

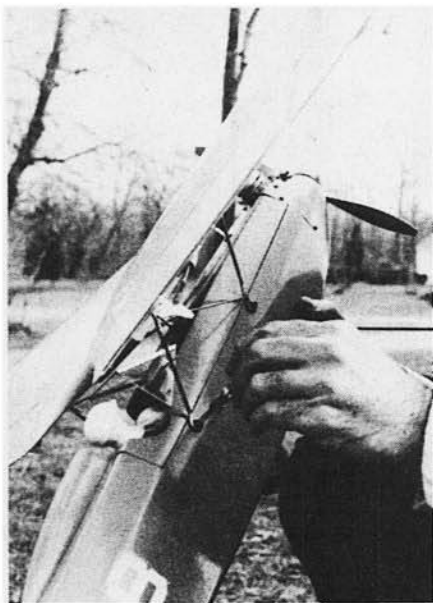
A STOL "CADET" TRAINER

by Gene Rogers



Gets you in and out of tight spots. "Cadet" has STOL characteristics, a light loading, proportional flaps and power in reserve. Easy to fly.

Stingy fields call for steep approaches. Try this mild-mannered parasol type with STOL characteristics. Proportional flaps permit slow-flight and new potential. Pro-Line radio system and a Super Tigre .46 powerplant. It can handle .35's to .60's. Ship spans 62", 630 squares of area. Uses a Tatone engine mount, tank and hinges.



Four nylon screws lock wing in position, shear when you hit the potatoes (ala Caplan). Pilot is Williams Bros. The nice wife will paint it.

When one becomes involved with full scale aircraft flying, as well as model R/C piloting, it becomes apparent just how closely related the two are. A trainer for example, is always a joy to fly, whether you're an Air Force F-101 pilot at the controls of a restored PT-19 trainer or if you happen to be an R/C contest flyer clowning around with a friend's deBolt Champ.

The likeness in performance between light aircraft and R/C models also becomes very apparent to a pilot of both.

The main handicap an R/C flyer must contend with is that he doesn't have the "feel" of the controls of the aircraft in his hands. Since he doesn't have these control pressures in his hands or against his feet, nor the "G" forces exerted on the seat of his pants, he must rely on seeing the attitude of his plane in all directions and react accordingly.

The effectiveness of flaps in any full sized aircraft cannot be disputed. They make for steeper, shorter landing approaches, thus clearing obstacles more easily, reducing the touchdown speed and making it much easier to touch down on a given spot on the runway.

These same fine features offered by flaps are just as well appreciated on an R/C plane. A steeper landing descent will allow us to fly out of much smaller fields. Most of our R/C planes are amply powered for exhilarating climbs, but it's the landings that require the acreage.

In order to safely and effectively use flaps on a model, the pilot must understand them and control the ship accordingly. When lowering the flaps on a full scale aircraft, the pilot immediately gets a physical reminder in the form of the pressure he must exert on the control column to maintain his proper pitch attitude. To relax this

pressure, he then cranks in down elevator trim. A model is not all this lucky, for the modeler flying it will not "feel" it on the controls and therefore must anticipate this correction with down elevator trim.

The flap area on the "Cadet" design is of the same proportion to its wing area as used on the full scale Cessna 150 lightplane. The same 40 degrees of rotation as used by Cessna was also applied to the "Cadet." This guesstimate for the model proved correct, allowing effective flap control, but not to the extreme.

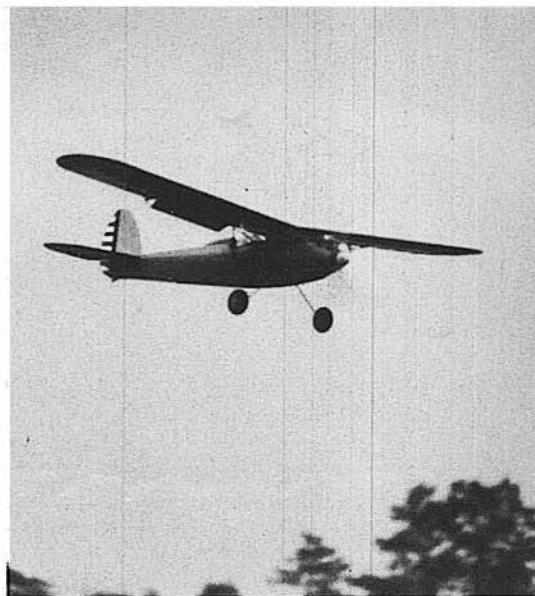
Lowering the flaps can be done simultaneously with down elevator trim control, or it can be accomplished with small increments of each. To be on the safe side, I initially started out by applying down elevator trim first, then lowering the flaps to raise the nose. After a little experimentation I found that full down trim and fully lowered flaps provided an ideal pitch attitude for a landing approach with an idling engine.

