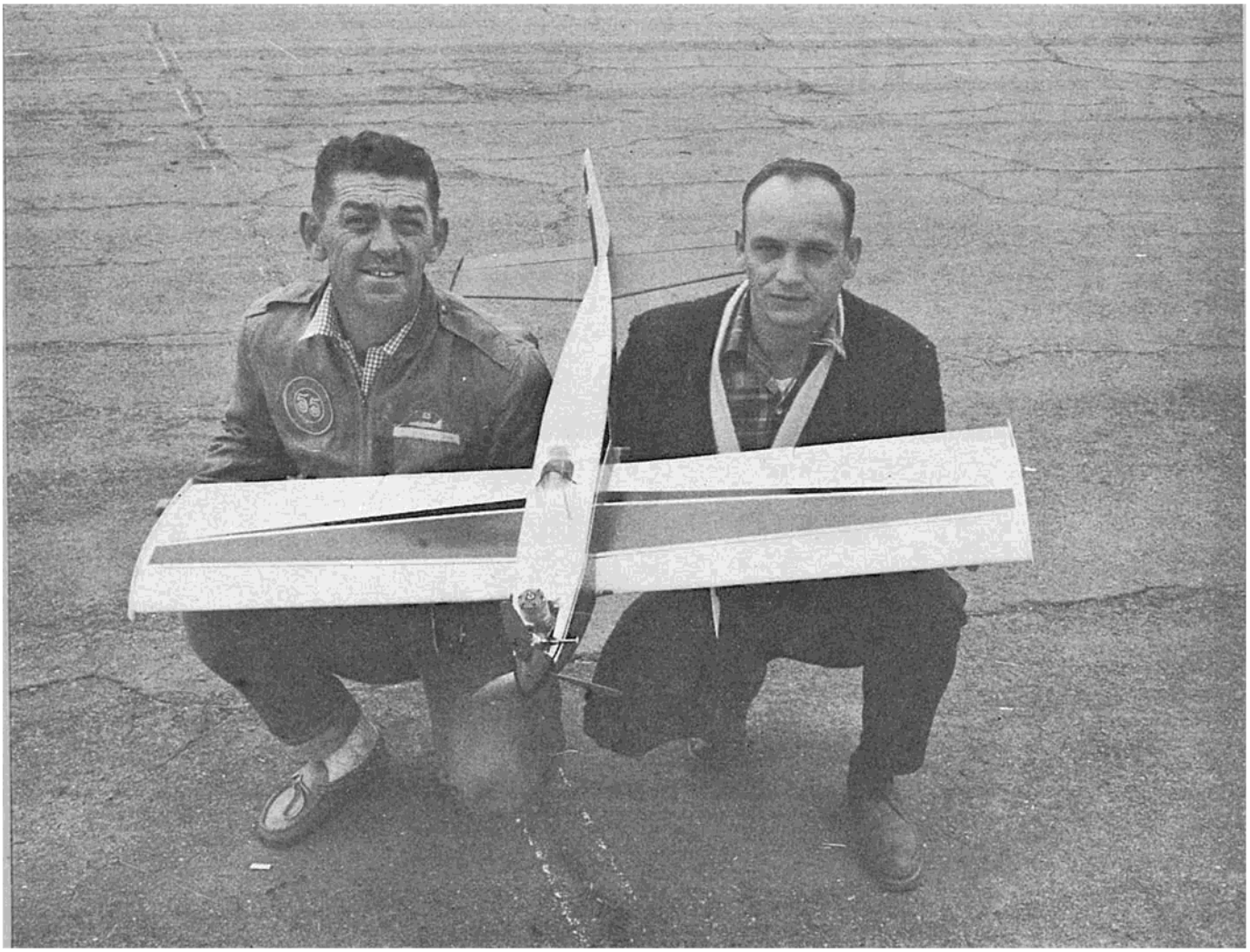
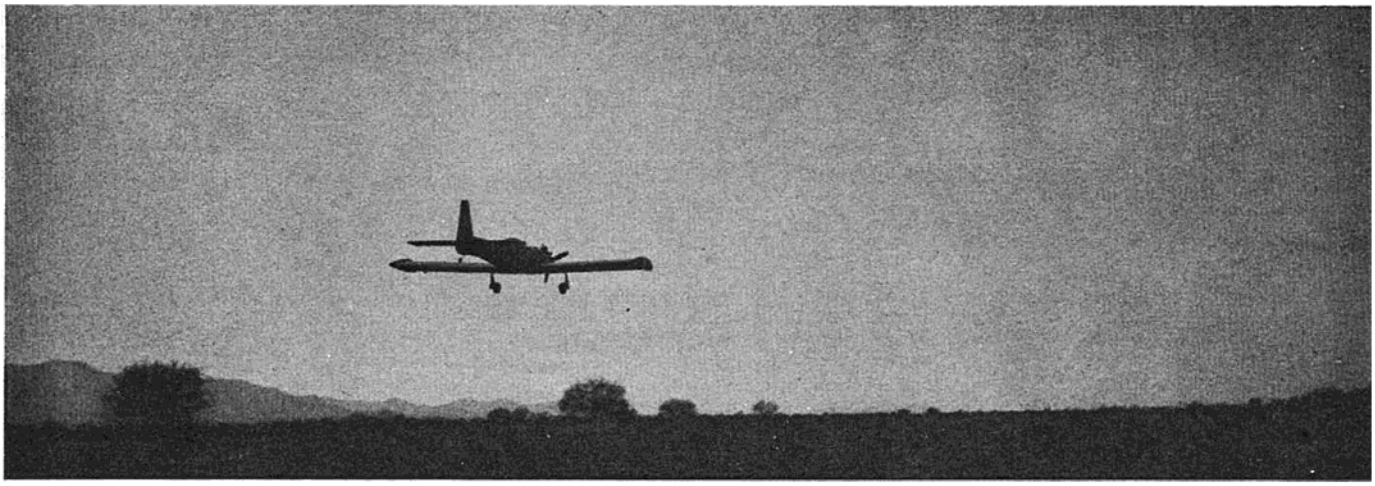


