don a turn on the Command Master system and Mambo. Center: Ray Smith prepares for glider launch. Right: RCM's B. Murphy with 4-channel Digitrio. In background, Dale Willoughby instructs Lou Andrews on bipe gliding (?).





Left: Ground plane antenna? No, it's not for sale. Bernie just takes a prang a little hard. . . . Center: Bill Hobbs tunes up Sr. Falcon with Digitrio-4 prototype. Right: Walt Good's Kurwi 33 on a Hi-Start launch.



x 3/8" balsa strips and 1/16" sheet covering. A word of caution here — these materials are supplied in the form of extra lengths of wing spar and covering sheet.

The fuselage literally falls together, and again, the building instructions are adequate. Be sure that you plan ahead on your particular engine installation, as it is needed to accurately position the firewall bulkhead.

One interesting point in equipment installation is the placement of the receiver **behind** the servos. The reason given being a reduction of damage in the event of a prang. An arrangement of this type also keeps the receiver farther removed from noise-producing components and give the antenna a clear path to the tail, which should improve the receiver operation. Installation of the CAR (coupled ailerons-rudder) linkage requires a little trial and patience but should not cause any problems. We will publish photos of the La Jollita #2 in a later issue.

●

The Ninth Annual Technical Symposium on Radio Control, presented by the DCRC, was held on May 14-15 at the Johns Hopkins Applied Physics Laboratory and at the nearby club field. Those who attended were certain to have gained in knowledge, aspiration, and inspiration. Some may have even gained a little weight as a result of the good food served at the luncheon and also the evening banquet on Saturday!

Saturday's program of eating was interrupted by discussions and presentations of technical papers on equipment reliability, antennas, and varied aspects of the sport which we refer to as OUR hobby.

Many of the local fliers displayed the fruits of a long cold winter in the form of their latest R/C bird, many of which were of the engineless, soaring variety — long, long, long span gliders. After watching Dale Willoughby's film on slope soaring Saturday afternoon, I imagine the next Symposium will see even more of these graceful birds. Dale, by the way, along with Bill "Pushbutton" Northrop, are members of one of the world's most exclusive R/C organizations — The Royal Order Of Radio Control Editors For The Encouragement And Preservation Of Radio Control Glider Flying In America. The only other member not present was our Fearless Leader who was home working on his six foot Mai Tai. (?)

There was a saying in the service to the effect — "If it moves, salute it. If it doesn't move, paint it." Sid Axelrod of Top Flite has a sequel to the last part of that saying—"if it doesn't move, Monokote it!" His wife swears that they have Monokote shelves in the kitchen and even a yellow Monokote refrigerator! Don't stand still around Sid!

John Strong, the Symposium Chairman, is a good man to know. The East Coast had had the most miserable cold, windy, and rainy weather for weeks on end. Saturday was a drizzly, damp day. Sunday, when everyone had been promised their fill of flying, John ordered a perfect day for flying. What did they supply? A perfect day for flying — sunny and warm, with just a gentle breeze! (Monday was cloudy and damp again.)

Seven flight lines operated continuously throughout the day and everything with wings was flying, from the smallest to the largest, with almost every piece of equipment being proportional. This DCRC bunch has a choice field — forty acres of sod farm — that's all grass! I wonder if they require you to replace the divits?

Yours Truly took to the air with Snoopy and the Antic, still searching for the Red Baron. While cruising across the terrain at low altitude, suddenly out of the blue — another ship! Could it be? It was! AUGH! The Red Baron! (Alias Jack Symborski and his Antic with Polish markings.) He's on my tail — curse you, Red Baron!

Obviously, I didn't get any photos of the "chase." Sorry 'bout that! If anyone did manage to film the flight of the two Antics, please contact me as I would like to share a couple of good shots with our readers. I would also appreciate any 8mm movies and will gladly pay for duplicating.

