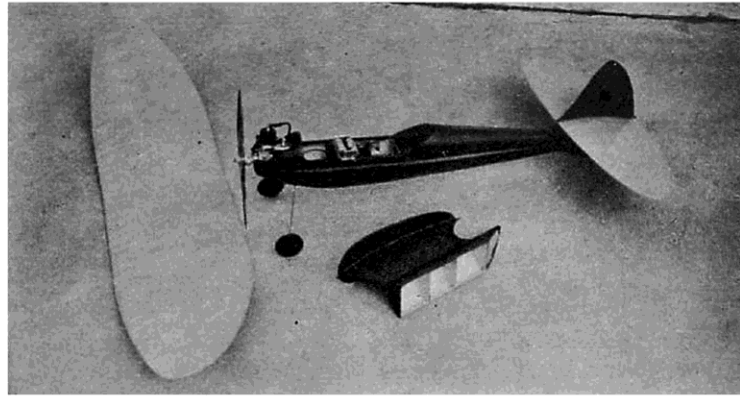


# THE ARROW

Champion A job of the Nationals, it flew 47:32 to set a national record. It's a winner, Class A or B.



Wing mounting pylon detaches from fuselage, giving easy access to batteries and timer.



Bill Gibson and the Arrow, after the winning flight at Chicago. Right—With Modelcraft perpetual trophy.

**E**SSENTIALLY the Arrow, like many planes, is not a completely original design. It is composed of the better elements of several planes which the designer has built and flown. Plans for the Arrow were first drawn in early December, 1939, and the original ship was finished late that month. As a matter of fact, the first test flight was made on a local golf course on the day before Christmas. The results of this flight indicated that we had all and more than we had expected on paper. The plane has a fast spiraling climb, and a slow soaring glide. The glide comes as a result of the ample wing area of approximately 392 square inches. The ship is quite strong and will stand the worst kind of contest flying. As an example, the original, built by Francis S. Beeler, has been flown all summer and is still in excellent condition, with its original covering still intact. Beeler has flown his ship in six contests, and according to their order, has taken the following places: two thirds, one second, one fourth, and two firsts. At the time of writing, the last contest he flew the plane in was at Chillicothe, Ohio, where the plane finally flew out of sight after a time of about six and one half minutes. His total time that day, for first place, was a little under eleven minutes. The plane was recovered three days later, having landed twenty-seven miles from the contest field, and was absolutely intact. All of these flights were in Class A, with an Ohlsson "19" for power. Beeler flew the plane once in Class B, using an Ohlsson "23" and took first place with a total time of about sixteen minutes.

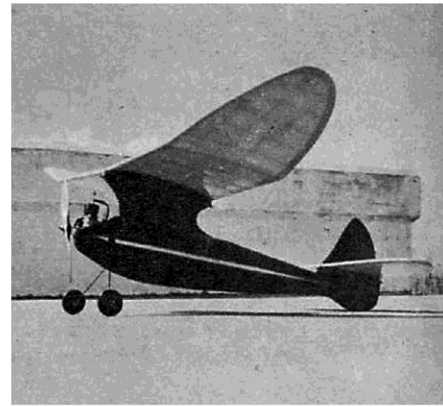
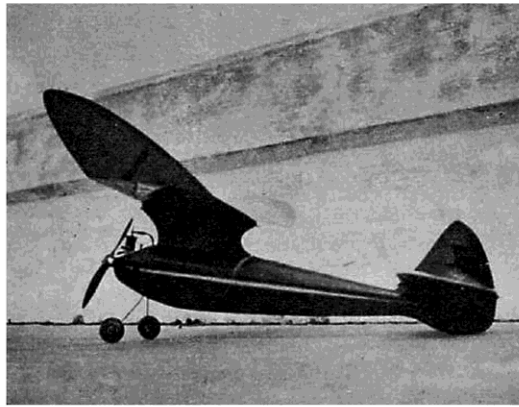
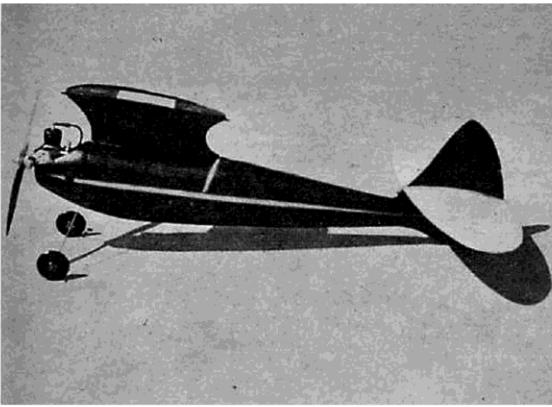
William Gibson, who has really done more with the plane than Beeler, has built several models of the original and has flown them in both Class A and Class B events, using Ohlssons "19" and "23" for power. In Class A he has won three firsts, one second and three thirds. In Class B, Gibson has always placed well up in the money in all contests. His most notable achievement with the plane was his remarkable flight at the Chicago Nationals, where he won the Class A open event. For forty-seven minutes and thirty-two seconds the plane soared around in view of the timers and finally came to rest at a point about seven miles from the field. This flight not only won the Modelcraft Trophy for Gibson, but established a new record for Class A flights.

