RCM'S DIGITRIO: BUILDING THE TRANSMITTER

Radio Control MODELER

CDC

SEPTEMBER 1965
50¢

2ND ANNIVERSARY ISSUE

AMERICA'S LEADING PUBLICATION FOR THE WORLD'S FASTEST GROWING HOBBY

EXCLUSIVE REPORT!

The 1965 Willow Grove
NATIONALS

R/C: THE NEW ERA
PART 1

RCM PRODUCT REPORT
C&S DIGICON II

SPECIAL 'HOT BOAT' SECTION

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R/C MODELER CORPORATION, Publisher

Editorial and Advertising Office
P. O. Box 487
Sierra Madre, California 91026
Phone (213) 356-1066

Business and Circulation Office
P. O. Box 1128
Laguna Beach, California 92652
Phone (714) 494-0768

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EDITOR'S MEMO

by DON DEWEY

THIS issue of Radio Control Modeler marks our second anniversary as a hobby publication. I must confess, there were times when we didn't think we'd make it. Either physically, mentally, or financially. For two years we've tried to reach the goals we had set for you in this publication. It's taken 18 hours a day, seven days a week, during those two years, and we still haven't met them. We still have a long way to go to bring you the type of publication you want – and deserve.

A good number of the letters we receive from our many friends throughout the world ask about how this publication got started–who works for it and how it's published. It started on the screened-in front porch of my former home. We had all the attributes of success. These attributes consisted of the fact that between Chuck and myself, we had five hundred dollars, and a desire to put out a publication strictly for the R/C fraternity. The fact that neither one of us had ever been inside a publishing house or had the slightest concept of how a magazine was put together, didn't phase us in the least. Chuck owned a hobby shop and could work part-time . . . I was to work full time on it . . . and we conned Kathleen into coming in at midnight each night when she was finished with her swing shift as operator at the local telephone company to straighten out what we'd messed up during the day.

The first printer we contacted politely informed us that he would be glad to talk to us about printing the first issue when we had accumulated $50,000 initial capital. We thought he was kidding, of course.

He wasn't. Today, we know that it takes more than $150,000 a year to publish this magazine. And if all goes well, with new publication, it will just break even after the first couple of years. So, besides blood, sweat, and tears, how did we make it?

We didn't. **You** made it. This is your anniversary . . . each and every one of you. Each of you, by your letters of encouragement when the going got a little rough – your constructive criticism when we didn't quite make it "up the hill," – your editorial contributions – your support and most important of all, your friendship – made this issue possible.

And the members of our industry – you'll find their names in the Showcase section, and the Advertiser Index of every issue – their faith and confidence in a couple of unknown and unproven "would-be" editors, made it possible to keep the flow of paper running through the presses. It doesn't matter, at this moment, what they produce or sell – or whether they work out of their garage or a 10,000 square foot plant – they **all** bent over backwards to help us. Everyone of them is a personal friend to this publication, and the many favors they have gone out of their way to do for this magazine will be forever beyond repayment.

To the people on our masthead – for many of them, it's a title only, and they serve you simply for the reward of knowing they have contributed to your pleasure in this hobby, and consequently, made a contribution to the state of the art and science of radio control.

Today, two years later, this magazine is considered to have achieved a certain degree of success as a hobby publication. It is a long way from the goals we have set, but we will meet these goals one by one, no matter how long it may take. This, I promise you. But whatever degree of success it has attained to date, the laurels belong to you, the individual modeler and member of the hobby industry . . . the finest group of people I have ever had the pleasure and privilege of knowing.

It could only happen in a country like America. Only **you** could have made it possible.

●

We were both honored and pleased, this month, when Jack Sellors, VP for the Cleveland Radio Control Club, stopped by and made your editor an Honorary Member of the Cleveland flyboys. Jack was in Southern California on business, and came by the house and office to present the membership card on behalf of the club. We sincerely appreciate this honor, and wish that we could actively participate in, and contribute to, the activities of the clubs that have bestowed this privilege upon us. We promised Jack that we'd run the Polariod print of him and yours truly in order to prove to Ken Berman

(Continued on Page 7)

RADIO CONTROL MODELER MAGAZINE

SEPTEMBER 1965 VOLUME 2, NUMBER 10

THE COVER

Sally Dewey holds Meinke's pre-fab Royal Coachman with Citizen-Ship APS Proportional system. Right: A Digitrio Prototype under construction by RCM's Editor. Lower Right: Chuck Waas prepares C & S Proportional controlled White Heat by Octura.

FEATURES

DEPARTMENTS

NEXT MONTH:

RCM DIGITRIO: *Part III – Constructing the transmitter stick assemblies, and final alignment. By Ed Thompson.*

HAMMERHEAD: *The craftsman's multi design by Jim Fielding.*

THE NEW ERA – PART II: *Free Style Aerobatics.*

and the rest of the Cleveland group that he'd really been here! So let him off the hook, fellows . . .

●

I'm sure that all of us can remember the first solo R/C flight we made – and the feeling of pride and accomplishment not to mention the nervousness, that went along with it. This month we received a copy of a letter addressed to Carl Goldberg at CG Models that we would like to share with you:

Dear Carl,

I'm not in the habit of writing to manufacturers regarding their products, but felt that this letter needed to be written. I have just completed and flown my first full house ten channel radio control model – a Sr. Falcon.

Your advertising of this airplane is the most factual I have encountered. You are absolutely right. It is the simplest, soundest, most attractive airplane of its type I have ever built. And the parts **do** fit. These laurels do not come from a newcomer to the field of model aviation. I have been building models and flying them for the last 30 years. One of my first successful "gassies" was a Senior Clipper which you will well remember. The hobby has come a long, long way since those days.

But I digress. You no doubt have felt the same apprehension I felt when I first took the Falcon out to the flying field. Here was the final result of many long hours of arduous labor before me. Hours of fitting and filling, and sanding, and rubbing to get the 'proper' shine to the finished product. Your advertised six and a quarter pounds compared to my finished six pounds fifteen ounces, the difference no doubt in paint, as I am using Bonner servos as shown on the plan.

Normally, I have had a good friend with many hours of experience in flying radio control take off my models the first time. His reactions are much quicker and surer than mine. But this afternoon, there was no one around but me. I decided to fuel up and taxi the ship around the field a little, just to get the feel of it, you understand. This I did. I taxied eight ounces of fuel through the tank and tried to gain control of my emotions – stop the knocking knees and the palpitating heart. You know all of the symptoms. I found that taxiing was really no great chore and regained my composure enough that I fueled up again.

This time I taxied around a little more but decided that I could do so somewhat faster than before. Accordingly, I upped the rpm of the engine to about half throttle. This was fine going downwind, but when I turned into the wind and traveled a short distance I found that the ship was airborne. Quickly, I shut down the powerplant, and the ship drifted slowly to earth. I breathed a sigh of relief and picked it up – all in one piece and no scratches.

By now, self confidence was building. Afterall, I had taken it off and landed it with no problems. Why not try again? So, I cranked it up again and taxied around a little more. By now I was feeling much more confidence. As the plane neared me upwind, I turned it into the wind and thought . . . "what the hell, let 'er go." I hit the throttle and watched her eat up the strip. Hit a couple of bumps to up elevator and away she went. Straight and true and as realistic as any plane I have ever seen. Got a couple of hundred feet of air between the plane and the ground and gently turned it 180 degrees. Downwind everything remained fine, the ship still climbing at full throttle. Another gentle turn and crosswind, all systems fine. Took it back upwind and cut the throttle. She came around and started to settle. I made a long downwind leg, turned and brought it in. All seven lbs., or thereabout of it settled gently as a leaf.

The exhilaration is incomprehensible, as I'm sure you know. I got it up and down in one piece on the first try. Quite an accomplishment for me who is something less than a Sunday flyer. One more flight that day and then home. All I had to do was wipe the excess oil off of the surfaces and hang it up again. A great feeling.

I just thought you would like to know what one old timer in the field thinks about your product. It's great. I only hope I can continue to fly it for the rest of the summer as successfully as I did the first day out, and I hope you continue to come out with models equally as good as this one in the years to come. I can sing nothing but praises for your product line.

Thanks again for marketing such a fine product.

Sincerely,
Richard (Dick) Vogt
Aerotelemechanics, Inc.
Secretary

While on the subject of letters, here's one from our buddy Emerson Hoffman, written aboard the S.S. Atlantic:

Dear Don:

Your plans are too damn expensive! About the only people that can afford them are hard-drinking, overpaid, high-living Merchant Seamen – like me! You guys that moan about the lack of "Juniors" coming into model building, give me a pain – especially when you turn around and hang a price tag on your product that makes a working stiff blanch, not to mention what a high school kid must feel. Any kid trying to break into this racket will have to steal a hell of a lot of hub-caps to do it!

(Continued on Page 8)

And not too many of the 'Powers' seem to be doing much about it. Except maybe you guys!

A Double shot on the rocks for your full sized plans of the D.Q.A. 704 and the Lorelei! A welcome trend! Most of the youngsters and beginners around home (Lebanon County, Pa.) start out with an .049 plane, and at least you save them a little dough. Almost like the '30's, when magazine plans were complete enough to build a plane with no sweat. I just love some of our present day magazines that print plans with not one measurement or scale included. And many of them are aimed right at the novice. What hypocrisy! If it's the Juniors you want to help, give them full sized plans – the buck you lost could come back to you tenfold if you get them hooked on the hobby.

Enclosed is a French Model Magazine that I picked up last trip when we were in Cannes. Just like Playboy! (Maybe that is where Heffner got the idea!!!)

All of which brings us to Class I rule changes. What Class I? Rudder only is now multi and proportional requiring up to $300.00 for the gear. I'll agree it is a step up from past performance of Class I, and looks good the way it is. But what about the probably 70 to 80% of R/C modelers who use R/O on escapements? You have to tell them to dig up another $200 if they want to compete on equal footing at the contests. There is something wrong with any hobby when there is no event for the majority to compete in.

Last summer our club (Lebanon Valley R/C Club) put on a spot landing contest for single channel, R/O, inviting other local clubs. Only a few landed inside a 100' circle, but everyone had a ball. Most beginners and Sunday-fliers are not interested in loops, rolls and other exotic maneuvers. Just keeping the plane in the vicinity and landing it on the runway is enough challenge for them. And the only judging needed is a tape measure. But time in the air was a problem.

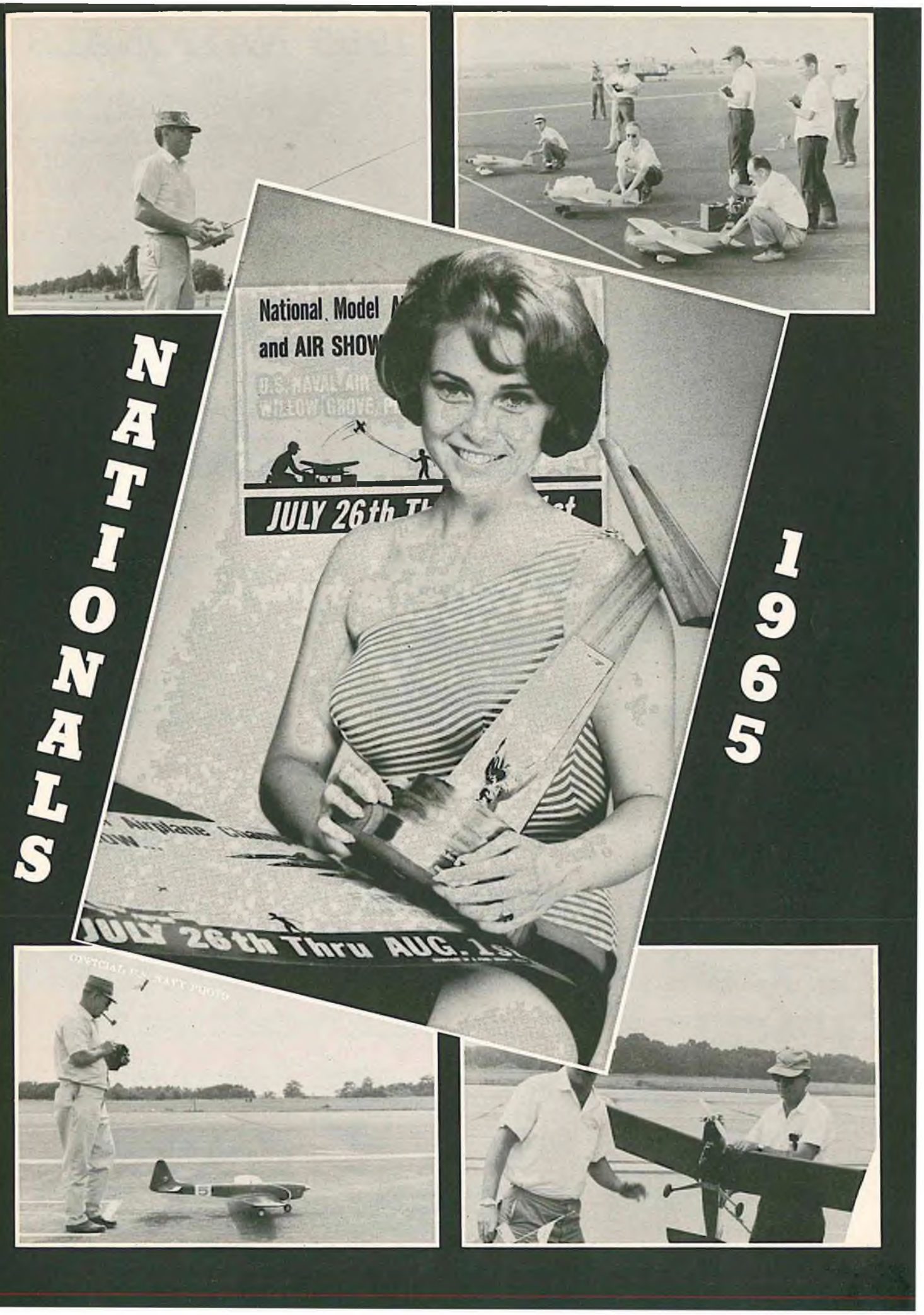
Although our club is mostly multi, we realize the problem of the R/O flier, and have been kicking the problem around. For the single channel, R/O flier, we would like to see evolve a spot landing contest, with endurance added, for sport-type planes. In fact, the fundamental motive of the contest and its rules would be to develop (and preserve) a realistic, rugged and stable sport-type S/C, R/O model.

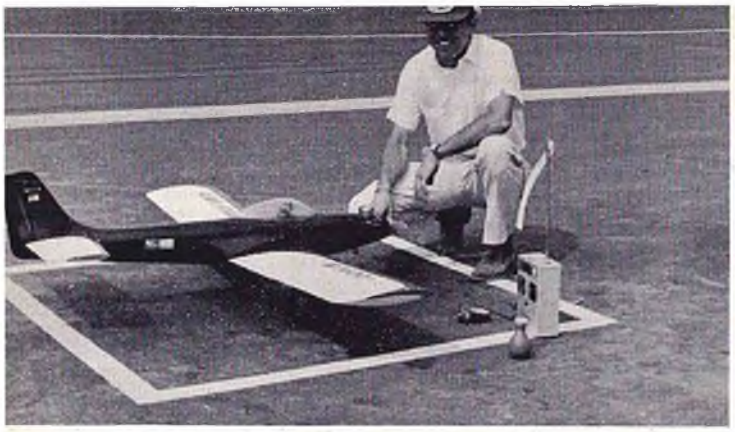
Allow a motor run of about 30 seconds to produce a flight of about 1½ minutes, giving one point for each second the plane is in the air. And allow one point for every foot the model lands inside the outer edge of a 100' radius circle. The points from these two segments are added to give a maximum point total of about 200 points. This type of contest would eliminate the judging problems of multi R/C events, and also the thermal-ballooned scores of F/F. The short duration of each flight would permit plenty of flights per day even if superhet receivers are not designated. The contestant whose plane isn't too hot on endurance, could still make up points in the landing segment. And the timed motor run would be a natural for the boys coming over from free flight. But to eliminate contest-only planes, all planes must have the feature of being able to by-pass the timer and fly off a full tank (remembering again that we are trying to promote a rugged sport plane for the Sunday flier).

The plane size, .049 only, since 80% of the local Sunday fliers and beginners start (and end) here. Lower cost is another factor. Hand launched planes only, but if the landing circle is close-mowed, points could be subtracted if the plane flops over on landing (thereby promoting sufficient and rugged landing gears and wheels). Strictly non-proportional escapements (either rubber driven or the newer non-proportional servo types now on the market), or S/C pulse controls only. Engine run timed by either M/C or a fuel cut-off timer. Strict area, wing-loading and power-loading rules to keep planes at their present configuration (locally, Falcons, Lil Esquires, Schoolboys and Miss Americas predominate). An ample cross section rule should be used to eliminate stick-jobs. The rules should be developed to promote a good sport-flier, realistic appearing, rugged, 200 to 300 sq. wing area R/O, S/C craft, and eliminate frail, over-powered zoom-zoom types. The conventional plane must have something going for it since I note the trend towards "Old-Timer" F/F contests gaining in popularity the past several years.

We think a contest and plane of this type would provide plenty of challenge, interest and excitement for the expert as well as for the novice, but with the big difference in that the beginner would be able to compete with the expert since the cost factor has been harnessed, and the type of flying is within the scope of the novice. And there is the added bonus of having a rugged everyday sport plane to fly just by by-passing the timer. To insure plane ruggedness, generous minimum wing loading should be used (probably around 14 to 18 oz. per sq. ft. of wing area) and those who build light can easily meet the rules by adding temporary weight. And since a Cox Golden Bee .049 just doesn't stand up to a Cox TD .049, probably engine horsepower should be worked into a power-loading formula to insure equality in the engine department. The rules should

(Continued on Page 72)


NATIONALS
1965
National Model
and AIR SHOW
JULY 26th
JULY 26th Thru AUG.



1965 NATIONALS

Cliff Weirick makes it two in a ro
as Navy hosted Nationals makes i
T.V. debut. Here is RCM's excl

Two in a row for victorious Cliff Weirick. GlasKraft Candy fuselage. (RCM Design)

Tom Brett prepares his unusual Class III original design.

Three AMA open plyon entrants — Austin Leftwich, extreme left, new record holder.

Vic Husak, with his large economy size (8') Class III entry.

Scale Mustang entered by John H. Krauer.

Doug Spreng with Don Mathes of Micro-Avionics. Ship featured a single wing flap.

Ed Izzo, 7th in Class III, favors high aspect ratio design.

Bobby Woods accepts 5th place trophy for Class I Jr-Sr.

Cliff Weirick calls the shots for Phil Kraft during heated Class III competition.

Triangle TV syndicate filming the R/C activities for N.B.C. TV.

Bob Bailey's Nieuport 27 hits flying speed just prior to takeoff.

F. W. Peoples' Jocelyn-Parsons Aerobatic Special.

15 year old Bob Kelly receives trophy for best performance by a Junior in Class III.

VILLOW GROVE, PA.

*ve report on the highlights and fi-
al results of the 1965 Nationals at
Villow Grove Naval Air Station.*

Nick Neville of Rocket City R/C Specialties — a well-deserved 1st in Class II. Scored higher than 90% of Class III entrants and highest ever recorded in Class II.

Miss Model Aviation congratulates Gary Davis — 1st in Jr-Sr, Class I.

The start of a heat in a Goodyear plyon event. Cliff Weirick, center, won the event.

N.M.P.R.A. perpetual trophy awarded to winning Goodyear team of Maurice Woods and Cliff Weirick.

Bill Northrop took 3rd in scale with giant D.H. Gypsy Moth.

Ralph Jackson's Piper Comanche — 2nd in scale.

Bud Atkinson — a 2nd in Class II for the Propo Cat.

Gordon's Sigma 7 — a second in Class I.

The star of the show — Hal deBolt held lead until the last day of the meet exceptional flying, Hal.

Miss Model Aviation presents Eby with 1st place Class III Novice trophy.

Lloyd Sager — 2nd in Class II.

Bill Bertrand's scale Piper Tri-Pacer.

Bill Kings Fleet Model I characterized by excellent airborne performance.

AMA Plyon		Class I Open		Class III Open	
1st	**Austin Leftwich**	1st	**Jackie Gardner**	1st	**Cliff Weirick**
2nd	**John Rohrbach**	2nd	**George Gordon**	2nd	**Hal deBolt**
3rd	**Ted White**	3rd	**M. Reed**	3rd	**Harold Coleso**

Austin Leftwich with 75 mph Delta — a new record for A.M.A. pylon.

Walt Burgin's Taylorcraft lifts off on scale qualifying flight.

John Rohrbach's scale entry — Merco 49 powered P-63.

George Hahn's scale Victa Airtourer.

Hale Wallace's Cessna Skymaster — a remarkable aircraft.

Carl Goldberg with Mehlin Smith — CG's new Shoestring kit, available soon.

Another view of Tom Brett's unique Class III design.

Ed Kazmirski with another of the "Big 'Un's".

Lou Andrews with the Aeromaster. Flown by Huber, the Class III bipe will be available soon as an AAMCO kit.

Russ Morgan and trophy for best total high point, Jr-Sr.

Jim Kirkland and Citron, shown here with Hal deBolt.

Focke-Wulf 190 entered by Dick Nicely.

Three Goodyear midgets await the flagman's signal.

ass 1 Jr-Sr.		Class II Open		Scale	
t	**Gary Davis**	1st	**Nick Neville**	1st	**C. McCullough**
nd	**R. Schmidt**	2nd	**Lloyd Sager**	2nd	**Ralph Jackson**
d	**Russ Morgan**	3rd	**Bud Atkinson**	3rd	**Bill Northrop**

Jackie Gardner, top man in Class I Open. This year's Class I entries double that of 1964 Nationals.

Claude McCullough's Douglas XTB 2D-1 tops in scale with 10,498.5 points.

Ted White — 3rd in AMA pylon. To the victor. . . .?

Gordon, 2nd in Class I Open, accepts trophy from Miss Model Aviation.

Dick Nicely's Focke-Wulf at start of flight.

What Nat's would be complete without a scale Cub?

Bill Kings Fleet Model I in the approach.

A legend in his own time — Hal Goldclank executing a figure 7.

Jim Fieldings Hammerhead — to be featured in October RCM.

Bob Kern's unusual Class III entry.

Close-up of George Hahn's Airtourer.

Weirick assisting Phil Kraft with Kwik Fli.

The flagman signals the start of a Goodyear qualifying run.

Receiver, decoder unit shown measures 2¼" x 1⅜" x 1⅜". Together with 3 Controlaire servos and five nicad pencells, entire airborne weight of Digitrio system is 15 ounces. Kraft servos can also be used, as amplifiers will be shown for both units.

RCM DIGITRIO

PART II

ED THOMPSON

Constructing the transmitter PC board is this month's project — if you're new to electronics, follow the instructions to the letter and you'll have no difficulty whatsoever. Start now to build this excellent proportional system. Advance material is not available, so take your time . . .

Preface

If the first article in this series stirred your interest and imagination, this and succeeding installments, will answer any questions you might have concerning the RCM Digitrio. Since Don has assigned me the position of Contributing Technical Editor and placed no restriction on the content or length of this series, I think you'll find the articles quite complete – even to the point of boredom for those with a "better-than-average" technical background. This attempt at completeness, however, will allow the average RC'er to "keep up" with the various stages of construction, and what otherwise might be an advanced project for the technician alone. Also, unlike a "quickie" article, this series can be used as a reference by experimenters who would rather "roll their own."

The theory that prefaces each segment of this series will be written somewhere above Ohm's Law and below complicated discussions requiring specialized knowledge or math for understanding. You will not have to be an engineer to understand the language used – I am writing for your understanding and not to impress anyone with technical terminology. The RCM Digitrio was not born from an Einstein-type inspiration, nor was it copied from any other system. Rather, it came from several years of staring at a scope and asking a myriad questions of people with advanced technical backgrounds. Although this system is designed to be duplicated without an oscilloscope, I would suggest that you buddy up with a friend who can assist you if you should run into difficulty.

Throughout the series, reference to ground will be synonymous with emitter potential of the stage under discussion. Let's get started with the transmitter-coder.

Theory of Transmitter

Figures 1, 2, 3 and 4 and the schematic will be used for the following theory discussion. Study these for familiarization before proceeding. All action starts with the pulse generator Q5. The waveform for Point A, Figure 2 shows how C14 charges positive until the firing point of Q5 is reached. When Q5 fires, the rapid downward transition couples a negative-going pulse to Q7's base via C16. R13 and R30 provide a means of varying the time lapse between negative transitions. If the resistance of either R13 or R30 is increased it will increase the time required for C14 to charge to the firing point. The opposite is true if the resistance is decreased. R29 is used to decrease the effect of R30's movement. R13 is used as a coarse setting of Channel 1 and R30 is used for the motor stick control. By selection of R29 we can adjust the servo movement extremes. So far then, we have a negative pulse going to Q7's base with control of the repitition rate.