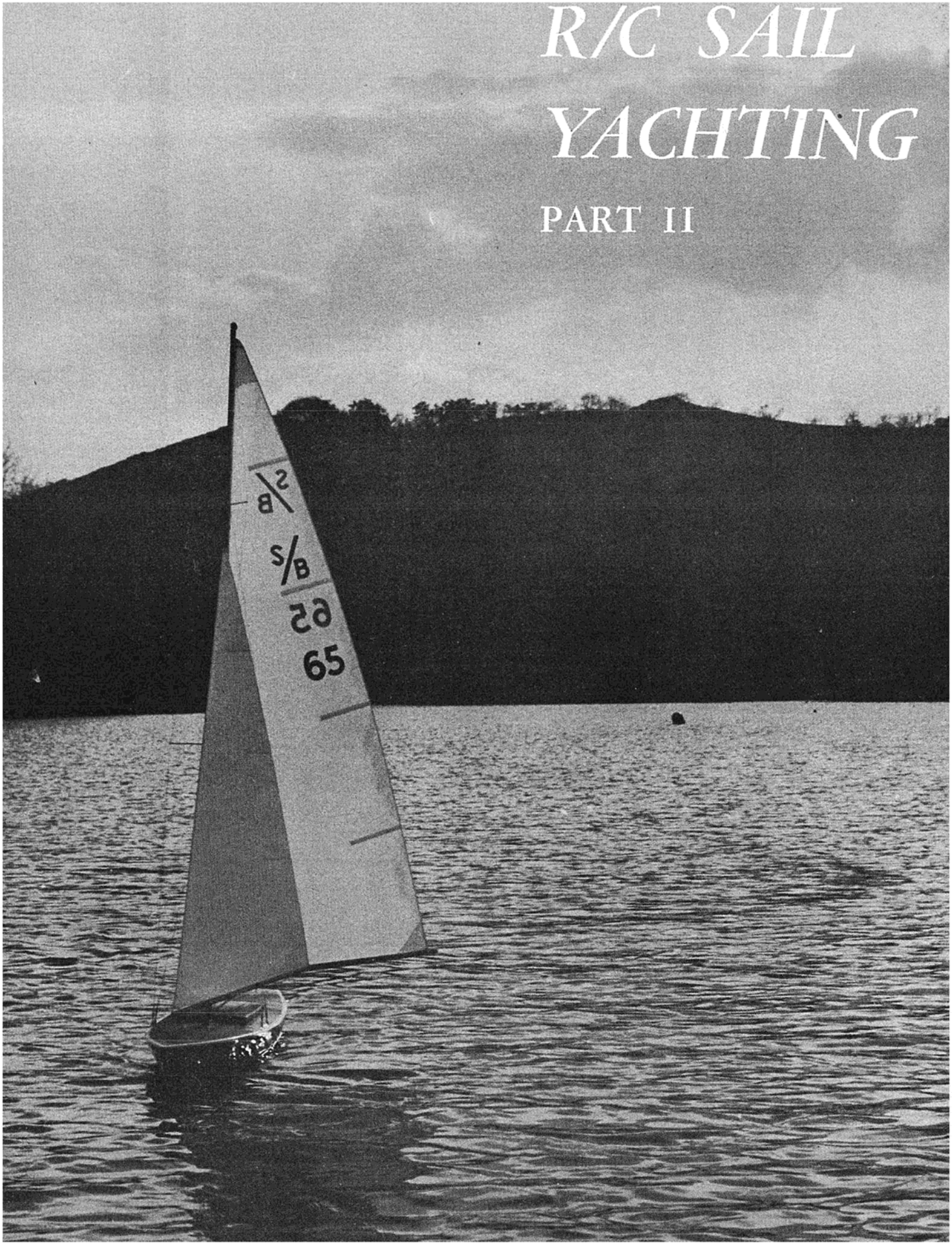
The Symposium ended late Sunday evening as the sun slowly sank into the West and the visitors headed for home with memories and ideas and that ever-present feeling of warm friendship that prevails whenever RC'ers gather.

(Continued on Page **56***)*

Left: Pushbutton Northrop, member of exclusive "Royal Order of R/C Editors For The Encouragement And Preservation Of R/C Glider Flying In America." Center: Command Master and Mambo. Right: Lou Andrews and Aeromaster.

R/C SAIL YACHTING

PART II



IN the first part of this article (July RCM) we discussed the general construction techniques for R/C sail yachts, applying them to our SB #65, Santa Barbara One Design. This month, tune the R/C sail yacht for sport sailing and competition racing. And, if we at RCM have learned anything during our preparation for this series of articles, it is this — R/C sail yachting is one of the most challenging and rewarding phases of our hobby. Constructing the model yacht is not difficult. Learning to handle it on the local lake is quite comparable to learning to steer a simple rudder-only airplane around the sky. But — learning to tune it for competition racing, then pitting your yacht against others of the same design, requires all of the skill of the serious and dedicated Class III competition pilot.

The difference in speed and maneuverability of a well-tuned yacht over a poorly tuned one is almost unbelievable, even when the yachts are identical in design. Although the following information is rather basic, and designed to be used as the primary steps in tuning a new boat, it can also be used as a check list for an older model if you feel it is not performing to its full potential. Specific dimensions given apply to the Santa Barbara One Design:

(1) Check the fully rigged yacht for correct static balance as indicated on the plans. Tolerance for the SB One Design is ½". Shift the batteries to acquire correct balance.

(2) The mast should be reasonably straight with the recommended rake aft (1" to 2"). Sight the mast from the top down. Lay the yacht on its side on grass or protective padding. It is **necessary** to have the standing rigging set up correctly and quite taut. The main shrouds should be in direct line with the mast, viewing from the side. Lower shrouds are located aft of the main shrouds at the deck. The jib stay should be as taut as possible without distorting the mast. This is tensioned by the backstay, and in turn, governs the rake of the mast. The first look at the mast may shock you, as it will probably resemble a "three dimensioned S!" If your rigging has been properly designed, you will be able to straighten the mast by adjusting the tensions of the shrouds. This shroud adjustment will be quite obvious when you view the yacht from the bow. To correct a fore and aft curve where the mast curves aft the full length, tighten the lower shrouds and slack off on the backstay. If the mast curves aft from the main spreaders, increase the tension on the diamond rigging by removing the masthead fitting and shimming it up with a small washer. These, and other adjustments, may take a little time and experimentation, but any misalignment can, and should, be corrected for maximum performance.

