the BLUE BIRDS

The most exciting of all model air show acts, and a magnificent technical achievement, is the designer's formation model consisting of four jets locked together and powered by a single OS Max 10.

■ Ken Willard

NO, THEY'RE not the Blue Angels. The Blue Angels fly the A4D. The Navy likes them best for precision flight demonstrations. And they're not the Thunderbirds. The Air Force prefers the T-38 for their shows.

So what are they? Well, sort of a hybrid between the two service teams, so I called them the "Blue Thunder Angel Birds." But that's kinda hard to remember, so I shortened it to the "Blue Birds." Then I went and gave them the color markings of the Blue Angels, so no matter what I call them, when they come flying overhead, everybody says "Hey, look! The Blue Angels!"

Everyone who talks to me seems to agree that this "formation plane," as the editor calls it, is the most unusual design in RC to come along for some time, ranking right along with the Flying Doghouse, Flatiron, and Lawn Mower as a show stopper. Then, the next thing that comes up is "How'd you get the idea, and get it to balance and fly?"

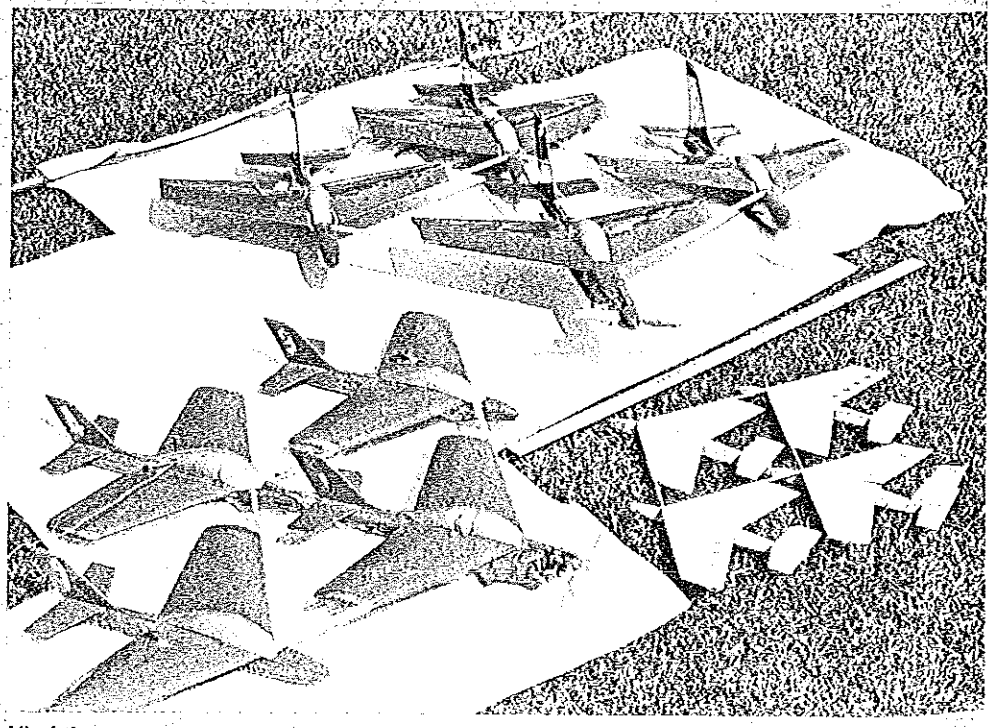
Well, the idea isn't new. Back in the Thirties, the Marines had a show team called the Top Hats. They tied their planes together with a ribbon, and took off, did their aerobatics, and came in and landed, with the ribbon still tying them together. That was when I got the original idea of attaching planes together, but with a dowel. Never did get around to doing it; the closest I came was to attach three of those little ten-cent gliders together—you may remember them. They had a plastic fitting to hold the wing on the fuselage, and you could use one of the fittings to hold two wingtips together and presto, instant close formation.

Other experimenters tried various ideas from time to time. Then, back in 1968, I built a scale model of the Phoenix-Warren Skycar, which had a diamond-shaped wing, technically called a rhomboid wing. It flew well. Then along came the Blue Angels with the diamond formation. The similarity was evident. Why not tie four planes together in the diamond formation, balance it the same as the rhomboid wing, and see what happens? The Blue Birds are the result.

But not without considerable experimentation. First, I built a hand-launched glider version, and put adjustable ailerons on the outboard wings of the wingmen, and tried to use the stab of "tailend Charlie" for the elevator. The ailerons were effective, but the stab wasn't. Then I replaced the stab movement with simultaneous movement, up and down, of the ailerons on the rear plane so they acted as an elevator for the whole formation. It worked, but a lot of up elevator was required just for stability in level flight. Of course, I had momentarily forgotten that the rhomboid wing is a reflex airfoil. So, by realigning the rear plane so that it was in a slightly nosedown angle when the others were level, the stability problem was solved.

How about center of gravity location? Should be roughly the same as it was on the Skycar. After a few experimental glides with the test vehicle, it was evident that the CG location was not too critical. If you got it too far forward, the elevators weren't too effective in giving nose-up response. If you got it too far back, the whole assembly tended to wallow indecisively through the air. After some tests at both extremes, I picked the location which seems to give good straight flight and good elevator action as well. Even so, the location can vary as much as half an inch.

Following the test program with the hand-launched glider, I built a "quickie"

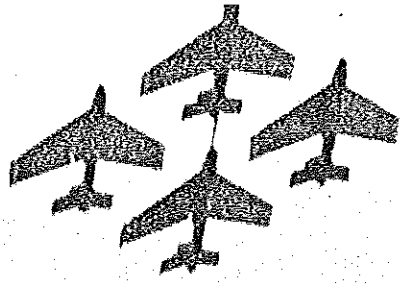


All of the test structures assembled for photo, final version at top, 1/2A version lower left, and chuck glider lower right. The 36-in. ruler affords a quick comparison of the sizes.

½A-powered version. I cut and shaped ACE foam wings to the planform needed, then cut some fuselages from scrap foam material, and installed a radio similarly to that shown in the plans. Since the wing section is semi-symmetrical on Ace wings, I left it that way, but with one small change. The wing on the rearward plane was installed upside down; this was to help the formation have the reflex airfoil. It worked.

The ½A version had no throttle, so it had to fly full power, or glide. The first flight ended in a crash because there wasn't enough elevator or aileron action in the glide. It was even marginal under power, but when the engine quit, the formation went into a shallow dive with slight left turn, even though I was holding full right aileron and full up elevator.

After repairing the damage, I changed the linkage to the control surfaces to get more throw, and tested again. Very good; much more responsive under power, and good aileron action even in the glide. However, as soon as the model slowed down, even with full up elevator, it would not flare out for landing. Then it struck me. This version of the rhomboid wing was significantly different from the Skycar, in that, for all practical purposes, it is a rhomboid wing with a lot of holes in it! The air would flow up through the surfaces when the plane went to a high angle of attack, and render the elevators ineffective.