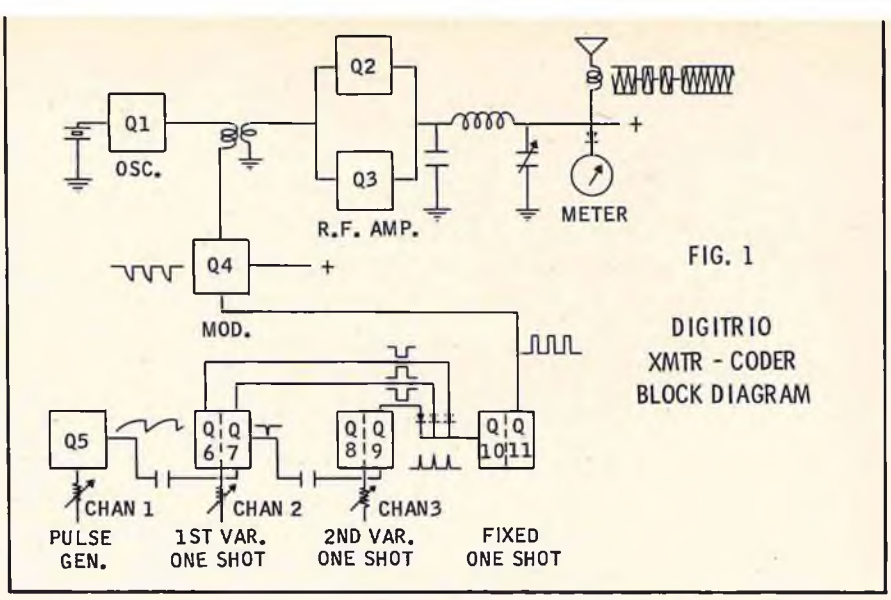


FIG. 1

DIGITRIO XMTR - CODER BLOCK DIAGRAM

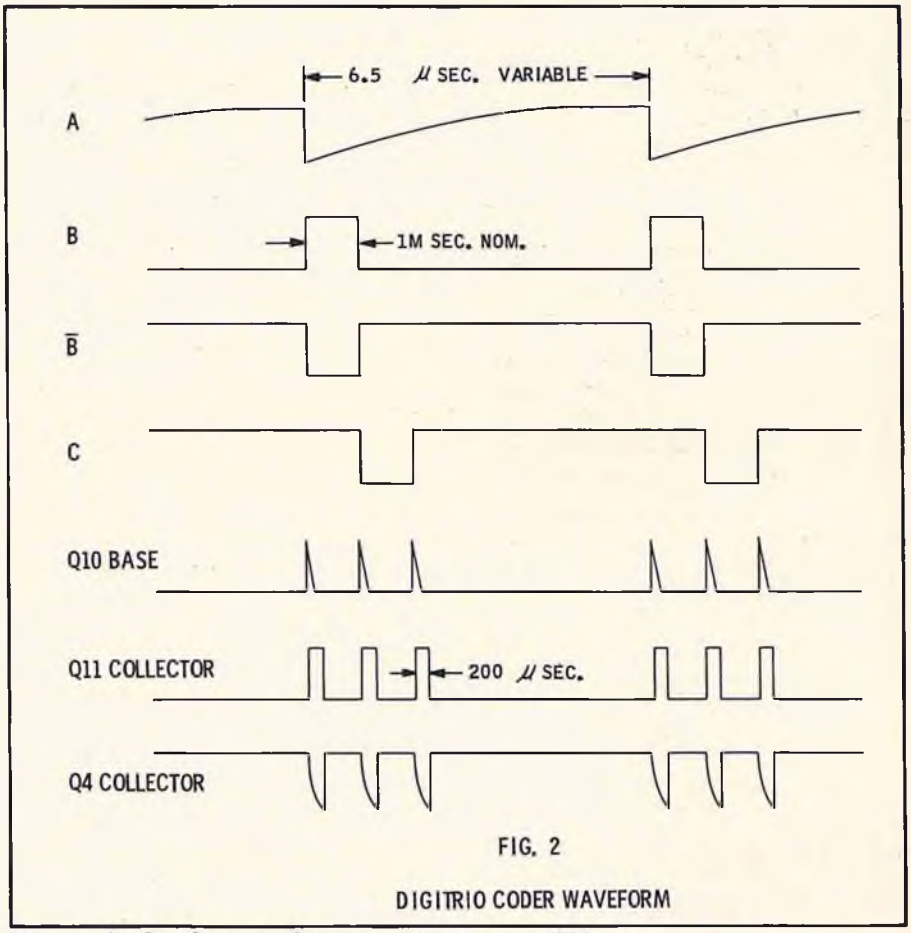


FIG. 2

DIGITRIO CODER WAVEFORM

When this negative pulse is applied to Q7's base the first variable one shot (Q6 & Q7) triggers (See Points B and B of Figure 2 waveforms). The cycle time of this one shot is determined by R31 and/or R34. R34 is the stick control and R31 the trim. R32 decreases the effect of R31's movement. The instant this one shot triggers, Q7 conducts, coupling a positive pulse across C20. When the one shot cycle is completed Q6 conducts (returning to its normal state) coupling a positive pulse across C21.

Q8 and Q9 form another variable one shot identical to Q6 and Q7. It is triggered by a negative pulse coupled across C17 when Q7's collector goes negative at the completion of its cycle. When this second one shot has completed its cycle Q8 conducting, couples a positive pulse across C19. C19, C20 and C21 are tied to ground with R21, R22 and R23. The short time constant of these resistor-capacitor combinations result in short positive pulses applied to Q10's base (See Figure 2). D4, D5 and D6 form an "OR" gate and prevent the negative transitions of the one shots

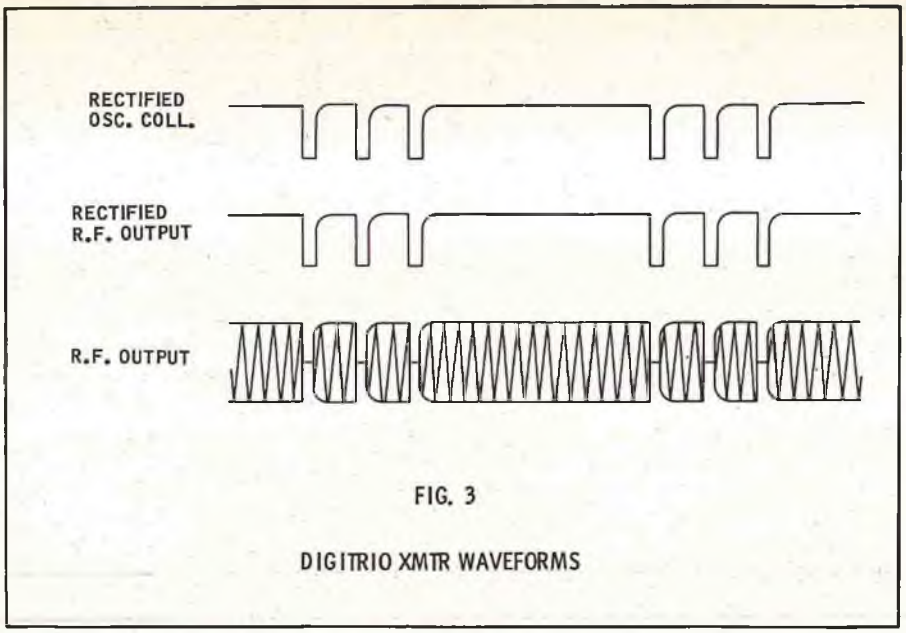


FIG. 3

DIGITRIO XMTR WAVEFORMS

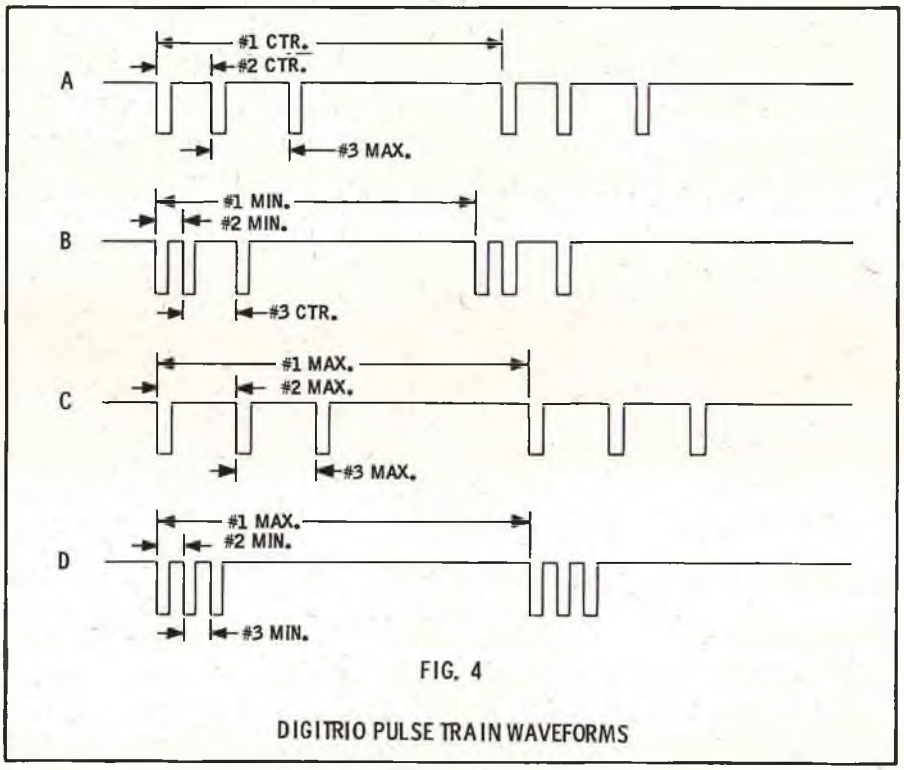


FIG. 4

DIGITRIO PULSE TRAIN WAVEFORMS

from appearing at Q10's base as well as isolating the different sources from each other. Let's review what we have so far.

The pulse generator initiates the action. When it triggers the first variable one shot, we produce Pulse 1 at Q10's base. We can vary the time between the #1 pulses with R13 (coarse) or R30 (motor control stick). When the first variable one shot completes its cycle we produce Pulse 2 at Q10's base. We can vary the time between Pulses 1 and 2 with R34 (control stick) or R31 (trim).

At the same time Pulse 2 is produced, we trigger the second variable one shot. When it completes its cycle we produce Pulse 3 at Q10's base. We can vary the time between Pulses 2 and 3 with R38 (control stick) or R35 (trim). The time between #1 pulses will be Channel 1. The time between Pulses 1 and 2 will be Channel 2. The time between Pulses 2 and 3 will be Channel 3. Since all channels are initiated at the completion of its preceding channel there is no interaction.

The pause between "sets" of three pulses is called the "sync" pause. The receiving decoder uses this pause to reset, or sync, itself as we'll see later. So far we have three independently controllable positive pulses at the base of Q10. These positive pulses are used to trigger the fixed one shot described below.

Q10 and Q11 form a fixed one shot that will produce a positive pulse at Q11's collector (See Figure 2) of approximately 200us duration each time it is triggered. These positive pulses are directly coupled to Q4's base and will cause this stage to cutoff for the duration of each pulse (See Figure 2). We will call Q4 the modulator as it is used to control the transmitter output. That's it for the decoder, now for the transmitter.

Q1 is the oscillator and gets regenerative feedback across L1 to sustain oscillation. The frequency of oscillation is determined by the crystal. R1 and R2 provide forward bias for this stage. L2's primary and C2 form a tuned circuit for the collector and is tuned to the operating frequency. L2's secondary couples the RF energy to the RF amplifier. The oscillator operates on the fundamental frequency desired and the crystal is a commonly available third overtone type.

Q2 and Q3 form the RF amplifier. Although sufficient power would be available with a one-transistor circuit, two are used in parallel to share the load and heat dissipation. R4-C4 and R5-C5 are used to insure that one transistor doesn't "hog" all the driving power and provide the DC bias voltage return to ground. The RF amplifier operates in Class C and derives forward bias voltage from the RF voltage rectified at the base emitter diode. C6, C7, C8 and L5 form the RF amplifier tuned circuit and is tuned to the operating frequency by C7-C8.

C9, C10, R6, R7 and D1 sample and rectify the RF voltage at the antenna which is applied to M1. R7 allows adjustment to suit the meter used. Positive voltage is applied to the amplifier through L6 which isolates the RF from the rest of the circuit. C3, C11, C12, C13, L3 and L4 are all used to provide RF feedback immunity.

Q4 modulates the transmitter by turning off the oscillator each time a positive pulse is produced at Q11's collector (See Figure 2). By using this method, oscillator leak-through is eliminated when operating the transmitter in close proximity to the receiver when testing etc. This method also produces extremely clean transmitter pulses from the standpoint of rise time and modulation depth.

The emitter of Q4 is tied to the positive side of the battery supply. Its collector goes directly to the oscillator. Q11's collector is normally negative with respect to Q4's emitter, forward-biasing Q4. This applies positive voltage to the oscillator's collector and bias resistors allowing it to operate. R8 and R9 are the bias resistors for Q4. Whenever Q11 conducts, its collector goes to ground potential and this removes forward bias from Q4. The result is that Q4 cuts off, removing the positive voltage going to the oscillator and the oscillator stops. This occurs each time one of the 200us

positive pulses, which we generated earlier in the coder, appears at Q11's collector. The RF at the antenna therefore is a carrier that is spiked off in a train of three 200us pulses with controllable recurrent rate and independent control of pulse separation. Figure 3 shows waveforms for the transmitter. The gentle curve at the top of each output pulse trailing edge helps prevent ringing in the receiver IF stages. When we get to the receiver you will note how clean the signal is. Figure 4 shows variations of the pulse trains as control pot settings are changed. Pulses are shown at center or extremes for simplicity but pulse separation is continuously adjustable throughout the control pot ranges.

Z1 is a zener diode wired in the circuit in a reverse bias configuration. It has the property to conduct when its reverse breakdown voltage is applied. It will maintain this voltage as the applied voltage is increased (current increases of course) up to its dissipation limits. R28 (2 ea. 180 Ohm ¼w in parallel) sets the current in a middle range to provide a stable voltage (5.1v) for the coder regardless of normal battery voltage fluctuations. This prevents trim drift due to varying voltage. Figure 1 can be used as a visual aid to tie all the foregoing theory together.

The battery pack is eight 600 M.A. Pencell nicads wired in series. This gives about four-five hours operating time. I doubt if a 9v dry battery will fit in the case shown and do not recommend their use. C23 and C24 are used to filter the circuit DC-wise. J1 and J2 are used as charging jacks for both the transmitter and receiver. They are wired to the off side of the switch. The antenna is center-loaded and contrary to many proponents of the unloaded or base-loaded types I have yet to encounter dead spots while using it. If you are of the "rather fight than switch" group, a base loading coil can be added and a "stick" used, at the expense of lowered "radiated" power.

Parts List and Procurement

By far one of your biggest problems in constructing the Digitrio will be procuring the parts. To make it as easy as possible for you I have included the manufacturer and manufacturer's part number. An unfortunate aspect of our hobby is that most electronic parts dealers handle only parts by certain manufacturers and we electronic builders bounce back and forth between distributors trying to come up with our total requirements. The two largest catalog dealers are very fast and efficient, as long as they have the part on hand and you give them **their** catalog number for the part. The sad part comes when they don't have a part and instead of sending it when they do get it in stock, they send you a "sorry we're temporarily out of the part you requested – reorder in 30 days" type reply. Also I have yet to receive a reply to inquiries about the availability of parts for which I didn't have their catalog number!

Of course, I think we all understand that any purchases **we** make will hardly make a dent in their profits, and in some cases, their handling costs will even exceed their profits – **costing** them money! So it's a sad lot for us "scratch builders." On the brighter side, we are fortunate to have a couple of hobby distributors who will go out of their way to help us when we need parts. Their assortment of parts, however, is limited to selected items used in their own equipment or carried by popular demand. One of these distributors is kitting this system and by buying in large lots they may save you money over buying individual parts – plus a lot of leg work.

For you scratch builders my parts list shows the parts I used in the original "Digitrio" which I obtained from ordinary sources. To give you the best possible chance of duplication I'll comment on the "odd ball," critical ones and give some substitutes.

1. C15, C18 and C22 are "Cal Rad"

RCM DIGITRIO TRANSMITTER PARTS LIST

REFERENCE NUMBER	DESCRIPTION	MANUFACTURER	MANUFACTURER NUMBER
Ant.	C. L. Ant.	World Engines	(Controlaire)
C1	100 PF	Erie	831X5R101K
C2	15 PF	"	831U2M150K
C3	.1	Centralab	UK10-104
C4	.005	"	CK502
C5	.005	"	"
C6	50 PF	Erie	831U2M500K
C7	50 PF	"	"
C8	7-100 PF	Arco	423
C9	27 PF	Erie	831U2M270K
C10	.001	"	CK60AW102M
C11	.05	Centralab	UK10-503
C12	.05	"	"
C13	.05	Centralab	UK10-503
C14	1.0 Tantalum	Mallory	TAS105KO35POA
C15	.1	Cal Rad	.1 Mylar
C16	.01	Centralab	CK-103
C17	.001	Erie	CK60AW102M
C18	.1	Cal Rad	.1 Mylar
C19	.001	Erie	CK60AW102M
C20	.001	"	"
C21	.001	"	"
C22	.01	Cal Rad	.01 Mylar
C23	100 Electrolytic	Mallory	TT15X100
C24	15 MFD @ 15V	World Engines	— — — —
D1	Ger. Diode	Ohmite	IN56A, IN 34 etc.
D2	Sil. Diode	"	IN457
D3	"	"	"
D4	"	"	"
D5	"	"	"
D6	"	"	"
J1	Phono Jack	Switchcraft	3501F
J2	"	"	"
L1	47 uh choke	Miller	74F475A1
L2	OSC Coil Hand Wound on C.T.C. Coil Form No. 2173-3-3		
L3	47 uh choke	Miller	74F475A1
L4	"	"	"
L5	RF amp coil	B & W	No. 3007
L6	47 uh choke	Miller	74F475A1
M1	1 M.A. meter	Ace	22B3
Q1	2N706	Motorola	2N706
Q2	2N706	Motorola	2N706
Q3	"	"	"
Q4	2N3638	Fairchild	2N3638
Q5	2N2160	G.E.	2N2160
Q6	2N3638	Fairchild	2N3638
Q7	"	"	"
Q8	"	"	"
Q9	"	"	"
Q10	"	"	"
Q11	"	"	"
R1	1K ¼W	Ohmite	LIDSM
R2	4.7K ¼W	"	"
R3	47 ¼W	"	"
R4	330 ¼W	"	"
R5	330 ¼W	"	"
R6	1K ¼W	"	"
R7	50K var.	Mallory	MTC54L1
R8	4.7K ¼W	Ohmite	LIDSM
R9	4.7K "	"	"
R10	Deleted	— — — —	— — —.—
R11	1K ¼W	Ohmite	LIDSM
R12	27K "	"	"
R13	10K var.	Mallory	MTC14L1

(PARTS LIST CONTINUED ON PAGE 26)

DIGITRIO TRANSMITTER PARTS LIST (Cont.)

R14	1K ¼W	Ohmite	LIDSM
R15	10K "	"	"
R16	1K "	"	"
R17	27K "	"	"
R18	1K "	"	"
R19	10K "	"	"
R20	1K "	"	"
R21	10K "	"	"
R22	10K "	"	"
R23	10K "	"	"
R24	27K "	"	"
R25	1K "	"	"
R26	1K "	"	"
R27	10K "	"	"
R28	90 ½W — 2 ea. 180's ¼W in parallel	"	"
R29	10K ¼W	"	"
R30	10K var.	"	CU1031
R31	10K var.	"	"
R32	22K ¼W	"	LIDSM
R33	4.7K "	"	"
R34	10K var.	"	CU1031
R35	10K var.	"	"
R36	22K ¼W	"	LIDSM
R37	4.7K "	"	"
R38	10K var.	"	CU1031
S1	DPDT Switch	World Engines	W. E. DPDT
XTAL	— — — —	" "	— — — —
Z1	5.1V Zener Diode	IR	1N751A
— —	Ant. Grommet	World Engines	— — — —
— —	1N34 for F.S. MTR.	Ohmite	1N34 etc.
— —	P.C. Board	World Engines	— — — —
— —	Hook-Up Wire	" "	— — — —
— —	Case	LMB	#145
— —	Hook-Up Wire	World Engines	— — — —
— —	Heat Shrink Tubing	" "	— — — —
Misc.	Nuts, Bolts, Washers, etc.		

parts. These should be +-10% mylar, paper or tantalum. The first two are cheaper. An alternate is "Goodall" although I don't have a part number and couldn't find them myself through normal channels. Tantalums are more expensive but should be readily available from a number of different sources. I have a "Cal Rad" catalog but they apparently only sell to dealers and don't show an address. So try your local dealer, or World Engines. Don't substitute run-of-the-mill miniature capacitors with wide capacitor and temperature tolerances or low leakage resistance.

2. D2 through D6 — You're on your own here but any **good** silicon diode should work. I wouldn't recommend the so-many-for-a-dollar-in-a-package type.
3. L5 — Try "Airdux" #516T as a substitute. I would recommend that you use the coil stock rather than hand winding. It will look a lot neater and chances of exact duplication are much greater!
4. I used a 50 ua meter in my original which I purchased from the Lafayette store in town. They later closed down and I wrote to Lafayette about availability along with a complete description. I have yet to receive a reply. The Ace meter looks better anyway. The main thing is that you can use what you have from 50 ua to 1M.A. — that's why R7 is in the circuit.
5. I don't recommend substitution for any of the transistors used except the manufacturer of the 2N706's. Several manufacturers make this item. If you have trouble finding the 2N3638's, try World Engines.
6. R7 and R13 — I ordered these from the Mallory catalog. If necessary, substitute "Centralabs." The 10K is Ace #29A14. Substitute the 50K with Ace #29A15. (25K)
7. R30, R31, R34, R35 and R38. Don't substitute these with cheaper pots. These are sealed and as linear as you'll find. They should last the life of the system without trouble.
8. Crystal — Specify frequency when ordering. Ask for fundamental, third overtone, parallel mode type.
9. Z1 — This should be available from several other manufacturers, T.I. and Motorola are two.
10. R10 — This was a 47 Ohm resistor originally used in the pulse generator circuit in series with B1 (top lead of Q5 on schematic), for temperature stabilization. Tests proved it to be unnecessary and it was deleted.
11. R12, R17 and R24 — Here I would recommend 5% resistors. Although shown on parts list as 10% by the Ohmite number (LIDSM). This will insure more accuracy in your one shot cycle times. If you use Ohmites, the number is (LIDED). In any case, the resistance value and wattage must precede the type number when ordering. If you don't have these, and will be delayed in obtaining them, don't worry about it — it's not that important.
12. C14 — Although a normal electrolytic can be used here the tantalum shown will make adjustment of this circuit much easier and more stable.

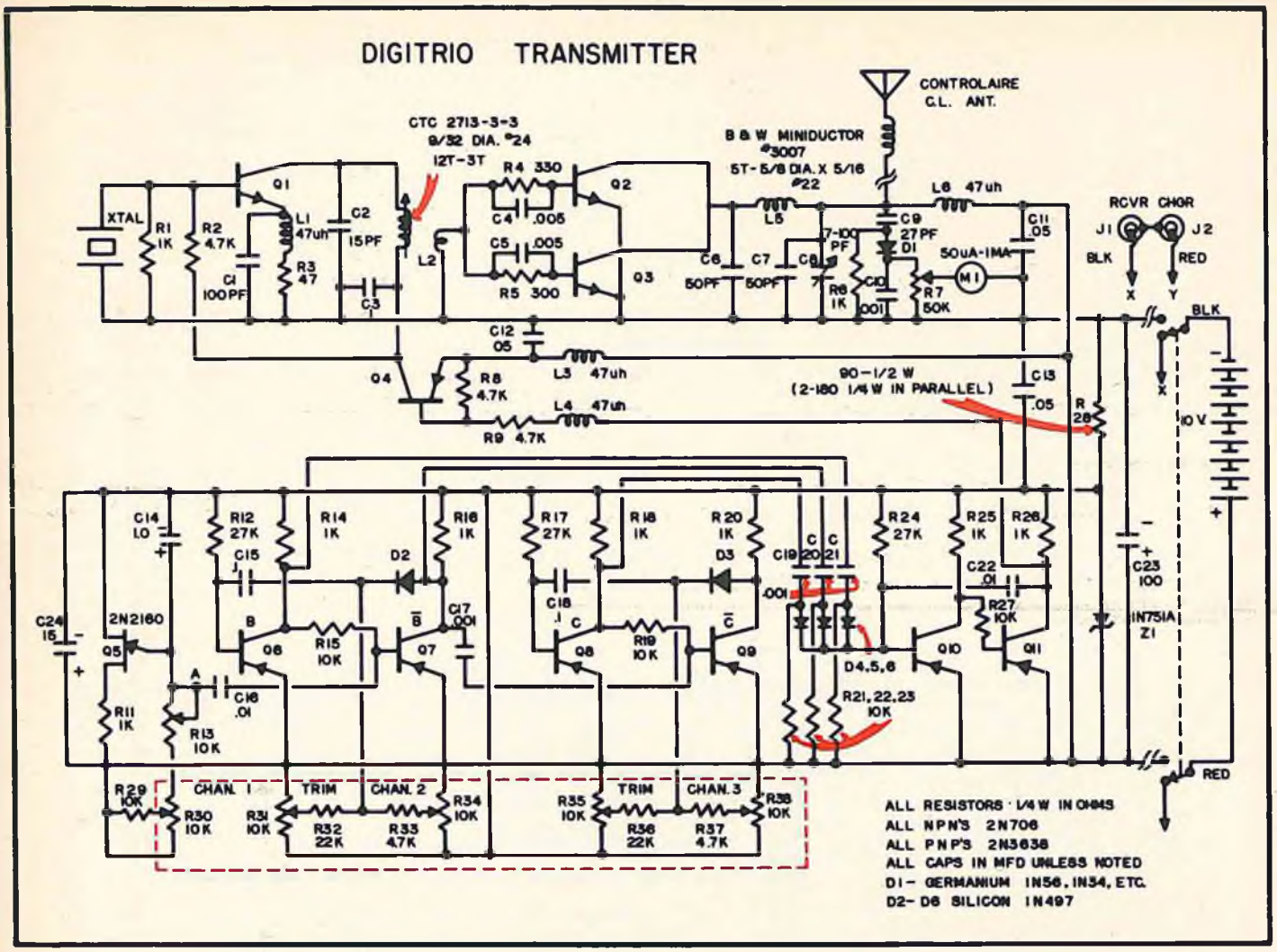
Since this system is being kitted, all parts are also available individually from WORLD ENGINES. I have personally built a transmitter using only parts supplied by them and approve of every one.