On Sunday, August 11th, Gibson released his plane for his first Class B flight. After six minutes, the plane passed from the sight of the timers and was not recovered.

Amplly tried and tested, this plane is offered for your use with the suggestion that instructions be strictly followed.

## CONSTRUCTION

First cut out all of the body formers for the bottom half of the fuselage from  $\frac{1}{8}$ " sheet balsa. Glue a strip of  $\frac{1}{16} \times \frac{3}{16}$ " piece of hard balsa across the top of all open formers. Cut out the fire wall from  $\frac{3}{16}$ " three-ply white pine or birch. Pine is better because it is lighter. Notch all formers and the fire wall as shown on plan.



Left—With wing pylon in place. Center and right—The completed model, ready for first official. Its 392 sq. in. wing area affords exceptional glide. Climb is fast spiral.

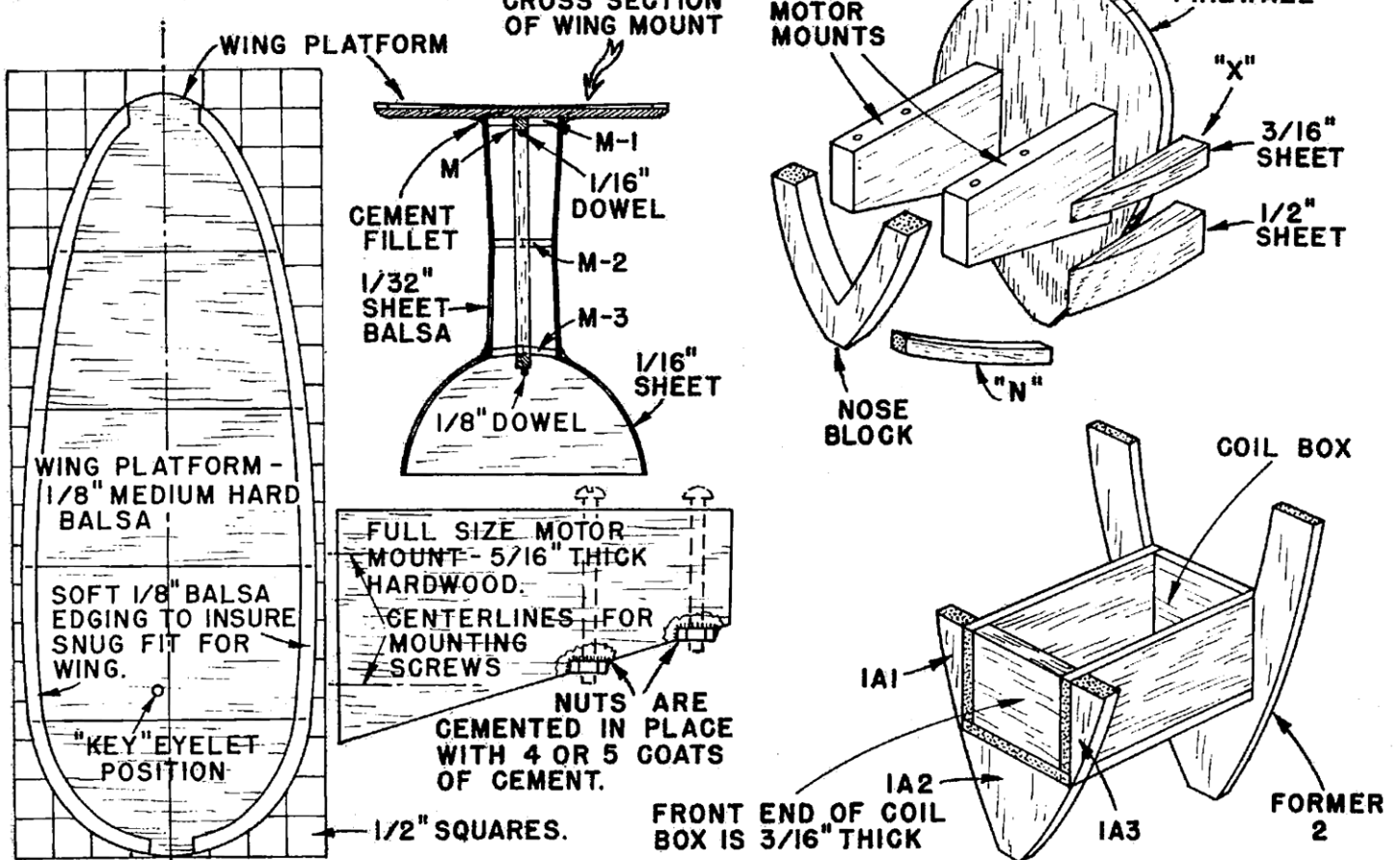
## BY WILLIAM GIBSON AND FRANCIS S BEELER