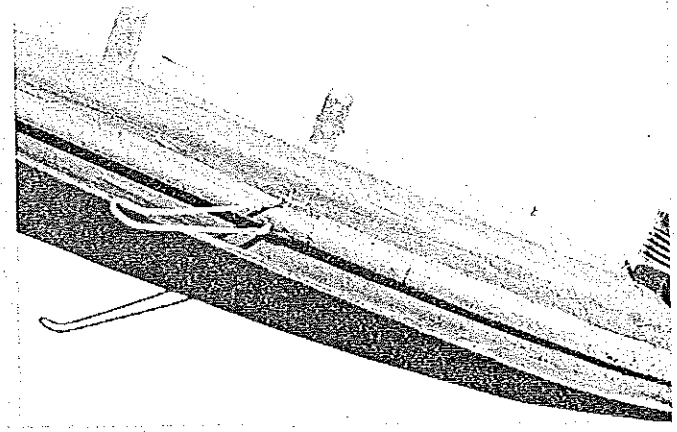
. . . . it looked just like the Blue Angels, cruising over at about 6,000 feet!

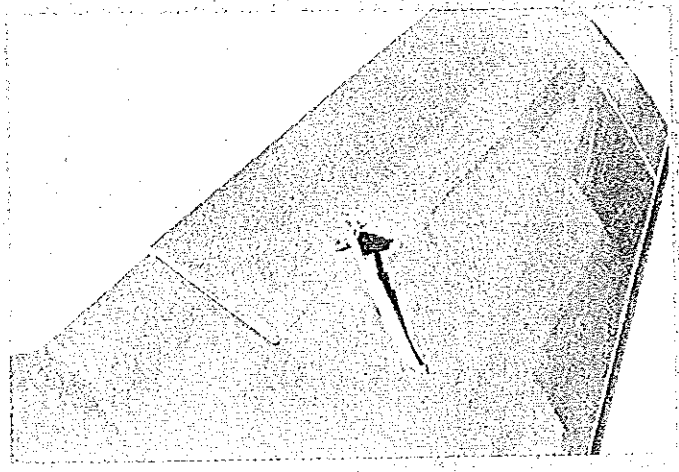
I have never in my life heard such a reaction from a modeling event audience. A mighty roar went up, then expressions of consternation, wonder, and finally, after they recognized what it was, applause. I did the formation loop, then the wide open barrel roll, then a split-S and high speed pass in front of the crowd, returned and landed. It took me 20 minutes to get back to my car through the gauntlet of photographers. . . .

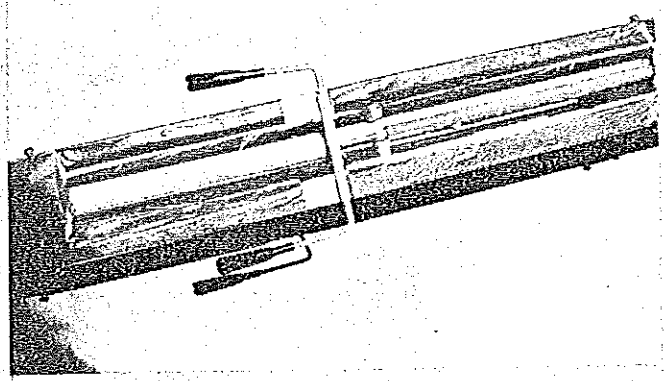
How to solve that problem? Couldn't move the CG back or the plane would wallow, and increasing the elevator movement wouldn't help. So, it had to be flying technique.

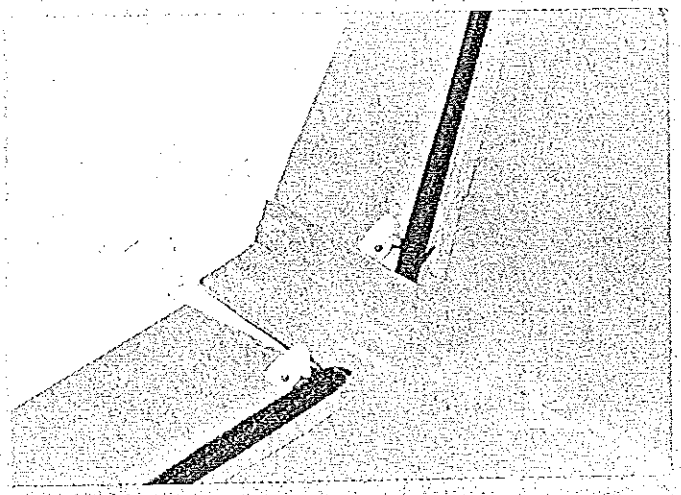
After more repairs, another test flight—and no change from the previous configuration, because it did fly well under power. But I kept the model high, and when the engine quit, I pushed down elevator and went into a dive at about a 30-degree angle, then, as the model came over the end of the runway, at about five feet of altitude, I pulled up elevator. The model flared, with the excess speed, and then slowed down rapidly, dropping onto the runway in a level attitude. The only problem, which occurred a couple of times later on, was that occasionally the engine would quit when there wasn't sufficient room to make the dive to a spot landing on the runway. The obvious answer was engine control.

Having proven the practicality of the concept, I designed the larger version expressly around the Max 10 for power. The Max 10 has an excellent speed range from idle to full throttle, and with that flexibility, landing the formation plane with a little throttle is merely a matter of establishing a sink rate on final approach, then applying a bit of up elevator. The slipstream hits the elevators, the plane flares