Making the P.C. Board

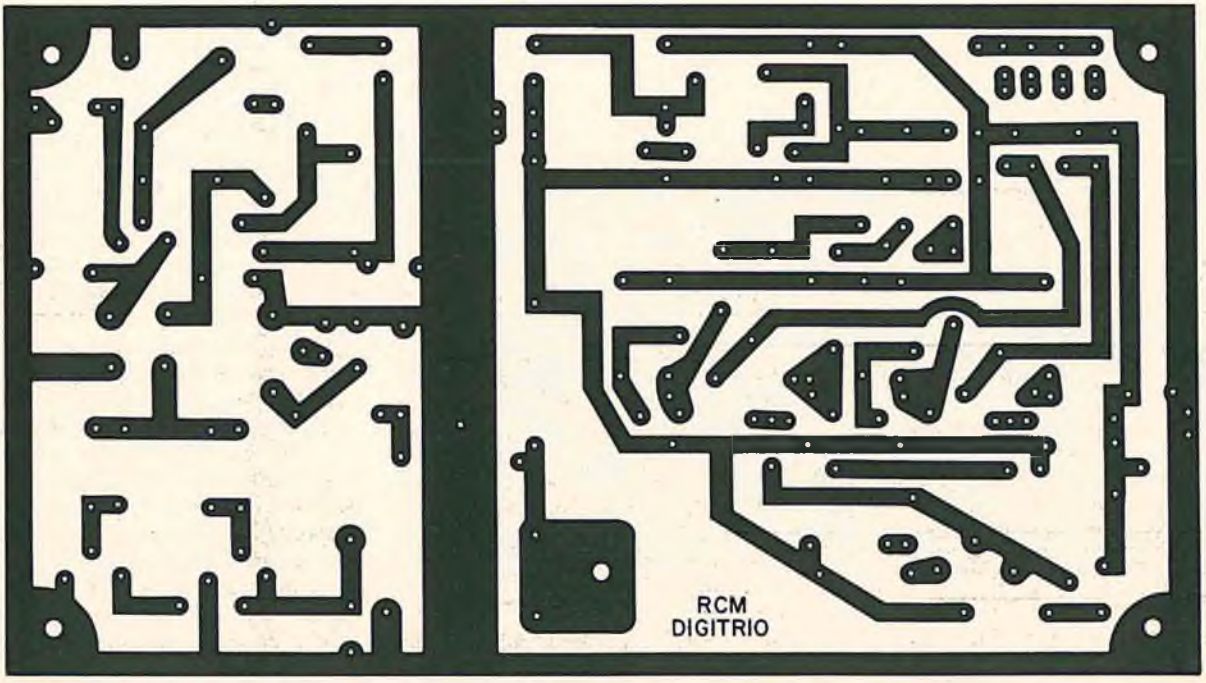
There are numerous methods for making a printed circuit board, although the photographic method is by far the most efficient and produces the highest quality results — albeit more expensive. If you decide to produce your boards photographically, obtain the following materials; available from your local electronics supply house: Kepro Photo-Sensitized Copper Clad glass epoxy board, 12" x 12" Catalog #S1-1212G ($10.20); Kepro Developer #D1-PT ($1.15); and Kepro Etching Solution #E-1PT ($.85). The foot square piece of photo-sensitized copper clad board will be enough for all of the printed circuit boards used in the RCM Digitrio. If the Kepro items are not available locally, write Kepro System, Inc., Tree Court Industrial Park, St. Louis, Missouri 63122. In addition to the above, you will need to round up a #2 photoflood bulb from your local photo dealer, a sheet of plate glass 12" x 12" or larger, and two pyrex trays.

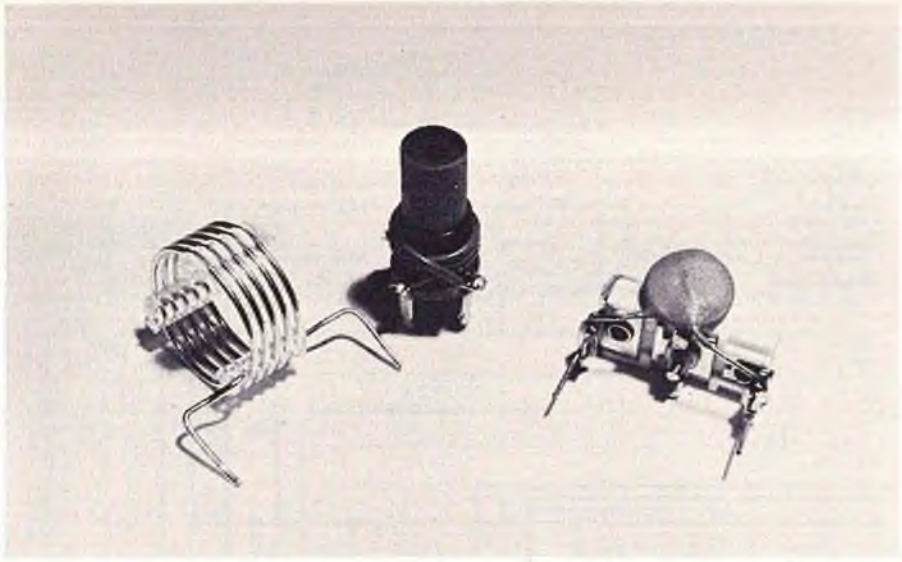
Cut out the full-size printed circuit board layout for the transmitter from your copy of RCM and take it to your local blueprint shop to have a negative made, same size. When you have the negative, you're ready to go. Set the two pyrex trays in the kitchen and pour the entire pint of developer in one and the etching solution in the other. Draw the shades or drapes in order to keep the room light down to a minimum — total darkness is not necessary, just dim light. Cut off a section of your twelve inch square photo-sensitized board just slightly larger than the size of the transmitter board. Wrap the balance of the board up in its light-tight protective wrapper and put away until you're ready to make the receiver-decoder and servo amplifier boards.

Place the section of copper clad board you have cut on a flat surface with the copper side up. Place your negative over the board so that the words "RCM Digitrio" read properly (glossy side of negative up). Wipe your piece of plate glass completely clean and free of dust, then place it over the copper clad board and negative — the glass holding the

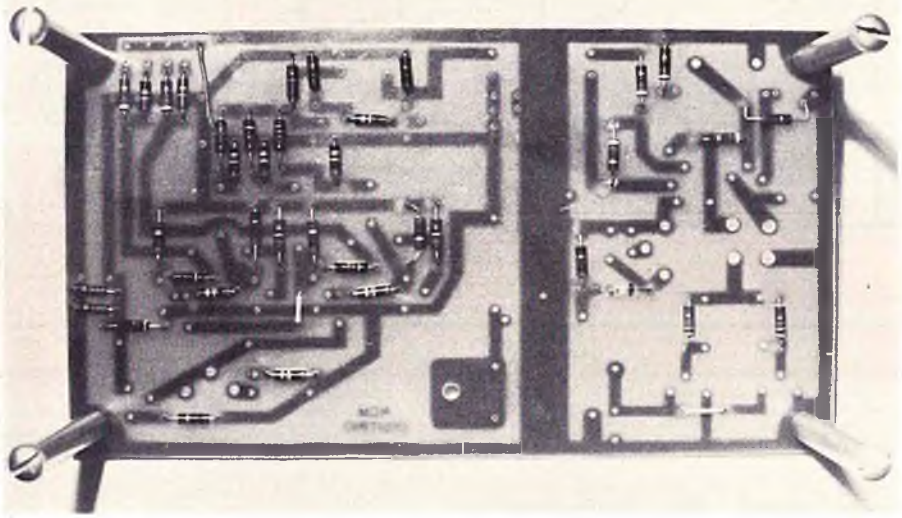


Full size transmitter P/C Board ready for photographer.

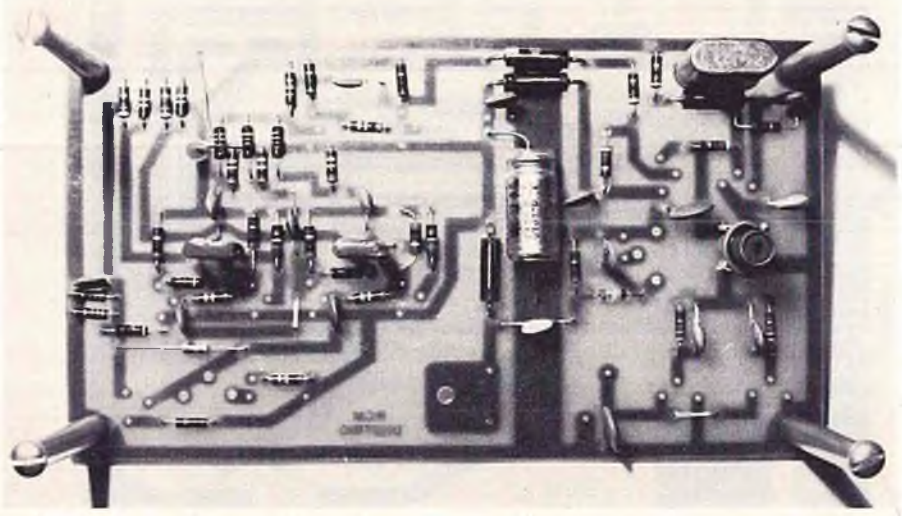




Left to Right: L5 cut from B&W or Airdux prewound stock, hand-wound L2, and C8 assembly (Arco 423 with 50 PF capacitor in place). Preliminary assemblies.



Transmitter PC board with all resistors and diodes in place. Leave 1/32" clearance between resistors and board in case you have to remove a component. Four mounting posts provide a "table" for working on PC board.



PC board with resistors, diodes, capacitors, crystal, 47uh chokes, and osc. coil (L2) in place.

sandwich in place. Now, position the #2 photoflood bulb in position exactly 10" from the plate glass.

When everything is ready, watch the clock, and turn on the #2 photoflood for seven minutes. At the end of this time, turn off the light, remove the copper clad board by its edges, and slide into the tray of developer. Rock the tray of developer slightly to provide agitation of the solution for one minute. Remove from the tray and set the developed board down on a paper towel for a couple of minutes to air dry. **Do Not** shake or blow on the board to dry it! When dry, you will be able to see a faint image on the board. Now, slide the board into the etching solution and turn on the lights in the room.

Etching the board depends upon the temperature of the etching solution, and the amount of agitation provided during the etching process. We place the pyrex tray over a burner on the stove and heat the solution every two or three minutes, agitating intermittently by gently rocking the pyrex tray from end to end. As the copper is etched away from the board, the solution will turn from an orange-brown color to a muddy brown-black. Complete etching should be completed in from 30-45 minutes in this fashion. Inspect the board and make sure there is no copper remaining between lands and that etching is complete. Remove the board from the solution and place in the kitchen sink. Turn on the cold water and let it run over the board for a full five minutes. During this time, you can clean up the rest of the materials. If you pour the etching solution down the drain, use plenty of running water or you'll be presented with a plumbing bill for new pipes!

Dry off the board and drill all holes with a #60 drill. Trim the board to exact size on your jig saw and then sand the edges. Your transmitter board is now completed.

Wiring the Printed Circuit Board

Before we assemble the components on the board, some preliminary work should be accomplished:

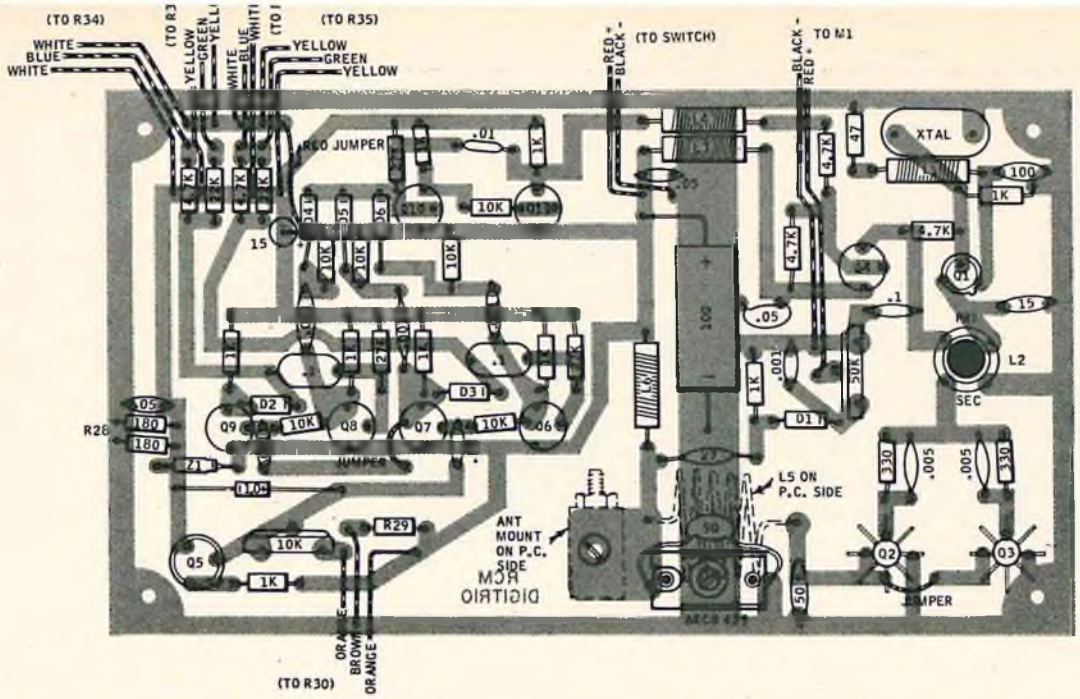
( ) Drill the four mounting holes, in each corner of the board, with a #17 or #18 drill.

( ) Drill the antenna mounting hole with a #31 drill.

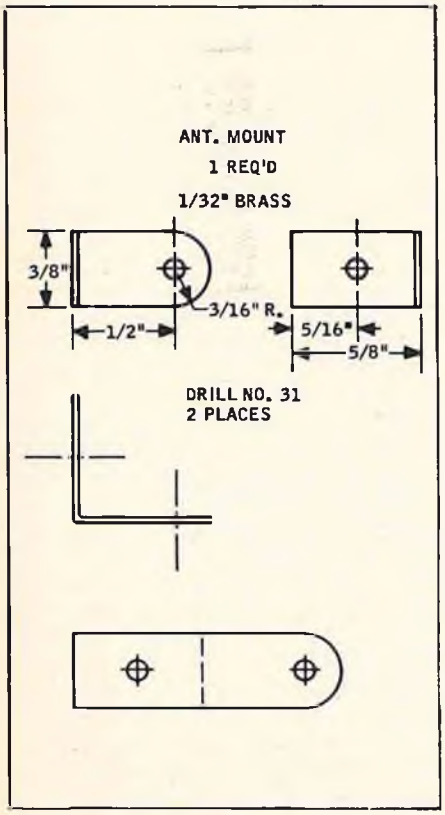
( ) Looking at the overlay, take your parts which will require holes larger than the #60's already drilled, and drill the board so they will fit.

( ) Close wind L2's primary at the bottom of the coil form, as indicated on the schematic. The three-turn secondary utilizes standard insulated Bonner hook-up wire and is close wound on top, and in the middle, of the primary. Coat the completed coil with Ambroid glue.

( ) If you wind L5 by hand, use a



Full-size component overlay shown above. Be sure to observe proper polarity of diodes. Also note location of primary and secondary on L2.



form slightly under ⅝" to allow for expansion when removed. If you use the prewound AirDux coil stock indicated, cut it long enough to allow for 1" leads when finished.

( ) Wrap and solder stiff wire around the lugs on C8 so it can be mounted without drilling excessively large holes. About #24 will be adequate.

( ) Solder C7 directly across C8, making sure it doesn't short across the plates.

( ) Screw your PC mounting posts to the component side of the board and it will form a platform to aid you in assembling the components (see metal work drawings for fabrication of these posts).

Before actually soldering the components in place, here are a few tips on proper soldering techniques. Use a low wattage iron (35 watts or so) with a small pointed tip. Apply the iron to the component lead about ⅛" above the copper lands. Touch your solder (a good, small-diameter resin type such as Ersin Multicore) to the opposite side of the lead. This will "tin" the lead. Slide the iron tip down the lead until it contacts the copper land, put another touch of solder on the opposite side of the lead and copper land simultaneously. The solder will flow around the lead and form a mound. Retract the iron by sliding it up the lead. Clean your iron every five or six "joints" by wiping it quickly with a clean rag or on a damp piece of foam rubber. After every 20-30 joints, clean your iron thoroughly and re-tin. This may sound like a lot of trouble but after a while it will become a matter of habit and will pay many dividends in the form of better looking and better constructed boards.

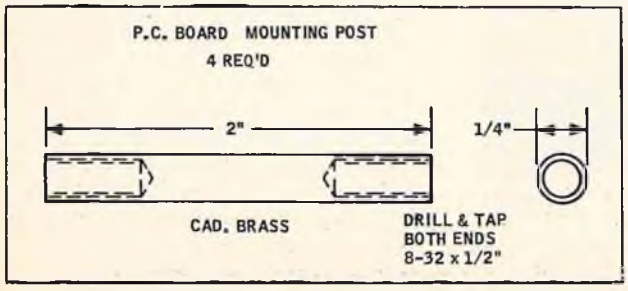
( ) Install the three jumpers as shown on the overlay. One is below Q2, another between Q7 and Q8. Use remnants of the resistor leads for these. The jumper above the 15MFD capacitor (C24) should be a piece of red insulated hook-up wire. Don't solder the bottom end as we'll insert the positive lead of C24 in this same hole later on.

( ) Mount all resistors except the small variable resistors R7 and R13.

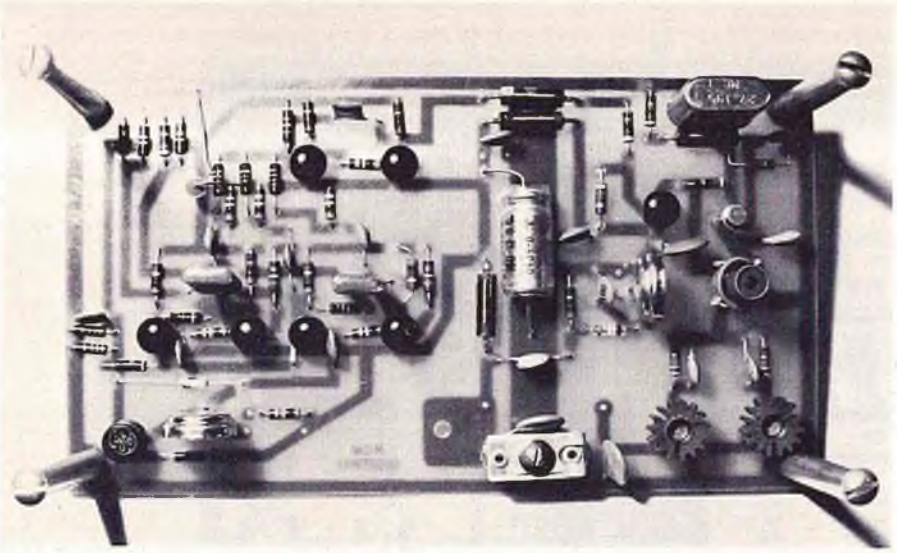
( ) Mount all diodes including Z1. Do this carefully, observing polarity markings on the overlay. When you bend the diode leads, do so from the tip so a radius is formed at the body. If bent too sharply, the glass envelope may crack.

( ) Mount the four 47 uh chokes — L1, L3, L4 and L6.

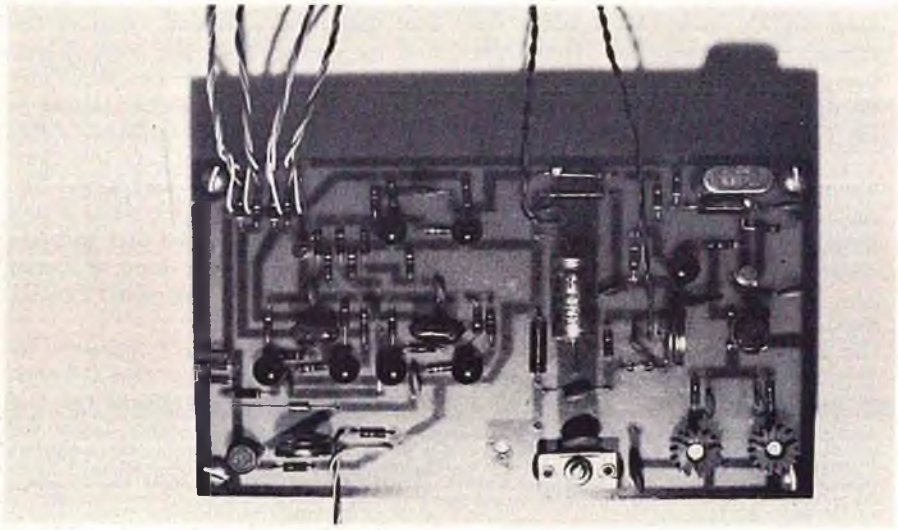
( ) Mount the 1, 15, and 100 MFD electrolytics, observing polarity.



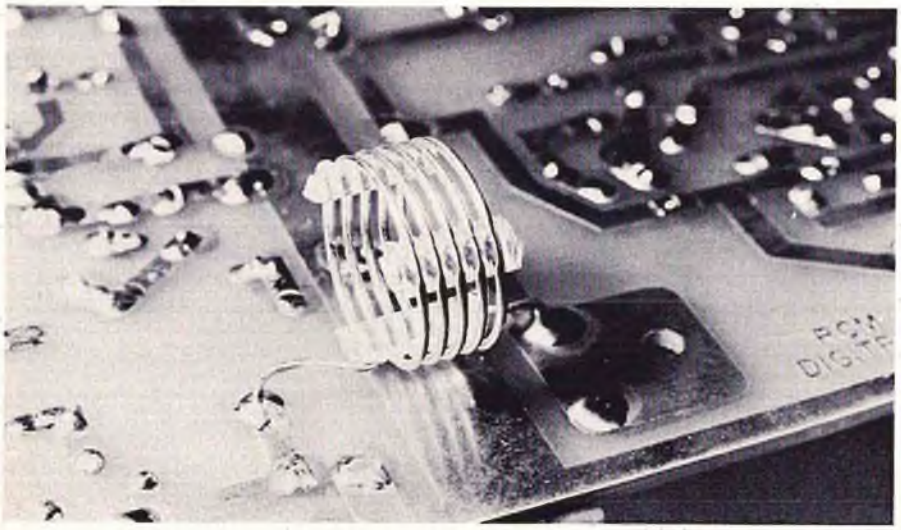
Although the sheet metal work is the subject of next month's installment, the four PC board mounting posts will provide a convenient set of legs — making your PC board a table on which to work. Antenna mount shown upper left.



All transistors and Mallory pots (R7 and R13) in place along with Arco 423. Note heat sinks on Q2 and Q3.



All wiring in place ready for connection to transmitter assembly. Wires in upper left to stick pots; center top to switch; center right to meter; and lower left to R30.



Close-up of L5 installed on PC side of board. This is 5 turns of standard prewound B&W or Airdux stock — saves winding. Be sure to leave clearance between L5 and board. Hole at right is for antenna mount.

(C14, C23, and C24).

( ) Mount remaining fixed capacitors.

( ) Mount crystal and L2 flush against board to provide back cover clearance.

( ) Mount all transistors, starting with the 2N3638's.

( ) Mount C7-C8 assembly, L5, and small variable resistors R7 and R13.

( ) Install heat fins on Q2 and Q3 and mount any remaining parts.

( ) Make and install the antenna mount with 4-40 nut, bolt, and lockwasher (see metal working drawings for fabrication).

( ) Cut 12" lengths of #26 standard hook-wire (I use Controlaire) in the colors shown on the overlay, the orange-brown-orange trio should be 17" long. Insert these in pairs or groups of three as indicated. Twist them and tie a knot at the end. This will keep them separated and out of your way.

Before we proceed further, let's make a preliminary check of the board:

( ) Measure the resistance between the red and black wire going to the transmitter switch. Your meter should indicate approximately 1000 ohms.

( ) Temporarily lift one end of L3 and L6. The meter should not change appreciably. When connecting the meter, observe polarity.

( ) Swap leads (reverse polarity) and a slight decrease in resistance may occur. This indicates that Z1 is connected properly. Don't accept this as final proof, but double check the installation of all diodes (especially Z1) for correct polarity. I would recommend that you apply voltage in steps by tapping down on your transmitter battery pack with the meter on the milliamp range and in series with the negative lead. Don't re-connect L3 and L6 yet. Starting with 5 volts (4 nicads), increase the voltage a cell at a time. The current as indicated on the meter should progressively rise but at no time exceed approximately 50 ma. Re-connect L3 and L6 and start all over. The current should now not exceed approximately 120 ma. If it is much less, your oscillator is not operating. To check this, run your slug clockwise until it is at the bottom of the coil form. Slowly backing it out, adjust it for peak meter reading. Don't operate it very long under these test conditions.

( ) To check operation of Z1, connect your meter across Z1 — the red lead to positive battery, the black lead to the junction of the two 180 ohm resistors (R28) and Z1. Starting at 5 volts, again tap up a cell at a time. When you reach the sixth cell,

(Continued on Page 72)

KAHUNA

PART II

BY JOHN TOOMER

To dive you open the brakes first. It takes horsepower to dump a brake at speed and you might find you can't do it if you wait until you need them. Then begin applying down elevator and assorted other controls to bring the plane down.

One last word. All dethermalizers work in still air. You do not fly in still air. Make sure ou have enough control for unusual conditions.

I don't want to frighten you off with all this talk about not being able to land again. As I've said earlier the average ridge runner will never need to worry about this problem. It is usually too heavy to get into trouble and will be flown so close to the ground that it can't get into the trouble area which is several hundred feet up. I mention the matter for those few of you who like WINGS and may get into trouble before you realize what you have created.

Now on to construction! The basic design of the big K was laid out in 1955 or 56 as closely as I can remember and the first three were begun in 1957 I think. The design followed the then nordic philosophy. The underslung fin has definitely proved to be more effective than the more conventional position. The order of merit being something like 20%. Other designs achieve a similar effect by placing the tailplane atop the fin as a large portion of the interference problem seems to be generated by the upper surface of the tailplane. Wing chord was increased because of the higher wing loading of a controlled aircraft and the greater airspeed will extract more lift over a longer chordline. Airfoil section has been varied and only two or three Kahunas have had the same airfoil. The original section (#1 in Dia. 3) was the "Thing to use" back in 57. Sections #2 and #3 are used on current thermal machines and sections #4 and #5 on penetrators and stunt gliders. Section #6 is the one used on this version of Kahuna and was chosen because it dosen't have any unusual changes of lift or drag over a wide range of operating conditions. It is simple to build and cover and will give you all of the performance you can probably extract from it. Exotic airfoils are only of noticeable superiority in the hands of experts and on specialized machines.