THE DIGIFLI

BY DICK SMITH AND ED THOMPSON

DESIGNED TO UTILIZE THE FULL PERFORMANCE POTENTIAL OF THE RCM DIGITRIO, THE DIGIFLI IS ONE OF THE FINEST R/C AIRCRAFT CREATED SPECIFICALLY FOR PROPORTIONAL SYSTEMS.



PREFACE BY ED THOMPSON

AS I mentioned in a previous issue, Dick Smith and I cooperated on an airplane designed for the Digitrio. This craft evolved in order to take advantage of the Digitrio's small physical size, low weight, and infinite control. For beginners, I recommend that they have a veteran flyer available for preliminary flight tests and for general assistance. The tyro should also use a "hot" .23 and balance the plane slightly nose heavy from the C.G. shown on the plans. With a hot .35 or .40 this plane is a "screamin' demon" and will require the full-time efforts of the pilot for best results!

Although the Digifli is very fast, the biggest item which will require your attention is its "quickness." If you do not know the difference between "fast" and "quick" you will find out when you put this bombshell in the air!

The contest ability of the Digifli will depend upon the individual pilot. A successful pattern airplane has, for the most part, fallen into the large, smooth, docile type. While this plane is docile in the attitudes you may place it, it will **not** do the flying for you. In other words, here is a plane that you will have to fly, and its performance will be measured by the pilot's proficiency. Although we have not flown this plane on reeds, I shudder to think what the outcome might be with a .40 up front! If you have even felt inadequate while flying one of the current crop of free-flight reed ships with a digital system, now is your chance to step into the picture and feel like a pilot!

There have been many books written on model aircraft design, theory, and practice, none of which were used on the Digifli! Regardless of what methods are used in the design of an R/C airplane, in the final analysis a good ship is one that pleases the owner, and this airplane really "turns me on!" The airfoil is a S-T Special, or as a lot of designers say when they cannot think of a better answer — "a highly modified Clark-Y."

Dick Smith did all of the actual construction work on the aircraft and is responsible for its excellent appearance. He is quite a designer and deserves the lion's share of the credit for the Digifli.

THE DIGIFLI . . . . . BY DICK SMITH

In 1964 I was introduced to Ed by a mutual friend and was advised that he was working up a proportional outfit. I fully expected to see (as I had previously run into these "do-it-yourself-guys") a "Mickey Mouse" system. I took little or no interest in the unit for that reason. I was a reed man, unsatisfied with the performance of the proportional units available, except for a few isolated outfits of various makes.

Our mutual friend died suddenly in an aircraft crash shortly after Christmas 1964, which tended to bring Ed and I a little closer together. As our friendship grew, Ed spoke several times of his unit, but being a little hard-headed, everything just bounced off. That is, until the evening he brought it over to my house to give me a bench demonstration.