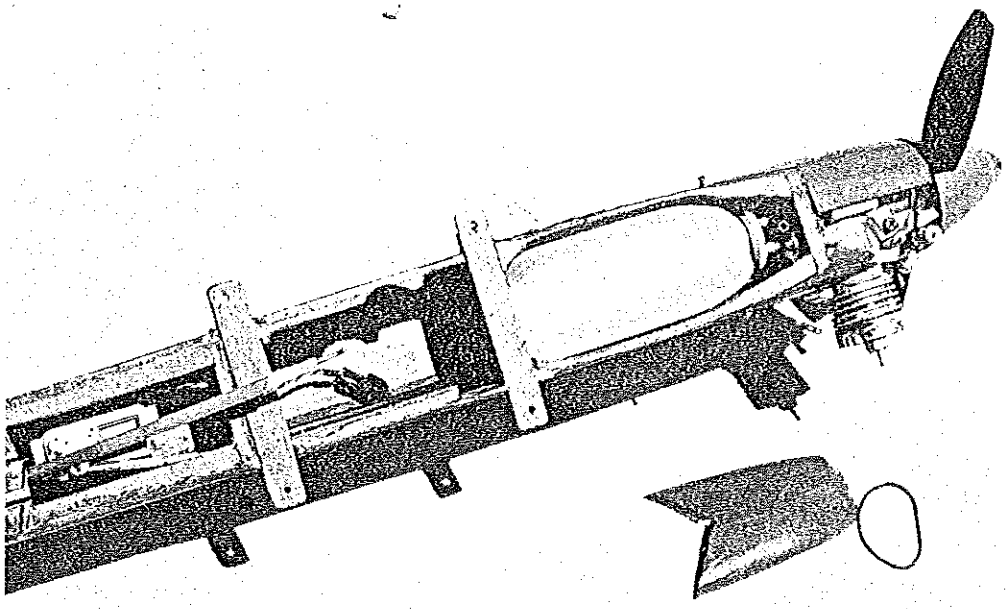




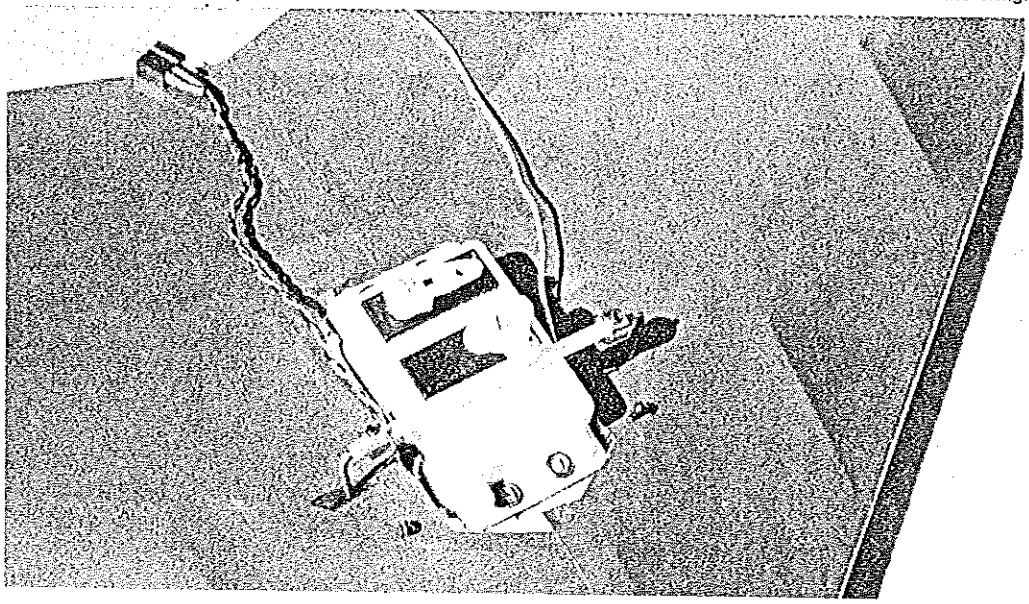




Clockwise from top, left: Detail of landing skid. Detail of left wing-man aileron connection—note MonoKote hinge. Bottom view of tail-plane wing control-surface horns; MonoKote hinge is on both top and bottom of hinge line. Detail of elevator control yoke installed in the rear plane—reinforcing plywood plate is installed later. Willard considered that "formation plane" was, in reality, a rhomboid wing—that helped.



Detail of the lead plane fuselage, showing engine, tank, radio compartment (between mounting sticks) and engine servo. Note Vee in tank compartment hatch which sits forward of the wing.



Cannon Supermini brick installed in lead wing. Nyrod connections—Z-bent wire coming up to top of brick—allow quick adjustment when length expands or contracts with temperature changes.

and lands nose high on the skid. In fact, with a bit of practice, you can make a skid landing, apply power, and make a touch and go.

The version shown in the plans also has slightly better lift characteristics, using the flat-bottomed airfoil. Once you get it trimmed out, it flies just like a sport plane under power. But you have to remember to keep a little power on for the landing if you want to grease it in.

The biggest problem in flying the Blue Birds is maintaining your orientation. The four fins can be very confusing to the eye, unless you keep them constantly under observation. It takes practice. More about that later.

The first public demonstration of the Blue Birds was at the Pioneers' World War II Scramble, at Hill Country Air Museum. We kept them out of sight, under a sheet in my station wagon, and drove to a secluded spot about 75 yards south of the spectator area, where I prepared them for flight out of sight of the crowd. By prearrangement, just prior to the Blue Birds, a ¼-scale PT-19 put on a demonstration. When he finished, the pilot flew it north of the grandstand and the announcer, Don Loughridge, kept the spectators' attention glued to the PT-19 by saying, "Watch it carefully. He will be performing a special maneuver." Meanwhile, to the south, I launched the Blue Birds away from the crowd (they couldn't hear the Max 10 with that Quadra growling away) and after getting about 250 feet of altitude, I brought the formation back towards the crowd. As I did, Don announced "We tried to get the Blue Angels to come to our meet, but they wouldn't promise—but, Look! Here they come!" And for all the world it looked just like the Blue Angels cruising over at about 6000 feet!

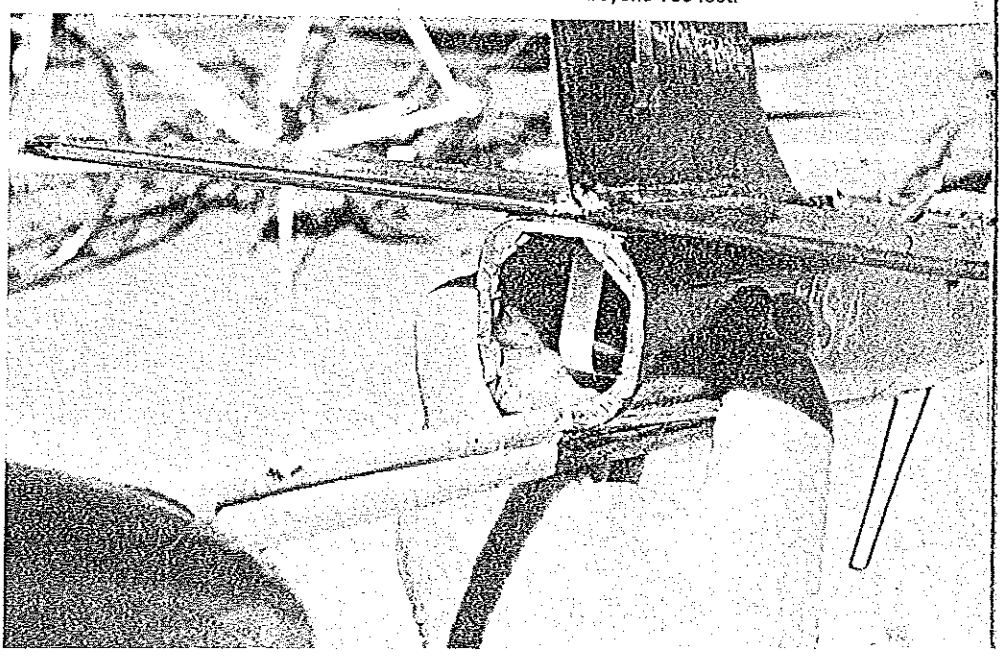
I have never in my life heard such a reaction from a modeling event audience. A mighty roar went up, then expressions of consternation, wonder, and finally, after they recognized what it was, applause. I did the formation loop, then the wide open barrel roll, then a split-S and high speed pass in front of the crowd, returned and landed. It took me 20 minutes to get back to my car through the gauntlet of photographers.