Kahuna's wing is polyhedral for rudder only flying and can be used for multi as well although there is very little reason to use polyhedral on a plane with ailerons. My own K is rudder-elevator only with eight foot polyhedrals for a special purpose connected with that mysterious "weather vane" atop the fin. Ridge runners fly a 'beat or track back and forth along the lift zone of the hill or cliff edge. If the wind is high or the hill low there will be a considerable horizontal component present in the wind and the flyer will be called upon to make continuous corrections of the flight path by blipping "weather" rudder to keep the plane headed enough into the wind so it won't blow away. While trimming Nordics I had noticed a condition of trim which would be of use under these conditions. It certainly was not of any use on Nordics and we had a few things to say about it at the time. This system works best on gentle slopes and in steady wind conditions. The steering vane provides enough additional fin area that the plane tends to turn into the wind. The polyhedral tips (or considerable dihedral also works) tend to bank the plane away from the wind if the plane is flying across the wind. These forces tend to balance out at an angle of somewhere between 40 and 60 degrees if the vane is carefully trimmed in size. The glider will then hold this fixed heading and crab along the ridge (diag. 4). Wind speed and angle of upward flow modify the effect so that at time rudder control will still be needed to keep the plane on course. With the steering vane in place you will have three stable conditions. Dead into the wind, and right or left at whatever angle your plane trims out to. Flying a beat then consists of simply turning the plane into the wind at the end of the beat and letting up on control as it swings by the trimmed angle. It will then yaw back into the wind and begin the next pass. Heavy gliders don't respond too well to this system. The plane is rather stiff on control with the vane so removing it for normal flying is advised.

My original Kahuna is still flying. It took me two years to build mine and in that time two others were built and washed out by the builders. They have since made more exotic versions. The normal building time isn't two years. I just happen to be rather slow. I'm beginning to wish I could prang the thing, for I'd like to build several other things I've designed but the K and the present Enterprise crowd me as it is. The moral is evidently "Build weakly, so you can build again!"

Read the article to the end. Look over the plans carefully. Read the article again. Make sure you understand. Decide exactly what you want your model to be like and then cross off any parts or modifications you don't need so you don't end up with two left wings. I'd suggest you stick to straight wings unless you are building a rudder only version. If you are going to use servos, build the eight footer. If you don't have a work area long enough to lay out the fuselage or wings all at one time, do what I did, build half at a time and let the rest hang over the edge. I built mine on a two by three foot drawing board and I drew these plans on a board only two feet each way.

Begin construction by splicing everything that isn't long enough. If you lay things out correctly you can get both fuselage sides out of two three foot long boards by laying the sides out tail to tail. Cut out all the plywood parts. Make the wing tongue out of good hard dural or steel. Make two tongues just in case. Try to stay away from dural if you can for it has a habit of binding in the wing tunnels and there is nothing more annoying than an eight foot sailplane with non detachable wings fifty miles from home by VW. Graphite or silicone grease might help. My tunnels are brass and my tongue is dural. Perhaps tin tunnels wouldn't have this problem. The wing tunnels are bent from tin or brass. Solder the seam if you are able to.

The method of attaching the wings may dismay you. They are not knock off. But then again they are not "fold up" which is the main intent. I've seen both plywood and dural wing tongues of the more common type collapse on pull-outs. So far this system hasn't. The tongue should fit fairly tightly in the tunnels, but don't worry if it doesn't. My own buzzard has been flying, yea, these many years with no restraint on the wings at all and the most I've ever experienced is a quarter of an inch separation from the fuselage from time to time. There are hooks in the wing roots over which you can slip a rubber band or "O" ring if you wish to hold the wings on more definitely. The tongue and locating pin are made totally removable so they will not be a hazard when transporting the machine or working on it. The wing hooks are a hazard.

Lash the fuselage tunnel to F3 and epoxy; make sure you have a good brand. Use only that made by a known reputable manufacturer. There are several worthless brands on the market which do not set up properly. Anything that sets up faster than ten or fifteen minutes or is sticky or greasy feeling after twenty four hours is a defective formula and should be discarded. Fast set-up does not allow long chains of molecules to form from which epoxies get their superior strength. Sticky or greasy materials indicate improper chain formation also, usually because of contaminated formulas. If in doubt stick to cement.

At the same time, epoxy or glue the brass or steel locating pin tube to F4 after lashing it in place. By the way it doesn't matter if the wing tongue and locating pin tube aren't long enough to reach to the outer surface of the fuselage sides when they are assembled, for the wings rest against the ply wing roots. If your wing tongue tunnel and locating pin tube turn out too long they are filed off flush with the wing roots.

Next get a hunk of wood about three by four by five inches and saw out the nose block. Use balsa if you have to, but pine, teak or mahogany is more to the point. Sand the side contours to finished shape, but you can leave the top and bottom until later if you wish.

Meanwhile back at the construction board you are gluing the hardwood and balsa longerons and cross braces in place on the sides. I used hardwood for the top longerons to make the hatch opening less prone to damage. When everything seems reasonably dry begin assembly of the fuselage by attaching the nose block and F1 to the sides. Lay the fuselage up side down on some reasonably flat surface for the assembly operation. Use a clamp on the nose block and sides. Protect the sides by cardboard or some wooden wedges so the clamp is gripping parallel surfaces. I know you won't let this part dry as thoroughly as you should, so go ahead and add all the other formers. Lashing, clamping, twisting and wedging the thing so it doesn't fly apart. All I ask is that you somehow keep the top edges reasonably flat on your workbench. Add the additional cross bracing and the fin superstructure. Make sure you get this latter in straight! If you build in a warp you will have to remove it all and start again. Add the bottom planking. This can be two thin sheets glued one on top of the other or one thicker sheet. The two thin sheets place less strain on the fuselage. See my comment on radio installation *before* planking the bottom.

With the main structure of the fuselage complete you can now finish the nose block. If you wish you can fiberglass the nose section. As built your Kahuna will be tail heavy so you need not fear adding weight ahead of C.G.

Build the stabilizer next. If you plan to use the steering vane cut the slot for it after you have planked the center section. The steel locating pin shown on the stabilizer is to be added if you wish to bolt the stabilizer in place. A single bolt through the trim angle adjusting block will suffice. The locations for dowels are shown in case you wish to hold the tailplane on with rubber bands.

Build the structure on the fuselage for mounting the tailplane but don't plank the top of the fuselage yet. Add the wing fillets and the ply facings. Plank the fin and install the rudder.

Fit your servo decks or escapement panels to the fuselage. Install your radio gear. You might feel better doing this before you plank the bottom. It does help to be able to get at two sides while adding the innards.

If you use Bonner servos you will have a little trouble installing them as they just make the grade. Annco, Kraft, and the European servos all fit quite well. My own units are all home made so I can't say much about installing commercial units for I've only seen the results and haven't experienced the actual pains required.

If you plan any wing controls you are probably wondering how it is done. One installation was as follows: Plywood plates were fitted to the walls of the tail group servo compartment and brass bearing plates an inch or so square were epoxied onto them. The wing retaining hooks were replaced with 6-32 screws epoxied into blocks of hardwood in the wing roots. Wing nuts (what else?) then held the wings to the fuselage. The control rods pass through holes just forward of the wing tongue and attach to a bell crank for a Bonner or a more normal harness for one of the smaller servos that can be mounted crosswise. The installation I'm detailing hooked the rods into a sector plate attached to the operating arm of the servo. Adjustment for aileron positioning was by bicycle spoke turnbuckles.

Because we have several cross members blocking easy removal of the radio gear it is best to use cable connectors for all wiring unless you plan to permanently install your radio gear. Any type of connector will do, for you don't need to worry about vibration. (My own equipment is removable for I have only the one set which must be moved from plane to plane.) Install the largest batteries you can fit. As I've said, the plane will be tail heavy and a set of "C" (four) size cells or 500 ma DEAKS will just about ballast it correctly. The plane was deliberately made tail heavy to simplify C.G. trimming. The switches are mounted in the wing group compartment if you don't fit wing controls, and at the front of the receiver compartment if you do. Use a plywood plate glued across the fuselage under the upper longerons.

Install the push rods and assorted other mechanical items. Rudder movement should be about ten degrees either way but with assorted holes in the horn that will allow throws of five to seventeen degrees. Elevator movement is also plus or minus ten degrees with three to fifteen as additional ranges. If you fit elevator trim three to six degrees in either direction is adequate. Aileron throw is more difficult to state for it changes with the type of wing you make. In general about a two to one differential seems best with not much more than seven degrees of down unless you make a true mahogany log. Faster Buzzards can take more and will respond well to more nearly even differential. Kahuna doesn't respond rapidly to aileron except in a dive so don't expect snap rolls. Too much aileron will cause a decreasing effect and a nose down tendency.

Plank the top of the fuselage and anything else that looks like it could use it.

The canopy is next constructed. Pin the longerons to the fuselage and erect the various formers. Plank the canopy. This is a little tricky for you have to remove the pins as you add the side planks and then repin both the planking and longeron to the fuselage again. Plank the top of the canopy last. The canopy can be bolted to the fuselage or it can be clipped on using dress snaps. The hardwood blocks at front and rear and the bolt-on provision is for a second canopy that mounts a small cruising motor.

The wings are designed for a complex covering: heavy silkspan overlaid with light silk. This unusual method was employed to get rigidity without the weight of fully planked wings. The silk gives fracture strength to the covering. If you use only fabric covering you will do well to cap strip the ribs with ⅜" wide balsa. The wing can also be planked with 1/32" sheet and silkspan. The actual construction is conventional. Make sure the wing tongue tunnels are well epoxied or glued in their mounts and the entire root area should be especially well built. Use good tough balsa for the main spar webbing with the grain running vertically as this is where the wing gets half its strength. Also use good tough wood for the trailing edges.

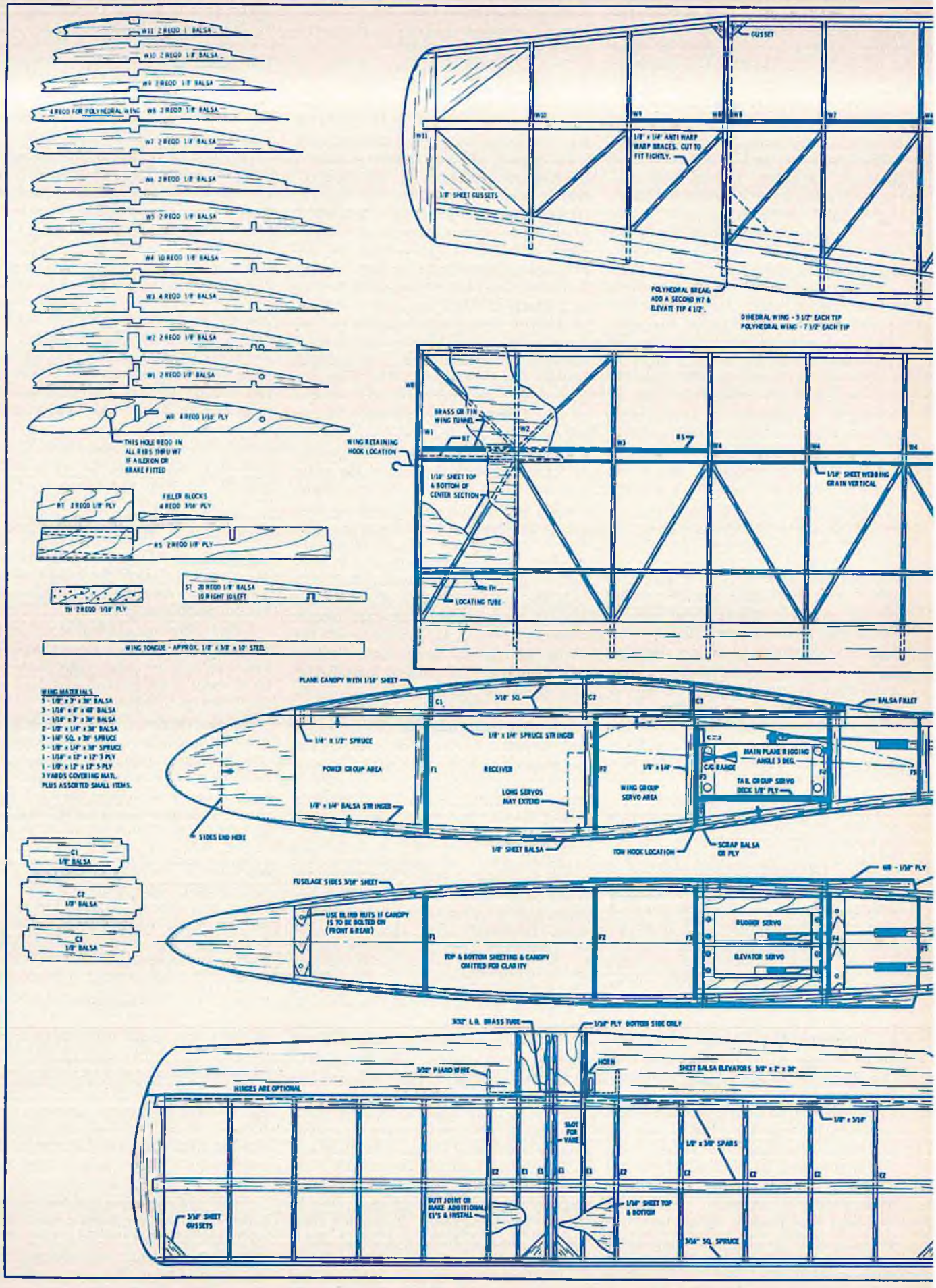
I don't show supporting structure for ailerons or brakes as I expect very few machines will be made with these features and I want to keep the plans reasonably easy to follow.

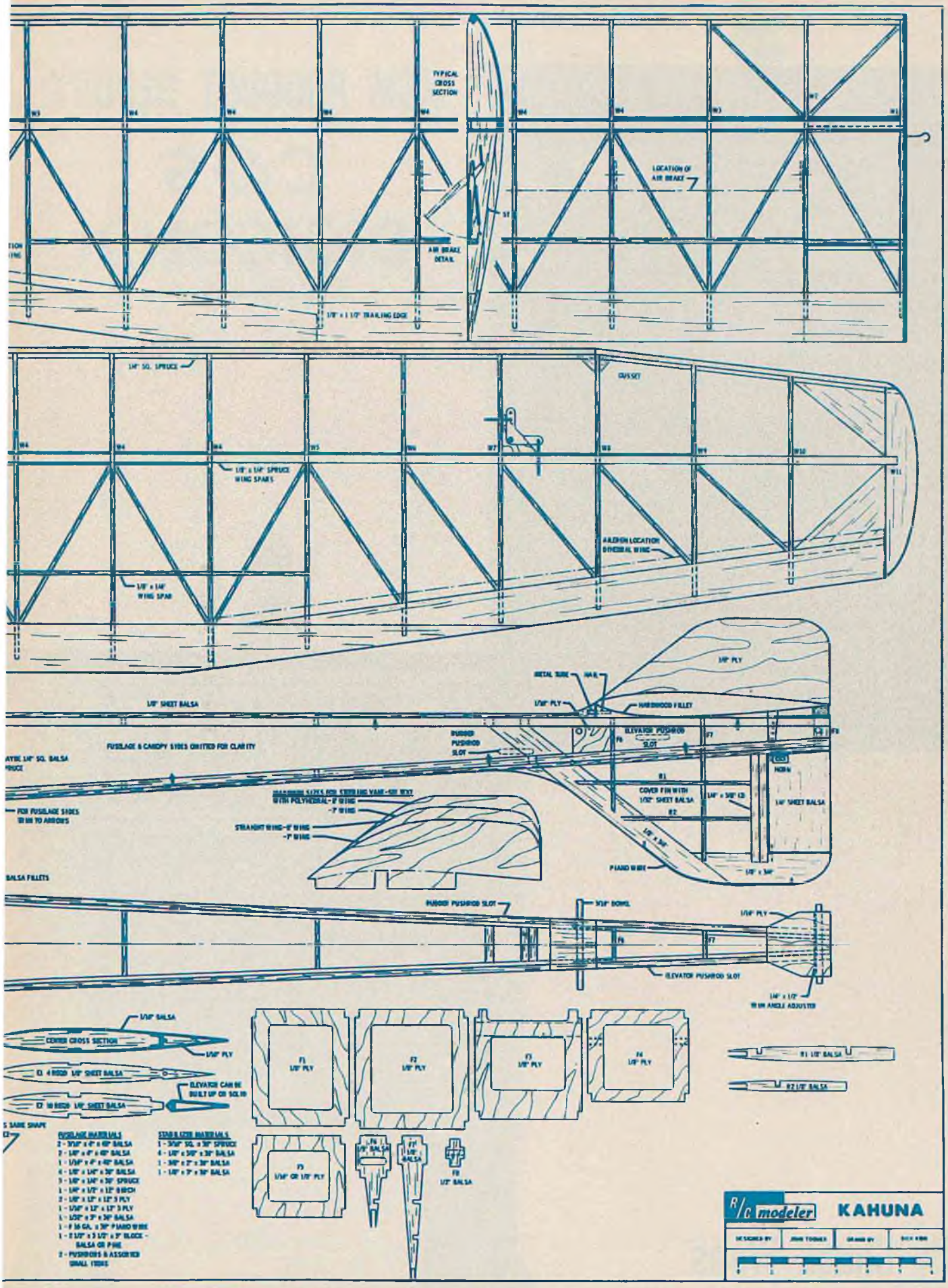
Fit the diagonal bracing *tightly*. It must be incompression to do its job. It is anti-warp insurance. It is the next best thing to geodetic construction that I know of. When the structure is complete install the panels on the fuselage and check to see that dihedral angle and angle of attack are the same for both panels. Be very methodical about this check. Your plane will fly with either of these off a little but it will pull some mighty strange maneuvers if it is ever driven at high speeds. Plank and cover the wings.

Dope the entire plane and structure with a very dilute solution of clear dope. Sand and repeat the dilute doping. Cover the entire plane with silkspan or a fabric. Dope with sanding sealer and sand off as many times as is required or until you give up on this never ending job. Paint the wings lightly. Spray them if at all possible and above all don't put too much paint on them. Too much paint will end up in warps. Maybe not this year but sooner or later.

Very light colors are best for visibility. Most Kahunas have been a basic white with small areas of two tone trim. Take care about applying wild assorted striping, especially on the wing under sur-

(*Continued on Page 69*)

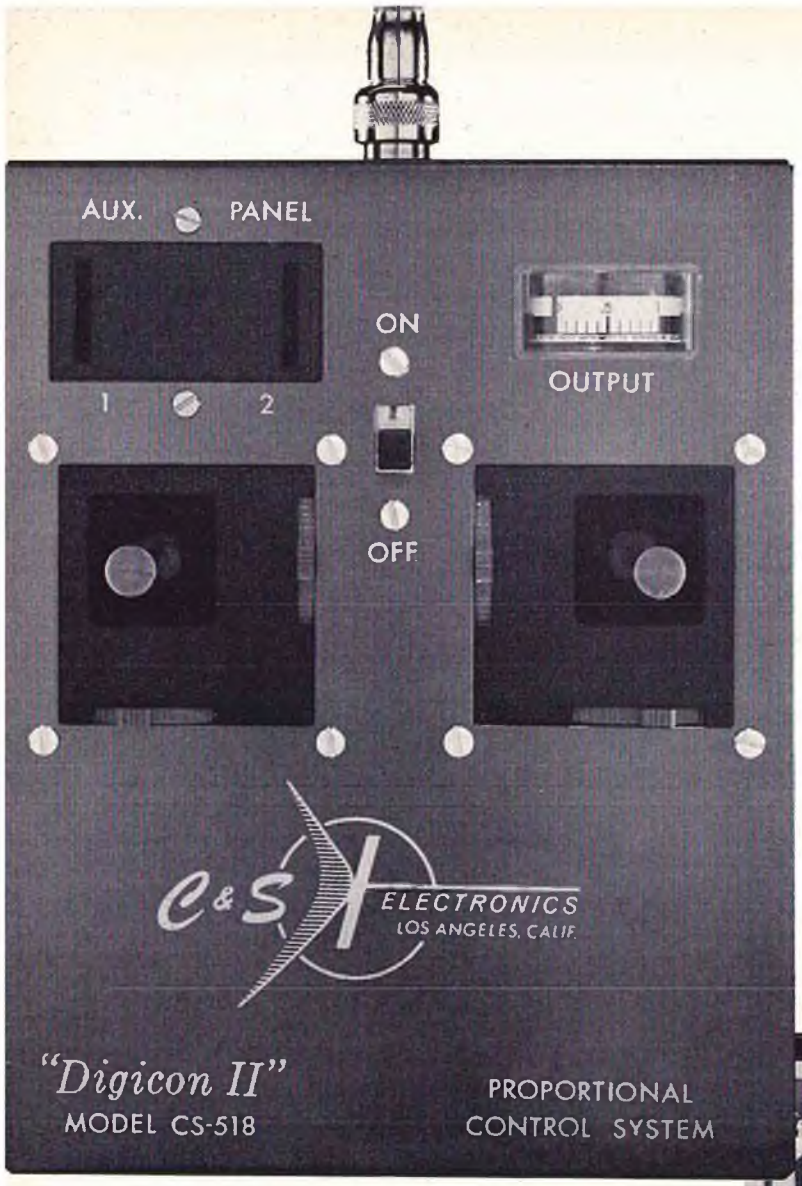

W11 2 REQD 1/8" BALSA
W10 2 REQD 1/8" BALSA
W9 2 REQD 1/8" BALSA
4 REQD FOR POLYHEDRAL WING W8 2 REQD 1/8" BALSA
W7 2 REQD 1/8" BALSA
W6 2 REQD 1/8" BALSA
W5 2 REQD 1/8" BALSA
W4 10 REQD 1/8" BALSA
W3 4 REQD 1/8" BALSA
W2 2 REQD 1/8" BALSA
W1 2 REQD 1/8" BALSA
W8 4 REQD 1/16" PLY
THIS HOLE REQD IN ALL RIBS THRU W7 IF AILERON OR BRAKE FITTED
GUSSET
W11
W10
W9
W8
W6
W7
1/8" x 1/4" ANTI WARP WARP BRACES. CUT TO FIT TIGHTLY.
1/8" SHEET GUSSETS
POLYHEDRAL BREAK. ADD A SECOND W7 & ELEVATE TIP 4 1/2".
DIHEDRAL WING - 3 1/2" EACH TIP
POLYHEDRAL WING - 7 1/2" EACH TIP
W8
BRASS OR TIN WING TUNNEL
W1
B1
W2
W3
B5
W4
W5
W6
WING RETAINING HOOK LOCATION
1/16" SHEET TOP & BOTTOM OF CENTER SECTION
1/16" SHEET WEBBING GRAIN VERTICAL
TH
LOCATING TUBE
B1 2 REQD 1/8" PLY
FILLER BLOCKS 4 REQD 3/16" PLY
B5 2 REQD 1/8" PLY
ST 20 REQD 1/8" BALSA 10 RIGHT 10 LEFT
TH 2 REQD 1/16" PLY
WING TONGUE - APPROX. 1/8" x 3/8" x 10" STEEL
WING MATERIALS
5 - 1/8" x 3" x 36" BALSA
3 - 1/16" x 4" x 48" BALSA
1 - 1/16" x 3" x 36" BALSA
2 - 1/2" x 1/4" x 36" BALSA
3 - 1/4" SQ. x 36" SPRUCE
5 - 1/8" x 1/4" x 36" SPRUCE
1 - 1/16" x 12" x 12" 3 PLY
1 - 1/8" x 12" x 12" 5 PLY
3 YARDS COVERING MATL.
PLUS ASSORTED SMALL ITEMS.
PLANK CANOPY WITH 1/16" SHEET
C1
3/16" SQ.
C2
C3
BALSA FILLET
1/4" X 1/2" SPRUCE
1/8" x 1/4" SPRUCE STRINGER
POWER GROUP AREA
F1
RECEIVER
F2
1/8" x 1/4"
C/G RANGE
MAIN PLANE RIGGING ANGLE 3 DEG.
F3
F4
F5
TAIL GROUP SERVO DECK 1/8" PLY
LONG SERVOS MAY EXTEND
WING GROUP SERVO AREA
1/8" x 1/4" BALSA STRINGER
SIDES END HERE
1/8" SHEET BALSA
TOW HOOK LOCATION
SCRAP BALSA OR PLY
C1 1/8" BALSA
C2 1/8" BALSA
C3 1/8" BALSA
FUSELAGE SIDES 3/16" SHEET
W8 - 1/16" PLY
USE BLIND NUTS IF CANOPY IS TO BE BOLTED ON (FRONT & REAR)
F1
F2
F3
F4
F5
RUDDER SERVO
ELEVATOR SERVO
TOP & BOTTOM SHEETING & CANOPY OMITTED FOR CLARITY
3/32" I.D. BRASS TUBE
1/16" PLY BOTTOM SIDE ONLY
3/32" PIANO WIRE
HORN
SHEET BALSA ELEVATORS 3/8" x 2" x 30"
HINGES ARE OPTIONAL
1/8" x 3/16"
SLOT FOR VANE
1/8" x 3/8" SPARS
C1
C2
C3
BUTT JOINT OR MAKE ADDITIONAL C1'S & INSTALL
1/16" SHEET TOP & BOTTOM
3/16" SHEET GUSSETS
3/16" SQ. SPRUCE