One word of caution — if the rigging is set with too much tension, the compression loads thrown on the mast will distort it. When not sailing, the lower shrouds are always set more loosely than the upper shrouds. If each shroud were to be set, for example, with ten pounds of tension, the compression loads would be well over sixty pounds at the bottom of the mast! On the SB One Design, a small deck riser located under the mast transfers the mast loads directly down to the keel. The maximum amount of load a mast can carry depends on the individual mast size and density of the wood used. For approximate tensions, and these are intended as guides only, set the lower shrouds at 6-8 pounds; the jib stay as tight as possible, which will be about 6-8 pounds; and the backstay as needed to tension the jibstay, usually about 6 pounds. One method of tensioning is to suspend a 10 pound weight from a piece of rigging wire so that you will have an idea as to the maximum tension. This does not apply to lower shrouds which should just barely be set tight.

(3) Halyards, which are used to hoist the sails, and outhauls, which are used to secure the clew of the sail at the aft end of the booms, are intended to adjust the draft or "airfoil" of the sails. Slack outhaul and halyard tensions will produce drafty, or highly cambered airfoil shapes for light winds. Tensions are increased as wind velocities increase until the sails are quite flat for heavy winds. The correct amount of draft will be determined by experience.

The draft of the jib sail is best adjusted by the jib halyard on the SB One Design, although it should be cut into the sail since downhaul or outhaul will not take care of a poorly cut sail. Outhaul adjustments are slight and seldom used on this sail. The draft of the main sail, however, is best adjusted with the outhaul, rather than the halyard, except in extreme cases.

As an example, let's set up for a light wind of about five knots. The jib halyard is tensioned tightly to pull the wrinkles out of the luff. (The forward side of a sail fastened to the mast or stay.) The main halyard is tensioned to a point where it prevents scalloping between the hooks at the luff. Too much tension will produce a wrinkle running up the sail, parallel with the luff. Now, stretch the foot of the main out along the boom, then slack it off about ½" and secure it with the outhaul. Repeat this procedure with the jib, but slack off ¼" or less.

Secure the main sheet to the main sheet arm (the long arm on the Halycon servo) of the servo and main boom. Adjust the length so the sail can be pulled in to the center-line of the hull and then down firmly. A sheeting servo must be strong enough to lift at least 12 pounds

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R/C SAIL YACHTS

(Continued from Page **55***)*

dead weight a distance of 12" in about 8 seconds. Secure the jib sheet and adjust the length so the end of the jib club will be about 2" off the center-line of the hull when the main is sheeted-in tight.

(4) The seemingly insignificant and small jib sail may need some explanation. It is not "hung" on the model just for looks. It is incorporated in the design for the express purpose of increasing the efficiency and driving power of the main when sailing to windward and when reaching. That is what it is intended to do — **if** it is set correctly. If, on the other hand, it is set incorrectly, you would be better off without it! When sailing a course to windward, the jib directs the wind past the lee side of the main sail. This is a high velocity wind passage that creates a vacuum or pull on the main, thus increasing its efficiency. If the jib is pulled in too far, it will direct the wind into the back side of the main (termed "backwinding the main") which, of course, will kill the power of a good portion of the sail. A rule of thumb to use for a jib setting is to allow the jib to luff just before the main sail luffs. (Luffing is to alter a course toward the wind until heading into the wind. Or, a sail is luffing when it is not completely full.) To obtain the most out of the jib and mainsail relationship, the leech (trailing edge of a sail) of the jib should form a parallel slot in relation to the backside of the main. This can be checked by viewing the yacht from the lee side when looking forward from the

transom. The yacht must be on its stand, bow pointing about 45 degrees off the wind, on approximately a windward course. The sails must be sheeted in tight and enough wind to keep the sails full. If the slot is too narrow at the top, slack off on the baskstay slightly. (This condition is prevelant in light winds.) If the slot is too wide at the top, usually due to heavy winds, tighten up on the baskstay. Other methods used by some skippers include installing a boom vang on the jib club, or devising a method of moving the swivel fore or aft at the jib club. If you move the swivel aft, it will narrow the slot at the top, or open the slot when moved forward. This actually varies the tensions on the leech of the jib.

(5) The boom vang is a spring or rubber band used to limit or restrain the rising tendencies of a boom. When set up hard in heavy winds, it will help to flatten the sail and decrease the spiral form of the sail. Set the vang tension to allow about ½" rise in the main boom. The boom vang has no purpose going to windward, but is used on a reach or a run to prevent the leech of the mainsail from falling off.

Before progressing further, let us say at this point that these instructions and their accompanying terminology may sound quite confusing and time consuming to the novice yacht skipper or the part-time yachtsman, but rest assured they will become second nature to you after a few times out.

The ability of a yacht to sail to windward is of utmost importance. The majority of races are won or lost on this leg. Improper tuning or balance affects the yacht's performance more radically on the windward course than sailing courses off the wind. It is, therefore, obvious that we must concentrate our efforts toward tuning the yacht to "point" high into the wind, move well through the water, and respond briskly to control commands. Assuming the static balance is within reasonable tolerance, and that the mast, rigging, sails, and sheeting information has been digested, we can now start on the final phase of tuning. This final phase will be the subject of next month's article.