Since that time they have been flown at several events, but they are well known now, and you couldn't surprise the crowd. Even so, the Blue Birds are unquestionably the greatest crowd pleaser yet. So get yourself some wood, dowels, fiberglass rods and MonoKote, and put your own formation together. Admittedly it isn't easy, and certainly not for beginners, but it'll be the hit of your club shows.

The Blue Birds are not hard to build, but it is a bit tedious. There are some tricky phases.

Study the plans, and look at the construction photos. As you can see, basically you build four virtually identical aircraft, and then modify each one so that it can do

Tailend of lead plane, showing 5/16 dowel to rear plane, Nyrod to elevators, and battery pack below fin. Open fuselage end painted orange to simulate afterburner flame. The connecting fiberglass rods are painted with very pale blue enamel, so as to be invisible beyond 150 feet.



its assigned function. Those of you that are reasonably experienced can make whatever modifications you need to fit your own radio equipment—Kraft, Ace, Futaba, Litco, and other super-mini systems. I used the Cannon for two reasons: I like it, and I had one available while I was developing the concept.

Fuselages: Three of the fuselages—the two wingmen and "tailend Charlie"—are identical in basic structure. The triangular longerons are glued to the sides, slotted to receive the bulkheads, then joined together. Add the top and bottom sheeting and you have the familiar box fuselages, ready to have the nose blocks glued in place. Note there is no rear bulkhead; none is needed, and when you finish up and are ready to decorate, paint the opening at the back in brilliant orange to simulate full afterburners.

Note in the cross section view how the corners are rounded by taking advantage of the triangular stock. Leave the corners square underneath the wing and the stab on the top of the fuselage; it gives a better seating surface to attach the wing.

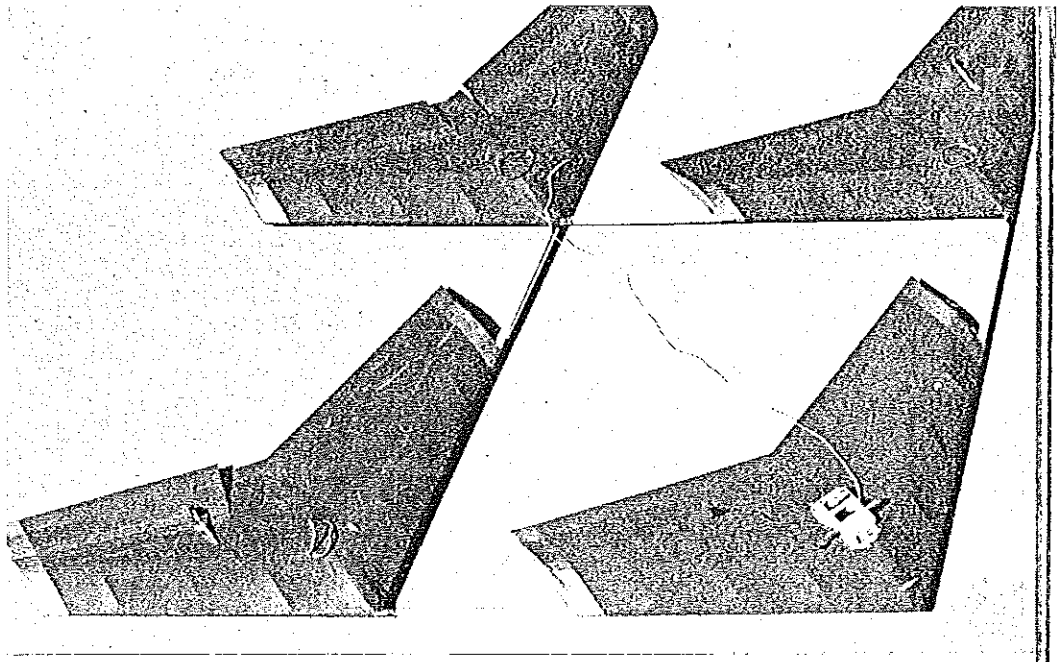
The lead plane fuselage is only slightly different, in that it has a 3/16" plywood firewall up front, and bulkheads #1 and #2 are spaced differently in order to accommodate the fuel tank and the radio. Also, there is no top sheeting forward of the trailing edge of the wing in order that access to the tank compartment and the engine servo compartment is readily available. As for the location of the battery pack, and how to install it there, it's a matter of sequence in construction. Leave the sheeting off the top, cut away the triangular stock as required to insert the battery pack, and after you have it installed, then sheet over it. Yes, the pack is "permanently" installed. The reason it is placed there is to help get some weight back towards the tail. My Blue Birds are so nose heavy that I am carrying two ounces of ballast attached to the end of the dowel which sticks out of the tail of the rear fuselage. It's understandable, when you note the location of the CG and consider the engine and fuel weight up there in front.

Leave until later the balsa block streamlining hatches which are forward of the wings, so they can be tailored to fit the wings and leading edges, which are all tied together to give the diamond structure.

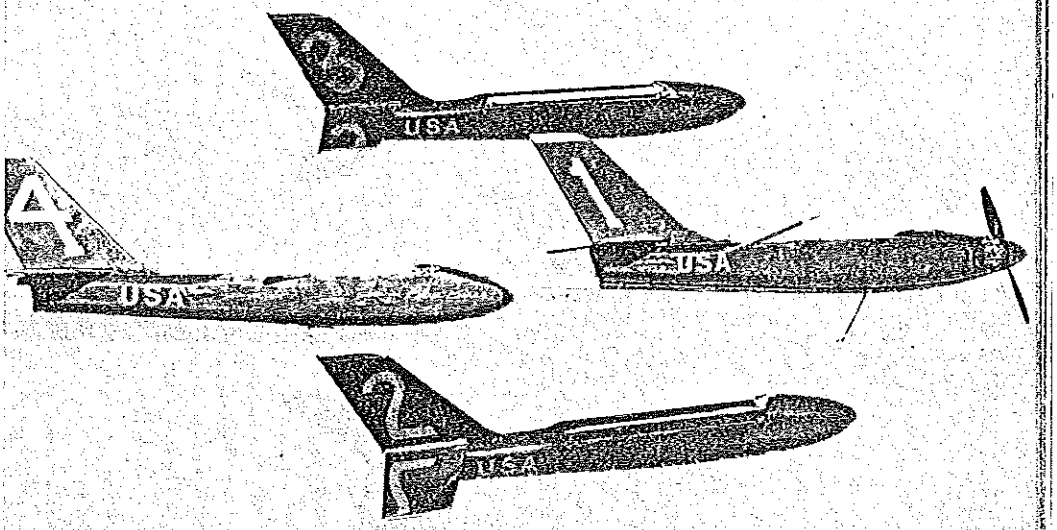
Tail Surfaces: Four identical stabs and fins are cut from the 1/8" balsa; the edges are sanded smooth and round.

Wings: Here's where we get into some rather tricky construction. Not in the wing structure, but in the manner in which the wings are joined for the formation diamond. There probably are many ways to do this, so if you think of a different one, go ahead. Here's the way I did it.