Watching the model descend for a landing at a steep angle, but yet at a slow landing speed, adds to the satisfaction and offers refreshed enjoyment to R/C flying. Flying buddy Bob Caplan bet me a delicious pizza (I hope it has sausage on it 'cause then he can't eat it and I'll gorge it all up... Ed) I wouldn't land my "Cadet" in the 50 x 150 foot vacant lot next to his house. After Don McGovern gets all the photos he needs to accompany this text and I get a few more practice landings, I intend to stop over at Bob's (evacuate the neighborhood, he can't be serious!) on my way to John's Pizzeria, and I don't intend to bring any money with me either! He's just jealous he didn't build flaps on his "Cadet" version.

The "Cadet" was designed primarily as a fun type aircraft, to be flown out of small



Take your last look at the tailwheel. The "Cadet" just landed flaps down, turning here for take-off. Wire crystallized, dropped wheel in mid-air. Had been used for a thousand flights on other ships. Lost in der woods.



A slow "fly-by" in the fading light. Flaps are extended partially. Lower, trim out by degrees.

The framework is truly rugged. Note sheeted wing tips. No block is used. Stab is also hollow, capped with sheet, sanded to airfoil. Fun to build.

ball-field sized flying sites, making full use of the flaps on landing. The ship will also take-off from very rough surfaces, using partial flaps. However, as with a full sized airplane, the ground run will be shorter with flaps, but the rate of climb will be slightly less. My ship, equipped with the new Super Tigre .46 takes off extremely rapidly without flaps. This engine incidentally will draw fuel for a sustained period of time, with the fuselage held vertically and the throttle set at idling speed!

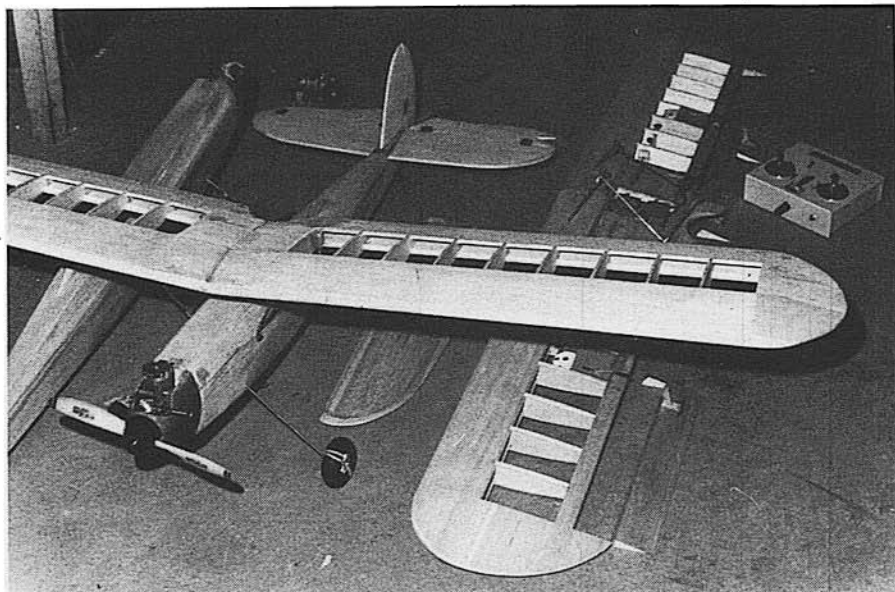
As a trainer the "Cadet" will serve very well. It is not only an easy ship to fly, but it is a very simple one to construct. Friend Bob Caplan had the courage to build one simultaneously with mine, before the design was ever flight tested. It appears hopefully in some of the accompanying photos. Bob's model was built without ailerons or flaps as a comparison, and flies very well using rudder for turning.