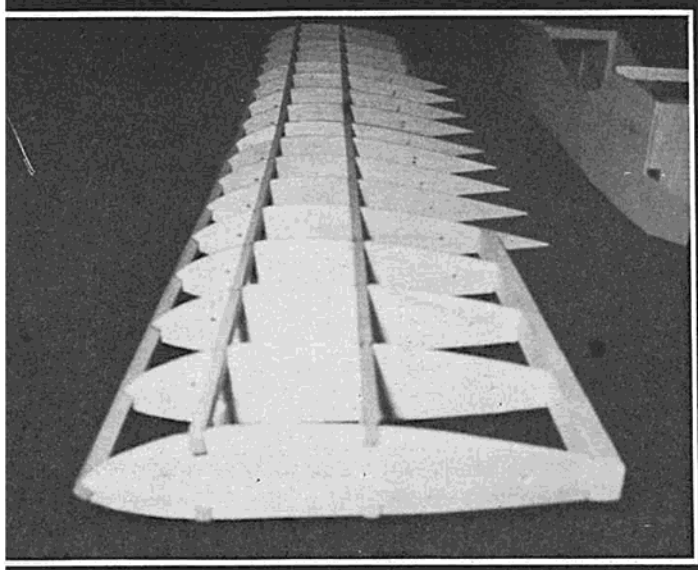
By now, Ed was fully aware of my attitude toward proportional units, thus came armed to the teeth with test conditions, propaganda, and the hope of brainwashing me. I would like to point out that, at that time, my proportional flying experience was very limited, and practically all of my opinions were based on the observations of other modelers flying this type of equipment.

Enter Ed . . . arms full of equipment — transmitter, receiver, servos, wiring harness, battery packs, etc., etc. From that point on, all I got to say was "Hi, Ed," because for the next four hours I listened and watched his demonstrations of servo power, torque and centering capability, and wild dissertations as to which component did what! After many cups of coffee, extremely painful eardrums and sleepy eyes, I agreed to put the gear into one of my ships and try it out. Initially, I made this concession in behalf of my own self-defense, but soon after, I learned rapidly that I was in for some real fun and many, many hours of enjoyable flying.

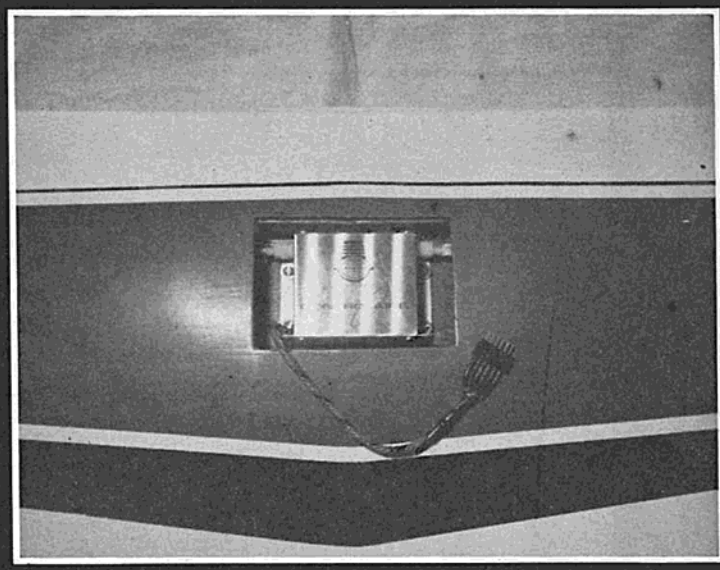
For the prototype, Ed had built up the old kit type Citizen-Ship servos, employing his own amplifier boards. Each servo had amplifier boards slightly different from the other and utilizing different components. This, of course, was done to check each one for maximum reliability.

The next day was a difficult one at work, and all my concentration was toward a nice supper and early bedtime that night. My wife prepared the nice supper, all right, but about the time I swallowed the last bite — re-enter Ed, arms even more loaded than the previous evening and a greeting consisting of "You ready?"

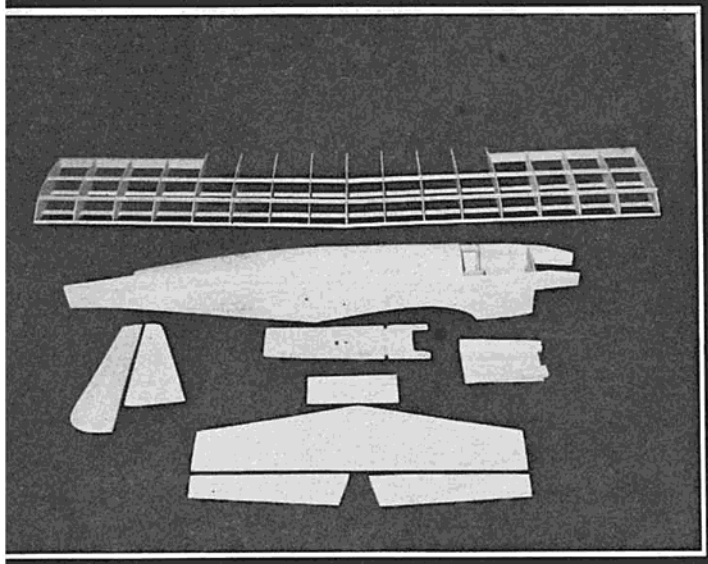
Ed took his armful, and I my weary body out to the shop. Jan put on the 48-cup coffee pot and we went to work. Along about 1:30 A.M., all the new