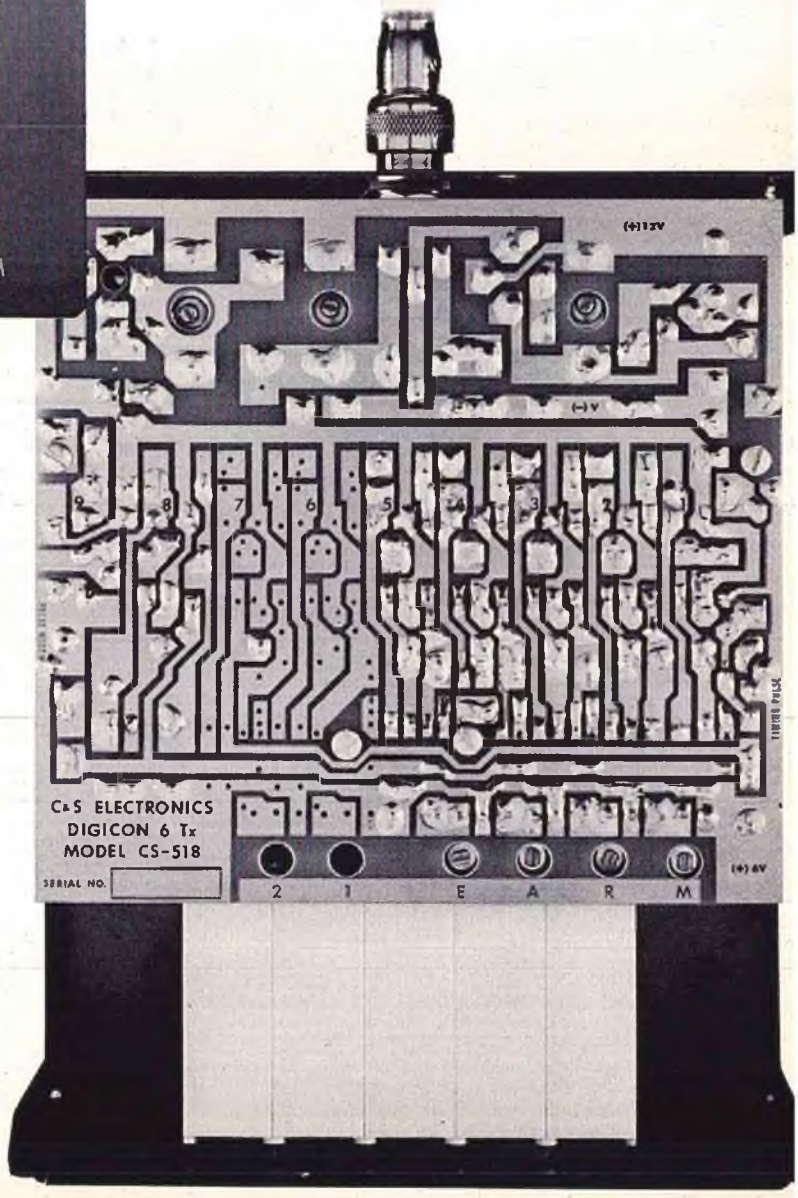

TYPICAL CROSS SECTION
LOCATION OF AIR BRAKE
AIR BRAKE DETAIL
1/8" x 1 1/2" TRAILING EDGE
1/4" SQ. SPRUCE
GUSSET
1/8" x 1/4" SPRUCE WING SPARS
AILERON LOCATION DIHEDRAL WING
1/8" x 1/4" WING SPAR
1/8" SHEET BALSA
1/8" PLY
METAL TUBE
1/16" PLY
HARDWOOD FILLET
FUSELAGE & CANOPY SIDES OMITTED FOR CLARITY
RUDDER PUSHROD SLOT
ELEVATOR PUSHROD SLOT
F6
F7
F8
B1
B2
COVER F/B WITH 1/32" SHEET BALSA
1/4" x 3/8" LG.
1/4" SHEET BALSA
1/8" x 3/4"
PIANO WIRE
1/8" x 3/4"
FOR FUSELAGE SIDES TRIM TO ARROWS
BALSA FILLETS
STRAIGHT WING-0° WING
-7° WING
RUDDER PUSHROD SLOT
3/16" DOWEL
1/16" PLY
ELEVATOR PUSHROD SLOT
1/4" x 1/2" TRIM ANGLE ADJUSTER
1/16" BALSA
CENTER CROSS SECTION
1/16" PLY
ELEVATOR CAN BE BUILT UP OR SOLID
F1 1/8" PLY
F2 1/8" PLY
F3 1/8" PLY
F4 1/8" PLY
B1 1/8" BALSA
B2 1/8" BALSA
F5 1/16" OR 1/8" PLY
F6 1/8" BALSA
F7 1/8" BALSA
F8 1/2" BALSA
FUSELAGE MATERIALS
2 - 3/16" x 4" x 48" BALSA
2 - 1/8" x 4" x 48" BALSA
1 - 1/16" x 4" x 48" BALSA
4 - 1/8" x 1/4" x 36" BALSA
3 - 1/8" x 1/4" x 36" SPRUCE
1 - 1/4" x 1/2" x 12" BIRCH
2 - 1/8" x 12" x 12" 3 PLY
1 - 1/16" x 12" x 12" 3 PLY
1 - 1/32" x 3" x 36" BALSA
1 - # 16 GA. x 36" PIANO WIRE
1 - 2 1/2" x 3 1/2" x 3" BLOCK - BALSA OR PINE
2 - PUSHRODS & ASSORTED SMALL ITEMS
STAB & RUDD MATERIALS
1 - 3/16" SQ. x 36" SPRUCE
4 - 1/8" x 3/8" x 36" BALSA
1 - 3/8" x 2" x 36" BALSA
1 - 1/8" x 3" x 36" BALSA
R/C modeler
KAHUNA
DESIGNED BY
JOHN TOOMEY
DRAWN BY

RCM PRODUCT REPORT:

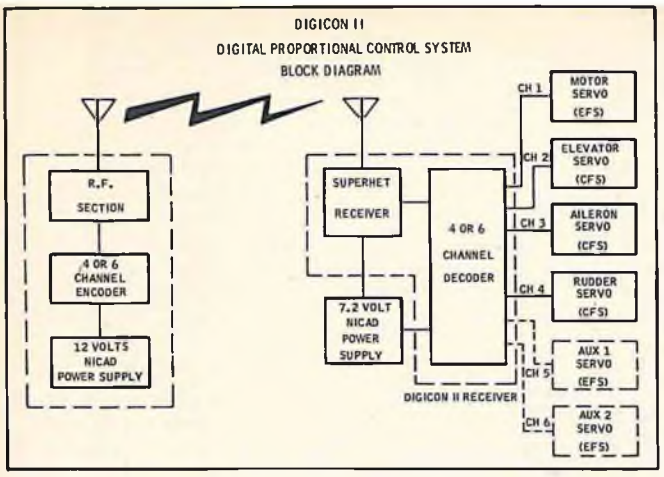
C & S DIGICON II

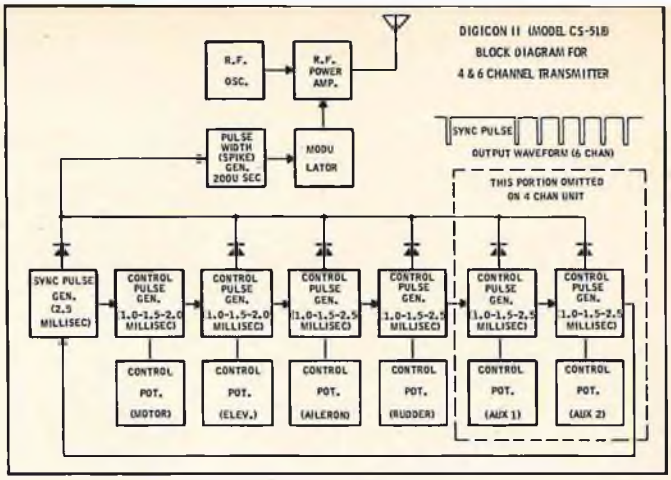
Proportional System

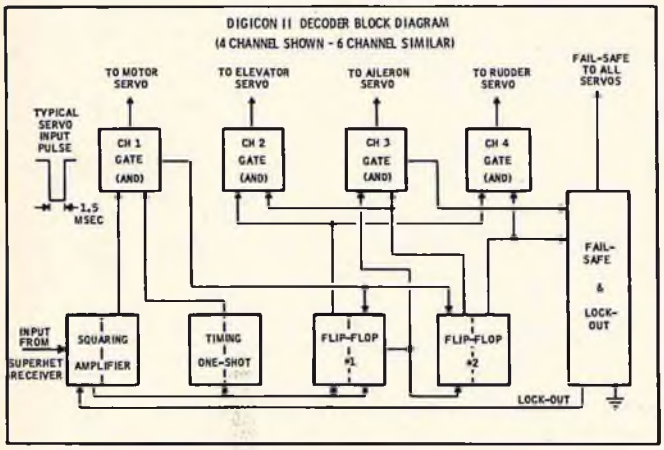


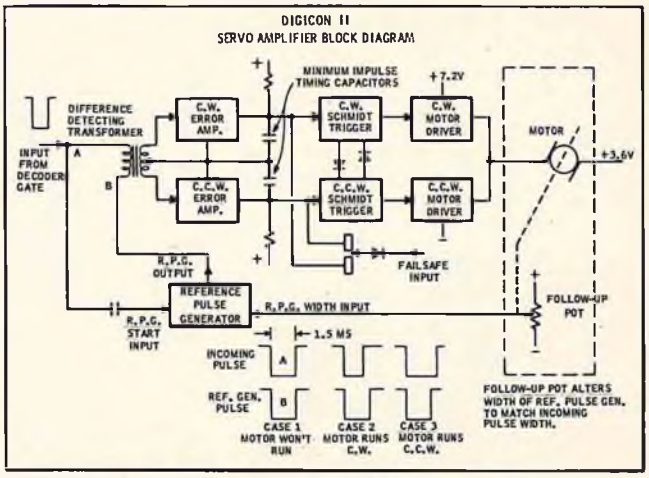


By Chuck Waas









THE Digicon II Proportional Control System, manufactured by C&S Electronics, 13400-12, Saticoy Street, North Hollywood, California, is available in a four channel and a six channel version. The former includes controls for motor, rudder, elevator, and aileron, plus flight trims for the last three functions. Total controls available would be the equivalent of a fourteen channel reed system. The six channel version provides two auxiliary proportional channels to operate optional accessories such as retracting gear, flaps, dive brakes, etc.

In order to provide maximum flexibility for the consumer, the Digicon II transmitter can be purchased as a four channel unit, and can, at the owner's request, be converted by the factory to a six channel configuration at a later date. The same is true of the receiver-decoder unit – the four can be factory converted to a six channel unit at the owner's request. All channels are independent, simultaneous, fully proportional control channels.

The Digicon II, as received at Radio Control Modeler Magazine, consisted of a fully tuned and factory tested transmitter (four channel), receiver, four servos, switch harness and plugs, batteries and charger. Total airborne weight of the system is 23 ounces. This is a digital type system utilizing solid state circuitry throughout. A separate battery charger serves to recharge the 12 volt transmitter battery and 7.2 volt receiver battery simultaneously. Both nickel cadmium units are of 600 mah capacity.

Digicon II Transmitter

The Digicon II transmitter is an all-transistorized unit delivering one of the highest power outputs of the many proportional systems we have tested at RCM – approximately one watt out! This output is monitored by an RF meter on the front of the transmitter, giving an indication of the relative battery condition.

The C&S Digicon II transmitter is well packaged, and employs the familiar overall green C&S color with yellow overprinting. Standard Bonner control sticks are used, with the elevator and aileron on the right, and rudder and engine on the left. Both sticks are self centering with the exception, of course, of the motor control function which remains in the preset position. All of the flight control surfaces are trimmed via a trim lever adjacent to each stick control axis. Basically, this is a single stick system, since most of your flying is done with the right hand stick – elevator and aileron. The left hand stick is primarily used for ground control.

The block diagrams accompanying this article will give a visual description of the theory of operation of the Digicon II system. Simply, the circuitry is basically a crystal controlled silicon transistor oscillator feeding two parallel connected silicon planar output transistors. Connection to the non-center-loaded antenna is made through a combination matching and loading coil.

An electronic ring counter is used to provide the timing control pulses which modulate the RF carrier, and contain the control information. Width of each of the pulses is varied by the related control stick pot in the transmitter to position the servos as desired. There is no control interaction between the various channels.

The operating voltage of the Digicon II transmitter is 12 volts D.C. The power amplifier input (current) is 100-120 ma and (power) 1.2 to 1.4 watts. Operation time on a single full charge is approximately four hours. The pulse train duration for the four channel system is 8.5 millisecond and 11.5 milliseconds for the six channel version. The frame rate for the four channel is 118 fps and 87 fps for the six. The timing pulse width is 2.5 milliseconds. Channel pulse width is variable from 1 to 2 milliseconds with 1.5 milliseconds neutral. The off time pulse is 200 microseconds. The overall tuning range is 26.995 to 27.255 with a frequency tolerance of .005%. Operating temperature range is 9 degrees F to +140 de-

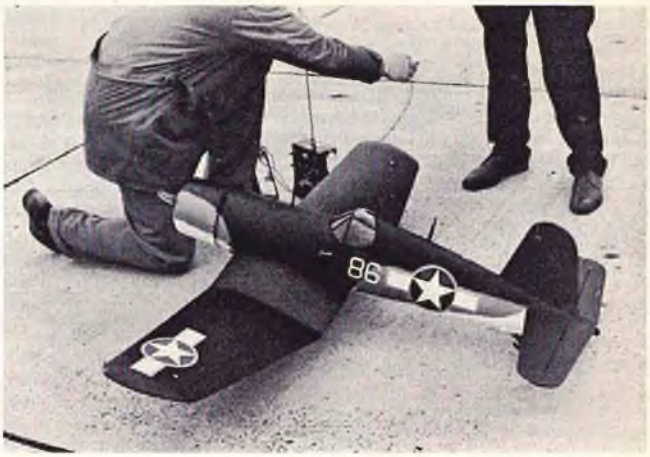
(Continued on Page 48)

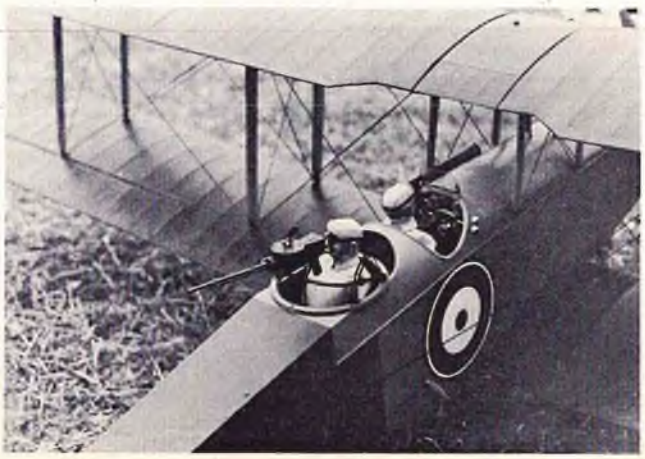
SCENES FROM THE 1965 British Nationals

By Noel Falconer

Scale highlights mark one of the most successful events of 1965

Below: 1st place scale winner Dennis Thumpston's D.H. 9 marked by minute attention to detail. **Top, right:** Dennis Bryant's 2nd place Miles Satyr. Note 2nd photo showing scale dummy engine with McCoy 60 hidden inside. **Right, below:** 3rd place F4U Corsair by Arthur Lalley incurred damaged wing during qualifying flight. **Bottom, right:** Dave Platt's 4th place Miles Magister — to be featured in RCM.





Don Haa's (Model Engineering Co., Florida) "Almost Ready-to-Fly" Gemini — an outstanding example of the new era in radio control — and a fine example of craftsmanship in a competition model.

R/C: THE NEW ERA

PART 1: New concepts, new materials . . . . and an exciting and CHALLENGING FUTURE FOR THE RC'ER

MOST of us have a tendency to take the technological advances of today's RC kits, accessories, and equipment pretty much for granted. But, for a relatively small industry, the advancements in model aviation have been nothing short of phenomenal. Only a few short years ago, for example, die-cut kit parts were unheard of, and the printed balsa sheet was the rule rather than a collector's item as it is today.

As industrial production techniques advanced, and our hobby began to grow by leaps and bounds, more and more experimentation began in the fields of prefabrication — the attempt to reduce the amount of building time for the ultimate consumer and flyer. Experiments began with new space-age materials — Royalite, expanded polystyrene, fibreglass, Air-O-Sheet, magnesium, aluminum, among many others. Some of these experiments were impractical, or too expensive, and doomed to failure. But, they were a beginning, and laid the ground work for the models of the future. Many RC'ers will remember the early attempts to produce a fibreglass fuselage, for example — the Polytron for single channel, and the Meteor for multi. Or, the "ready-to-fly" plastic Aeronca Champion by Babcock Controls, and the early experiments in forming wing cores from expanded polystyrene, or foam, by pioneers like Ed Izzo.

Today, we stand on the threshold of an all-new era in radio control — An era of modern materials designed for the modern flyer — an era of prefabrication that includes the ready-to-fly airplane.

We are aware that these products will arouse the ire of many dyed-in-the-wool model builders — but these products are here to stay, and more and more of them are coming. But, as they make their appearance, so do more and more "builder's kits" — the type of design that requires the craftsmanship of the true "builder." And, for both of these categories, there is a place, and all made possible by radio equipment that gives the RC'er more time to fly, and also such precise incremental control as to make possible the fabulous scale designs that would only be dreamed about a few years ago.

Foam Wings

Let's take a closer look at the new era in materials. The most prominent, of course, are the currently popular foam wing cores, offered by several national manufacturers. These cores are avail-

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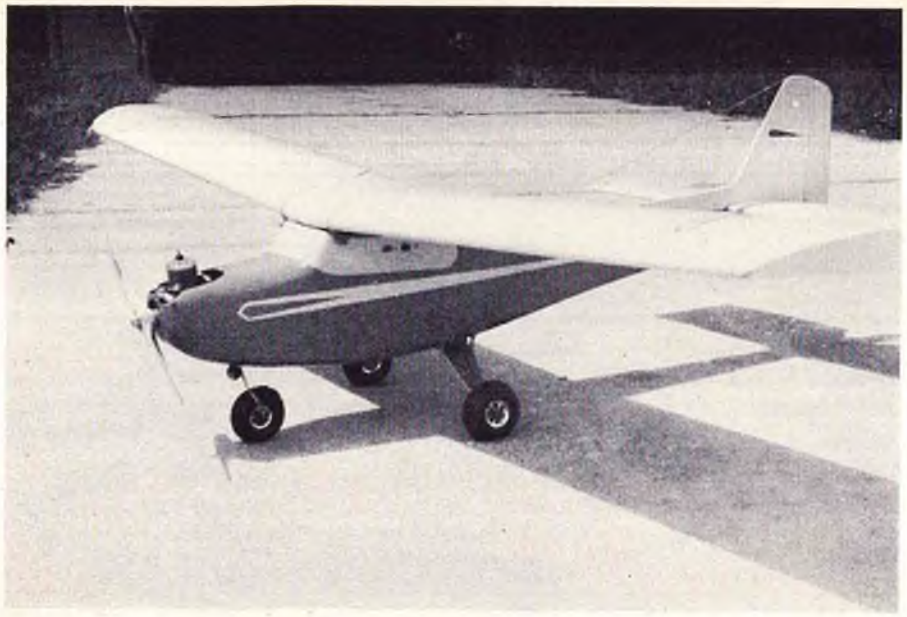


Model Engineering Co.'s "Tiros" has fibreglass fuselage, plus covered and doped foam wing and stab.

able for most of the popular aircraft designs seen in competition and sport circles today – designs such as the Candy, Kwik-Fli, Citron, Beachcomber, Jenny, Falcon, etc. In most cases, foam stabilizer cores are available separately as companion units to the wings.

Now the question remains, why the tremendous interest in foam wings? What are their advantages and disadvantages? Let's take a look at the pro's and con's:

Speed and ease of assembly: There is no doubt that a foam wing can be completely assembled and sheeted with a definite savings in time over conventional construction. Our experience with various foam wing cores show that you can completely sheet the cores, add the dihedral braces with epoxy glue, add the tips, and sand them in one evening.

Trueness: Generally speaking, foam wings are completely true, and free from warps of any kind as received by the modeler. It can safely be stated that the average modeler can not produce a wing by conventional construction that will end up as true as a foam wing assembly. However, in sheeting, it is possible to introduce warps in the thinner trailing edge sections, and once sheeted, are virtually impossible to remove.

Weight and Strength: A popular conception among modelers who have **not** worked with foam wings is that they weigh quite a bit less than a conventional built-up and silked structure. This is definitely not true. A foam wing core, completely sheeted with 1/16" balsa sheet and covered with a single layer of silkspan, will weigh the same or more than a conventional wing when both are constructed by the average modeler. In our experiment with the same wing, a 54" span, 12" chord core, designed for strip ailerons, the cores from three different manufacturers weighed within 1 ounce of each other, or 4½ – ounces per panel, overall. When two coats of contact cement were applied, followed by 1/16 sheeting, epoxy glue in the centersection, and ¼" sheet tips, the completed wing weighed 1¾ pounds to 2 pounds. The same wing built by the more conventional method, weighed 1¾ pounds at the same point. This is not to infer that **all** foam wings weigh more than **all** conventional wings – in many cases they will vary from the same weight to as much as 2 ounces lighter.

But now we encounter the strength factor. This, alone, adds to the appeal of a foam core structure, for the strength of these units is substantially higher than the conventional wing structure.

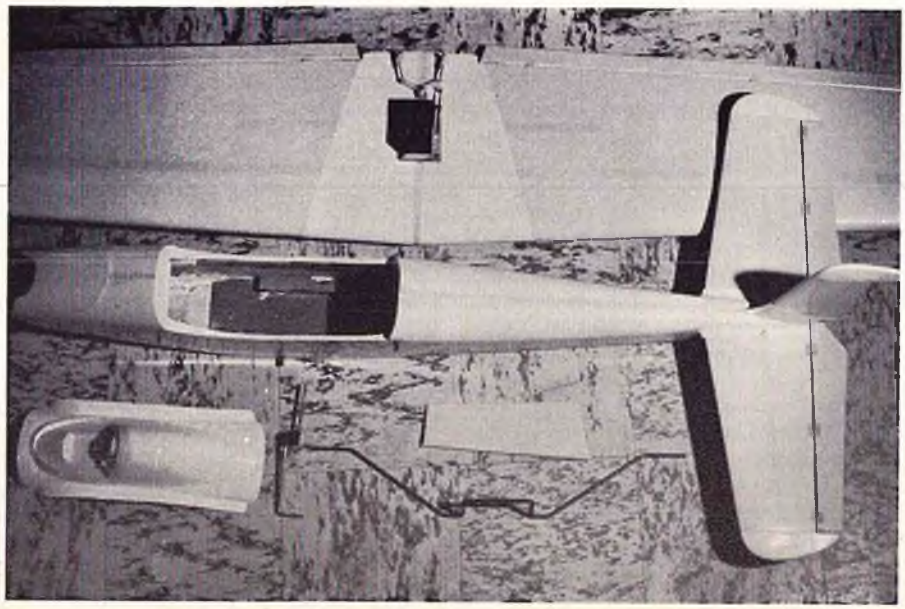
Cost: Can you build a foam wing for the same price as the materials cost for a conventional wing? The answer is both yes and no. Most foam wing core manufacturers offer the core with dihedral braces pre-cut. In some cases, formed leading edges and trailing edges are included, but the sheeting and cement must be purchased separately. Let's take a look at the total cost of a foam wing.

These cores will vary in price, so we will take an average cost of $9.95. Assuming that we have purchased this same 54" x 12" wing, as previously mentioned, we will have to add to the above cost a pint of contact cement at approximately $3.00 (varies from manufacturer to manufacturer). To this, we must add eight sheets of 1/16" sheet, 6" wide, at 55¢ each. Throw in another 75¢ for tip stock, and our total now comes to $20.10, ready for sanding and covering.

So, insofar as the cost is concerned, the materials cost is greater than a conventional wing, but savings in time is from 50-80% over the built-up structure.

Analysis: The RC'er who enjoys building more than flying will probably continue to prefer to "build his own." The flyer, on the other hand, will enjoy the features of a completely true wing, built in a minimum amount of time, and providing him with a true airfoil and maximum strength-to-weight ratio.

RCM's new 'Jubilee' from Lanier Industries is ready to fly sport or competition multi. Needs only hinging surfaces and joining wing panels. No painting on fuel proofing.



Fibreglass Fuselages

The first two fibreglass fuselages with which we experimented, were the Poly-

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RCM BOATING *SPECIAL*

- EXCLUSIVE I.M.P.B.A. CAPE CORAL ANNUAL REGATTA
- RCM'S 'HOT BOAT' FOR SEPTEMBER
- THE ROOSTERTAIL

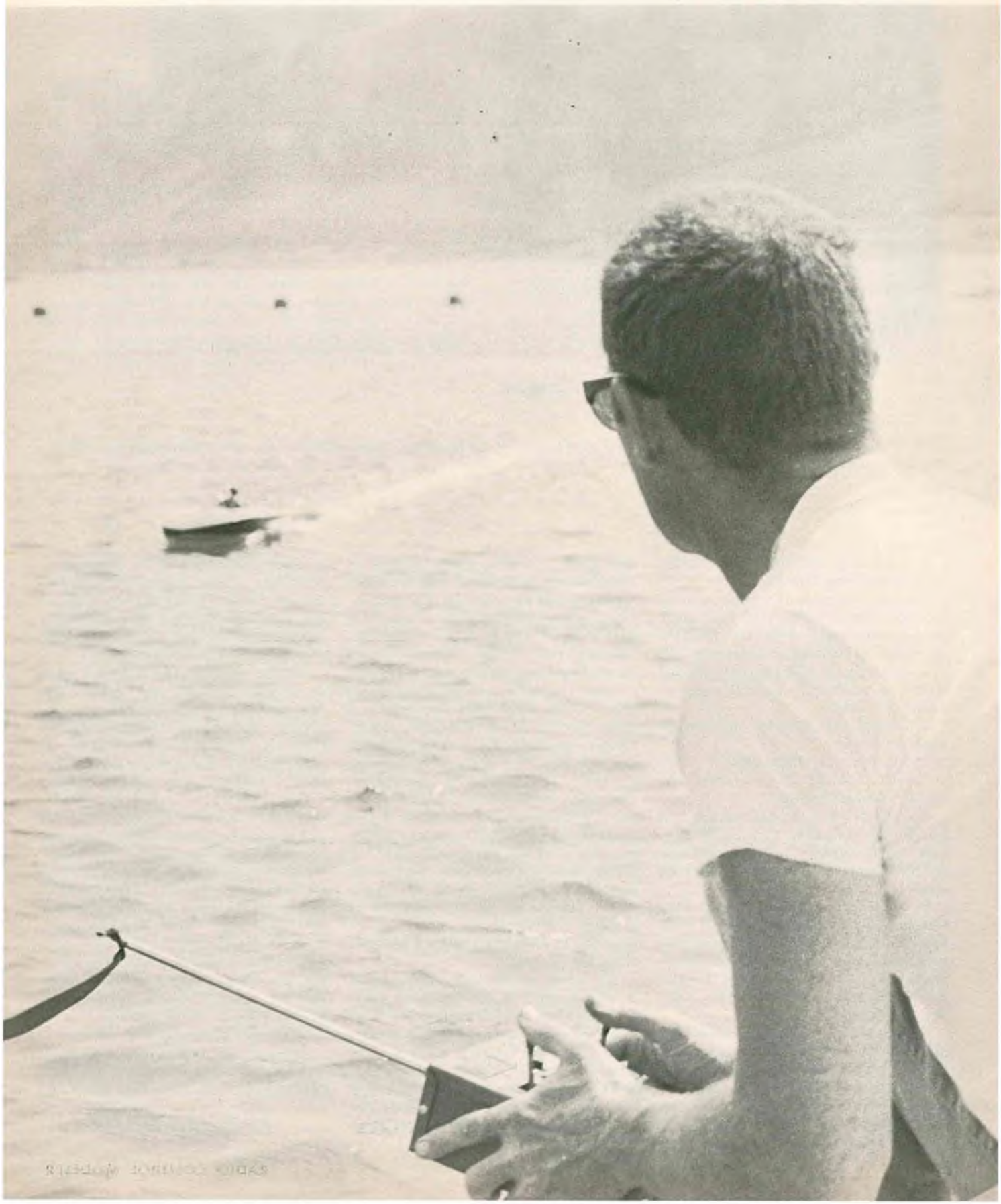


Photo by Cape Coral News Bureau

16TH ANNUAL IMPBA REGATTA

By Bernie Murphy

Ron Buck of Wheaton, Illinois, sets new world record of 35.5 seconds on the quarter-mile oval in Class E-2 Hydro competition at Annual IMPBA 'Nats'. In photo above Buck accepts trophy from Mary Duncan, 1965 Miss Florida World. As Joe Miller, Jr., National Hobby Center Executive Secretary looks on.