In the meantime, if you seriously intend to enter competition yacht racing, we urge you to obtain the following books on the subject: "Model Yacht Construction And Sailing," by Lt. Col. C. E. Bowden, distributed by Percival Marshall Co. Ltd., Great Queens Street, London W.C.2, England; "Model Sailing Yachts," by Electrical Press Ltd., and distributed by Percival Marshall Co. Ltd.; "Model Racing Yachts," by Dennis Brown, and distributed by Robert Ross & Co. Ltd., South Hampton, England; and "Build Yourself A Model Yacht," by W. J. Daniels and H. B. Ducker, also distributed by Percival Marshall Co. Ltd.

KITS & PIECES

(Continued from Page **53***)*

Several months ago, I received a sample of Franklin's Titebond glue from North El Monte Hobby. This, in my opinion, is the best all-around glue for R/C model building. It handles like white glue, sets up more quickly, and is sandable! Titebond is stronger and more resistant to fuel, water, and solvents. It does not draw or raise when doped. Give it a try — I think you will like it. I do!

●

A new mechanical brake, available from Rocket City Model Products at $2 per pair has been tested and found to be unusually smooth, simple, positive, and also inexpensive (a most unusual feature for brakes)!

●

In answer to the many inquiries — yes, in the front street! Alas — poor Ken Willard and his "good neighbor policy."

'Til next month — see **you** at the field! (Ed's note: That's the **field,** Bernie, **not** the street!)

The Roostertail

The Official Publication of the International Model Power Boat Association
General Office:
2405 19th Avenue Broadview, Ill.

'Miss Lisa,' W. P. Markland's 30"L x 12"W single channel design. 6 lbs., 14 ozs., OS .35.

CONTRARY to the last issue of the Roostertail, the dates for the 17th Annual IMPBA regatta will be held on the **weekend** of August 20, and 21, 1966. Somehow the published dates were indicating that the contest would be held on a Sunday and Monday, and it just is not so! Double check your calendar, and mark the weekend of Aug. 20, and 21, as the dates to come to Potawatami park in Wheeling, Ill. You will receive detailed instructions, lists of accomodations, and an advance registration form by direct mail, if you are a member of the IMPBA.

For those of you living in the Western United States, the West Coast District Regatta will be held on September 3, and 4. The San Francisco Model Yacht Club will host this meet at Lake Merced in Golden Gate Park. You have all summer to get your boats in shape, so this should be a highly competitive meet.

Ballots for the election of officers for the IMPBA will be in the mail shortly. This year, the ballot will include a special waiver to set aside Article IV Section 2 of the Constitution, which states that in order to be elected to the office of President of the IMPBA, a man must have served as a Director. The purpose of this rule is to insure that the man who heads the IMPBA is familiar with the rules, procedures, problems, and projects which affect the membership. These conditions would not be met by some of the Directors now serving, since their duties do not encompass all of the problems and projects in process. Secondly, none of the present Directors has expressed a desire to become a candidate for the office of President, and several have chosen not to run when asked if they would consider the job. This, then, almost rules out a candidate for President under the provisions of Article IV, Section 2. Mert Mischnick has been asked to remain as President, and has declined, but recommends that we consider his very able, and competent assistant, Mr. Robert J. Pachman, the present Secretary-Treasurer of the IMPBA. Bob is the Commodore of the DeVry Dolphins, the host of the 17th Annual Regatta, Past Commander of the Cicero, Ill., Post of the American Legion, and a former Outboard racing competitor. By serving as Secretary-Treasurer, he has become thoroughly familiar with all the facets of the IMPBA, and is without a doubt, the best qualified man for the job, in experience with the IMPBA, in experience as an administrator, and as an active R/C model boater.

* * *

Squawk Department. The following letter has been received by the IMPBA general office:

"Due to the lack of interest and deceptive wording in the recent IMPBA balloting, a class change was made which in our opinion will be detrimental to the boat fraternity. This change effectively eliminated prototype racing. In more simple terms this eliminated any incentive for building or racing a runabout or cabin cruiser type hull. If this is not enough, insult is added to injury by declaring that this event will be replaced by a displacement class.

"We, the undersigned (signatures were attached), would like to bring up the following points:

1. Who in the IMPBA races a displacement hull with an internal combustion engine? All but two of the electric records are held by planing hulls.

2. Just what percentage of a hull is allowed to rise out of the water? This rule change was made to simplify hull classifications, but note just one example — Navy warships rise higher in the water when steaming at full speed when compared to their resting water line. Who will be able to judge whether a fast displacement design cabin cruiser is planing or not?

3. This classification does nothing to clarify hull requirements. It offends a large number of people who appreciate a fine pleasure boat and it eliminates one-third of the standing IMPBA records to establish a class in which there is no interest.