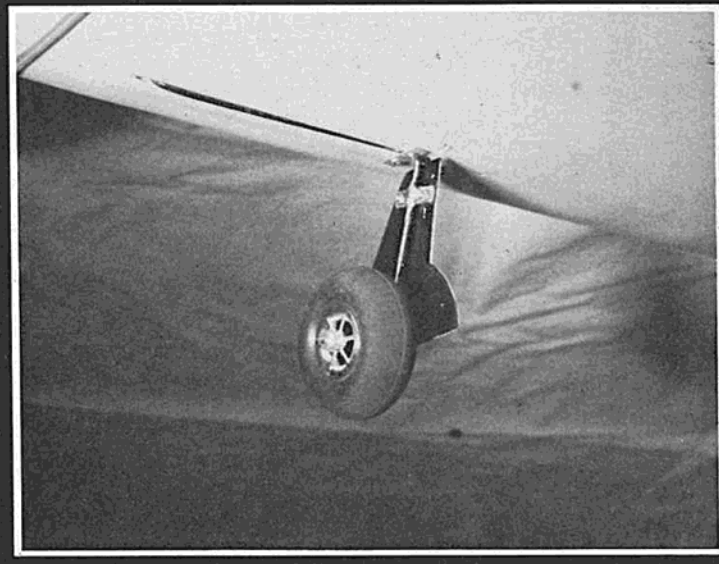
Digifli wing shows simple, strong, and lightweight structure.



Digitrio aileron servo mounted in wing.

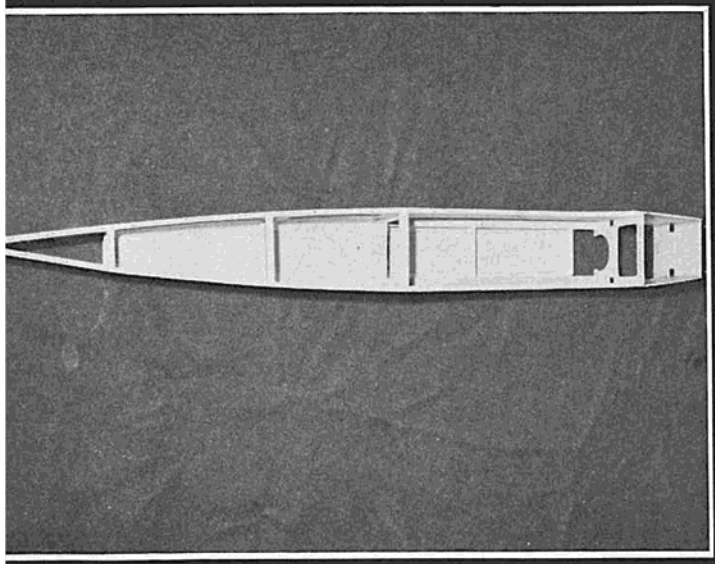


Basic airframe is keynoted by simplicity.