Attach the  $\frac{5}{16}$ " bass motor blocks by using flat-head wood screws that are countersunk into the fire wall. Before screwing the blocks on, place plenty of glue on the joint. It is also well to screw the screws in about three quarters of their length, then remove them, fill the holes with glue, and then tighten the screws. It is best to use one-inch screws that are fairly narrow. Put two or three coats of glue around the joint on the wall. Attach the landing gear wire to fire wall. Use  $\frac{5}{64}$ " or  $\frac{3}{32}$ " music wire for the landing gear. The lighter wire is preferred. Drill the motor mounts for your motor. The width of the mounts and the holes shown are for either an Ohlsson "19" or an Ohlsson "23" motor. Glue nuts on the bottoms of the holes. Use three or four coats of glue. The screws can then be removed at will. Although it is not nec-

essary to draw up complete three-views of the fuselage, it will be necessary to draw a top view with correct former spacings.

Next, take the top view of the fuselage and crease the plan along the line which indicates the back of the fire wall. (Former 1.) Secure a flat board, about three feet long, and place the top view of the fuselage on this board so that the crease along Former 1 is *exactly* perpendicular to the center line drawn through the middle of the top view and also is against the squared-off end of the board. Cover the plan with wax paper and pin the  $\frac{3}{16}$ " square longerons to the board and in the position shown. We recommend that you soak the longerons in water before pinning them. Slip the fire wall, upside down, onto the longerons and tack the fire wall to the end of the board with two thin (Turn to page 42)

### PLANS BY PAUL PLECAN



# The Arrow

(Continued from page 26)

brads in order to hold it in position. Use a T square and be sure that the fire wall is mounted absolutely straight up and down and straight across. Cut the ends of the longerons and fit them to the motor blocks as shown. Before gluing them, glue a piece of  $\frac{3}{16}$ " scrap sheet, cut to shape, in the space between the longeron and the motor blocks. Then glue to longerons, to these pieces, and to the motor blocks. Glue pieces of  $\frac{1}{2}$ " square balsa along the motor blocks, below the longeron (as shown on plan) and cut and sand to shape. Cut the nose block, making an opening to fit your motor, and glue to end of motor blocks.

Glue all formers to longerons as shown on plan. Then glue the bottom longeron of  $\frac{3}{16}$ " square balsa along the bottom of each former. Glue Former N from fire wall to nose block. Glue R1 in place. Formers 1A1-1A2 and 1A3 are not glued in until later.