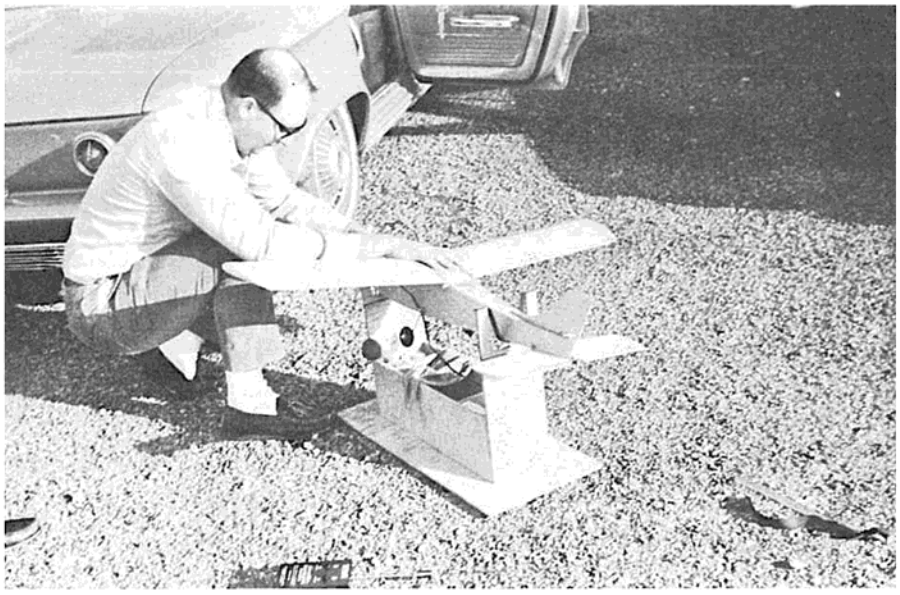
"We wish to offer our petition for the re-establishment of the prototype class and records as they were in the past with one change. We suggest that prototype boats must be of a pleasure boat design and they must be run with all hatches and cowlings in place (i.e., Norco Newports, Sea Queens, Cobras, Sea Maids, etc.). Therefore, racing planing hulls such as ski boats, cracker boxes, flatties, etc., would be considered unlimited hulls."

Your comments are invited. Please include your IMPBA Life Number with your signature. The letter we received had 42 signatures, but we know for a fact, since we have the master file of members, that all of the men signing the petition were not members. Your application for membership will be accepted at the time you reply, if you so desire, and wish to have your vote counted. This rule change, which is under fire, had only 14 votes against it! Where were the other 28 members when it was ballot time?

Contest Calendar

5/22	DeVry Dolphins, Wheeling, Ill.
6/25, 26	Aurora MPBC, Aurora, Ill.
6/25, 26	Metro Marine, Toronto, Canada
7/23, 24	Minute Breakers, Lombard, Ill.
8/7	TCRC, Beloit, Wis.
8/21, 22	17th Annual IMPBA, Wheeling, Ill.
9/3, 4	Marquette MPBC, Chicago, Ill.
9/3, 4	SFMYC West Dist., San Francisco, Calif.
9/18	DeVry Dolphins, Wheeling, Ill.
9/24, 25	St.LMPBA, St. Louis, Mo.

If you need information regarding any of the scheduled regattas, such as the location of the park, the events to be run, special rules, etc., just drop a line to the General Office, and we'll see to it that the proper people receive your letter.



Dick Stewart's Schoolmaster wtih Cox .09, Royal servo on rudder, SE-2 escapement on throttle, CitizenShip transmitter and receiver. Successful ship from Memphis RC Club.

SUNDAY FLIER

By KEN WILLARD

MAN, oh man! The troubles you Sunday fliers have! The problems . . . the patience . . . but most of all, the sense of humor! I'm proud to be one of you, and hope I'll always qualify!

As I said last time, this month it's your turn to write the column — or at least let me tell about your activities. So let's go . . .

First off, let's hear from Morton Rupp, of Bryan, Ohio — a classic example of a Sunday flier who still hopes to overcome a seemingly impossible set of circumstances:

Dear Ken:

I have a rather perplexing problem which I hope I can describe without writing a complete book. First of all, I am a beginner in an area of little R/C activity. That probably speaks volumes in itself. A year ago I purchased a well advertised R/C system and installed it in Ted Strader's "Gypsy." To date I have had about six disasters of varying degree and a like number of semi-free-flights (beautiful, as long as I stayed off the stick), plus a near nervous breakdown.

The installation instructions were carefully followed, all the prescribed checks made, including tuning, timing, tone adjustment, battery range, etc. It operates perfectly, for a short time. It then becomes completely unpredictable except for two instances. It will work when I try to show someone how it misbehaves. It will not *work at any other time, especially after a 25 mile drive to the field. For instance, a right signal might give right rudder, left, down, a series of eight or ten short pulses, or start the escapement cycling, which it will continue to do* after *the signal is released, and until the transmitter is turned off. A battery check will show some loss of voltage, but never down to the limits stated in the instructions. This condition prevails whether it is on the ground, in the air with the motor running, in the glide a third of a mile away, or home on the table.*

I returned the unit to the factory, getting it back with the message that it operated perfectly, and that low batteries could cause the condition described. Proceeding on this theory, I became the proud owner of a cigar box full of 70-cent transistor batteries in short order (I may wholesale them to cover the cost of bankruptcy proceedings). I suspect that they bench tested it for a comparatively short period of time, which could account for the fact that it did not misbehave. Several experienced fliers have looked it over and could find nothing wrong with the setup in the plane. However, I tried changes such as moving the receiver farther away from the batteries; making sure the antenna does not come close to other components; etc., but it made no noticeable difference.