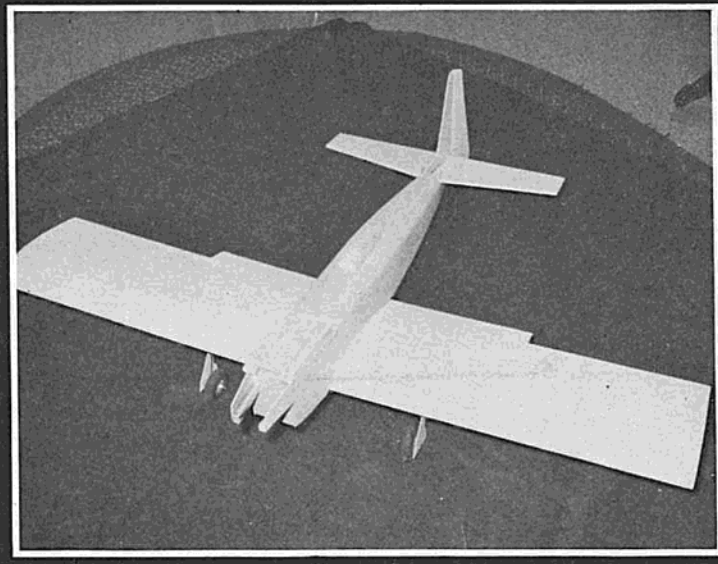


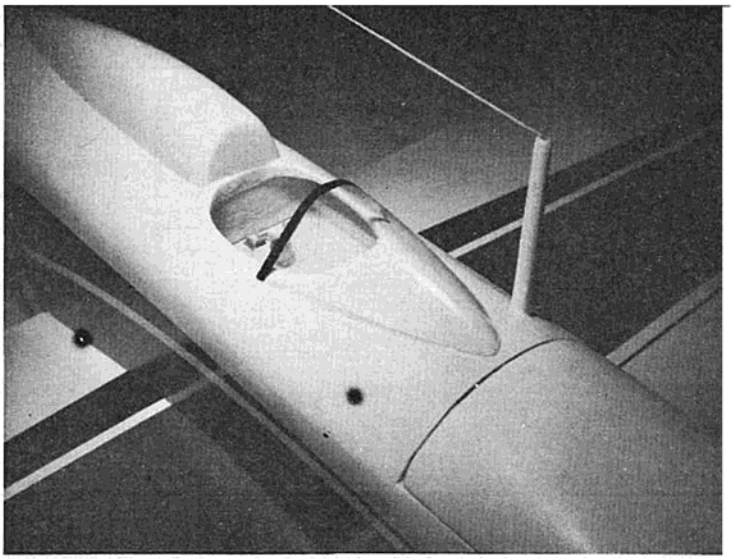
Standard low-wing gear configuration dressed up with wheel fairings.

Basic fuselage structure — light but strong.

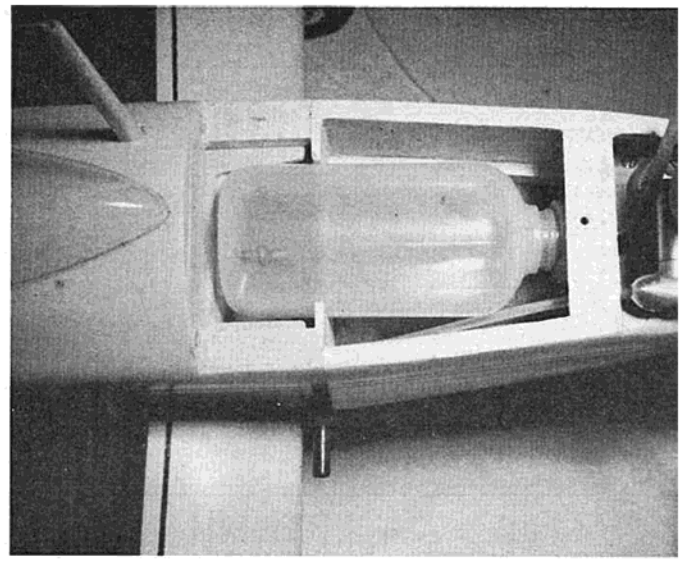


Completed airframe ready for finishing.