For a radio system, my "Cadet" is equipped with the new Pro-Line six channel proportional system. The system seems to be of extremely fine quality in both construction and performance. The controls function in a fast and precise manner, with very fine resolution. The Pro-Line larger type servos were installed in my ship and make a neat package when mounted crosswise in the fuselage. These servos were boxed in with wood rails for ease of installation in other airplanes.

Construction

The construction of the "Cadet" should not be difficult for a model builder with balsa kit building experience. The crutch type structure of the fuselage makes its assembly both fun and simple. This type structure is very strong and lines itself up automatically. It also offers an infinite variety of fuselage cross-sections. It is a type of structure that should be more popular in R/C design than it presently is.

The easiest way to scratch-build an airplane is to fabricate your own kit. After studying and understanding the plans completely, cut out all the parts you possibly



can, building your own "custom kit" in effect. This will familiarize you with the design and make assembly much simpler, faster and more enjoyable. It might be wise to purchase two sets of plans, using one set for patterns. I usually cut the parts right from the plans and rubber cement them to the balsa sheet. When removing the patterns from the balsa, be careful to rub off the rubber cement from the face of the balsa. It comes off easily, but glues and epoxies will not bond to the rubber cement.

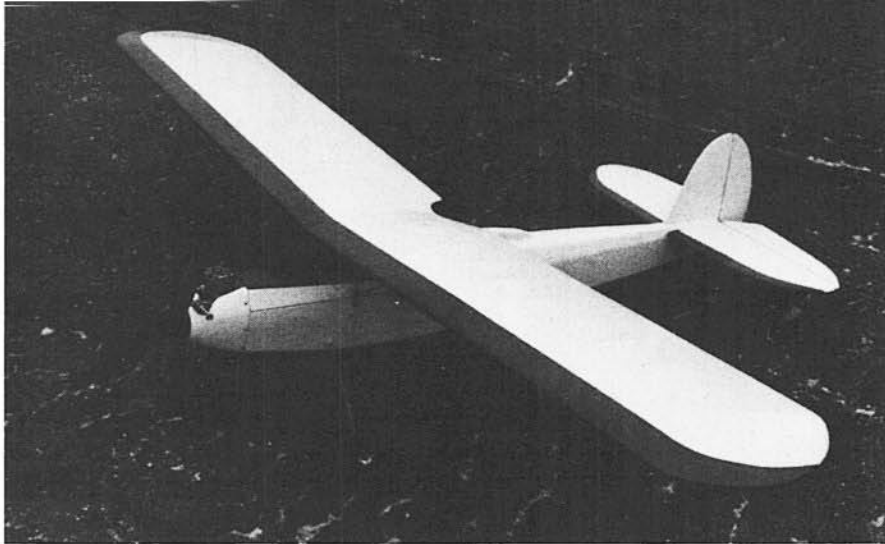
The Fuselage

Start by constructing the fuselage crutch directly over the top view of the fuselage. The crutch is indicated by the shaded area. Be certain to use spruce for the forward portion of the crutch as shown. If you cannot locate 1/4" x 5/8" spruce strips, laminate a piece of 1/4" square spruce and 1/4" X 3/8" spruce with epoxy to create the required size. This might be a little more work, but if done properly, it will be stronger than a single piece of spruce.

