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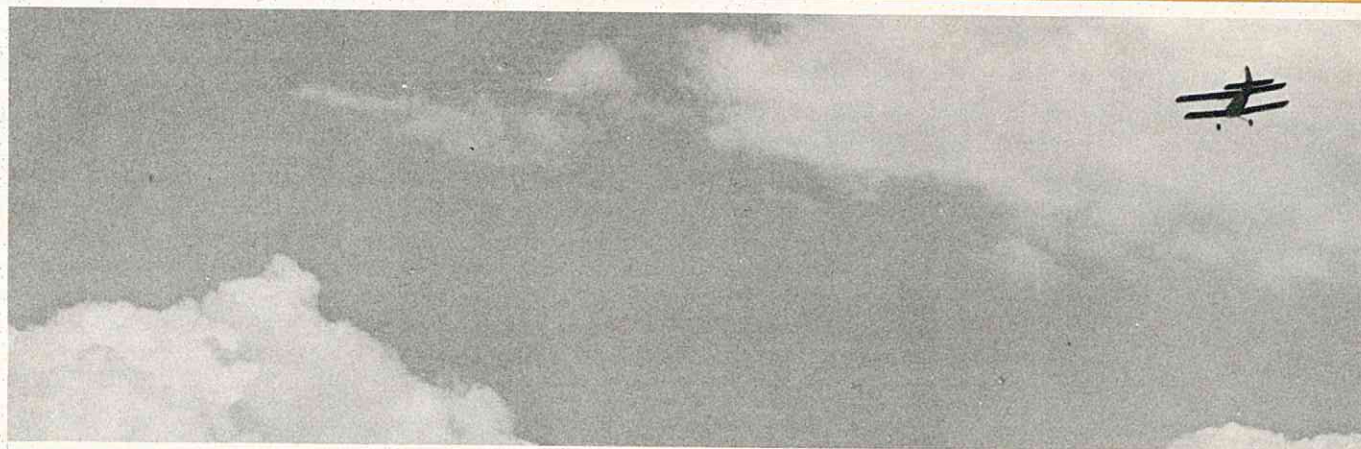
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BY ED THOMPSON

RCM TECHNICAL EDITOR

RCM CLASSIC



PREFACE

This month I would like to acknowledge originality for a circuit feature used in the Classic PS-3 servo amplifier. In the PS-3 Classic servo amplifier Q4, Q5 and C6 make up the pulse stretcher portion of the circuitry. This circuit is unique not only for its simplicity but also for its application. This circuit is used by several other manufacturers and in its own way can be considered somewhat of a "breakthrough" in the development of mini servos. The originality for this unique circuit belongs to Phil Kraft and in spite of the fact that other manufacturers are using this circuit, Phil has applied for a patent, describing in detail its function and application as applied to radio control digital servos.

I have received many letters inquiring about a 6 meter modification to the Classic system and the necessary

changes are passed on this month to permit the Classic to be placed on 6 meters. I will present a more thorough article later on, but for now here is a list of the changes necessary if you hold an amateur license and wish to take advantage of 6 meter operation.

TRANSMITTER

C11...27pf

C13...16pf

C15...8pf

C24(in parallel with C23)...delete

RFC1,2, & 3...4 microhy (see note below)

L1...6½ turns, wire no. 24, tap @ 2¼ turns

L2 & L3...10 turns, closewound, wire no. 18, 5/16" dia.

Note:

RFC1 & 2 had a nominal Q of 75.

RFC3 is pie-wound and had a Q of 24.

For best results these chokes should be obtained from Royal Electronics. L1, 2

& 3 are wound using the same procedures as for 27 MC.

RECEIVER

C1 & 2...16pf

RFC...4 microhy (see note below)

L1...8½ turns, wire no. 24, tap @ 3 3/4 turns

L2...8¼ turns, wire no. 24, tap @ 1 3/4 turns

Note: The RFC used had a nominal Q of 75 and should be obtained from Royal Electronics for best results. Lug 2 of L1 should be clipped off where it enters the PC board to prevent its being grounded. The capacitor C1 is connected to lugs 2 & 3 and D1 is connected to lugs 1 & 3. Lug 1 is used for the centertap which is now connected to the antenna. L2 is wound using the same procedures as for the 27 MC version. The antenna remains 36".