16th Annual gathering at Cape Coral hosts new world's record by Ron Buck. Read RCM's on-the-spot coverage of this national boating spectacular. . . .

One evening, early in June, I received a phone call from Don Dewey.

"Bernie," he said, "I want you to go to Cape Coral, Florida, over the Fourth of July weekend." I figured that the pressures of editing a magazine had finally caught up with him, and he had blown a transistor. *Nobody* goes to Florida in July!

I decided that the best thing to do was humor him.

"Sure, Don – anything else?"

"Yeah. I want you to cover the IMPBA Annual Regatta."

BOATS??? Now I was certain that he had short-circuited. I'm an RC'er – sure – R/C airplanes! I've never seen an R/C boat run, let alone report on them!

It soon became apparent that Don was not to be talked out of this wild idea, so I agreed, feeling certain that he would reconsider after a good night's recharging. I waited patiently for the call that would cancel this crazy journey. Nothing.

Resigned to my fate, I boarded the plane for Florida early Friday morning. With each stop, I mumbled a few pleasant words about Our Editor, and the place I felt *he* should go! With the passing hours, the weather got hotter, and finally, at Tampa, the planes air conditioning gave up in disgust. When we arrived at Fort Meyers, our destination, I was whisked into the driver's seat by Hurtz, for the final lap of the trip. (Note to copy reader – if you ever sat on a 200 degree plastic seat, it Hurtz!)

Cape Coral, scene of the regatta, was only a short drive from the airport. I went directly to the National Hobby Center, sponsor of the regatta, and was greeted by its director, Joe Miller, and his staff. The NHC is an unusual organization, in that it is non-profit (Eds note: Nothing unusual here!), and that it is solely dedicated to the advancement of hobbies of all types. The NHC is run by the most dedicated, hard working and enthusiastic group of people that I have ever had the pleasure of meeting. No effort was spared in attempting to make the regatta a pleasant affair for everyone.

The pond, as the contestants called it, was located in the beautiful Cape Coral Gardens, and consisted of a large lake (the contestants said it was small), with a 130 foot fountain running right down the center! The oval course was laid out around the fountain. Although the fountains were not actually in the running area, they seemed to have some magnetic attraction for the boats as they sped around, and many ended up hung in the protective chicken wire. To me, they added an air of excitement to the races, although I heard a few nasty words from some contestants.

Entries were from such distant points as Illinois, Indiana and Texas. Earl Mundt handled the directing of the contest without a complaint – something that I have never seen at an airplane contest! Everyone was willing to pitch in and lend a hand when needed.

Competition was hot (as was the weather) and heavy during the two day event. Ron Buck turned the ¼ mile oval course in a sizzling 0:35.5 for a new class 60 record. Ron, who hails from Chicago, was running a White Heat 60 powered by a Rossi .60, using Controlaire reed gear. Loel Reinhart, from Miami, placed third in F class with a scale service runabout, and second in 60 class with a scale Crackerbox powered by an old Atwood Superchamp! Not bad for a fellow who had never seen a power boat other than his own!

Although not an R/C event, we must mention the tether boat running. These guys are in a class by themselves, all

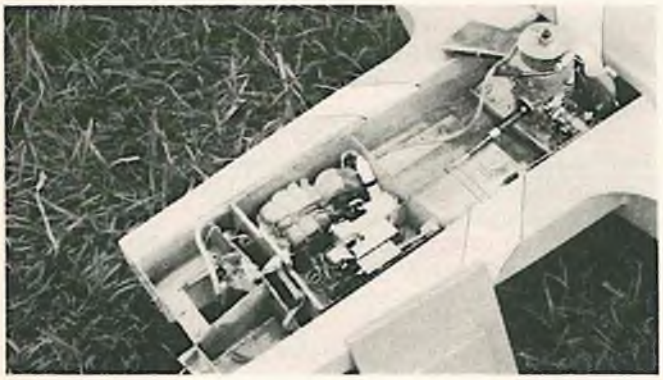
(Continued on Page 62)

Front to rear: Scale cracker box, original 3 point hydro, and scale service runabout. Loel Reinhart, Miami.

A lineup of entries from Houston, Texas.

Roy Reinhart holds scale service runabout as father checks controls.

Don and Scott Jordan's fibreglass Cobra, White Heat X, and Super Challenger.

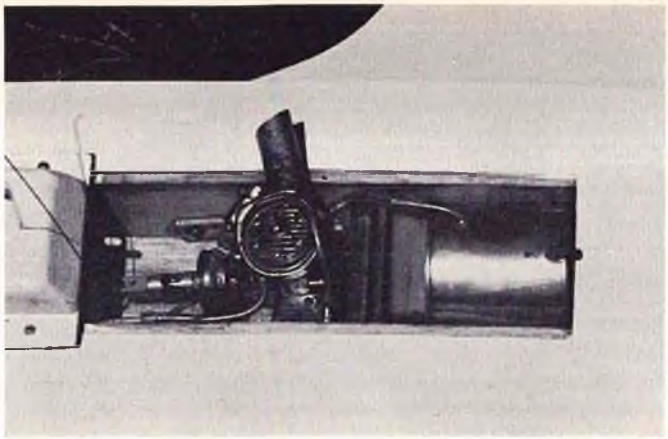


A typical installation — Don Jordan's Super Challenger with TAS engine.

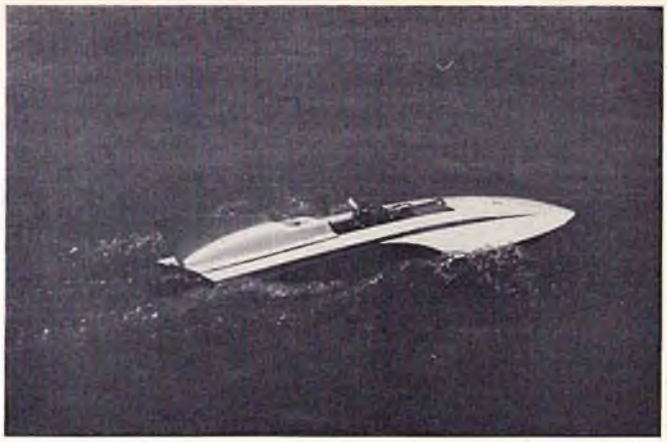
Houston's Frank Traina entered this Corvette hull with hand planked deck. Gannett 4 cycle engine.

Earl Mundt's Super Challenger passes the camera.

Eileen and William Perry with their fibreglass Challenger II.



Close-up photo shows engine installation, fuel tank.



At low throttle, the Hornet moves onto the course for a test run.

RCM'S 'HOT BOAT' FOR SEPTEMBER

THE INSIDE STORY OF Jim Henry's record smashing Hornet Hydro — by Bob Foley

James C. Henry, Commodore of the San Diego Argonauts R/C Model Boat Club, has caused something of a sensation on the West Coast with the wild, record-smashing performances of his Hornet Hydroplane. The members of the Argonauts club are quite proud of Jim and his "hot boat," and are prone to boast about the outfit as though it were their own.

Jim has been an SK advocate for several seasons, and he has built some hot SK boats. But somewhere along the line, he caught the bug to run a model hydro. He knew, or should have known, what he was letting himself in for! Hydroplanes have a reputation, well earned, for occasional bursts of blinding speed on private test runs, coupled with inevitable frustrating crankiness when the chips are down. At any rate, Jim decided to build a hydro from the Hornet kit. This was a smart move, because the Hornet is known to be a going machine when set up properly. Dick Carey of Los Angeles ran quite a few model hydros in developing the Hornet design, and Bill Hutchison, also of L.A., developed a kit that is without equal in model boating (author's opinion). The quality of the material, the accuracy of the die-cutting, and the completeness of the plans and instructions make the B & H Hornet Hydroplane Kit an outstanding value for the performance minded R/C model boatman. But we digress.

James Henry built a Hornet, and fooled us all by installing an old Veco .19 R/C engine. The Hornet really hauls with a hot Super Tigre .35 supplying the go power! However, Henry's .19 powered outfit appeared downright under-powered when he showed up at the salt water pond in San Diego in January, 1965, ready for the first test runs. Were we in for a surprise! Jim's model rose right up on the sponsons and propellor, and wailed across the water trailing the roostertail of spray that is the trademark of a prop-riding hydro.

The electronic timer was set up, and Jim settled down to ironing out the bugs and adjusting for maximum straightaway speed. The clock told us what we already knew. This rig was a potential record holder! At that time, the fastest .19 powered model boat run was 18.00 mph, the record set by Griff Parker with "Apple Honey" (RCM, June-July, 1964). Soon Henry's hydro was going 20+. It didn't turn worth a darn, but the throttle response was reliable and cornering was fine at low speed. Also, acceleration appeared to be good.

Early this year, James hit the magic combination of fuel, propellor, water condition, and weather. The only glitch

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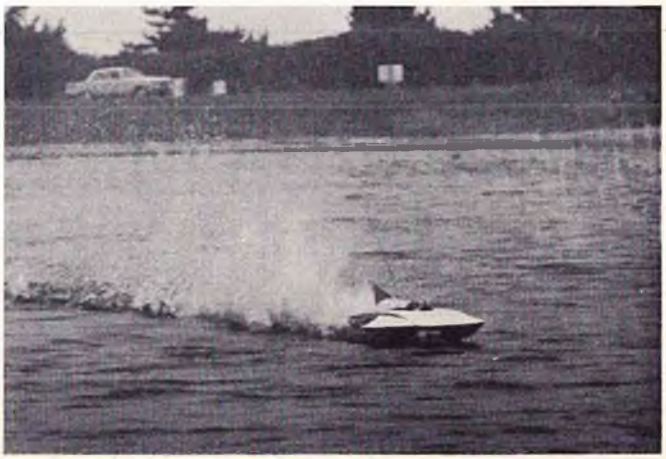
At speed, Jim Henry's Hornet rises up on sponsons and lower half of propeller.

Jim's Hornet at full throttle, churning up a roostertail. Note absence of sponson spray.



TOP OUT

Jerry Kleinburg

A two-part story. On the way to a 'dork' at the Longview (Tex.) meet, Norm Rhodes assumes the 'Digimite Hold-up' stance as he loses range on a touch and go. Ship retreived for a cleanup as Buddy Brammer, left, grins over Norm's muddy plight. The popular Texan persisted, found new set needed antenna tuning, went on to beat Buddy by 8 points.

THE CONTEST SCENE

As the contest season hits its peak the news coming in reflects familiar names – names of Class I fliers whose contest consistency keeps them in the trophy circle each year. A quick rundown finds Jackie Gardner winning three firsts – Pensacola, Jackson, and Mobile – while Tom Williams edged Don Downing in Tulsa, and Norm Rhodes won at San Marcos while pacing Buddy (no, not George!) Brammer at Longview, Houston and Port Arthur. Incidently, all these wins and any following are good for points since AMA began keeping score this year to name National Champions in radio control events. This is a good move since the nature of RCing prevents a try at a National Trophy during the annual Nats wing-ding. Full details aren't available at this time but it's understood 'National Champ' points are being tabulated at headquarters for 1st, 2nd, and 3rd places at all sanctioned RC meets.

While watching the top bananas it's still a good idea to keep an eye on the middle of the class I bunch. Fliers such as Chuck Morgan (Ariz.), Walt Staff (Utah), Carl Von Sutter (Miss.), Dick Dickson (Tex.), Aaron Saathoff (Utah), Gerry Meyers (La.), and Hank Waltman (Ala.) have shown persistency and it won't be long until they start garnering their share of firsts. (Although Carl Von Sutter didn't win the no. 1 spot at the Jackson Capital City RC Meet, we hear he did win a $100 attendance prize – which isn't a bad consolation at all while taking 2nd place hardware.)

As expected ten channel superhet reed rigs of all the popular brands continue to dependably dominate the Class I equipment picture during this season, while kit planes are showing up in in-

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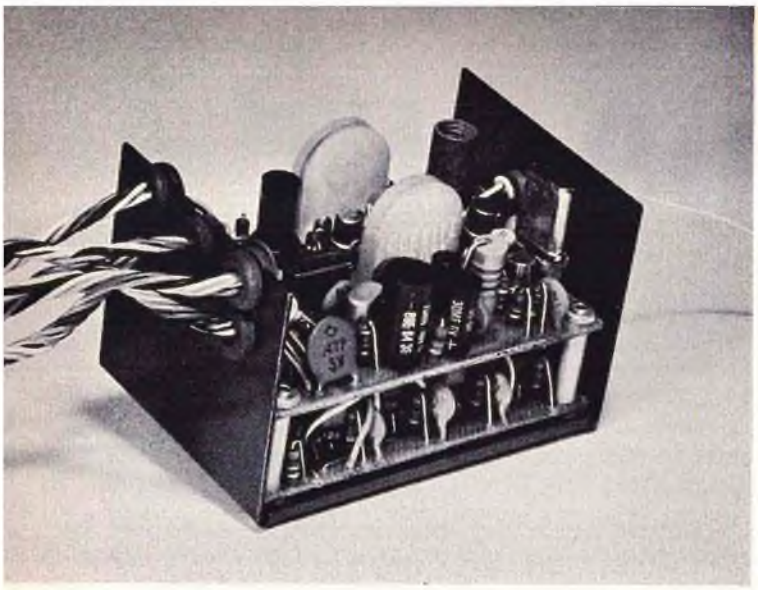
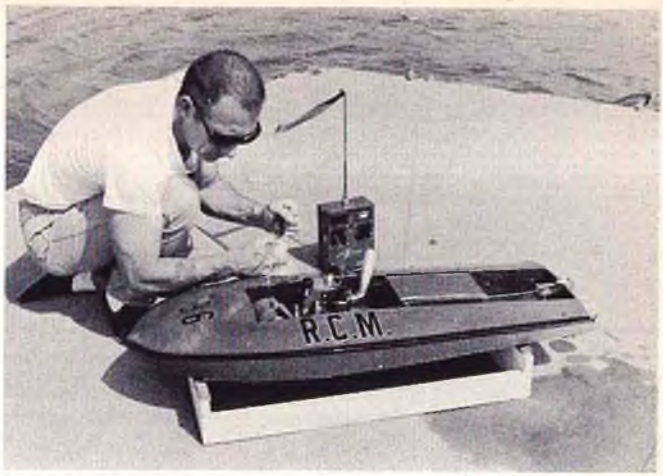
Don Downing fires up his original Class I five-footer. Features a full symmetrical section wing! Flew very well at 5½ lbs. on a ST 40. Placed 4th at Longview, 2nd in Tulsa and Houston meets. Note the ground adjustable elevator.

Martha Beason, Shreveport RC Sharks Sparks Editor, gets equipment low-down from Norm Rhodes, center, while a friend looks on. Ship's a Texas Mambo, Enya 45 powered to lift Digimite propo gear. Placed 1st in Houston, San Marcos, Port Arthur contests. Read below for Martha's contribution.





Left: Digicon II receiver-decoder. Above, Bill O'Brien fuels up RCM's White Heat.

grees F. Size of the transmitter is 2¾" deep by 6" wide by 7½" high. Antenna is 54" fully extended. Total weight of the transmitter, complete with battery and antenna, is 45 ounces.

Digicon II Receiver

The Digicon II Receiver is pre-cabled and employs color coded Dean's connector for easy identification of servo function. For example, orange (motor); black (rudder); yellow (elevator); green (aileron); red and white (auxiliary).

Solid state circuitry is used throughout the Digicon receiver, and includes Clevite Transfilters in the I.F. stages, replacing the more commonly used adjustable transformers, eliminating the possibility of transformer "misalignment" due to drift or vibration. Decoder logic circuits utilize diodes, resistors, and silicon transistors to decode the information from the receiver output. Individual channel outputs are obtained through AND gates and fed to the related servos.

The C&S proportional receiver has a narrow band width, rejecting signals 5 KC or more away from the receiver frequency. Sensitivity is eight microvolts or less. Reverse AGC prevents overloading at close operating ranges.

A "Fail-safe and lockout" circuit is utilized by C&S, providing a neutralizing voltage to center the servos when correctly decoded information is not received. When an extremely strong interference signal is received, a slight servo "dither" around neutral occurs, due to the sampling rate of the lockout circuit.

The nickel cadmium battery supply for the C&S receiver consists of 6 (six) 600 mah cylindrical Gould cells in a hi-impact Cycolac case.

Sensitivity of the Digicon II receiver is less than 8 microvolts for full control. Bandwidth is 4 Kc at 6db. Intermediate frequency is 455 Kc. Operating voltage is 6.0 volts nominal with a current drain of 65 ma for the four channel version and 85 ma for the six channel configuration. AGC operates full control from 8 to 100,000 microvolts. Operating temperature range is from 0 degree F to +140 degrees F. All standard R/C frequencies are available from stock and others on special order. Overall receiver dimensions: 1⅝" high x 1⅞" wide x 2⅝" long (four channel) or 3⅜" long (six channel). All-up receiver weight including plugs and wires is five ounces. The six channel version weighs one ounce additional.

Digicon II Servos

The C&S Digicon system utilizes the new linear mode Bonner-type proportional servos, although the internal circuitry is designed specifically by C&S in order to use these servo mechanisms with the Digicon II. Two types of servos are used – the center-fail-safe and end-fail-safe – the former for flight controls and the latter for motor and auxiliary functions.

Servo components and circuitry are housed in the high impact Cycolac case, the amplifier mounted on a small P.C. board in the case. The feedback pot and wiper lands are on a smaller P.C. board affixed at right angles to the main circuit board. One small poten-

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Bill Cannon of C & S looks on as RCM's C & S Proportional controlled White Heat rests between runs

Equipment compartment in the White Heat. Two C & S Proportional servos paralleled to give the needed 8 lbs. of thrust for rudder.

7 FOR 1

By Chuck Cunningham

One of the most frequently overlooked ideas by a majority of modelers is the similarity of design in all types of model aircraft. This is particularly true in radio controlled models. By this, I don't mean that they all look alike, (which, is somewhat true), but that the different types are all *designed* alike.

With this thought in mind, we can see from the drawings accompanying this article, that from a basic premise we can develop at least seven differing types of aircraft with very little modification. Let's take them one at a time and see where they are similar, and where they do differ. Turn to your old magazine file and look at the March 1965 issue of RCM for "R/C Design Made Easy" to find the relationships of one part to another, and use this in conjunction with the ideas given here.

Drawing #1 is the "Basic Aircraft." It is the very popular shoulder wing configuration, and you can quickly see in it some of its very famous relatives such as the Falcon and the Stormer. This type of design offers good stability with an ease of flying that is often lacking in the more attractive low wing models. But what happens when we shift the wing to the bottom of the fuselage, move the horizontal stabilizer to the top, add landing gear to the wing and . . . well, that's all there is to it and we now have an aircraft that resembles many of the very popular contest ships of today – the Taurus, Beachcomber, Kwik-Fli and others. This is shown in drawing #2. Of course, you will note that I have "designed" these two ships around the same thrust line and with a flat top which allows for very easy building.

All of the rest of the ships shown in drawing #3 through #4 are laid out in exactly the same way, with the same type of body. In several places the thrust line has been raised, but this is primarily for appearance and could be left alone. The "Basic Aircraft" is shown in dotted lines on all of the others.

Now that we have an understanding of what I am trying to show, we will

(*Continued on Page 67*)

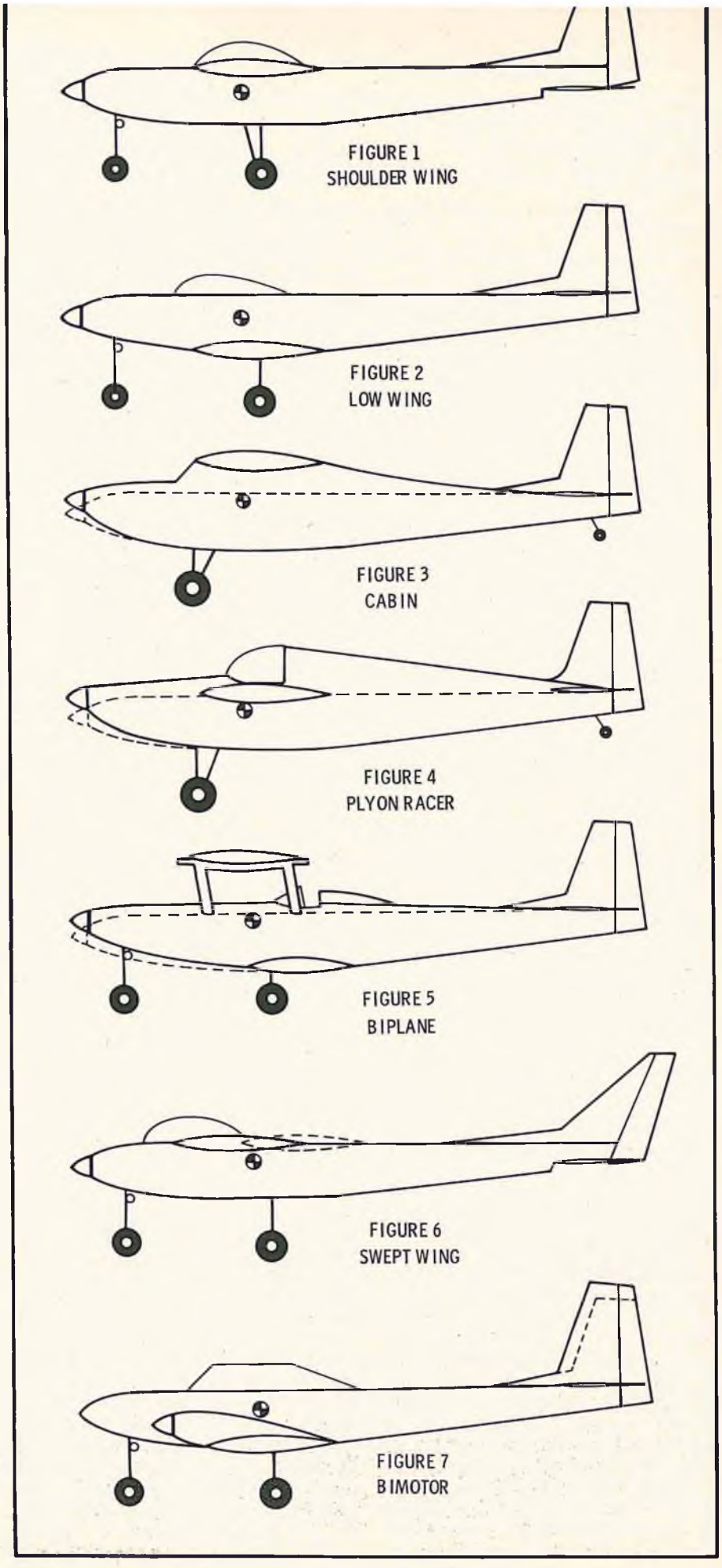


FIGURE 1
SHOULDER WING

FIGURE 2
LOW WING

FIGURE 3
CABIN

FIGURE 4
PLYON RACER

FIGURE 5
BIPLANE

FIGURE 6
SWEPT WING

FIGURE 7
BIMOTOR

RCM 'Hot Boat'

(Continued from Page 46)

was a badly overheating engine. The clock was set up that Sunday, and Jim startled all present by cranking off a 21+ mph run right away. The back-up run was slower, as the engine got hot and sagged. Back to the pits for adjustments. We were all watching to see what would happen on the next run. It happened! 23 mph! Again, an overheated engine slowed things up and spoiled the return run through the traps. More adjustments. With the water glassy calm, Henry eased the Hornet back out on the course later that afternoon. The first pass through the traps was in excess of 25 mph! Overheating persisted, and the backup run was timed at 23+. The average of the two runs was better than 6 mph over the record, and it appeared that all Jim Henry needed was a sanctioned meet to prove that he had a world-beater. The opportunity presented itself at the end of February. The Argonauts were sponsoring their annual Mid-Winter Contest, and with a full day of time trials, it appeared that Henry would be able to uncork his Hornet for a record-breaking run.