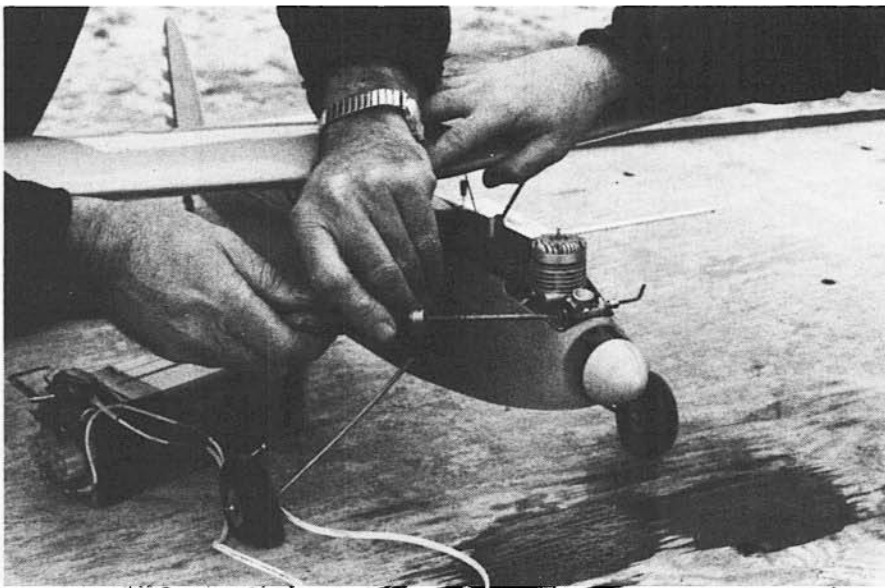
All cross members of the crutch are of balsa and should be epoxied in place. Be sure that these are accurately placed at the firewall and landing gear bulkhead. Note that the firewall member is tilted at a 2 degree angle to allow the firewall to maintain the downthrust required.

Fasten the landing gear to the firewall by binding it with nylon fishline or strong thread, then coat it with epoxy. This operation should be done at this time as it could be very awkward later.

Remove the crutch from the plans and epoxy the firewall and the landing gear bulkhead in place. The remainder of the bulkheads can be cemented in place with Ambroid or white glue. Next, epoxy the plywood side doublers in place. If these aren't even with the bottom of the bulkheads, sand the contour to meet them. Now epoxy the bottom doubler in place and sand it even where it might overhang the side doublers. At this point, it's good practice to fasten the doublers to the firewall and landing gear bulkhead with 1/2" long wire



The design serves well as a trainer, with just three channels operating. Five channels are recommended for flap equipped versions of the "Cadet."



Frozen numb fingers make the final adjustment. The Super Tigre mill sang with power, it drew fuel vertically on dead idle. Test flights went fine.

Pro-Line transmitter, ST .46 on Tatone mount, the Stick-A-Tube tank deal with receiver, battery pack beneath. Keep weight forward and tail light. Switch and servos, one, two, three. Flaps, aileron servo in wing hatch.



Photos by Gene Rogers and Don McGovern

brads. These brads will add much strength to the structure.

The full length balsa side sheets are now installed by epoxying them to the plywood doublers and cementing them to the balsa bulkheads. Install the full length bottom sheeting in the same manner. The top sheeting can now be glued in position.

To insure a good fit, the removable hatch is built in place, by lightly tack-cementing its bottom sheeting to the crutch. It can easily be popped off later with a razor.

The Wing Assembly

The best way to handle the wing construction is by building the both sides of the wing together, with the dihedral set up on a wing jig or hinged building plywood building board. The dihedral angle is set up at a slope of 1" per foot on each side.

Prop the leading and trailing edges up directly over the plans with small balsa blocks. The height of these blocks can be determined by referring to the sectional view of the wing chord on the plans. The wingtips are set up in the same manner with the height of the tip above the board determined by the position of the datum line shown on the sectional view.

Glue all the ribs in place between the leading and trailing edges. Be certain to use epoxy to hold the plywood ribs and dihedral gussets in place. Be sure that the wing strut holes are accurately located in these ribs. This is required to insure proper wing alignment.

While the wing is still set up in the above manner, glue all sheeting and capstrips in place and weight down on the building surface while the glue is drying, to insure a true wing. I hope Bob Caplan has carefully read the preceding. Sometimes I believe he thinks about propellers when he builds wings!