After cutting out the ribs and notching them for the spars and leading edge (round

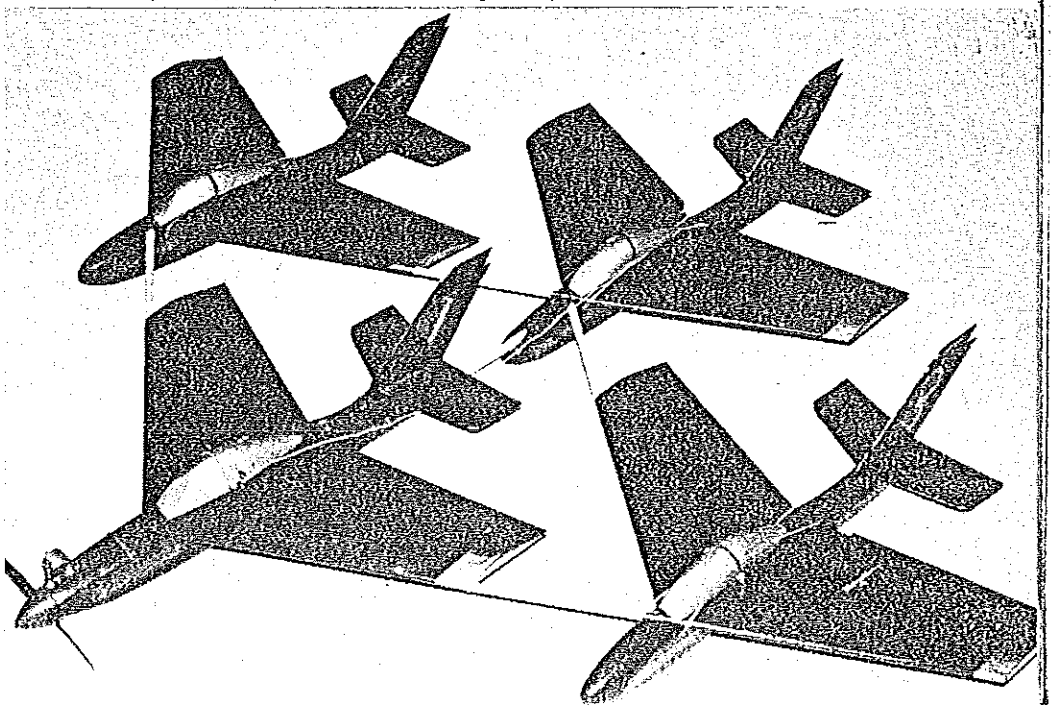


The wing assembly with fuselages removed. Aircraft surfaces are covered with basic Navy blue MonoKote with gold Trimstrip. Navy blue Trimstrip used for aileron and elevator hinges.



The four fuselages. No. 1 and 4 are connected with 5/16 dowel; No. 2 and 3 are held to the wing assembly with rubber bands. Anyone duplicating this project is advised to study text carefully.

The assembled Blue Birds ready for flights. With "tailend Charlie" in slightly nose-down attitude on plans, 12 degrees up is required for neutral setting—30 up and down from that neutral.



notch to fit the 5/16" fiberglass rods and dowels), I built four identical wings, except that the leading edges were not installed.

Next, I selected one wing for the lead plane, and added the required structure for mounting the Supermini Cannon brick, including the additional transverse spars behind the radio, the side supports for the radio, and the mounting structure as shown in the plans to attach the wing to the fuselage. I admit it is complicated and will require some ingenuity and study on your part, particularly if you use a different radio setup. As I said earlier, it is not a project for a beginner.

Next, after selecting a wing for the right wingman, left wingman, and tailend Charlie, each was modified to perform its function. On the right wingman, the outer wing aileron is cut apart from the first outboard rib, and an aileron is created by adding the structure as required. Note the slant of the leading edge of the aileron, and that of the new trailing edge of the wing, which provides the necessary angle for the aileron to have down movement clearance (the hinge line is on the top surface). That angle is depicted on the side view of tailend Charlie's wing.

Similarly, the left outboard wing of the left wingman is modified to add the left aileron.

The "ailerons" on tailend Charlie are slightly different in construction than those of the wingmen, extending inward further so the control links will be shorter where they extend out from the fuselage. That's to prevent the possibility of flutter, since these "ailerons" are actually the elevators of the formation.

Now you have four wings, each modified as needed to do its job. The next step is to join them together. This is accomplished by using the continuous leading edge technique.

Epoxy the 5/16" fiberglass rod leading edge to the lead plane's wing. Then, with the wingmen planes' wings properly spaced according to the plans, and the assembly setting on a flat surface, epoxy the fiberglass leading edge extension from the lead plane to the outboard leading edge notches of the wing planes. You'll need a big flat surface to do this.

Next, locate the inboard wing leading edge dowels on the wingmen planes, and where the extension of the dowels intersect, that is the apex of the leading edges of tailend Charlie's wing. Carefully notch the two dowels at that point to line up the tops and bottoms, and epoxy the intersection together.

This next step is one of the tricky parts of the building process. Block up the trailing edge of the rear plane's wing so it is one-half inch up from the flat surface on which the entire assembly rests. The block is placed only under the center ribs; it will cause the other ribs to lift away from the surface, not only at the trailing edge but,