Remove pins that hold one side of longerons and glue a piece of  $\frac{1}{16}$ " soft sheet balsa, four inches wide, to the side of the body. This piece runs from the center of the fire wall to the center of Former 4. Glue a piece of the same sheet from the center of the fire wall to the nose block. Then glue a piece of  $\frac{1}{32}$ " sheet, 4" wide, from the center of Former 4 to the center of Former 8. Do not glue  $\frac{1}{32}$ " sheet on the bottom rudder until you have covered the other side of the fuselage as last described. Then glue the balsa covering along the edge of the bottom longeron. Then remove the pins from the other longeron, and cover the other side of the fuselage as you covered the first side. Trim off excess balsa from the edge of the bottom or keel longeron. Cover the body from Former 8 to the front edge of S2 with one piece of  $\frac{1}{32}$ " sheet balsa. This piece covers R1 and forms part of the bottom rudder. As quickly as you can, cover the opposite side of the fuselage in the same manner, making sure that the rudder lines up properly. All sheets can be held with pins until the glue has dried. The writer neglected to mention that all sheet should run *only* to the center of the longerons along the middle of the body. This will leave a lap for gluing the top sheeting.

As soon as the glue has set well, remove the fuselage from the board by first pulling the brads holding the fire wall. Check the fuselage and be sure it is in perfect alignment. If it is not, soak it in hot water, place it on a flat surface, weight it down and allow it to dry at least twelve hours.

Next build the entire wing-mount section as indicated on the plan and fit it carefully to the fuselage. Be sure that the peg which goes through the fire wall fits tightly and does not allow the wing mount to move in front. Cover the vertical part of the wing mount with  $\frac{1}{32}$ " sheet. Then cover the rounded part of the mount with soft  $\frac{1}{16}$ " sheet.

Glue Formers 5AT and 5T in place and be sure that Former 5AT fits flat against Former 5A on the wing mount. Glue the rest of the body

formers in place. Glue Former S in place and follow this by gluing Former S1 in place. Glue tail-mount pegs in place, using plenty of glue to hold them. Cover top of body, one half at a time, with  $\frac{1}{32}$ " soft sheet from Former 5AT to Former 8T. Also cover with  $\frac{1}{32}$ " sheet from Former 9T to S2. This sheet runs from middle of side longerons to top of Former S. Glue tail-mount platform in place.

Glue  $\frac{1}{16}$ " round birch dowel in place along Former 4 as indicated, for holding wing-platform rubber bands. This dowel runs through entire fuselage. Glue 1A1, 1A2, and 1A3 in place. Build coil box and glue in place. Glue in strip of  $\frac{1}{8}$ " hard sheet after having attached battery box to it. Wire motor according to standard hook-up, but leave unattached wire for wiring to flight timer. The timer is used for balancing and does not go in until entire plane is finished, including covering and doping. Booster points are not indicated on the plan, this being left to the modeler's own choice and judgment.

Cover the fuselage and wing mount with silk, wet and shrink. Give the same no more than two coats of colored dope. Be sure to coat the motor blocks, fire wall and inside of the nose with two or three coats of dope.

The sheet  $\frac{1}{16}$ " balsa, covering the top part of the nose, is attached last and should be cut out to fit your motor. Cover this with silk and dope inside and out with two coats of colored dope.

In making the wing, cut out W1, W2, W3, and W4 from  $\frac{3}{16}$ " medium-hard sheet balsa. Glue W2 and W3 together. Place wing plan on a flat surface, cover with wax paper and pin W1, W2, and W3 in place. Place a piece of  $\frac{1}{32}$ " scrap balsa under trailing edge of wing at each notch in trailing edge. Do not extend the  $\frac{1}{32}$ " scrap back more than  $\frac{1}{8}$ " under the trailing edge. This scrap piece is used to maintain the undercamber of the airfoil. Next soak the leading edges in hot water and pin in place on the plan. Bevel the edge of W4, where it joins the leading edge and W3, in order to secure a good fit, and glue it in place. Glue Ribs 7, 8, 9, 10 and 11 to the leading and trailing edges. When glue is dry, slip spars in place and glue well. Glue Ribs 2, 3, 4 and 5 in place. Slip spars in place and glue well. Be sure all spars do not extend below the bottom of the ribs as this would spoil the contour of the airfoil. Remove pins that hold the tip end of the wing to the working surface and lift it off the plan. File or sand the leading and trailing edges and tip of this section, to proper airfoil shape as indicated by the plan. With the aid of blocks, place the tip section in place with the tip itself raised 3" from the working surface. Cut the ends of the spars, where they are glued to the center-section spars, so that Rib 6 will fit flush against the ends of the tip spars and will also be perpendicular to the working surface. Also level the leading and trailing-edge joints to secure a good fit. Glue the tip section to the center section,