This information will allow you to place your Classic on 6 meters. The

winding of L1 in the receiver will probably be the most difficult with the information given. However, the technically minded should be able to complete the conversion without any problems. If you have any doubts about the 6 meter conversion I would suggest that you wait until I present the complete conversion article or get in touch with a "technician friend". The 6 meter version of the Classic performs excellently and tune-up procedures are identical to the 27 MC version. Ground range with the antenna off the transmitter should be approximately 20 to 30 feet. The present 27 MC transmitter antenna can be used by shorting across the loading coil with a piece of wire. I have not tested a substitute antenna and antenna mount to date and this is one of the items holding up formal presentation. The formal presentation of the 6 meter modification will appear in the near future.

I have been receiving many letters requesting reprints of both the Classic and Digitrio series of articles. The girls at RCM have taken the time to make 3M copies of these articles to assist those readers desiring this information. I would like to point out that 3M copies can be obtained by writing to the Circulation Department of RCM. There is a small handling charge of 50c for each article copied, so be sure to include 50c per article that you wish copied. I would also like to point out that Royal has construction manuals for construction of the Classic which they are offering for sale and prices can be obtained by writing to them. World Engines has been offering the complete reprint of the Digitrio series for some time now and they can be contacted to that end.

In an effort to obtain electronic articles of the high quality expected by RCM readers, RCM is considering running an electronic design contest. I am still formulating the ground work for this contest and am passing it on to those readers who may be interested in entering, so that they may get an early start.

I have several unanswered foreign letters in my possession at the present time and would very much like to answer them. However, I cannot interpret the correct address of the sender. It would be very helpful to me if foreign writers would print clearly or typewrite their return addresses.

DESIGNER'S NOTES:

Since this article semi-winds up the Classic, I'd like to pass on the following comments. The Classic has been thor-

oughly flight tested and expertly designed to provide glitchless and reliable long-term operation. I have not exaggerated any claim for its performance nor "gilded the lily" with intent to entice you to build it. I have tried to be factual regarding my comments about the Classic. I could care less if you have BUILT the Classic as long as you have enjoyed the articles and/or they have contributed to your enjoyment or enlightenment of the electronic aspect of our sport. I don't think the Classic is THE best system in the World, for that would be an asinine assumption and would be contradictory to common electronic sense. Most other systems have individual features, according to their design, that I haven't tried to, or couldn't, improve on. It is equally asinine to assume that the Classic is a "tinkerer's delight" or won't compare favorably with manufactured systems if properly built. That kind of assumption also contradicts common electronic sense. I have spent seemingly endless days and nights on its design, testing and presentation to detail a modern "state of the art" system that I am proud of and I invite comparison with any commercial system or kit available. The main ingredient to a successful Classic system is the builder - you! If you substitute parts unprofessionally, ignore construction details, or don't avail yourself of qualified service/repair when obviously needed, you are handicapping yourself. If you do these things and then gripe about the design as a whole, you are being less than realistic because others with less, or totally without electronic experience have built flawless-operating Classics from the same instructions and you are inviting comparison with your own abilities.

Some of you will have trouble regardless of how faithfully you try to duplicate the Classic. There are hundreds of parts and solder joints in the Classic and any one of them might cause you trouble. Seek competent help and you will be rewarded. Remember how many commercial units have pranged at your field in spite of the painstaking detail the manufacturers take to prevent them.

Lack of confidence in a system probably accounts for 90% of the reason a modeler won't own a particular brand of equipment and "bad mouths" it at the flying field. This is true even when many of the other modelers at the field are flying the very same brand of equipment without trouble. This is human nature and you find champions for a particular brand for the opposite

reason (complete confidence). All this discussion about confidence, etc. leads me to a recommendation. If you find you don't have confidence in your Classic after you've built it and can't seem to get it working right, by all means "unload it". Chances are one of the other local modelers will jump at the chance to buy it for what you've got in it and you've only lost your labor and learned a lesson not to build kits, or at least the ones I design, and you've done me a favor by not pranging planes all over the place with a system I designed with tender loving care! If on the other hand you are a Classic champion "good mouth it" and write me a letter so I can keep my ego on even balance. For all of you who have kept patience with my unrelated prefaces and dragged out presentation of the Classic, I'd like to express my thanks for your understanding that I reserve the right to say what I want in my own articles and that I present them as fast as I can, consistent with the high quality you've come to expect. To the rest who obviously think I'm writing only for them and their convenience, I'll repeat, similarly, what I've said before: "when you design and publish your digital system I promise not to tell you how to or how many articles to do it in" (unless of course it's published in RCM and I'm still the technical editor) and I'd like to add: "good luck with your Classic", to both groups.