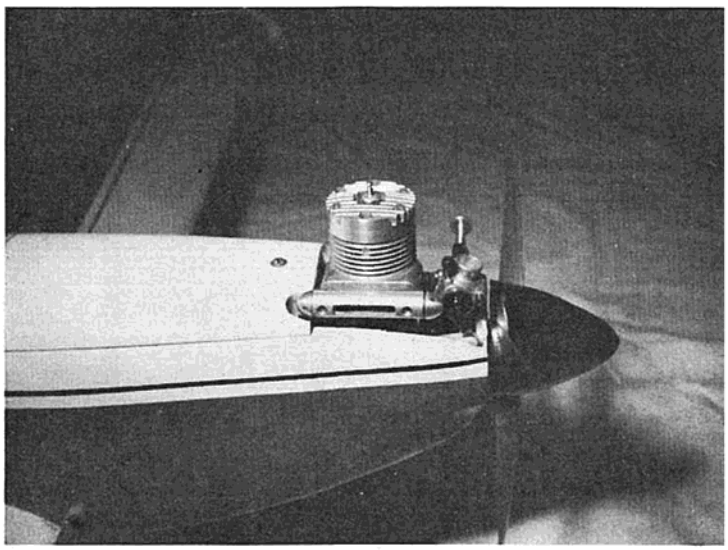




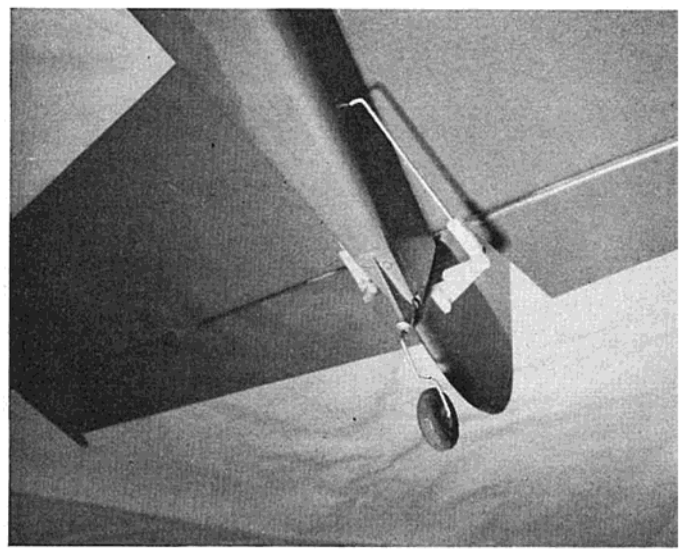
Cockpit and antenna post. Windshield is rear section of 8" Sig canopy



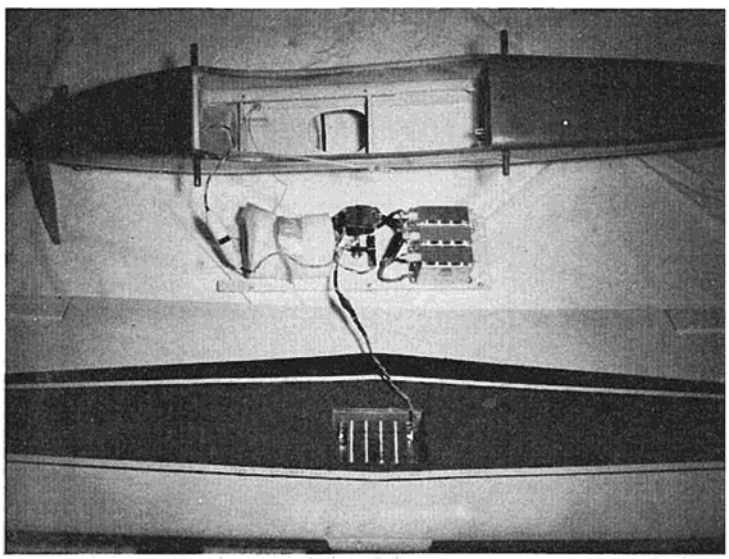
Details of tank installation and hatch hold-down.



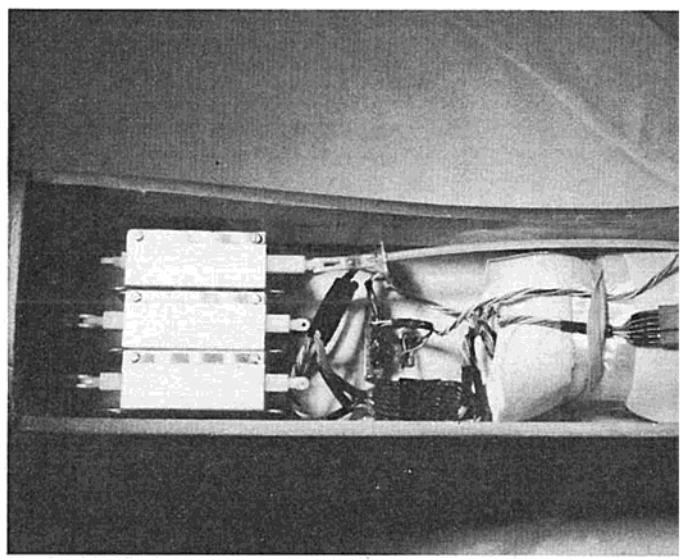
Note cut-out in hatch used for clearance on Max 40.



Control surface linkage and tail wheel details.



Complete installation utilizing radio tray detailed on plans.



RCM Digitrio completely installed.

gear was installed in a well-worn Falcon 56 and completely ground checked. The range check proved my previous suspicions that I had nice neighbors because this was preformed in the middle of the street, after midnight, with Ed walking further and further away with the bird, yelling out the control surface response to my stick movements! Not a peep from the neighbors. My physical status the next day? Forget it!

The next morning dawned bright and clear in Phoenix, Arizona, and the black and white Falcon nestled in the back of my old station wagon. As I drove toward Ed's house, I noted only a slight breeze stirring, and I remember thinking, "This is a good day for test hops." I brought my car to a halt, walked to the door, and knocked quietly so as not to wake the Thompson kids. The kids answered the door and then went to wake up Ed! It was catching up with him, too. Breakfast was served as the sun rose higher (as did the breeze)!