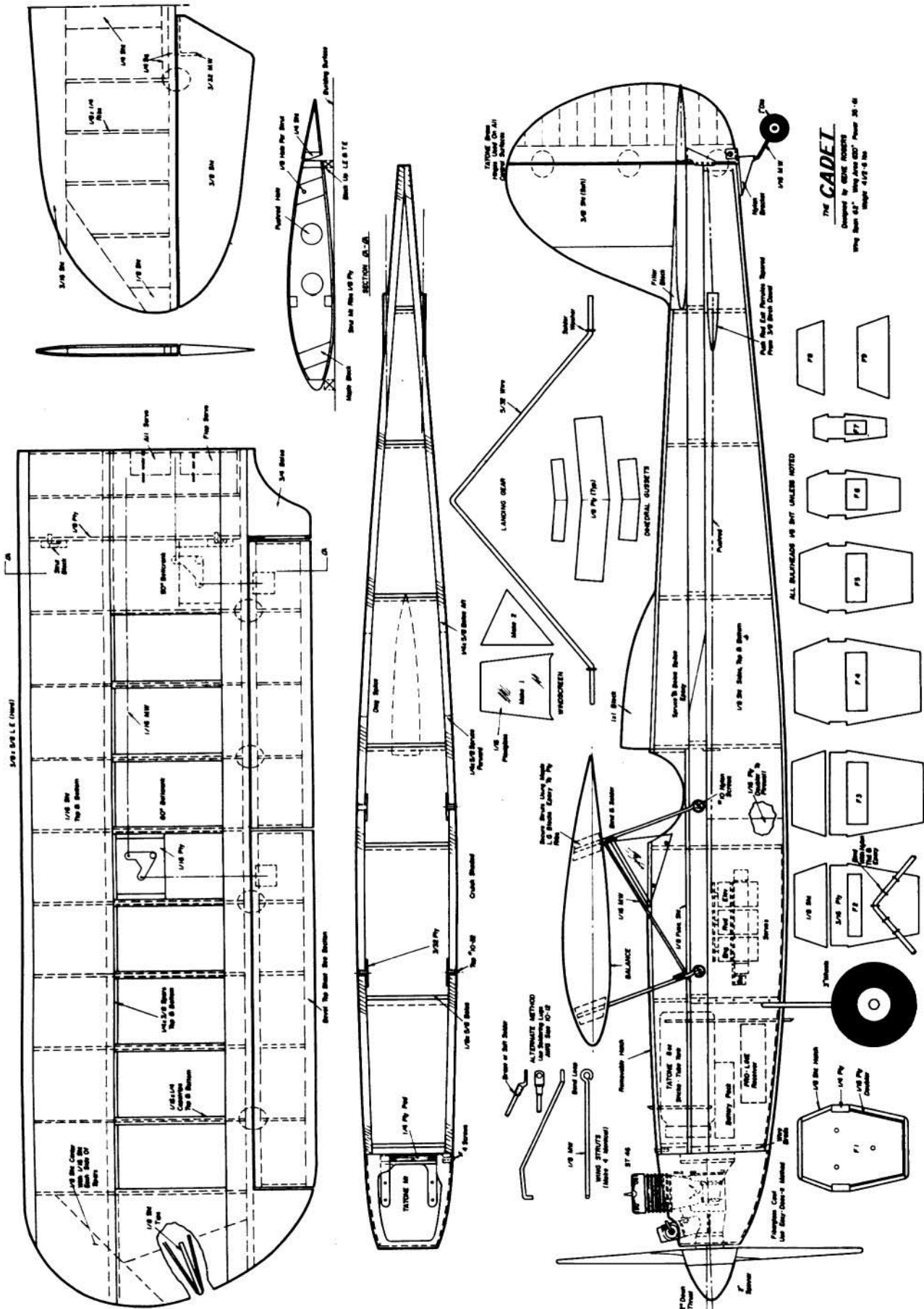
The wing struts are formed from music wire as shown on the plans. The loop in the wire can be formed by heating the wire cherry red and bending it around a dowel pin or bolt while it is hot. A second pin can be spaced 1/8" inch from the pivot pin to keep the end of the wire from rotating while forming it. Be certain to make all four struts exactly alike. Likeness to each other is most important here.

If you aren't inclined or equipped to bend the loop in the music wire, an alternate method of using a soldering lug, as shown on the plans will make the job easier. Do be careful to do a really good soldering job here. A pulled-out lug could be very dangerous to the spectators below!

The wing struts are fastened to the plywood wing ribs, using a slotted maple block similar to the method used in securing a wing mounted landing gear strut on a low wing. You must epoxy these maple blocks in place. The blocks can be held to the ribs with "C" clamps while the epoxy is curing.