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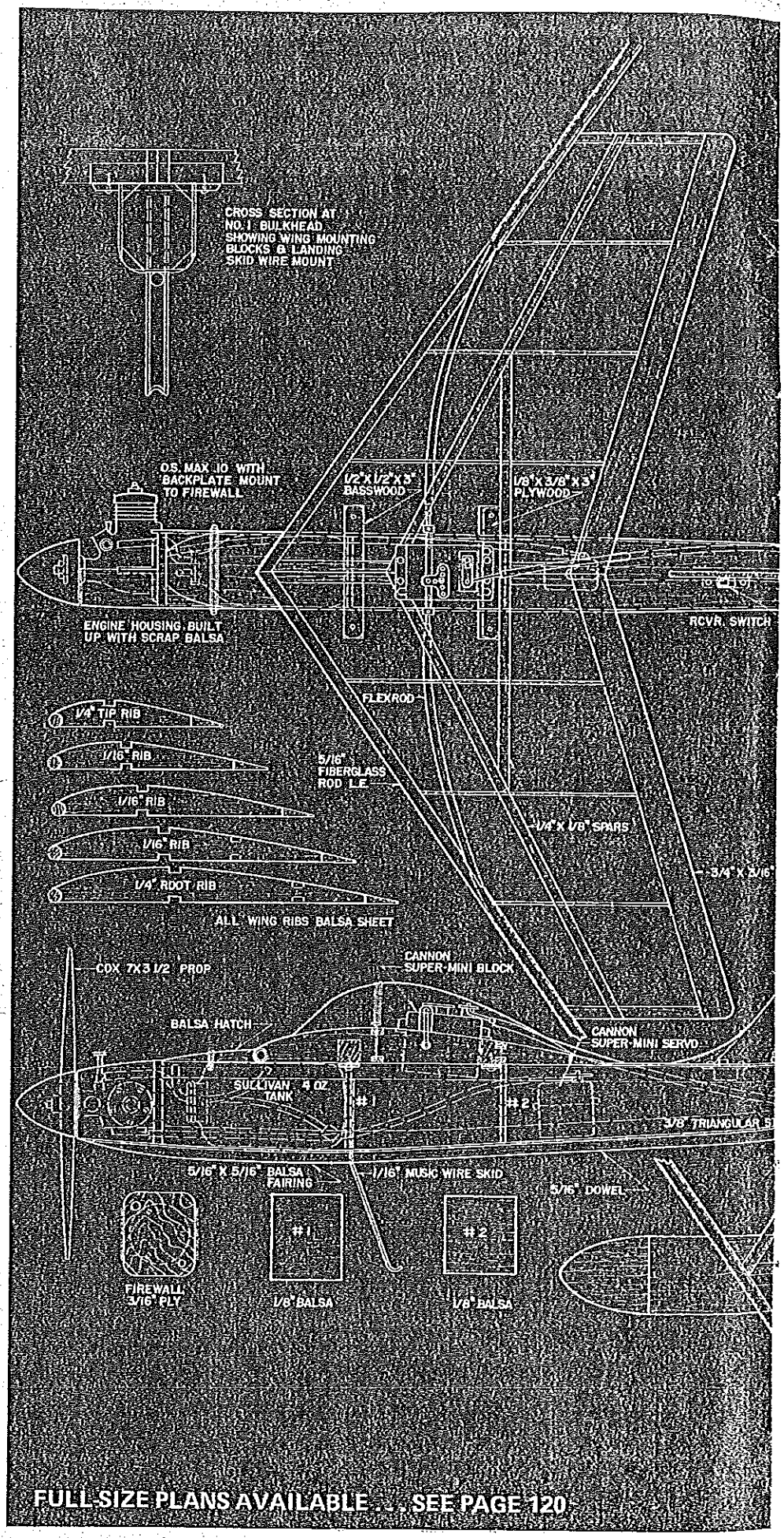
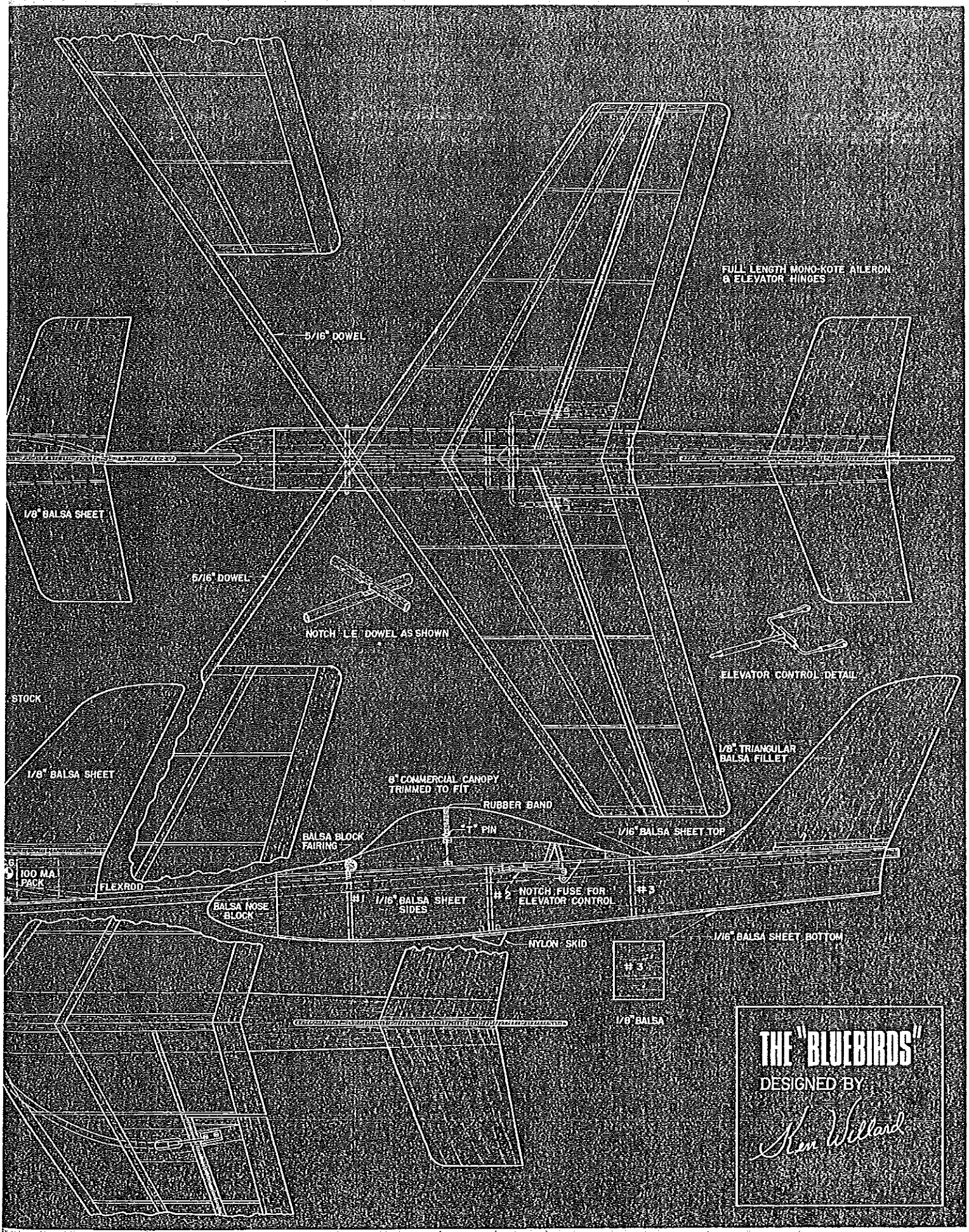


FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 120


FULL LENGTH MONO-KOTE AILERON & ELEVATOR HINGES
5/16" DOWEL
1/8" BALSA SHEET
5/16" DOWEL
NOTCH L.E. DOWEL AS SHOWN
ELEVATOR CONTROL DETAIL
STOCK
1/8" BALSA SHEET
1/8" TRIANGULAR BALSA FILLET
6" COMMERCIAL CANOPY TRIMMED TO FIT
RUBBER BAND
"T" PIN
1/16" BALSA SHEET TOP
BALSA BLOCK FAIRING
100 MA PACK
FLEXROD
BALSA NOSE BLOCK
#1
1/16" BALSA SHEET SIDES
#2
NOTCH FUSE FOR ELEVATOR CONTROL
#3
NYLON SKID
1/16" BALSA SHEET BOTTOM
#3
1/8" BALSA
THE "BLUEBIRDS"
DESIGNED BY:
Stan Willard

usually to the left. Adjusting for that circle—not too open, not too close or overbanked—is tougher with low wings which normally require a good bit more dihedral than is scale. You walk the edge between winding in to the left, or wandering off to the right as torque dies down, to wind in anyway. But it can be done and, if you wish the ultimate, you'll go low wing. (Don't try a low wing if you never built scale before.) But you don't have to—the great winning flights at Johnsville were made by a Stosser and a Chambermaid (both to appear in *Model Aviation*).