using plenty of glue, and allow to dry well before removing from plan. After the wing half has dried and been removed from the plan, glue the bracing strip in place behind the joint of the center and tip sections, where the leading edges join. Glue Rib 6 in place. Sand or file the leading edge and trailing edge of the center section to proper shape. Glue False Ribs D and E in place. Place wing on a flat surface and check for warp. If there is any warp, soak the wing in hot water, place on flat surface and hold down with weights. Allow twelve hours for drying. This will remove any warp.

Build the other half of the wing in exactly the same fashion as above outlined. When the two halves are completed, they can be joined in the center. In this place, the spars are overlapped by pushing the two spars on one half of the wing inside of the two spars on the other half of the wing. Try this first one way and then the other in order to determine which combination brings the leading and trailing-edge joints together for the best fit. Bevel the spar tips and leading and trailing-edge tips to secure a perfect fit. Pin one side of the wing to a flat working surface, place the other half in position and use blocks to raise the other half of the wing two inches above the working surface at the point where the polyhedral begins. Be *positive* that at this point both the leading and trailing edges are exactly two inches above the working surface. This will insure a level wing without warp. Glue the wing well at the center and allow several hours for drying. Remove wing from working surface and glue in braces along leading and trailing edges where they join in the center. Sand all joints to proper shape. Glue Rib 1 in place. With fine sandpaper, *carefully* sand the top and bottom edges of Ribs 2 and Rib 1 down about  $\frac{1}{32}$ ". Glue pieces of  $\frac{1}{32}$ " sheet balsa across center section between Ribs 2. This sheeting should be glued to the bottom first. It runs, with the grain crosswise to the ribs, from Rib 1 to Rib 2 on each half. Glue in the piece of birch dowel which is used as a key. This piece extends out of the bottom of the wing about  $\frac{1}{8}$ ". Then cover the top of the center section with  $\frac{1}{32}$ " sheet balsa. Sand this covering until it is smooth.

We recommend covering the wing with Silkspan as it is light and strong. Cover the bottom of the wing first and be sure that the paper is glued to each rib in order to maintain the undercamber of the airfoil. The grain of the paper should run from tip to tip. Dampen the paper, one half at a time, and place on flat surface with weights until dry. Then do the same for the other half. Dope each half, one side at a time, and weight on flat surface while drying. Do not give the wings more than two coats of dope. This method of weighting the wings, while it takes longer, will insure a flat wing when you are finished. When the bottom half of the wing is covered and doped, then cover and dope the top half in the same manner, except that you do not have to glue the papers to each rib. The finished wing should not weigh over four ounces.

(Turn to page 45)

After finishing the wing, it should be placed upon the wing-mount platform, carefully aligned, and an eyelet glued into the wing-mount platform to hold the birch key. The writer used only one key and aligned the wing after each flight. Glue pieces of balsa along the edge of the wing-mount platform and sand to the shape of the wing undercamber. Be sure to secure a snug fit for the wing on the platform. Also be sure that both the trailing edge and the leading edge are resting on the platform. The use of balsa strips along the edge of the platform increases its strength and prevents splitting.

The stabilizer is of conventional construction and uses a modified "Clark Y" airfoil. It is of large area and is extremely effective.