Eleven miles and twenty minutes later we arrived at the ARCS flying field at Beardsley, Arizona, and started the usual pre-flight checks. By now the desert wind was fairly strong, but steady, so it wouldn't be too bad. The engine was started, ship lined up, released, and away she went. I allowed her to run quite a distance before applying any back pressure on the stick. When I felt the time was right, I applied a slow, easy, steady pressure and the little bird became unstuck. Stick-neutralized, she started a very gentle climb with the left wing dropping slightly, a little right trim and away we went!

From all outward appearances, everything was perfect. Then, several days and many flights later, a transformer failure caused the rudder servo to stick in full left, but we got away with only a broken shear plate, busted prop, and dirty engine.

Ed replaced the transformer and we were in the air again. About a week later, however, the same servo ran away again, which proved to be due to exactly the same problem. This time Ed replaced it with a different type altogether, and from that day on, any and all problems ceased to exist. Ed says he has since replaced the transformer with solid-state devices to eliminate the mass (whatever that means). Many modelers in this area (Arizona and California) flew this little propo, all with excellent results and no derogatory remarks.

By now, all interested parties are well aware that the original two-channel proportional has grown to a three channel unit and is tabbed the "Digitrio." Many days, weeks, and months have passed since the flights on the old prototype, but that's not all that has passed. All (and I do mean all) of my previous doubts about the shortcomings of Ed's system have been completely dislodged. After my return from an extended trip back East last summer, Ed brought over his repackaged Digitrio, which by now had flown several hundred flights.

My first trip into the wild blue was with a modified Falcon built by Rusty Fried. Later, Ed's unit was installed in the Don Dewey Special powered by a "sick" .35. This was something of an enlarged Royal Coachman – a typical Dewey design characterized by what appeared to be an "upside-down fuselage." Flown off a strip of pavement in the middle of the desert near the house, Ed and I took turns feeling the ship out. All went well for a long time until a Highway Patrolman pulled up to chat and observe. Ed was airborne at the time, putting the model through all sort of "didos," which included a low pass so that the patrolman could get a good look (nice and smooth). Pulling the nose up a little, Ed rolled it on its back. At this point, the "sick" engine regurgitated, which was immediately followed by a slick inverted landing. Actually, Ed said he became confused with the upside-down fuselage . . . he thought he was right side up all the time! Looking at the model, the patrolman frowned, then looked at us and smiled graciously. He entered his car and drove away with another look – one of complete dismay! Although Ed has bought several yards of desert and a Dewey Special, a check of the gear proved it was not only reliable and smooth, but also rugged! For the more sadistically inclined, the before and after photos of this particular flight were used as the lead photographs in the April issue of RCM for the "R/C Flying Safety" article by Cdr. Lou Guerrieri.

Back to the workshop to build another model. We were looking for something a little different this time but could find nothing that satisfied both our desires. We immediately got started on the only alternative left – we dug out the paper, pencils, T-square, and curves and commenced designing our own ship. It took two weeks from drafting board to test flights. The late hours we spent during those two weeks proved completely worthwhile. Our new bird flew beautifully right from the start. The Super Tigre 23, installed initially, proved to be a good combo for training purposes. It later was replaced with a 35 and then really put through its paces. With this new mill pulling the ship, and with one of Ed's newly completed radio systems built from World Engines kits, it surpassed all of our expectations.

We dubbed the bird the "Digifli." The following weekend found us in Tucson where the ARCS of Phoenix were invited to a Fly-In by the Tucson R/C Club. All of our members received absolute first-class treatment and many fine associations were made by the members of the two clubs. This, naturally, gave us a chance to show off our new bird. Equipment and model were enthusiastically greeted, especially after one of our members, Chuck Watkins, made a couple of demonstration flights – including several low inverted passes.

Chuck was especially impressed with the inverted flight characteristics. He bugged us to fly it again, to which I agreed, but only after I had a chance to fly the unlimited pylon race with the Digifli. Chuck didn't get the opportunity to fly it again because I evened the score with Ed while rounding the first pylon. It was all me. I told the transmitter "crash," the receiver picked up the signal, the servos moved and the model responded perfectly, right into the cement ramp! Even crashes are smoother with the Digitrio.