Perhaps a thumbnail sketch of one of my typical "flying" sessions would give some insight into the problem: Check batteries with load on (batteries, not me) . . . read 18 volts on Tx; 9 volts on Rx. (Specified minimum: 16v.-Tx; 7v.-Rx). Make range check at home. Key carefully. Conserve batteries while walking. Range — 3 blocks. A couple of wrong signals at this distance. Drive to field. Make range check. Range — 2 blocks — starts to become erratic. Check batteries. Slight voltage drop, possible ¼ volt. Try again — 200 feet. Once more — erratic from plane on out although still receiving at several blocks. Check batteries—8v.-Rx; 18v.-Tx. Slink home. Snarl at wife. Try it on kitchen table. Erratic. Put away till next Sunday. Try again on table — WORKS PERFECT! Install new batteries to be sure. Drive to field. Repeat above procedure. Check with doctor about tic under left eye.

Seriously, though, it does have me stumped, and although I have purchased new equipment for this year, I hate to see it set idle if it can be made to work. I can find no one in the area who is familiar with this system so any hints you can give me will be very much appreciated.

Sincerely,
Morton L. Rupp
Bryan, Ohio

Well, I gave him a hint. Chalk it up to experience. The system is no longer on the market. Get one of the well-proven combos of relayless receiver and escapement, such as Kraft, C&S, F&M, Controlaire, or CitizenShip for the receiver, and Bonner, CitizenShip, O.S. Minitron, or Babcock Mk II (there are still a few around) for the escapement. Or, OS, Hinode, or Royal Products single channel servos. But isn't it something that, after such a discouraging start, Morton still persists? You gotta' admire him!

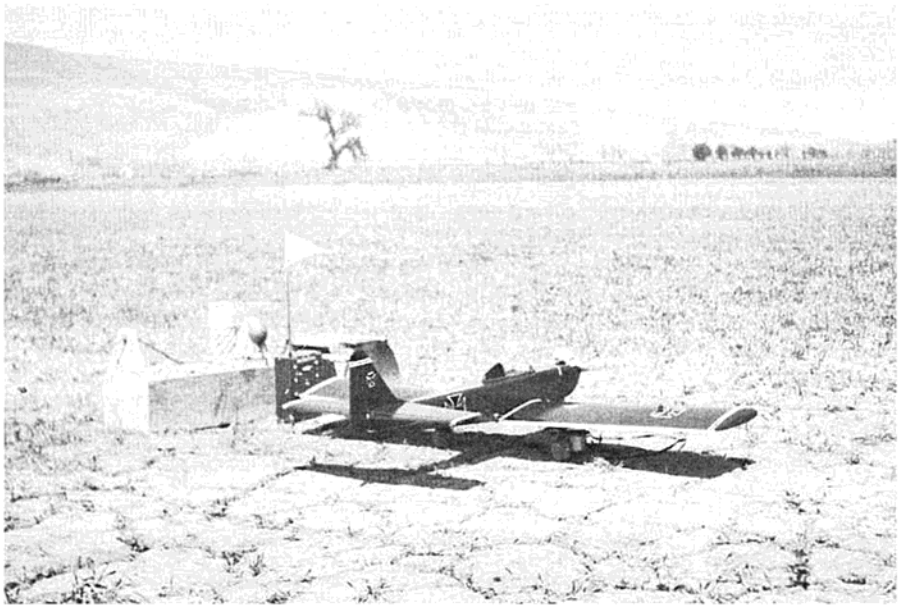
Next, my old friend Tom Stence came through with his annual report — and it reads a helluva lot better than some corporate reports. Tom's "return on investment" rate is measured in pleasure. It's apparent he receives a high rate of return. We're fortunate to have the opportunity to share it with him:

Dear Ken;

It has been a long time since I inflicted one of my letters on you. But I passed my 55th birthday recently and age is beginning to bear down on me, so I feel the need to type myself up a rest.

Then too, the town here celebrated its sesquicentennial last summer, and it is doubtless a cause for celebration that this or any other town has been toler-

(*Continued on Page* **59**)



San Jose Wavemasters Secretary/Editor Jim Carr's low-wing Tauri with German markings.

SUNDAY FLIER

(*Continued from Page* **58**)

ated in the sight of Heaven for a century or a century and a half. But if this seems to have nothing to do with models or my age, let me point out that both the centennial and the sesquicentennial have occurred within my span of years, and witnessing a fifty-year event twice is calculated to make anybody feel old.

The affair was a success and a fine time was had by all (it was claimed). Antique costumes were made new or dug out of dusty attics and everyone was required to grow a beard. However, few of the women were able to make the grade and an exception finally had to be made in their case. The place looked a good bit like 1880 and I suspect that anyone returning after an absence must have thought that he had run into a warp in time, or that his last beer had operated in the reverse fashion and several times more strongly than the flagon of Rip Van Winkle.

It was a poor summer for flying models too. The wind blew constantly and the boondock flying spots were worse than ever. This is poor country for chasing misbehaving R/C's anyway. It's rolling, wooded in spots, and all of the uncultivated land runs to brush and 7 foot ironweeds. Perhaps it is what the writer of Scripture had in mind when he said that "the wicked flee when no man pursueth."