Covering is tissue. Models generally are tested and adjusted before painting. Dope usually is 50/50 nitrate. Covering lightly pre-stretched by water or alcohol spray. Painting generally is 50/50 nitrate tinted with Floquil railroad paint. Always use an airbrush. Models weigh between one and two ounces, less rubber.

All sorts of people fly these models, many whose first love is RC. It's a great way to expand one's horizon. At every flying session the enthusiasts appear astounded by what they are seeing—almost as if they can't believe it. F.O. doesn't believe it either—but, gosh, there it is.

Bill Winter

Blue Birds/Willard

continued from page 14

due to the sweep, at the leading edge as well, although not quite as far.

Now apply epoxy to the dowel leading edges of the rear plane, and to the rounded notches in the ribs where the dowel fits. By exerting slight pressure, you can bend the ribs down to meet the dowel, and press the dowel into the notches. Use five-minute epoxy, work fast but carefully, when you have the ribs and dowels notched together, hold them in place, *with the leading edge dowel resting on the flat surface,* until dry. Naturally, you will have covered the flat surface with wax paper for all this work, so the framework doesn't stick to the working surface.

After the assembly dries, and you let up on the pressure, the rear plane wing will spring slightly away from the surface due to the flexibility in the dowels. Don't worry about it; this springiness is retarded almost completely when the entire assembly is put together and the dowel leading from the lead plane back through the rear plane is installed.

Assembly: To begin the assembly of the formation, you must first locate the lead plane's wing on the fuselage, match the ⅛ × ⅜ × 3" plywood mounts—which are installed in the fuselage, with holes drilled for mounting screws—to the basswood mounting structure in the wing, and temporarily screw the wing in place.

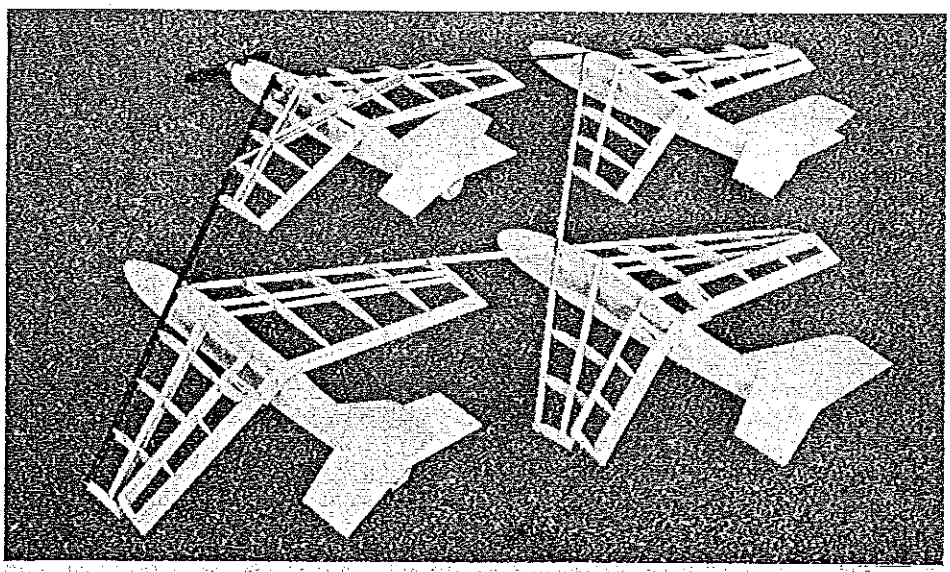
Next, cut holes in the nose block and bulkheads in the rear plane fuselage to accept the 5/16" dowel and the flexrod which runs along it, as shown. Be careful to maintain the alignment shown in the profile view, so the rear plane points slightly down in relation to the lead plane.

Note that the rear plane wing is held on the fuselage by rubber-bands which loop over little wood screws inserted in the sides at the bulkhead locations. Place the fuselage under the wing so the apex of the leading edge is properly located, and rubber band the two together fairly tightly. Run the dowel through the rear plane fuselage, out through the nose block, and forward along the centerline of the bottom sheeting of the lead plane. You may have to use a slight forcing action, but once you have the assembly properly lined up, epoxy the dowel in place.

Thus, the two fuselages of the lead plane and the rear plane really are the "fuselage structure" of the formation plane. The wingmen fuselages are for appearance purpose only, except for the vertical fins, which do serve a purpose in adding to the directional stability.

The connecting dowel between the lead plane and rear plane fuselages terminates at the location shown in the plans because that avoids the necessity of trying to bend it to the fuselage shape from there on forward. So, a balsa fairing is added to the forward part, since it can easily be cut to fit.

The wingmen fuselages are attached to the wing formation structure with rubber-bands in the same manner as the rear plane fuselage. With all fuselages in place, the streamlining balsa block fairings ahead of the wing can be glued in place and, when dry, they serve to align the fuselages properly to the dowels and the fiberglass lead-



Uncovered structure of the Blue Birds assembly—connecting dowel from lead plane to rear plane not installed. Willard finds orientation difficult in flight—those four fins!—and requires his helper to make transmitter trim changes so that he can maintain his concentration.

ing edges. Little block fairings are added behind the leading edges' extensions from the apex of the wing.

By now you will have noticed that when the wing assembly is fitted to the fuselages, it becomes fairly rigid in the longitudinal direction, since the structure is supported at four points (the leading edges and the trailing edges of the lead plane and rear plane) and strengthened by the longitudinal dowel. The tail surfaces can now be attached to the four fuselages, the wire landing gear skid epoxied in place, the rear nylon skid installed (also install nylon skids on the bottom of the wingmen fuselages, right at the back end of the fuselage, to keep them from getting scarred up when landing on asphalt), and the assembly is complete except for installation of engine and radio control mechanisms.

Engine Installation: This is somewhat of a builder's choice situation. In my case, I had a firewall backplate available to use with the Max 10, but regular engine mounts can be adapted. Be sure they are short ones that keep the engine as close to the firewall as possible, both for appearance and for balance. I prefer the backplate mounting because it is simpler.

The engine servo is mounted on servo tape on the bottom. As a precaution against it pulling loose, I also put a couple of drops of Hot Stuff between the tape and the bottom sheeting.

After you have tailored the flexible engine control rod to fit the engine control arm and the servo, you can build up the fuselage fairing forward of the firewall so that it houses the engine, allows access to the mounting bolts and control clevis, and fairs smoothly into the 1½" spinner on the Cox 7-3½ prop.

Receiver and Control Rod: If I were going to build another formation of Blue Birds, (and I plan to do so) I would use a different radio installation. It would consist of a small receiver in the fuselage compartment, just aft of the tank and bulkhead #1 in the lead plane. From that receiver, I would run long leads to servos which are individually mounted in the wings, just ahead of the surface they are to move, and connected directly to them. That type of mounting would eliminate one of the problems which I have to solve each time I fly the Blue Birds, namely, what will be the temperature, since the flexrods expand and contract, and change the surface settings. It's not serious, but you do have to consider it each time you fly.