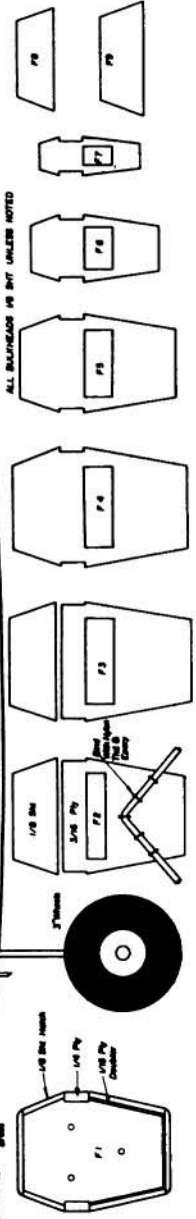
To insure the correct wing alignment, bolt the other ends of the struts to the fuselage. If all four struts are of the same length, they will form a parallelogram and only the correct distance from the firewall will have to be maintained and held in position while the epoxy is curing. Also, at this time, be careful to note that the wing is at right angles to the centerline of the fuselage.

After the epoxy has cured, attach the diagonal struts between the main struts by binding the joints with fine soft copper wire

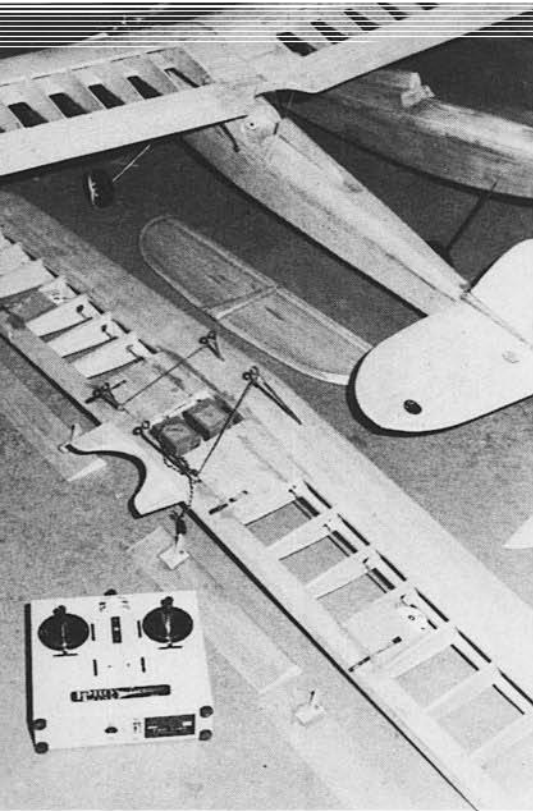


THE CADEI

Designed by GERT CARSTENS
 Wing Span 42" Body Length 20 1/2"
 Weight 4.1/2 oz.



ALL DIMENSIONS IN INCH UNLESS NOTED



No, it's not all that complicated. Divide balsa bones by two. Bob Caplan's frame came to visit. Both ships built in frantic race against each other. A Pro-Line rig in foreground, flaps and ailerons detached, barely visible here. Tatone brass hinges are visible on stab, splendid in all respects, epoxy into slits very easily.

A pair of "Cadets" to test the design with a variety of engine sizes and controls. Gene's is above, with Pro-Line, a Super Tigre .46, has operating wing flaps and ailerons; Bob Caplan's on an Enya .35, Heath GD-47, on just rudder, elevator and engine. Ship flies fine either way.

and solder neatly in position.

The construction of the tail surfaces is self-explanatory and only a reminder to keep them light should be needed. Mine were constructed a little on the heavy side and this, coupled with a heavy tailwheel required me to add four ounces of lead to the nose to get the ship to balance properly.

Detailing

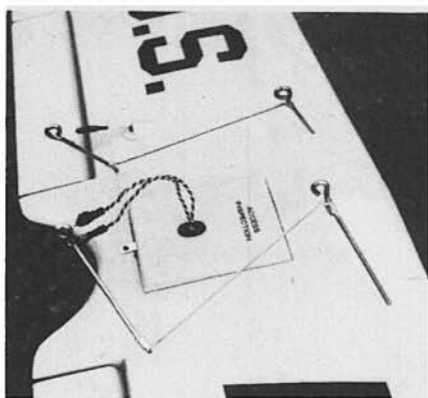
Once again, my favorite method for making cowlings was used on this design. Complete details of the Hobbyoxy Easy-Does-It method can be had directly from John E. Pox, c/o Hobbyoxy Products, 507 Main St., Belleville, New Jersey.