But you wanted to know about escapement flying vs. the high priced spread. There are only 4 active R/C lads here, with two others flying occasionally. Equipment runs from escapements, and various forms of S/C on up to the latest full house proportional. On the basis of actually flying models though, fully 75% of it is done with escapements. This is probably conservative.

My chief flying partner, Dale Hootman, and myself each put in close to 500 flights last summer, with escapements. We had no more than 3 malfunctions due to escapements, and two of those were with a new one I was adjusting. We agree that neither of us has seen any multi fllying that comes close to the reliability we get from escapements. The multi lads have a surgical outlook though. If the thing goes failsafe at the wrong moment and piles in they always say it was working ok anyhow. The operation was a success, only the patient died.

Yours,
Tom Stence
Ashland, Ohio

As you can see, I'm still getting replies from my survey of last summer on the servo vs. escapement in single channel flying activity.

The next letter is typical of the questions we are asked, here at RCM, regarding battery hookups. Paul Fox poses the problem:

Dear Ken: —

I'm confused. First, the printed instructions with a Controlaire superhet SH100 single channel receiver says to separate the battery supply between the receiver and actuator. In other words, it cautions to use two separate battery systems.

I have also read that nickel cadmium cells are difficult to use in single channel because of interaction, and that two different supplies should be used one for the receiver and one for the actuator. Yet, in a recent issue of RCM, Don Dewey writes that he gets excellent results from just one *single nickel cadmium pack using a Controlaire SH-100 and the new Rand LR-3 actuator.*

Lastly, I recently wrote Controlaire and asked them what voltage to use when employing rechargeable packs since you have only a choice of 2.4 volts or 3.6 volts. They answered—"definitely 3.6, but be sure to re-tune because we send the receivers out factory tuned on 3 volts using dry cells."

Paul Fox Jr.
Richardson, Texas

If your model can carry the weight, Paul, it's always best to use separate battery supplies for the actuator and the receiver. Some receivers work quite satisfactorily with the combined pack — you have to try the individual units to find out. There's no hard and fast rule. Nickel cadmium cells are, perhaps, the most misunderstood and abused items in use by RC'ers, and will be the subject of a very highly detailed article soon to be presented in RCM.

The next letter, from K. McClure of the Memphis Radio Club, was picked from several that were almost identical. They all indicated that, except in some "hotbed" multi areas, most RC clubs still have a place for us simple single channel souls who, as Tom Stence put it, can't afford the high priced spread:

Dear Ken: —

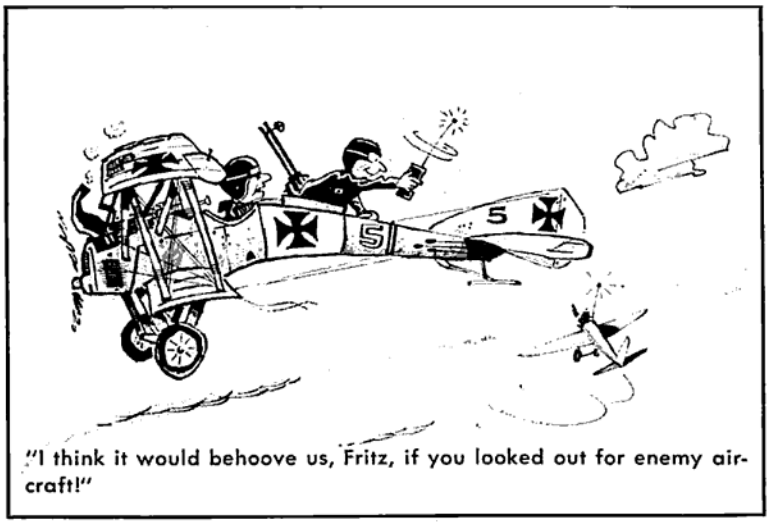
I am writing to you for two reasons — one, I am Activities Chairman of the Memphis RC Club and I am anxious to get a little recognition for our group, and second, I agree with you that everyone can't and doesn't want to a Doc Brooke or Cliff Weirick.

We have several of your "Sunday Fliers" in our club. In fact, my wife Glen, a nurse by profession, has in Orbit 3+1 in a deBolt Jenny with a Veco 19 on rudder and elevator. We have one active flier, Dick Stewart, who is still flying CitizenShip single channel superregen, with a Royal servo for rudder and an escapement for motor. His plane is a Schoolmaster, no less. We also have a Father and Son team, Harold and David Fanning. David is flying a Sterling Mambo with a CitizenShip Proportional on rudder and elevator. Jay Burkhart, a college student, has a Tri-Squire with reeds on rudder and elevator — very successful. Keep up the good work, we are all for you.

K. McClure
Memphis, Tenn.

Well, I'm all for you, too. So all you officers of RC clubs, please keep a place in your activity program for your Sunday Fliers, as they might tell on you! And they don't want to—they'd rather fly than snitch.

Write again, soon.