So, if you have the design ingenuity to do it that way, I'd recommend it. But also, check with the manufacturer of your radio, because you may have to put a choke in the long leads to the servos. Don't ask me why; I don't know, but I am told that it's a good idea if the leads are over 15 inches long.

However, if you go ahead with a setup like mine, then study the plans and photos carefully, and you can see how the flexrods are inserted into the fiberglass leading edges, then exit just outboard of the wingmen fuselages, and curve around to attach to the aileron horn. A little bracing piece of balsa between the top and bottom spars will hold the curve in place.

The fitting on the receiver for the ends of the aileron flexrods is made by carefully drilling a small hole in the side of a short length of inner nyrod, then inserting a wire with a 90° bend in it, which sticks out and can be inserted through the hole in the servo control. At the ends of the aileron nyrods, a length of wire that has a Z-bend in it is inserted into the inner nyrod, and the other end is inserted into the short piece which is now attached to the servo arm. The length of the vertical section of the Z-bend is tailored to fit the distance from the end of the aileron nyrod up to the top surface of the Supermini brick. A wheel collar is used to affix the Z-bend wire to the proper location inside of the short length of nyrod. The end of the Z-bend wire, which is inserted into the aileron nyrod, is permanently attached by applying a drop of Hot Stuff.

The wheel collar method of holding the aileron nyrod Z-bend attachment in place has two useful features. It makes it easy to assemble and disassemble, and also, when temperature changes occur, it provides an easy way to adjust the length.

The nyrod which goes back to the elevators has to be carefully routed through the fuselage and past the battery pack, then epoxied to the top of the connecting dowel back to bulkhead #2 in the rear fuselage. There, similarly to the aileron servo attachment, a wire bent 90° is inserted through a hole in the side of a short length of inner nyrod, and, where that short nyrod exits through the slots in the sides of the rear fuselage, short Quiklink wire rods, with clevises, are cut to length, bent 90° to have about a ½" length of wire rod which can be inserted inside the nyrod. The assembly is stiffened by epoxying a small piece of 1/16" plywood at the T-joint. The photos don't show that; I added it later when I discovered that I had slight elevator flutter at high speed.

Covering: Here again it's a matter of builder's choice. I used Super MonoKote to cover the entire surfaces, then, for trim over the basic Navy blue, I used gold Trimstrip. That also made it easy to use Navy blue Trimstrip to make the aileron and elevator hinges. Finally, to make the connecting areas of the fiberglass rods and dowels as inconspicuous as possible, I mixed some light blue enamel with some white enamel, until they became a very pale blue color, and painted the rods. Thus, at a distance, the connecting rods fade into the sky background and are almost invisible at more than 150 foot distance.

Flying: If you're anything like me, you'll be nervous on that first flight. I really was lucky. The rains in California had made a lot of fields grow some of the lovely "long, tall grass" that old-time modelers so dearly love, and I was able to test glide and get a good elevator setting. I found that, with the CG located as it shows on the plans, even though tailend Charlie is in a slightly nose-down attitude, I still had to have about 12° of up elevator as the neutral setting. And the total throw should be about 30° up and 30° down from that neutral. Ailerons should also have at least 30° of throw.

On the first flight, have an experienced associate hand launch the Blue Birds for you. Then you can be ready to instantly correct for any tendency to either dive or climb too steeply, should it occur. If it does, then your associate can come back to you, and while you fly the formation, he can make the trim adjustments for you. Under no circumstances should you try to do it! You will find that the Blue Birds fly very well, once trimmed out, but you will also find that, unless you keep your eyes on them at all times, you will quickly get disoriented by the four fins, and won't know which way the formation is banking. Only when they are virtually overhead does this disorientation tendency diminish. I know—I found out the hard way.

After a few flights you will know what changes, if any, are needed in the amount of surface travel. Also, at some time when your engine idle is very reliable, you should get extra altitude and throttle back to get

an idea of the glide angle, and also the response rate to elevator. This will be valuable to you in the event you have an unexpected engine flame-out. Dead-stick landings are not easy when your wing is full of holes, which is essentially the case with the formation plane.

One more thing. The four-ounce tank is well ahead of the CG, so the Blue Birds get a bit tailheavy if you fly the tank dry. No problem, but be ready for the trim change. I avoid it by usually only flying about two ounces worth.

You'll probably cuss me at times as you try to figure out some of the less obvious construction features, but go ahead. Persevere.

You'll be the hit of the show with your Blue Birds.

RC Technique/Myers

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engine. Discussed above.

4. *Plan your landing before you take off.* This is so obvious that you have to wonder why landings are the one maneuver that nearly everyone does poorly. You can see the jaw muscles tighten and the eyes go all squinty when an engine stops unexpectedly in flight. "Now, how do I get out of this?" seems to be the first thought in many heads. Sure, we all are aware that most airplane accidents happen in the vicinity of the runway, but that's no reason to panic. "A glider is easier to land than a powered plane" is another of my aphorisms. It gives the student confidence that he can land safely. "Concentrate on keeping the wings level." With that simple instruction foremost in his mind, most students make good landings *without even being aware of the fact that the plane has stopped moving.*

Spot landings are another matter, but like learning to shoot a gun, the first thing to do is get all your shots in one part of the target. Once that happens, it's quite easy to move the group over into the Bullseye.

CORRECTIONS

In the September issue, "Wing Sox" transportation bags by GBS Enterprises, were referred to as "Wind Sox." We regret the error.

In the October issue, page 60, center photo, Keith Clodfelter was erroneously identified as James Duckworth.

In the November issue, the Wildcat RC scale model was described in the article subhead as requiring a Pee Wee .02, although text, plan, and cutaway drawing all said "TD." TD it is—there's a world of difference.

In the November issue Nats RC Pattern report, the references to Tony Bonetti were intended to mean that his flying skill is better than ever. Our apologies to Tony and anyone else who may have felt that something else was meant. Tony has an enviable track record in Pattern competitons.

That's enough for this month. Keep the letters coming!

George Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.

Misfit/Randolph

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where ribs R2 are located, pin a piece of scrap 1/16 sheet between the trailing edge and the main spar. This is to hold rib R2 up from the plans, so when the 1/16 bottom sheeting is added later it will be flush. Glue the first regular rib near the center of the wing in place over the plan, and glue one of the plywood webs to it and the spar on its outboard side. The webbing makes an excellent spacer and assures that the ribs are perpendicular to the spar as well.

Continue adding ribs and webs out to the tip; there is no web between the last few tip ribs. After all ribs are in place glue in the top main spar. Be sure it is in good contact with the webs as well as the ribs. Glue a plywood web inboard of the first regular rib installed near the center section, and slide on the first R2 and glue it in place. Glue the top front spar in place and bevel the 1/8 sq. at the trailing edge to receive the top trailing sheet and glue it in place. The other half of the wing is assembled in the same sequence.

When both wing halves have been assembled, bevel the spars, leading and trailing edges where they will be joined to