Place the plan on the working surface and cover with wax paper. Glue the trailing-edge parts together on the plan, holding them down with pins. The leading edge is one piece of medium-hard  $\frac{1}{4}$ " square balsa. Soak it well in hot water, knead with your fingers to approximate shape, and glue in place. Hold it on the surface with pins. It is an excellent idea to put a coat of glue along the inside edge of this piece, as this will reduce pull and warping tendency. Glue the tapered spar in place. Glue all ribs in place. When the glue has dried for at least six hours, remove stabilizer from plan and glue a piece of  $\frac{1}{32}$ " sheet, in one piece, from the leading edge to the back of the trailing edge and between the No. 2 ribs on the stabilizer. The piece of sheet is glued on the bottom of the ribs. Glue the tail key of the  $\frac{1}{8}$ " round birch dowel in place, extending about  $\frac{1}{8}$ " below the surface. There are two pieces of  $\frac{1}{16} \times \frac{3}{16}$ " balsa which run along the joint where the rudder is glued on top of Rib 1. These pieces should not be glued in place until after the rudder is glued onto Rib 1. The pieces run from the leading edge to the trailing edge, add strength to the rudder mount and also provide a place for attaching the covering. Sand the edges to proper airfoil shape.

The rudder is of conventional construction and needs little in the way of construction hints. Glue the outline (R1-R2 and R3) together on the plan. Allow glue to dry. The airfoil is streamlined and is formed by gluing  $\frac{1}{16}$ " balsa strip on each side of the  $\frac{3}{16}$ " square spar. We suggest that you glue the spar to the top of the rudder and at the same time glue the bottom strips in place, holding them with pins. Be sure to glue both strips (i. e., on each side) at the same time. Then glue the remaining strips in place. Cut the rudder tab out of light sheet aluminum. Bend the hinges so that two fall on one side of the trailing edge of the rudder, and the middle one falls on the other side of the trailing edge. The rudder should be sanded to streamline shape before gluing the tab in place. Glue the finished rudder on top of Rib 1 on the stabilizer after gluing the two  $\frac{1}{10} \times \frac{3}{16}$ " strips, mentioned above, in place. Place the stabilizer on the fuselage platform,

align the rudder perfectly and mark the key position. Glue an eyelet at that point and on the stabilizer platform. Next, holding the rudder in perfect position, turn the fuselage over and carefully mark a line with a pencil on the bottom of the stabilizer and along the rear edge of its platform. Remove stabilizer from fuselage and glue a small piece of  $\frac{1}{8}$ " square hard scrap balsa along each side of the stabilizer, at the point indicated by the pencil marks. The pieces will key the stabilizer in place.

Cover the bottom of the stabilizer with Silkspan. Shrink and give no more than two coats of dope. Be sure there is no warp. Cover the top of stabilizer and the rudder with tissue. Shrink and give two coats of dope.

When the entire plane has been completely finished, doped, wired, motor placed, batteries in sockets, and everything made ready for flight, with the exception of the flight timer, carefully balance the plane at the exact center of the wing—fifty-percent point of wing chord. By balance, we mean with the thrust line horizontal to the floor. Reach this point of balance by moving the flight timer around inside the fuselage until you have it in the proper place. Then mount it at this point. Your plane, finished, should weigh from twenty-two to twenty-four ounces.

## FLYING

Take the plane to an open smooth field, where you have plenty of room. You can, if you wish, try gliding it by pointing the nose at a spot about sixty feet ahead of you on the ground and give it a firm shove—into the wind. If you have balanced according to instructions, the plane will ride out with a slight tendency to nose up. Here is an unusual statement. If you have built this plane according to instructions, have the rudder set in a neutral position, you can open your motor wide for a test flight. Obviously you probably will not have perfect adjustment on the first flight, but this model will not spiral into the ground. It is extremely stable and will pull out of almost any bad position.

With your rudder set in a neutral position, make your first flight and observe the climb under power, and the glide. The climb should be in a slow spiral—either right or left. If the climb is too straight and the model hangs on the prop, move the tab very slightly either right or left until you have obtained a proper climb. If, after the motor cuts off, the plane glides straight, it should have a tendency to dip a little. This indicates proper balance. Subsequent rudder tab adjustments to cause the model to circle either right or left in about four-hundred-foot circles will eliminate this dip.

With respect to motors, this plane operates best with the Ohlsson "19" or motors of like bore and stroke. The smaller bore Class A motors will not bring out its peak performance because of insufficient power. An Ohlsson "23" takes it up like a skyrocket.