CLASSIC FINAL CHECKOUT GENERAL

If you have followed the Classic articles to this point and performed all of the preliminary checks presented you should have a working system. If any of the items built have not checked out properly, according to the articles, they must be repaired before final checkout can be properly accomplished. A "technician friend" can help you on all but the most difficult problems. Royal Electronics has agreed to repair any Classic equipment built according to instructions as a service to RCM readers as well as to their kit customers. In addition to repairs Royal Electronics will completely align, test and certify (Federal Communications Commission requirement) any Classic system built according to instructions. I have talked to Sid Gates of Royal and he relayed that the charge for repair and/or service will be reasonable and equipment return prompt.

TRANSMITTER, RECEIVER AND DECODER

Complete alignment and/or testing procedures for these units were

presented with the construction article and further action is not necessary to check their operation until indicated during SYSTEM TESTING AND ALIGNMENT. I would like to stress that, although oscilloscope alignment is not necessary for proper system operation its accomplishment is highly advisable, to insure that your system meets design center specifications, especially when this service is offered by Royal Electronics at a nominal cost.

SYSTEM TESTING AND ALIGNMENT

- () Select a non-metallic surface clear of house wiring and metal objects for a work area - a wooden or formica kitchen table placed in the center of a room will do the trick.
- () Fully extend the transmitter antenna and turn it on.
- () Hold the transmitter as you would while flying and check the output meter. It should be in the upper 25% of the scale. Chances are it may be "pegged" if the transmitter batteries have just been charged. You may note that the more body contact you supply to the transmitter - such as holding it to your abdomen - the less the meter will read. This is normal and no cause for alarm.
- () Turn the transmitter off and collapse the antenna.
- () Place the transmitter on one end of the table and center the motor control stick and all trim levers including auxiliary channel levers.
- () Remove the bottom covers from all the servos.
- () Lay out the receiver decoder, receiver power pack and servos at the end of the table opposite the transmitter.

Note: If your transmitter was not aligned with an oscilloscope continue with the next step. If it was aligned with an oscilloscope skip the following thirteen steps and continue where indicated below.

- () Interconnect the receiver/decoder, receiver battery pack and one servo. Connect the servo to channel 1; channel 1 has the brown signal lead.
- () Remove the back cover of the transmitter and drop the PC board to provide access to the variable resistors on the PC board and the control pot shaft locking screws. If you are using Micro sticks reinstall the PC board mounting nuts on the back of the sticks.
- () Turn on the transmitter.
- () Turn on the airborne equipment and note that the servo runs to a null position and is approximately

centered.

- () Operate the appropriate transmitter control stick to run the servo. Insure that the servo runs in both directions. Adjust the servo centering as outlined in the servo construction article.
- () Move this same servo to channel 2. Channel 2 has the red signal wire. If the servo does not center exactly move the appropriate control stick until it does and loosen the pot shaft screw. Let the stick center itself and retighten the pot shaft screw. Repeat this process if necessary until the servo is exactly centered when the stick and its associated trim lever is centered.
- () Repeat this process until you have adjusted all the remaining channels (each transmitter control pot) to cause this same servo to center when each channel control is centered, including their associated trim levers. The motor control and auxiliary controls will have to be
- () Remove the servo you were using to adjust the transmitter controls and place it aside.
- () Connect, in turn, the remaining servos to channel 1 (brown signal wire) and center them as you did the first servo.

Note: All of the servos are now interchangeable between channels.