During the 90-mile drive back to Phoenix I occasionally heard Ed mumbling something about a successful day while I was fondling my sack full of toothpicks and dreaming of the next Digifli. Many such projects end up being completely abandoned after the first crash regardless of how smooth they are. But, I was convinced that this model had what it takes and although the lifespan of the first plane was comparatively short no design changes were necessary. So, the number 2 bird came off the assembly line exactly like the first with only gear-fairing doors added. We had already been the 23 and 35 route and Ed had just received a new Max OS 40 which we were itching to try out. The test flights on the new bird were performed at our usual flying site with an unusually large crowd present. The first attempts at take-off were pretty erratic as I was overanxious as to the torque factor with the 40 installed. This led me to overcontrol. Take-off was finally achieved by simply advancing the throttle and leaving everything else alone until the bird started a gentle climb. Although the engine was four-cycling, slight back-pressure on the stick caused the airplane to attain about a 35 degree climb accelerating all the time!

As I entered the first turn I realized that the tiger usually found in your tank I now had by the tail! This first flight terminated rapidly when the engine quit because we had not allowed ample bench time. We called it quits for the day and decided to run a few more tanks of fuel through the new Max (Ed still says, "it was mainly to allow my nerves to settle down"). Later flights pushed the bird and ourselves beyond all hopeful expectations. The Digifli comes in three "B" categories:

1. Bang – with a 23.

(Continued on Page 84)

(*Continued from page 23*)

2. Boom – with a 35.
3. Bomb – with a 40.

The plans presented here are drawn with the proper forces for a 3+1 setup, however we started with a coupled arrangement which impressed us considerably. For those who would like to use the coupled aileron and rudder the only deviation from these plans is to decrease the chord of the ailerons to 2" but use the same throw as indicated. Engine side thrust will vary slightly, depending on the engine size. The 23 should be set at O; 29's to 35's 1 degree right; and the OS Max 40 required 2 degrees right thrust. The gear-fairing doors have the same effect as mounting white-wall tires on your car. The antenna post, although enhancing the appearance, has a decidely functional aspect by keeping the antenna wire away from all internal electrical circuits and should be used. The wing-tip plates, while enhancing the appearance of the airplane, also have a functional purpose as they are much easier to replace than to rebuild a conventional wing tip. Controlaire nylon tubing and flexible cable were used for the aileron linkage and work fine. It cuts the installation time to a matter of minutes and keeps play to a minimum. (Ed is going to use this same method for **all** linkages in his Digifli which is now under construction.) I have previously used nylon tubing and cable in limited applications and have been so favorably impressed that this method has been employed to greater and greater lengths with each succeeding airplane. The proper installation of the Nylink is quite simple requiring only tinning of the cable end, sliding the Nylink over the cable and placing a drop of solder in the slot provided. I have found by drilling a hole through the back wall of the Nylink connector and inserting the wire through this hole a more rigid connection can be made. One precaution to be observed when using this method is to keep the distance between the end of the nylon tubing and the Nylink proper to a minimum. This eliminates the possibility of the exposed cable flexing.

CONSTRUCTION

Overall construction of the Digifli is typical of a Class III type. Because of this I will expound in a few areas that I feel may require special attention.

Wing

For maximum rigidity and warp-free construction special attention must be devoted to the sheeting of the wing. First, apply the sheeting equally over the two ¼" spars on the top of the wing. After installing the aileron linkage apply the sheeting in the same area at the bottom of the wing. From there on the sheeting should be added toward the trailing edge alternately from top to bottom. The last sheeting process should be the top leading edge. If the nylon cable is installed use the fairing shown on the bottom of the wing. Be sure to glue the nylon tubing at each wing rib.

Fuselage

The only noteworthy item in the construction of the fuselage is to go light with the sanding block while shaping the top deck. The antenna post is made by first drilling completely through the dowel and then shaping to a streamlined section. Be sure and embed the antenna post well within the block shown on the plans inside the fuselage and set with epoxy. If you should elect to utilize nylon tubing and flexible cable throughout the entire ship be sure to install the tubing through the tail section prior to covering the bottom of the fuselage.

Horizontal Stabilizer

This unit should be kept as light as possible by using low-weight balsa.

RADIO INSTALLATION

The full complement of radio equipment, including switch and charging jack, can be installed on the equipment-mounting tray as shown on the plans. The two notches in this tray allow a rubber band to hold the foam-wrapped receiver in place. The charging jack and switch are easily accessible through the cockpit opening. This installation allows easy removal and replacement of the entire radio system. Countersink ¼" holes under each of the two servo cover screws on the bottom of each servo to eliminate possible contact between the servo and the board. Be sure to use the bushings supplied with the servo kit rather than wood screws.

CONCLUSION

I sincerely hope that the Digifli will give you many hours of enjoyable flying and I would sincerely appreciate hearing your comments.