The engine is mounted on a cast aluminum Tatone Engine Mount. When using smaller than a .60 sized engine, the back of the mount will have to be shimmed out as shown on the plans, or you may use a Tatone Long Beam Mount.

The windscreen is made from folding heavy celluloid, or by cutting pieces of plexiglass as shown on the plans. The plexiglass windscreen is epoxied at the corners and capped with thin aluminum corner angles. The windscreen is fastened to the hatch with small wood screws, backed up with plywood pads, cemented inside the hatch and cockpit.

Covering and Finishing

The entire "Cadet" was covered with medium weight Silkspan, grade GM, with the



A neat access hatch permits servicing servos. Note 1/8" dia. piano wire wing mount, diagonal bracing. The nylon bolts shear on hard impact.



open framework areas of the wing receiving two layers of the paper.

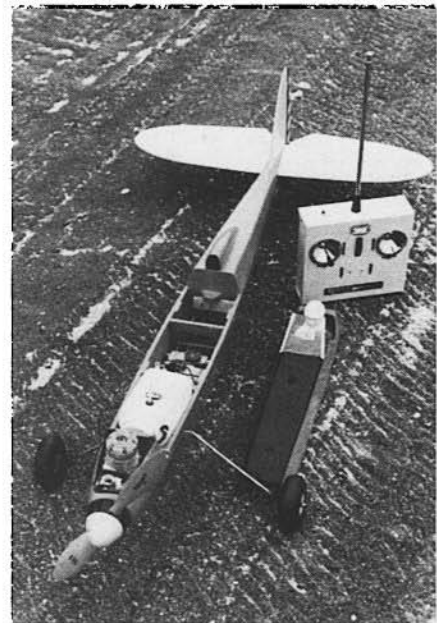
The double covering over these open areas should have the Silkspan's grain running at right angles to each other, with the first layer's grain running spanwise. Shrink this first layer with water and brush two coats of clear dope on it, before applying the second layer of covering with the grain running chordwise. This method of covering is not only economical, but it is very strong. It is also very puncture resistant and it adheres well to the framework as one rigid unit.

The Silkspan was prepared for the colored dope by applying a mixture of talcum powder and clear dope, then sanding lightly with a 320 grit paper after drying. Two coats of colored dope, followed by two coats of clear dope were then sprayed on. After thoroughly curing, the finish was rubbed down with auto type white polishing compound and received an application of paste wax.

Test Flying

Before journeying to the flying field, check the plane over carefully, making sure that all is in proper alignment. Most important, make certain that the ship balances as per the plans. If it is tail heavy, add the lead as far forward as possible. I fastened the nose weight to my ship by suspending it from the motor mounting bolts below the Tatone mount.

Open cockpit and forward hatch detach for easy access. Tatone engine mount and "Stick-A-Tube" fuel tank. Servos easily serviced in fuselage.



Use care to see that all control surfaces are at their neutral position when the trim levers on the transmitter are set at neutral. The radio receiver should not be packed too tightly in the fuselage. Vibration can play havoc with the radio and really set your control surfaces dancing. Check this out with the engine running and at all running speeds.

If you are not an experienced R/C flyer, if at all possible, get a seasoned pilot to test hop your ship for you. If you have some experience and think you can handle that first flight alone, get a proficient flyer to at least coach you while you're flying. He can help you trim it out and make a calmer assessment of its flight characteristics.

Unless you have a lot of experience and really calm flying conditions, do not use the flaps on the airplane until it is trimmed out to perfection and you have gained confidence in flying the ship. As said before, flaps are a great asset to any airplane, but you must plan your moves on a model before you make them.

When you are ready to try out the flaps, check them out with plenty of altitude. This is money in the bank with all flight maneuvers, except landing that is! Throttle the engine back and fly the plane at a level attitude to slow it down. Now, lower the flap lever on the transmitter to about 1/4 of its travel and you will immediately see the ship take a nose-up attitude. Correct this with down trim on the elevator. Don't forget to push this lever up! Do this in small increments until you have the flaps fully retracted and the ship flying level. Now throttle the engine back to idle and watch the "Cadet" sink down. Add a little more down trim to this and you'll be making steep, but slow landing approaches. Don't forget these steeper approaches require a more precise flare-out control, or you'll be breaking a lot of props! Good luck with yours and have fun. Never over the pit areas. safety starts in the brain.