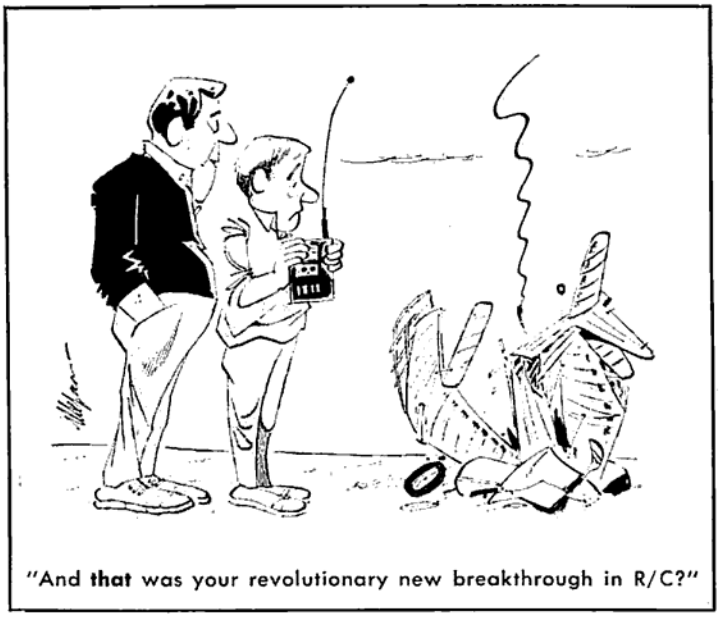
"I think it would behoove us, Fritz, if you looked out for enemy aircraft!"

"I don't mind getting caught by radar, but this is going **too** far!"

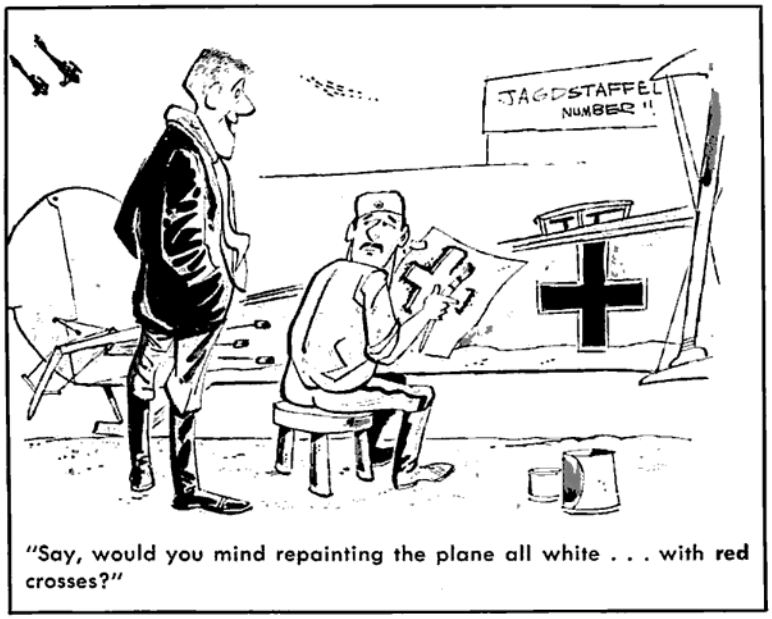
A.C., D.C., R/C

By

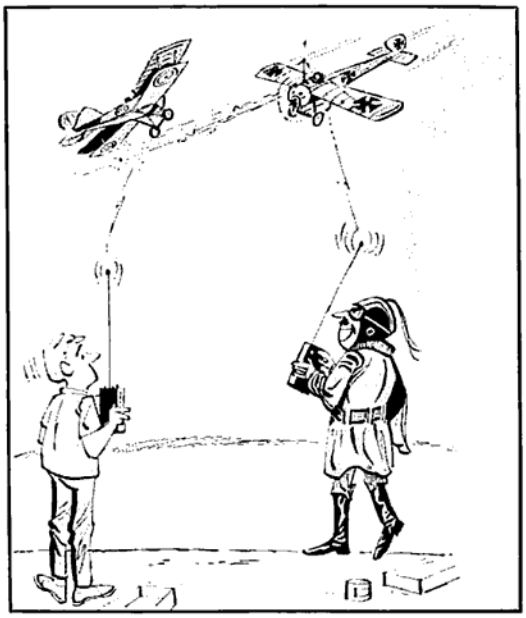
DENNIS ELLEFSON



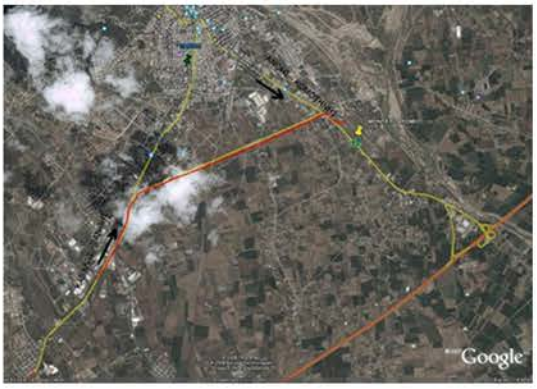
"And **that** was your revolutionary new breakthrough in R/C?"



"Say, would you mind repainting the plane all white . . . with **red** crosses?"



Airport Xanthi 1



Airport Xanthi 2

Airport Xanthi 3

Airport Xanthi 4

Airport Xanthi 5

Airport Xanthi 6

Airport Xanthi 7

Pilots (Hlsat,Savvas,Kostas)