Alas, it was not to be. In a test run, Jim ran out of water and beached the rig. Hull damage was negligible, but the propellor was banged up. Any hydro man will tell you that the prop is the real secret to success, and Henry's prop, when repaired, just didn't seem to have it. That was only the beginning. Contest day, the wind was blowing a small gale, and Jim's Hornet displayed a real aversion to rough water. In addition, the engine went sour and just would not wind up. The rig never made it to 18 mph. To add insult to injury, a .15 powered SK ran through the rough water to a 19.4 mph record.

If the Hornet's dismal performance at this meet discouraged Jim, he didn't let it show. Instead, he got to work on the rig in order to have it ready for the next time trials. The first problem was the engine, and Jim tore it down to see what had happened to the compression. He also acquired a new Veco .19. Both were converted to water-cooling. With two engines built up and the over-heating problem seemingly licked, Henry was again ready to go. Running the clocks early in April, he began testing props. Several were tried, and one modified by the author was finally settled on for the next attempt on the record. This wheel yielded 24 mph on these test runs.

On April 24th and 25th, at Delano, California, the Bakersfield Blue Dolphins put on two days of sanctioned time trials. Rough water again! Hydros and SK boats alike were plagued by high wind and choppy water all day Saturday. Sunday morning, Jim made his test runs to find the right needle valve setting. The water stayed calm just long enough for a flat-bottom .15 to run through at 23.29 mph for a new record. Then the wind! Jim made several runs with the Hornet, finally reaching 23.51 mph for both the IMPBA and WAM records for .19 hydros. Those of us who saw the record run were amazed by the rough water performance of the boat. It bounced, leaped, and at one point rolled up 90 degrees on its side, but it kept going and set the record. Finally it did a 360 degree roll, landing right side up with a dead engine — fuel starvation, apparently. The rough water definitely held the speed down somewhat.

Since that time, Jim has worked with the boat to improve the rough water handling and the cornering ability. Many contests now have multiple-boat racing events for .19 class boats, and, clearly, James Henry is aiming his Hornet at this type of competition.

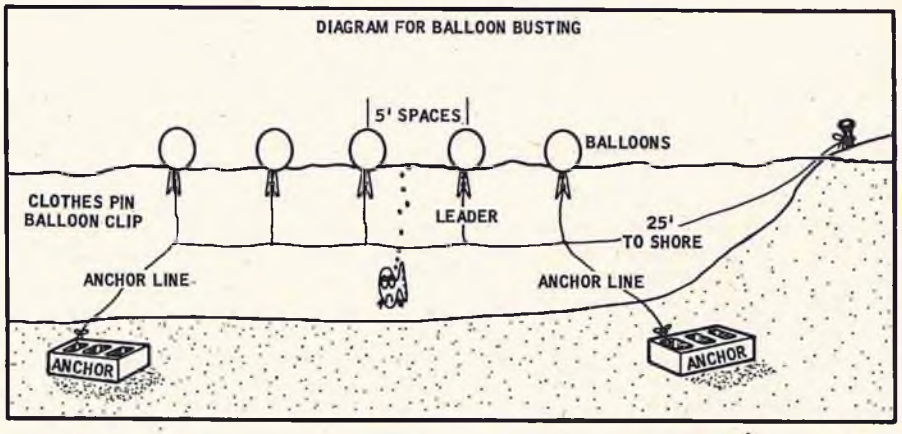
Jim built his Hornet from the kit with only a few minor modifications. Most obvious, and least important, the deck over the sponsons was dropped ½" to ¾". The air traps behind the sponsons were cut down depthwise but the length remains the same. The suggested rails or strakes along the sponson runners were omitted. In their place, a small metal skid fin was fitted at the aft inside edge of the port sponson. The V-strut was not used. Instead, Jim fabricated a more streamlined strut. He also fabricated a transom rudder bracket with a deep hydro rudder. The engine, as mentioned above, is the old Veco .19 R/C with plain bearings. Copper tubing clamped around the head and cylinder fins solved the cooling problem. The water pickup is in the prop blast. The engine itself has not been personally inspected by the author, but one can safely assume that it is in stock condition. The rules do not require this, but common sense does, as reliability is a prime factor when one is seeking a record.

The fuel mixture used was not disclosed but the author is certain that it would have been one of the tamer commercial blends. Jim is pretty cautious when it comes to risking an engine on a

(Continued on Page 63)

The Roostertail

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



Now that the "Balloon Busting" course is an official precision boat course for competition, there remains the chore of tending the balloons during a meet. This task can be made considerably easier if a little forethought is given to the operation. Forethought is not always easy to come by, so you are about to receive the benefits of my 20/20 hindsight, and thus take advantage of the lessons learned, mostly from the best teacher in the world – experience! I guess the reason that experience is the best teacher, is because you can't cut the class.

The basic requirements for the system are simplicity, fast operation and low cost. The materials required include: Balloons, about half a dozen for each contestant anticipated (and a few extra for good measure); about 100 ft. of stout nylon cord; 5 "clip" or spring clothes pins; and two anchors.

The balloons can often be bought by the gross through a novelty shop – or ask your hobby dealer if he can get them for you. In gross lots, they are quite reasonable in price. Be sure to get the round balloons, long skinny ones do not meet the 5" diameter minimum. Blow them up as required. A lot of blown up balloons are hard to store, and are quite a temptation to the kids. The nylon line should be secured to the shore, and at about 25 to 30 feet from shore, secure the first clothes leader (a clothes pin tied to the end of 2 ft. of line). Secure the remaining clothes pin leaders at 5 ft. intervals, and leave enough line after the last clothes pin to reach the bottom of the pond, plus a two feet more, and tie the end to one of the anchors. (A cement block makes a good anchor.) Attach another piece of line to the attach point of the first clothes pin leader, making it two feet longer than the depth of the pond, and tie it to the other anchor. And there you are!

In the event that you have used wooden clothes pins, and it has a tendency to float, add enough weight to the clothes pin to sink it. This will insure that the clothes pins and lines sink after the balloon is popped, and thus will not foul the prop of the boat passing over.

To set the course, secure the line some 15 ft. to the side of the contestant's position, run out away from shore to the first clothes pin leader, attach the first balloon in clip of the clothes pin, set the first anchor already tied to the anchor line, then proceed to string out the course parallel to the shore, crossing in front of the contestant's position. At the last balloon, anchor the set, via the line to the second anchor.

This system allows you to set up balloons with a positive position, and permits it in muddy water, either by boat or wading, in deep water, or shallow. Always start by holding the lead line attached to the shore, so that you will be able to find the clothes pins. This might sound a bit strange, but after wading around just once there is usually enough

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R/C: The New Era

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tron high wing design, and the Meteor for multi channel work. Even earlier experiments in fibreglass were carried out by such pioneers as Hartman, Beauchamp, and Puchalski. Today, fibreglass fuselages are apparent on almost every flying field in the country. The workmanship evidenced by these units range from the acceptable to almost flawless works of art. As an example, a fibreglass Senior Falcon fuselage can be purchased for $19.95 (Action Industries). Add to this, a foam wing for approximately $20 (all necessary materials) and a matching stab for approximately $5.00 (all necessary materials) and you have the makings of a ready to fly airplane. As with the foam wings, you will save a great deal of time, have a high strength-to-weight ratio, and a completely true airframe. And, as we have seen, the cost will be approximately $45 — slightly more than twice the price of the original kit, itself.

So, there **are** advantages in speed of assembly, strength-to-weight ratio, and trueness in airframe construction and alignment. This is offset, to some degree, by the overall cost of the prefabricated components.

Is it worth it? You pay your money and take your choice.

The Ready and Almost Ready-to-Fly

The next inevitable step from the highly prefabricated airframe components is the so-called, "ready-to-fly" airplane. A year and a half ago, we reviewed the Jubilee, one of the most revolutionary and truly remarkable aircraft we had seen. This ship, somewhat resembling Doug Spreng's Stormer design, was completely formed of a plastic-like material known as Air-O-Sheet, and was ready for the installation of equipment and motor. Shortly after publication by RCM, Len Purdy, designer and manufacturer of the Jubilee, ran into production difficulties and had to refuse all subsequent orders for this ship.

Now, a year-and-a-half later, the Jubilee is once again ready for the consumer, with all production difficulties seemingly ironed out. We received the new prototype, pictured with this article, and found it to be even more outstanding than the original model. The fuselage of the new version has been widened to accept any reed or proportional equipment. All that is necessary is to splice the wing halves together, hinge the elevator, ailerons, and rudder, strap on the landing gear, install your equipment and fly. Painting is not required, as the ship is furnished in two colors, although AMT spray lacquers can be used and are fuel proof. Price of this ready-to-fly is $59.95, and will be available direct from the manufacturer, Lanier Industries, or through your dealer.

Another manufacturer that is providing a ready-to-fly in a slighly different fashion is Model Engineering of Tampa, Florida. RCM has also checked out their 'Gemini' design, which closely resembles Jim Kirkland's Beachcomber. This ship features an unpainted fibreglass fuselage with all formers, motor mounts, and servo rails in place; a foam-and-balsa wing, completely covered and clear doped, ready to join at the center section; plus pre-covered and doped fin and stab, ready for final assembly. Complete price of the 'Gemini' is $69.50.

A smaller ship is also available from Model Engineering — the high-wing Tiros for Class I and II, again featuring a fibreglass fuselage and pre-covered and doped wing and tail surfaces. Price on this design is $59.50.

With both the Jubilee, and the Gemini and Tiros, individual replacement parts, such as fuselage, wing, stab, etc., are available as separate items.

Another ship in this category is the Royal Coachman design from Meinke Model Engineering. Originally presented as a construction article in RCM, the Royal Coachman is a 44" span trainer and sport ship for .09 to .15 mills. Meinke has produced the Coachman with completely assembled fuselage, sheeted foam wing ready for joining together, motor mount in place, plus completed rudder and stab. All that remains is a quick final sanding, painting, and equipment installation. This is available for $39.95. The hardware package is $3.95 extra. The Coachman marks the first "ready-to-fly" from this Florida company. Again, RCM has assembled and flown this unit and found it to be an excellent example of handcraftsmanship. Total time from receipt to first flights was two days, time enough for a quick paint job and equipment installation.

And there you have a few examples of the current crop of preassembled R/C aircraft, varying from $39.95 for a foam and balsa trainer to $69.95 for a full-house fibreglass and foam competition design. In between is the Jubilee, an all-new material that is complete ready-to-fly (with the exception of hinging the surfaces and joining the wing halves) and doesn't even require painting, for $59.95.

Are they worth the price? If so, are they here to stay? To both, we offer an unqualified, yes! As with foam wings and fibreglass fuselages, these new items are selling as fast as they can be manufactured. And quite obviously, they are well accepted by the R/C fraternity. When you consider the price of the items involved in a conventional multi-channel or proportional aircraft, time notwithstanding, you will find that they are certainly competitive. If you add in the building time, they are unequalled.

Summary

This, then, is a part of the new era of R/C — prefabrication. As more and more manufacturers are experimenting with various materials, we can expect to see more and more entries in this fast-growing field. Quite apparently, they will be welcomed with open arms.

We like them, we can fly, and in between, build that super-detailed scale ship we've dreamed about — but in the final analysis, the choice is up to you!

Next Month: RC: The New Era Free Style Aerobatics.

FLUYEN DER CLOUDENLOOPER

by LT. GRAHAM H. HICKS

A complete, concise "How-to-fly-it" Treatise from the Meisterfluyer . . .

Mit der cloudenlooper gefinishen, der juicentanken und der loudensputter boltenuttened, und das pulsenhearenboxen und grindergearenboxen geplacen, ist readyisch fur testenhoppen.

Taken der cloudenlooper und proceden fur der fluyenfielder mit nein branchenleavers ni sparkenwiren holdenpolers. 1st good also wenn ist nein smallenfry nearisch fur gefingerpoken der fluyenfoilen panelers.

Ist common-sensen fur walkencheckken der switcherboxenpulsensticker before fluyen. Wenn das switcherboxenpulsensticker ist OK, procedenen.

Mit picen von gardenhoser, geflippen der fingerslicer und gestarten der loudensputter. ACHTUNG! Maken surisch der boosterjuicer ist removen from der loudensputter hottenplugger or der cloudenlooper ist frontensluggisch und maybe groundensplatteren!

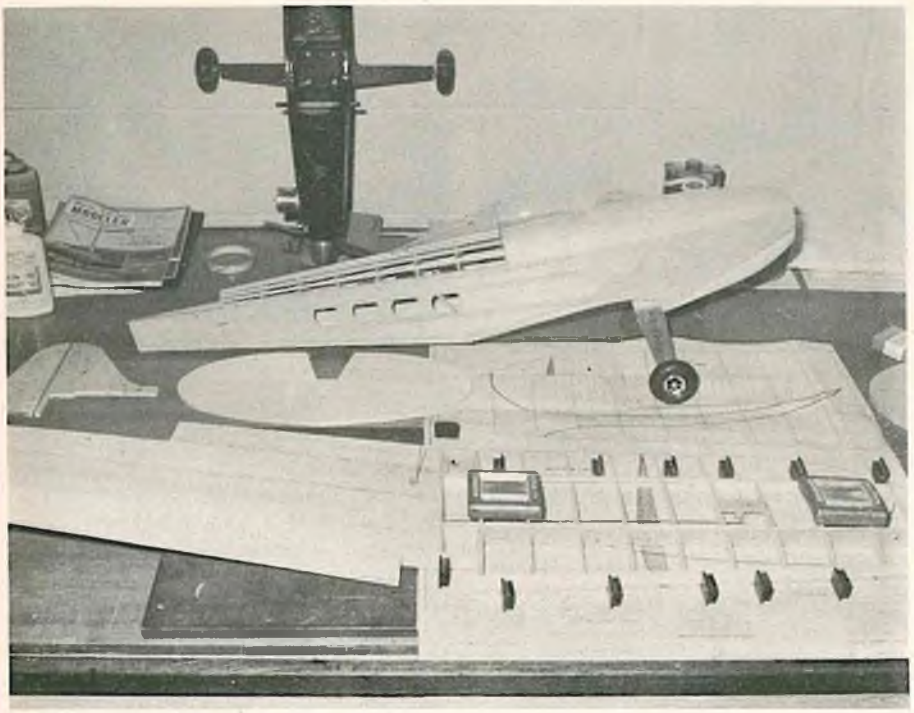
Wenn der loudensputter ist screamenspitten, geturnenloosen der stickenupper yawenflipper und begrabben der switcherboxenpulsenswitcher. Gebeepen der uppisch pulsensticker und der cloudenlooper ist pointen der fronten fur der cloudenfleecers und ist fluyen. GESUNDHEIT!

Gepushen der leftenrichten pulsensticker bin maken der cloudenlooper geturnen. Gepushen der upendowner pulsensticker bin maken der cloudenlooper upendowner fluyen. Gepushen das upendowner und leftenrichten pulsenstickers togetherisch bin maken der cloudenlooper stallenspinnen und maybe groundensplatteren. ACHTUNG!

Wenn der juicentanken ist runnenouten, ist unfortunate. Der loudensputter ist gestoppen und der cloudenlooper ist frontenpointen downenscreamin. Outergettin der way! As der cloudenlooper ist weedenskimmen, gebeepen ein littlisch uppen of der upendowner pulsensticker. Ist maken der cloudenlooper do ein "greasenlander." Ist good.

Mit der fluyen gefinishen, gewipen der cloudenlooper mit raggers fur removen der oilencrud. Gestuffen der cloudenlooper, switcherboxenpulsensticker, und fluyentoolenjunkenboxen in der Volkswagen. Geliften der Volkswagen loudensputter coveren.

Mit piecen von gardenhoser, geflippen der . . .



Sterling Models' Denight Special.

KITS and PIECES

By BERNIE MURPHY

RCM Contributing Editor

Early this year, when the NMPRA was formed, we became quite excited over the potential of an R/C Goodyear type plyon race. The one big drawback at that time was the fact that no kits were available, and as a result, the ships had to be scratch built. Gradually now, racer kits are beginning to appear, with many more still in the offing. The first to arrive at the local hobby shop was Sterling's Denight Special, and these disappeared almost before they were unpacked. Needless to say, we grabbed one.

The Sterling kit is basically the same as the plans which appeared in the March issue of RCM, by Joe Martin; however, some modifications have been made in the construction of the ship in order to simplify assembly. The kit includes wheel pants and cheek cowls formed of high impact styrene, which are both tough and light. A preformed spring aluminum landing gear is also included. Cowl blocks, wing tips and ailerons are rough shaped and, where required, hollowed. These machined balsa parts are of excellent quality. The die stamped parts required a little coaxing, but were not bad. (This may vary widely between kits.) Sterling's usual top quality canopy and decals and more than average hardware complete this impressive kit.

As usual, we began assembly with the fuselage. Full length sheet sides are used, and construction is typical of most R/C ships, with the exception that the nose section doublers are assembled to the out side of the fuselage, after the sides have been assembled to the formers. We strongly recommend the use of a good quality contact cement for this operation! Square stringers are installed on the top, bottom and sides of the fuselage simulating the built up framework of the original. Two small fill pieces (D3), not mentioned on the plans are cemented to the top of the motor mounts, behind D2, to allow the nose section to be sanded to shape. The top cowl block required some hollowing of the forward section (to be corrected in future kits). The top and bottom cowl blocks were tack glued into place, and the entire fuselage sanded to final shape.

We did not drill the holes for the Cam Locks or the wing leading edge

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Setting wing sheeting on the Denight.

The basic Denight structure prior to covering.

Kits & Pieces

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dowels during the fuselage assembly.

Wing construction followed the plans with few exceptions. All wing ribs were paired, and sanded to match, being certain that the rib bottoms were flat from the forward spar to the trailing edge. Spar slots were checked and trimmed, making certain that the spar would fit flush with the top of the rib. The holes for the leading edge dowels were drilled ⅛ inch instead of the ¼ inch specified (allowing for larger fitting). The framework was then assembled over the plans using a Magna-Jig (flat surface a must), noting that both W-1 and W-2 ribs are angled. After allowing the framework to dry thoroughly, the entire top of the framework was sanded, using a large sanding block, and carefully working from leading edge to trailing edge, assuring a smooth airfoil, and equalizing any variation in the ribs. At this point the aileron linkage must be installed. A Kwik Link was used for the push rod, since, with the clip removed, it will fit inside the framework, and not extend beyond the trailing edge. This allows the panel to be weighted on a flat surface during sheeting operations. The wing sheeting supplied in the kit has been straight line ripped in order to assure a good fit when joining the sheets. All sheeting was joined using epoxy glue, and after curing, was block sanded. The use of epoxy for this operation, produces a filled joint that will not "bleed" during doping.

The top sheeting is applied using white glue. Weights were used to hold the sheeting in place, and also assure that the framework was held flat on the Magna-Jig. Pins were used to hold the leading edge tightly in place. After the first panel is completely dry, the other panel is constructed on the stub spar, following the same procedures.

After the wing has been completed, except for the bottom sheeting, the leading edge should be sanded to final airfoil shape (on the top only). The wing can now be fitted to the fuselage saddle, trimming as needed, taking care not to change the decalage angle of the wing. With the wing fitted, and held accurately in place, the dowel holes can now be transferred to the landing gear block. We used a short piece of a broken ⅜ inch drill, twisting carefully into the landing gear mount, using the wing as a guide. These holes are drilled out to ¼ inch, and the dowels installed in the wing leading edge, assuring a perfect match.

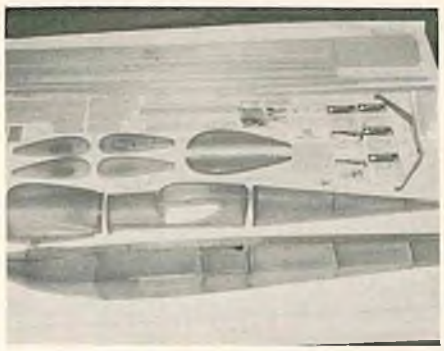
The wing rib bottoms were carefully sanded, in the same manner as the top, and the bottom sheeting added. Again, weights and pins are used to hold the sheeting in place and assure a true panel. The aileron pushrod remains inside of the wing structure, until after covering. When dry, the wing tips are installed, and the ailerons tack glued into place. A razor plane was used to shape the tips and ailerons to approximate shape. The entire wing is now sanded, the center section fiberglassed, covered and doped. Hinge the ailerons, cut an access hole for the pushrod, and the wing construction is complete.

The fuselage top cowl block (previously tack glued) is now removed, giving access to the Cam Lock bulkhead. Install the Cam Lock studs in the wing, and lock into the brackets. Place the wing into position on the fuselage and locate the Cam Lock brackets on the bulkhead, and complete the installation.

The tail surfaces need only to be sanded to shape, and covered. We chose to use silkspan for covering, as it required less dope to fill. Before covering the fuselage, a dummy former must be added at the rear of F-11, sanded to the stringer contour. A piece of 1/16 scrap works well. This is needed to finish off the rear of the fuselage stringers and hold the covering to shape. The top cowl block is now installed and the fuselage covered; we used silron. The tail surfaces can now be cemented into place, and the elevator and rudder added.

At this point, with all major construction completed, our building time has run out. A K&B Series 64 Torpedo

The Denight ready for color dope, cheek cowls, and wheel pants.



Dwight Hartman's 'Li'l Knarf' kit.

.35RC engine has been installed, and test flights will be made just as soon as we can complete the doping, and install our equipment. Throughout the building, we have been completely happy with the Sterling kit, and although we felt it desirable to deviate from their instructions insofar as the wing mounting, we must admit that the hole locations provided proved to be correct, providing every part was assembled exactly. We do feel that match drilling the mountings allows less chance for error. Next month – the flight test.

While on the Goodyear racer kick, another new kit appeared this month. This one by Dwight Hartman is a fiberglass and balsa kit of Jerry Nelson's original "Lil Knarf." This is Hartman's first attempt at a complete kit, and it appears that he has done a fine job. The kit includes a well done, four piece fiberglass fuselage, fiberglass wheel pants and wing tips, dural gear, wood for wing and tail surfaces and ALL hardware. There are no die cut parts. Price, exclusive of wheels and covering, $50.

Another new "kit" (dear to our editors heart) is the Royal Coachman, (June RCM, By a guy named Dewey), kitted by Meinke Model Engineering. The Coachman really isn't a kit – neither is it a ready to fly. An evening's work will put it in the air – the photo of ours is less than thirty minutes out of the box!! – the Airplane!! The fuselage arrives completely assembled, only the hold down dowels have been omitted for ease of finishing. Two finished wing panels are supplied, requiring only butt gluing. Wing panels are balsa covered foam. Tail surfaces require only hinging and gluing into place. A light sanding, cover if you must, dope and your Coachman is ready to go. The Royal Coachman is designed for single to six channel equipment, with a .09 to .19 powerplant. The materials used and the assembly workmanship are both excellent. We think you will like the Meinke "kit," we do. If you prefer flying to building, or have no time to build, this it IT. Price $39.95.

We mentioned in the June column that a Sr. Falcon fiberglass fuselage had been received from Action Industries. Our first impression was favorable; however, subsequent tests showed several shortcomings in the resin used, and also in the mold shape. Our findings were immediately reported to the manufacturer and confirmed. We are happy to say that a new mold was made, and a different resin used. The production fuselage is a well made one. A complete kit is also offered at $29.95. The complete kit consists of a fiberglass fuselage plus a standard Goldberg Sr. Falcon kit less wood fuselage parts. All parts, other than the fuselage, are supplied by Goldberg. The fuselage alone is available at $19.95.

For those of you who have been driving the local telephone operators wild, all correspondence should be addressed to me c/o R/C Modeler, 454 Gayle Drive, Linthicum, Maryland 21090.

Till next month – See YOU at the field.

Meinke's Royal Coachman and future Nat's contender.

Look, kid! You may be my son but you can't ride in it . . . see?

(Continued from Page 47)

creased numbers at all the meets. Falcons, Jennies, Tri Squires, the new Mambo, and Chargers are most popular and perform well. Most however, are generally under-powered in line with the kitters conservative recommendations although best contest results occur when 35's or 40's are installed and the aircraft beefed up to take the extra service. This points up the fact that there isn't a kit being marketed that is designed specifically for current Class I contesting. De Bolt's Jenny is adaptable and comes closest as kitted while the others take considerable modification to bring them to competitive configuration. In any case, it's wondered when this obvious void will be filled.

AROUND THE COUNTRY

Our pre-season scouting trip this year included Wichita, Kansas, where Loren Tregellas along with Bob Bereman and Bob Bash (that super builder) lead an enthusiastic RC group. Focal point for their get-togethers is Chuck Cusick's Hobby Hut where I found them on a Sunday night unwrapping their new Digimite sets. Their checkout of new gear is different, to say the least, and Loren — who's an electronics engineer with the Boeing Aircraft Company — claims it's a real sound way to proof a unit before flying. Here's how it's done:

Take one new rig — place in deep freeze until well cold-soaked. After chilling shock the unit on a table padded with several layers of blankets. Shocking is done by banging the unit flat on several sides. If it still works after several shocks, good—if not, check with Loren! Better still, the manufacturer.

The idea behind the chill-shock treatment is to put a thermal shrink on all solder points, then encouraging weak spots to part during the vibration process. Sounds rough but it can show up cold soldered joints and therefore a lot of future headaches.

Loren, who lives at 2828 Bonn St. in Wichita, belongs to the Wichita RC Club headed by Keith Horton. The club forms the nucleus of the Wichita Modelers Council, the organization responsible for obtaining one of the finest

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I.M.P.B.A. Regatta

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capable of turning an engine inside out. About all that rides in the water is half a prop, everything else is airborne. I hinted that they should consider joining the AMA!

Saturday evening, at the half-way point in the meet, an IMPBA banquet and meeting were held at the Lamplighter Restaurant in nearby Fort Meyers, which everyone certainly enjoyed.

Competition continued throughout Sunday morning and afternoon. When the smoke had cleared and the waters calmed, the final standings in Multi showed Ron Buck in first place, followed by Don Jordan in second with a fiberglass White Heat X, and Scott Jordan in third with a fiberglass Cobra. F class was won by Jack Richburg, of Houston, with another glass White Heat X, followed by Don Jordan and Loel Reinhart. The 60 class was topped by Ron Buck with his record breaking run, with Loel Reinhart's Atwood powered Crackerbox in second place.