- () Replace the servo bottom covers, leaving the last servo you adjusted connected to channel 1.
- () Move the channel 1 control stick to one of its extreme positions and move its trim lever in the same direction to its extreme position. After the servo "nulls" at its extreme position, note the clearance between the linear output shaft and the end of the linear output shaft slot. Move both the control stick and its trim lever to their opposite extremes and note the clearance between the output arm and the opposite end of the cutout slot. Without R11a and R11b installed in the servo you should have approximately 1/2 to 3/4 the width of the linear output arm clearance at both extremes of servo throw. These two clearances do not have to be equal so long as adequate clearance is present to prevent the servos "jamming" at extreme positions. If R11a and R11b of the recommended values were used the clearance at each end should be approximately 1/32"-1/64". If the clearances are not close to the same at each end or if jamming occurs on

one end and not the other, perhaps the linear output arm and wheel centering do not agree and mechanical servo alignment may be necessary. If the throw is found to be correct move the servo to channel 2 and check it the same way. Continue until all channels have been checked. If you find a channel that doesn't give proper throw it can be adjusted as follows: Adjust R6 (in transmitter) following the control pot of the channel you are correcting slightly (5-7°), recenter the servo with the transmitter control as described before by loosening the pot shaft screw and retightening at the control's center position (be sure the trim lever if any is centered also). Recheck the servo throw and repeat if necessary.

Note: The direction of R6's adjustment will depend on what kind of sticks you are using and the desired correction. You will be able to tell after the first adjustment if you are going in the right direction or not. To find the proper R6 to adjust note the color of the wire soldered to the center pot lug of the control pot corresponding to the channel you are correcting: Note where this wire enters the PC board, looking over the RF end of the PC board, the proper R6 to adjust will be directly to the right of this wire. If you inadvertently adjust the wrong R6, it (R6) will have to be recentered and that channel checked out again for centering and throw.

- () Connect all servos and check for proper operation.
- () Skip the next seven steps and, continue with receiver peaking.

Note: Continue here if you have aligned your transmitter with an oscilloscope.

- () Inter-connect the airborne components. Receiver/decoder, battery pack and servos. It doesn't make any difference which servos go to which decoder channel as the transmitter was aligned with an oscilloscope and all channels have identical characteristics.
- () Turn on the transmitter.
- () Turn on the airborne equipment. All servos should "null" at approximately their center position.
- () Remove the bottom cover of those servos not exactly centered and rotate the feedback element until they are. This procedure was given for each particular servo at the end of the servo construction instructions.
- () Check each servo for proper throw

by manipulating the appropriate transmitter controls.

- () Replace the servo bottom covers.
- () Continue with the next step.

Note: Continue here if the transmitter was not aligned with an oscilloscope.

- () Peak L1 and L2 of the receiver as follows:

1. Have an assistant "back off" while holding and manipulating the controls of the transmitter, antenna removed.
2. Peak L1 and L2 of the receiver to secure maximum range.

All servos should operate with a minimum transmitter/-receiver separation of 10 feet while standing broadside to the receiver antenna.

- () Turn off all equipment.
- () Remove the top cover of the receiver and lift out the receiver PC board.
- () Secure the adjusting slugs of L1 and L2 with a drop of "Plio-bond" cement being careful not to disturb them.
- () Replace the receiver PC board and case cover.
- () Perform a "transmitter antenna off" range check to verify 10' minimum range.

This completes the system testing and alignment.

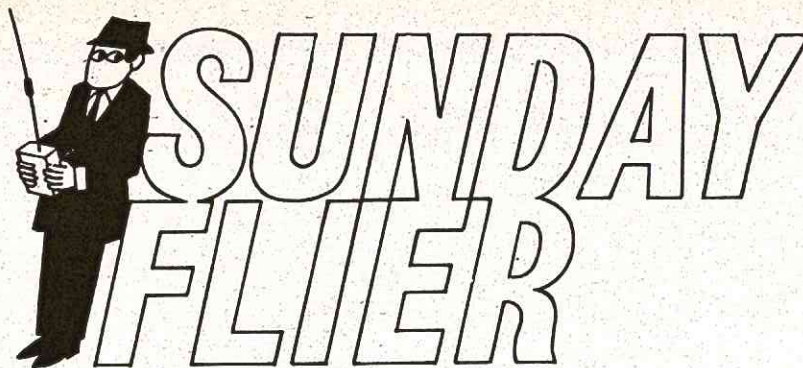
Note: If any problems were encountered during the system testing and alignment, however slight, don't risk a model until you have corrected it. If the instructions for aligning the transmitter left you confused, don't feel bad, they were hell to write and they take about 10 times longer to read than the actual work involved. Go over them a few times and they will become clearer.