The festivities were concluded Sunday afternoon with the presentation of awards to the winners by Miss Mary Ann Duncan, Miss Florida World 1965, at the lake.

This was the first attempt at a regatta by the National Hobby Center, and although some initial mistakes were made in planning, the affair was carried off in first class style. The NHC has big plans and big ideas. With the backing of Cape Coral, Gulf American Land Corp., and leadership such as Joe Miller and his staff, these plans will be carried through, benefiting hobbyists in all areas. These people will attempt the impossible to please the hobbyists in the Country. They have sponsored their first Regatta and also their first Model Airplane Meet. Both were a huge success, and as word spreads, will be even more successful in the future.

As for me, I boarded the flight home, the new owner of a complete fiberglass Cobra kit, complete with everything except a "pond." I guess the next thing will be membership in the IMPBA, but I hate to think of getting a subscription to RCM.

As for our Editor, Don and I are really the best of friends. In fact, I am footing the bill to have him completely rewired — for 1000V.!!

RCM'S 'Hot Boat'

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highly nitrated fuel. Many propellors have been tried. Most were around 1½" diameter and 2" to 3" pitch. Most have been modified Sorrell or Marine Modelcraft bronze or brass alloy wheels. A cupped wheel was used to set the record.

Probably one of the most important factors in the success of this boat is its light weight. Jim did not add any heavy reinforcing to the kit, and the finish was applied sparingly. The bottom is clear fibreglass, block sanded and rubbed out. The deck and cowling was sprayed with enamel. Aluminum has been used extensively in the hardware and fittings. The outfit has been operated with Orbit 4 channel super-regen relay radio and with Min-X 6 channel super-het relayless. Bonner servos are used for rudder and throttle.

The ultimate speed potential of this hull is unknown. Its best performances have been on smooth water. At 25 mph it is very stable on smooth water. On rough water it is all but unmanageable. One can only guess at how fast it would go with one of the radical .15 speed engines installed. The rig is an outstanding example of what can be done with a model hydroplane, given sufficient skill and perseverance.

Roostertail

(Continued from Page 51)

mud stirred up to make the job of finding the clips a frustrating chore. If the last contestant was a hot-shot, and broke all the balloons, you have nothing to guide you to the position of the balloons and clips unless you use the lead line. If you are setting balloons from a boat, just let the line guide you to the first position. Pretty Simple, No?

The HANDBOOK OF MODEL POWER BOATING attempts to classify power boats by engine size, and hull type. The definitions which appear are the best that we have been able to develop, but there always seems to be quite a bit of question about various types of hulls. In order to establish a pattern, we have maintained that Ski boats, or SK type hulls be classified as Type 3, or "Unlimited." Now the problem arises where modelers have built Ski boats which are models of the real boat, and are designed to carry passengers. Since this places it in the Proto, or Type 1 category, it is then neither fish nor fowl. Suppose a man builds a two place hydro, how should it race? Hydro, or Proto?

To avoid long drawn out definitions, which only seem to confuse the problem, I have proposed to the members at the annual meeting that we modify the definitions of the hull types and change the names applied to the types. The records would remain the same, as well as the actual classifications. In effect, I suggest that we name the Hull types the way we classify them, and thus take the confusion out of the present system. In the present system, Type 1 would be called "Displacement" instead of "Proto"; Type 2 would be called "Hydro" as before; Type 3 would become "Planing" instead of "Unlimited." Hydrofoils will be included with Hydro until such time as it warrants a type of its own.

A Displacement hull would be one which does not rise at racing speed enough to plane on the top of the water, but runs through the water instead. Examples of this type include tugs, finishing boats, trawlers, some cruisers, scale ships (Liners, tankers, warships) etc.

Hydro hulls will keep their definition which calls in part for "steps or discontinuities in the wetted surface."

A Planing hull is one which rises to skim the surface at racing speed. This then includes all the Ski boats, SK boats, Express Cruisers, etc., whether they have one seat or more, if they are scale or not. Also, we get away from the old rhubarb about a hull running without a top (or superstructure).

Now is the time to voice your opinion. Just put your name and IMPBA number on a postcard, with *Yes* or *No* on it if you like the change in "DEFINITIONS." Send it to "HULL TYPES," IMPBA General Office, 2405 S. 19th Ave., Broadview, Illinois.

NEW WORLD RECORD, and on top of that, the fastest speed by any size engine or any type hull under Radio Control! Delbert J. Silva of Daly City, California ran his 1.2 CI home built engine powered Hydro through the electronic time traps of Wes Hunt at an average time of 0:06.10 or 36.89 MPH. Del Silva is also the first man to receive an Octura Speed trophy. The existing mark was 35 MPH for Class F Hydro, and Del did a good job of smashing it. A phone call to Tom Perzentka of Octura got a replacement for the trophy. The new mark to beat is 40 MPH in the F class. We keep a list of the marks at the General Office, and all applications for records are checked against the list. To refresh your memory, Octura Models has offered a beautiful trophy to the first man who exceeds the times or speeds listed in the following classes:

Straight 1/16 Mile. . . .

Class C	.201-.300 CI	30 MPH
Class E	.459-.670 CI	40 MPH
Class F	.671-.305 CI	40 MPH

¼ Mile Oval:

Class C	45 Seconds
Class E	35 Seconds
Class F	40 Seconds

(Continued from Page 60)

model air parks in the country. The annual Wichita AAA meet attended regularly by many top fliers is held at the air park and it's not surprising this setting helps the council realize a yearly profit from their contest. It didn't happen over night, though. The Council, meeting almost every lunch hour at Ray Paul's Hobby Shop, after several years has reached a point where they engage a professional public relations firm to arrange financial support, trophies, and a publicity program! The details, to say the least, are enlightening, and clubs and modeling groups in all areas would do well to check into such possibilities for their own development.

IN THE MAIL

Paul Runge, of Ace RC Inc., answers our query about the upcoming 1965 Mid America Contest – says serious thought is being given to limit the meet to scale only. This is to stimulate the event and keep attendance *down* since, Paul relates, the 1964 affair was too well attended.

Paul's unique problem is something some contest sponsors wished they had – good attendance, that is. In a period when contest activity is *supposed* to be dropping off – if some segments of the modeling press are to be taken literally – the Mid America experience just shouldn't happen. Could be of course, that Paul and Carl Lindsey, who CD'd past affairs, did their homework thoroughly and made the contest attractive enough to appeal to fliers despite the perils which are lamented long and loud where success is not immediate and forthcoming!

The Mid America success doesn't stand alone however. To those who read below the static levels the 1964 season saw similar instances and indications of an awesome growth potential to which 1965 contests will give added proof. Many who were touted out of attending the Dallas Nats because of negative prognostications following the 1963 Los Alamitos meet realize they listened to a Lorelei song – a tune the hard working Dallas team (Gabbert, Teter, Huang, Summers, Johnston, etc.) fortunately filtered out and then showed what enterprise, dedication and four flight lines could do!

With every indicator (sales, club membership, public reaction, etc.) showing increasing potential, contest sponsors may take heart and head the experience of those who really accent the positive. Not only is profit possible (check with the Longview, Texas Exchange Club – for ten years they have

financed civic efforts from their annual meet), but the opportunity to raise all aspects of RCing to a rightful stature in the public eye has never had greater opportunity. It's for these reasons it is hoped Paul and his group will have a full program for the 1965 Mid America Contest and those that will follow. By doing so, Scale will prosper and, more importantly, a standard of Contest Operations will continue to be demonstrated to all who would take note.

STRICTLY FOR THE LADIES

One of RC's most refreshing spots is among the pages of "Sharks Sparks," the monthly newspiece of the SHeveport Area Radio Kontrollers. Cause of this spring-like breeze is its Secretary/Editor Martha Beason, who you'll find pictured in this column sweet-talking Norm Rhodes into dismantling his plane so she could see all those "cute do-dads Mr. Bonner makes." That's husband Larry on the other side of the pic doing the translating. (Incidently, Larry hasn't been doing badly in class III either – was 2nd to Kirkland at Pensacola and Jackson, 1st at Clarksdale and Port Arthur.) Part of each newsletter (well worth the buck and a half subscription tab) is devoted to advice to the ladies and we pass some of these gems on to our gal readers (bless 'em all). Besides, Emily, my own airplane wiper, insists on it! Here's a few:

"Be sure to clean off the dope you've spilled on yourself (if it's *red*) before answering the doorbell – it scares the wits out of the mailmen who think you're bleeding to death! Maybe it would work as a good excuse to get rid of annoying door-to-door salesmen. You could always say, "Excuse me, but I'm on the way to the hospital!"

"We learned a new *don't* the hard way – when you're helping him paint, use most anything to stir the dope with but never a *file* . . .

" – and have you noticed the wild colors they're using for silk or Silron (I think it's called) to cover their planes? Since it comes in about five yard pieces it's just right for whipping out a new 'nighty' to surprise him with. Requires a minimum of sewing, cutting – just a bit of matching ribbon to help hold things together – use your imagination for sewing, no pattern needed. And he might even decide he likes it on *you* instead of the airplane!!!"

That's about all this month, kiddies. We'll be back next month with more contest pattern flying technique and advice to the gals from Martha Beason (222 Bossier Rd. Barksdale AF Base, La.).

Sudden thought! That airplane silk night gown idea – a fellow could dream he's sleeping with a wing!

(Ed.'s note: You've gotta be kidding, Jer! I mean, there's a time and place for everything!)

Seven For One

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move on to the next ship, the old standby. Drawing #3 is of the high wing or cabin ship. This has long been the most popular in all of R/C work and even beyond. This drawing, however, illustrates a cabin ship designed around our basic design with the thrust line raised slightly and with the wing and stab at zero incidence. Everything else is in keeping with our original idea.

Drawing #4 is our basic ship as a pylon racer. Of course, you don't have to build the racer as large as the usual stunt ship. If you take the "Basic" and steam the whole thing very thoroughly for about eleven hundred hours and then allow it to cool in your home freezer for about twenty four hours it should be down to the correct size for a pylon racer – a hot 450 square inches.

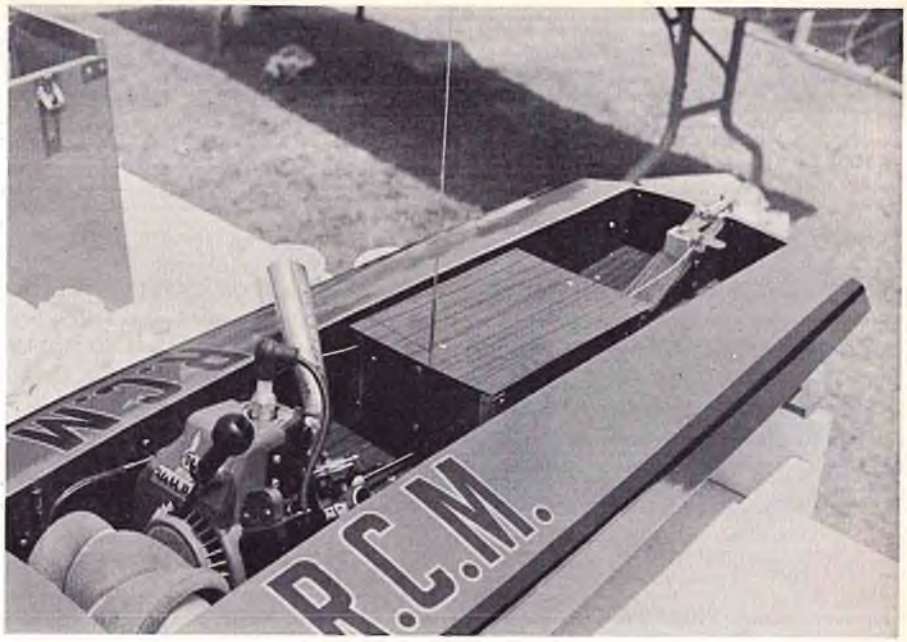
Shrinking the engine in this manner is a bit hard, substitute. But . . . anyhow, with the addition of cheek cowls, wheel pants, cockpit and all, we do have a plyon racer. This one looks like a Bonzo, but others can be duplicated in outline form. This does offer a safer way to go pylon if you do have the desire to "design it yourself."

Drawing #5 really takes off into the wild blue out yonder. For all of you waiting for deBolt to kit his Acrobat, here it is – our basic ship all dressed up with another wing, a cockpit, bright colors, and someplace to go. This is the simplest approach to Bipe design and one that has long been overlooked by all of us. Only . . . don't use too much wing! Just for the record, a very fine bipe could be built in this manner using two Falcon 56 wing kits and cutting down the area on them a bit, while resorting to the basic body design and plywood for the struts.

Drawing #6 is a face-lifting look at the "basic," all set to sweep into the sky on swept back wings. The only real change here is to sweep the rudder post to the rear and to move the wing forward so that the C.G. of the craft remains in the same relative position to the fuselage. Remember to calculate the balance on a swept wing aircraft to compute it on area. In other words, the balance is to be found at a point with 40% of the wing area ahead of it and 60% behind (or 33% if you wish). Rudder post sweep back looks mighty good, but certainly does make it harder for most ships to get anything workable out of the rudder. In this drawing the wing has been shown in the shoulder position but can be either shoulder or low wing. As a matter of stability, the shoulder position makes for a much better ship since the C.G. is acting below the wing. In swept wing designs, the dihedral is usually omitted, as the sweepback takes its place, and again, for this reason the shoulder wing is safer – it's a bit harder to dig in a tip on landing. A very fine flying aircraft, called the Sweeper, employs this general design and is being kitted in the near future.

Drawing #7 really gets us off the ground in a hurry because now we have taken our long suffering basic ship and have added another engine to it. This can take the form of either a low wing or a shoulder wing, but the design is the same. The only real design change to effect is to add to the area of the vertical stabilizer to help in control of the power. Up to one-third more area may be needed and this can be added in the form of sub rudders if you wish.

So, here we have our basic aircraft in seven disguises, and in each, something special is to be gained. Get out of the rut, get off of the idea that there is nothing new to build!



C&S Digicon

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tiometer in the servo provides for the centering adjustment of the output arm. This is pre-set at the factory and must not, under any circumstances be changed.

The servo output arm, driven by rack and pinion gearing, moves on upper and lower bearings consisting of 32 small steel balls.

The servo travel is a nominal ⅝" with a centering accuracy of plus or minus 1%. Response time is less than 10 milliseconds. Static thrust is 3½ pounds at any error amplitude. Operating voltage is 7.2 volts with a current drain of 20 ma at the neutral or command position and approximately .8 amp at full stall. Drift is plus or minus 1% in the temperature range of 0-140 deg. F.

Servo dimensions: 1" wide x 1¾" high x 3¾" long. Weight: 3 ounces.

Accessories

The battery charger provided with the Digicon II provides approximately 50 mils to charge the transmitter and receiver batteries simultaneously. The charger plugs into either plug on the bottom of the transmitter and the receiver into the other. A charging indicator lamp provides a charging operation reference.

A wiring harness with two slide action switches is provided so that equipment is ready to install with no wiring necessary for operation.

Price and Availability

The C&S Digicon II 518 is available from C&S Dealers for $495 for the 4 channel version, $500 for the 4 channel-factory convertible to 6 channels, and $550 for the six channel system. 4 channel to 6 conversion cost is $56.00.

Findings

All bench operational checks of the C&S Digicon II Proportional System were completely satisfactory and per the manufacturers specifications. No interaction of any kind was noticed. There was no servo drift through a variety of temperature changes. The aileron channel neutral was, however, quite broad. This was found to be a component defect in this particular unit. Upon spot checking two other C&S proportional systems available in local hobby shops, this particular defect was not apparent. It was brought to the attention of the C&S service department and corrected.

Since every proportional system we have evaluated at RCM has been checked out in a competition type aircraft, we decided to test the next available system in a competition racing hydroplane. Since the C&S Digicon II was "next up," the honors went to this individual system.

The unit chosen was RCM's new Octura White Heat V, equipped with Octura steering accessories and O & R Compact engine. Since proportional control has not yet come into major prominence in the R/C boating field, we were interested to find out its advantages and disadvantages. To begin with, far more power is needed to turn the rudder of a fast moving hydro than is usually necessary for model aircraft. Even when using powerful reed servos, wire spring assist is normally used in conjunction with the servo to aid in rudder control. For this reason, we used two C&S Digicon servos in parallel on the rudder, and one EFS on the throttle of the O&R. This proved to be more than adequate power, and turning

the fast moving hydro was absolutely no problem whatsover. In fact, the complete smoothness and precise control available enabled this author to place fourth in the multiple boat races at a local contest – and this was the first contest I had entered! The major advantage can be attributed simply to the completely precise, and definite incremental control afforded by this system.

Insofar as range is concerned, the C&S transmitter was operated as far as we could see the hydro, and at no time was the antenna fully extended on the transmitter! Range-wise, we sincerely doubt if you'll ever have trouble with this one watt power-house!

Overall, we have experienced no difficulties with the C&S Digicon II as specified. It is a well-constructed, smooth operating digital type system, manufactured and marketed by a well-known and respected manufacturer that should provide the consumer with a flexible proportional control system that will provide him with months and years of dependable, trouble-free service.

Kahuna

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faces and fuselage sides. At a distance such artwork can become confusing after an hour or so in the air.

Assemble and load the plane for flight. The balance point should fall between three and a half and four inches back from the leading edge of the wing. Ballast if you need to and then take the plane out to a grass covered field such as a school athletic field or park. Test glide and note whether the fuselage center line falls along the flight path. Aim at a spot about eighty feet in front of you. The first time or two you do this you might do well to fly over high weeds. Kahuna is about as big and as fast as you can hand launch with safety and it may take a couple of throws to get used to the power required and the smoothness necessary. The slightest deviation from a throw along the center line of the fuselage will cause the plane to either stall or dive. The trouble is that a stall looks just like a dive at this speed so before you start moving weights make very sure you are actually experiencing what you think you are. Trim the plane so the fuselage centerline points along the flight path.

Now that the plane is flying we can discuss some basic facts about center of gravity location and decalage angle. The decalage angle determines how fast the aircraft will recover from a displacement in pitch attitude and how badly the aircraft will oscillate about the stable attitude. With a rudder only machine we want pretty good recovery but the plane must damp out after a few zooms. In rudder-elevator or full multi we have control over pitch and can get

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Kahuna

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along with almost zero stability. For a given decalage angle, 3 degrees as specified on our plans, the plane will fly over a wide range of Center of Gravity locations. It will fly BEST at one location only and it is your job to find that location. As you move CG backward the glider will become more sensitive to control functions, especially elevator. When you reach the maximum rearward CG the plane will fly at only one speed and any control activation will cause loss of stability. Don't try this, for the plane (any plane) becomes spirally unstable when in this condition and sailplanes are almost impossible to control. Rearward CG locations are used for very light wind conditions. Most Nordics tend to this trim.

As the CG is moved forward the opposite series of conditions occur. Control becomes sluggish and heavy. Up and down become markedly different in speed of response. The plane flies with a more purposeful attitude and seems much steadier in the air. It can be trimmed to fly at a number of speeds. At maximum forward CG the plane has lost all pitch stability. Up elevator simply raises the nose slightly. We don't mention down in this condition. Our old friend spiral instability is back with us but for a different set of reasons.

At a point between these two extreme conditions is a spot at which the plane has a maximum range of speeds it can be trimmed to and a fair degree of controllability. This CG location also happens to be where maximum stability occurs. It is slightly forward of the midpoint between too far back and too far forward. With that sage comment I leave you to sort out your weight distribution.

We can make one more test before going out for a real try at it. You will need a little more height for this one. A low hill, bleachers at an athletic field or a building roof. Somewhere that you can glide for several hundred feet and make some control applications. Switch on your system and heave your buzzard off. Give quick blips to your rudder and see what happens. You aren't trying to turn so much as to see how the plane responds to rudder. Try it in both directions. Does the plane do exactly the same thing in each direction? Does the nose stay down or does it bob? Does the plane roll and if so how much? It should not begin a roll until a definite turn has begun. Pitch-up and roll indicate rearward CG. A sort of shudder without much turn indicates too much control surface movement. A plane this size requires some slight time before it begins to react to a control so don't confuse this normal reaction with lack of

control.

You can do the same with any other controls fitter. Take care with elevator though. This close to the ground you haven't room for or speed enough to do much. If you have fitted a speed control device this is the time to test it. Aim for a soft spot before you do though. They work pretty violently in still air. Practicing on your local cricket patch, athletic field or low hill side is a good way to become proficient at spot landing. (Also gives you lots of needed exercise. If you do this you can drop the RCAF plan.) It is a point of honor among glider pilots to specify the exact landing spot for every flight. (After all we can't taxi all over creation so we have to do SOMETHING to impress each other.)

After making sure that the plane is reasonably capable of flight you will want to give it a real try but are probably staring at the thing and wondering "How do I get *this* beast up *there*?" The simplest method is the one you have used to see if it will fly at all. Heave it off a cliff. How many times in the past have you wished you could do that to some model? Here's your chance man! Find a high hill or cliff with reasonably smooth ground or water for about a half a mile to windward and long enough so that the wind has to go over it rather than around it. Make sure there is a good recovery area to windward for the first few times you may run out of air before you get back to the ranch. Pick a day with medium steady wind. You may experience gusts on the ground but many times these are local turbulence and the wind fifty feet up is steady. For the first few flights, launch directly into the wind and ride it out for a hundred feet or so before beginning control.

Don't be surprised if your glider bounces around quite a bit. This is normal. In smooth air there will be no bouncing. In rough air or near the ground let the plane take care of itself. Your reaction time plus the reaction time of the plane is normally too slow to do much about it anyway.

A second method of launching is tow line. If you think you might want to try this system build a hook in the K. Lash it to former #2 in such a manner that the line will attach to a point about a half inch in front of F2. Other designs will normally specify this location. If, for some reason, they do not, pick a spot 40 deg. forward from the vertical CG position (if the plane is rudder only) and about 20 deg. of angle forward if it utilizes elevators.

Tow launching an R/C sailplane is both harder and easier than launching a Nordic. The R/C is harder to start up but is controllable on the line and

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Kahuna

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this makes hook placement less critical. Tows are mostly used for gently rolling hills where strong ground currents may be lacking and for thermal flying. Lines of one to four hundred feet are common and if you are looking for thermals you take all you can carry.

I might mention one other method of tow which is both hair raising and spectacular. Bungey launch is the use of an elastic catapult. It can be either the short type like a large sling-shot with stakes about fifty feet apart and a start position about a hundred feet behind or it can be a single line several hundred feet long with an elastic section. There must be enough elastic to maintain flying speed yet not so much that it overpowers the plane. The sling-shot or true Bungey launch is used in hilly country as it is very hard to gain much altitude using it. Long line requires a year's production of wakefield rubber to set up and can be used anywhere. Make sure the stakes are well anchored. There are few things more disheartening than to have trudged a quarter of a mile to the glider with the launching ring and then look over your shoulder and see a two foot iron stake come whirring gracefully over the horizon. At such times one is tempted to say things but usually forebears in favor of more direct action.

Editor's Memo

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aim at making eligible S/C, R/O sport type planes now on the market. So this summer our club is going to go around measuring up the planes being flown in the East, to see if we can come up with some kind of formula that will fit the planes that are being flown by the novice and beginner, and then put on a contest for these guys.

You might pass out this idea among the guys out there on the West Coast and see what they come up with. In this day of the 'Status-symbol,' S/C and escapement have become dirty words, but I think it's about time something is done to give this majority-group a little more prestige.

Yours truly,
Emerson H. Hoffman
S/S Atlantic

And so, with visions of ol' Em sitting around the Blue Boar Inn, wearing a turtleneck sweater and knit cap, a cup of grog in one hand, and some br---, 'er, young lady, on his lap, while in the background the surf pounds against the rotting timbers of Pier 84, we think this is a good idea. Let us have your opinion on the subject. . . .

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Forrest Hothem W80VJ, and Max Blose K5ZPY, both dropped us a note this month. For you other hams, Forrest is an active RC'er, and operates any band either AM or SSB, south of Coshocton, 69 miles northeast of Columbus, Ohio. Max runs an NCX-3 transceiver with about 200 watts PEP, but can also work 80 and 20 meters. Max is in Great Neck, N. Y. The rest of you amateurs, drop us a note.

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As a finale, received an assembled RCM superhet which was sent in and intended for the kit supplier, R/C Kits. The receiver was packaged in popcorn to protect it from rough handling. We ate some of the somewhat stale popcorn, and asked our secretary to forward it onto R/C Kits. By mistake, it was addressed to Ed Thompson, our Contributing Technical Editor, who repaired the rig, ate the rest of the popcorn, and then forwarded it on back to us with a fresh supply of popcorn inside. Now, we are to forward it once again to R/C Kits.

It is our highly sought after, and most valued and respected opinion, that one should simply place popcorn kernels in the box with radio components or assembled rigs . . . then, when received, the whole mess can be put in a pan and popped on the stove. This will provide fresh popcorn along with a temperature stability check of the components. If it passes the Popcorn Test, all is well. You have a good rig **and** a fresh supply of popcorn.

If it doesn't . . . ah, well! Anybody for popped transistors?

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May the bluebird of happiness always fly above you. Just don't look up. . . .

RCM Digitrio

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the voltage should stabilize at approximately 5.1 volts. As you continue tapping, this voltage should not rise appreciably. You will note that the Zener diode will feel warm to the touch after a few moments of this test. This is normal and no cause for alarm. If you get carried away and apply more than the recommended voltage (8 nicads in series), or reduce the value of R28, be prepared to buy another Zener!

That's it for the preliminary checkout. If you encounter any difficulty, re-check the board and try to locate any improperly installed, or possibly defective, component. If you can't correct the trouble, call on your "technician type" buddy. Set the PC board aside now, and get your hacksaw, drill, vise, and taps ready for the next part which is the fabrication of the case, stick, and pot assemblies also final assembly and preliminary checkout.

HOW TO BUG A KURWI . . .

Ol' Reliable – Better known as Dr. Walt Good's Multibug, is still an R/C workhorse. A new trick for the old dog is to carry Walt's Kurwi 33 R/C Glider piggy-back into the wild blue where it is then released. Sure beats running with a towline . . .

(Photo by Fremont Davis)