INSTALLATION

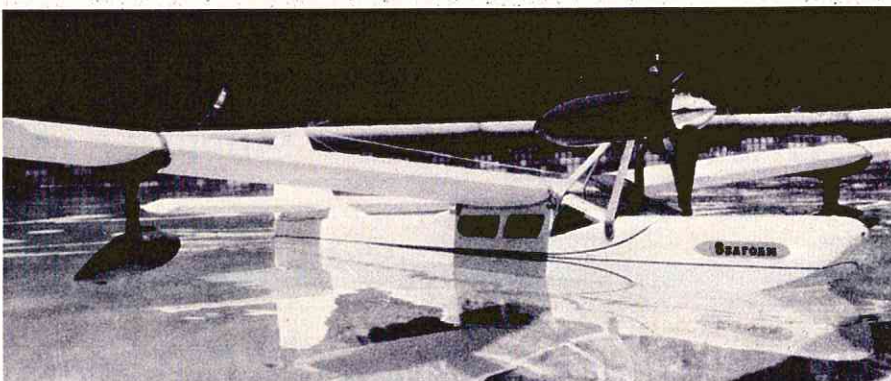
Use standard installation practices. There are no unusual precautions necessary. If you are an experienced modeler you know how to install the radio equipment. If you are a beginner you should seek personal help from an experienced modeler.

OPERATION

An experienced modeler will/should always preflight his equipment before flying, you know how. Don't settle for less than 10' of "transmitter antenna off" range. Note the transmitter meter reading for future reference of relative power output. Always insure that the transmitter antenna is fully extended before flying. Don't fly if the equipment isn't operating perfectly in every respect. If you are a beginner the comments under installation apply.



KEN WILLARD



Last month, I had intended to publish, in this issue, the plans and construction hints for the "Seafoam", a new amphibian design built around Midwest's foam wing and stab kit.

Well, a couple of things happened that I hadn't foreseen, so please bear with me. I'm sure I'll be able to make it next month.

The two things which prevented me from making the deadline for this issue were totally unrelated. First, I discovered on some of the test flights that a slight redesign was advisable to reduce "Dutch roll" tendencies at slow speed. Then, before I was able to make the changes and complete the flight testing, I was knocked out of action with a severe gall bladder attack which set me back a couple of weeks. However, that's over and done with, and this past weekend I completed the flight tests with the redesigned fin and rudder; so look for the "Seafoam" next month.

Meanwhile, that gives me the opportunity to cover a couple of items of interest. For example, in the October issue, I offered to help any visitors to the San Francisco area to get in touch with any of our local flying clubs so they could see some of the action, and I published my phone number so you could call me. Unfortunately, by the time the number was published, it came out wrong. I called the people at the number which was published and explained to them what happened; they

were very nice about it and offered to refer any calls they received, but to set the record straight, if you come to the San Francisco area and want to see some flying, and want to call me, the phone number is 967-3828. Area code is 415.

It is with deep regret that I hear of the retirement of Howard Bonner from the manufacturing — and research and development — of R/C equipment. The first indication which came was a notice that service and repair of Digimite equipment has been moved to:

DIGIMITE

2602 S. Artesia St.
Santa Ana, Calif. 92704

All original owners of Digimite equipment received this notice, but I have repeated it here for the benefit of those owners who may have bought used equipment and are unaware of the change.

When I received the notice, I checked with Don Dewey, who confirmed that Howard had closed up shop.

To me, the retirement of Howard Bonner signifies the end of an era in R/C which most of today's enthusiasts do not recall. At the risk of being nostalgic, or sentimental, maybe even maudlin, I'd like to take you back to the early 1950's.

On a cleared area in Sepulveda Basin, on the outskirts of Los Angeles at that time, we used to fly free flight