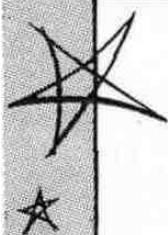
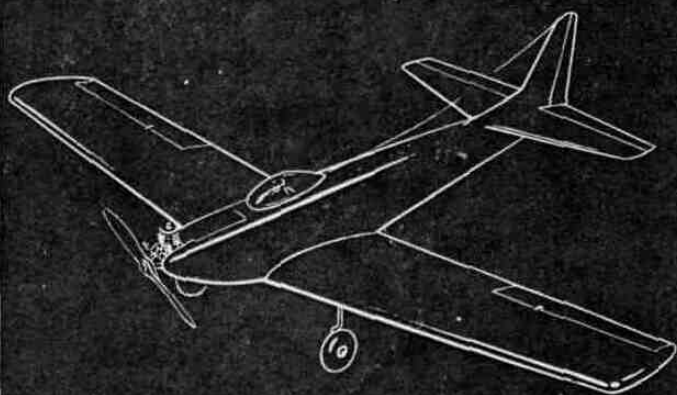


# ORION



## ASSEMBLY and OPERATING *Manual*



TOP FLITE MODELS, INC. 2635 South Wabash Avenue,  
Chicago, Ill., U.S.A.

# ORION

You have just purchased the finest R/C kit ever produced. We have put the best materials available into your kit plus **over** 16 years of model airplane manufacturing know-how.

Since you are a special kind of model enthusiast whose standards are high, we have produced this kit with your particular requirements in mind.

We hope you enjoy building and flying the Orion and would be pleased to hear your comments on how we at Top Flite can continue to serve you.

**TOP FLITE MODELS, INC.**

The designer says . . . . .

The Orion was designed and developed especially for contest work. For a complete run-down on some of the design features refer to the June, 1960 issue of Model Airplane News.

This kit is the most advanced and complete R/C kit produced to date. It is exactly as the original model with a few improvements. In a high performance contest model good workmanship is essential. Most important of all, flying surfaces must be true – more on this later. The ship should be flown with a minimum of eight channels, and not rudder only.

At this writing the prototype has had a full season of contest flying with no weak points showing up.

In spite of the advanced design the Orion is simple to build.

## HINTS ON GLUING

Glue joints are important — use your favorite glue. Cut 2 pieces of scrap balsa 1/8 x 1 x 2 for test bars. Glue these pieces together thus giving two square inches of glue area. When dry, try pulling apart to test your gluing technique. Double gluing is recommended on all highly stressed joints such as doublers, motor mounts, joining the wing halves, stab and rudder attachment, landing gear installation, etc.

White glue, such as "Elmer's", is recommended for plywood and the hardwood motor mounts. Good gluing will pay off in performance.

## FUSE, STAB, ELEVATORS & RUDDER

**Before** starting construction study plan carefully to become familiar with all the parts. It is recommended that the fuselage construction be started first. The fuse need not be built over the plan.

1. Pin the two fuse sides together and lay on the plan to transfer location of all formers and the thrust line. Using a ball point pen mark these locations on the edges of the fuse sides. These lines should be transferred accurately to insure good alignment. The fuse sides may now be taken apart and the thrust line marked the full length on both sides of the fuse sheets — make one left and one right. This **is** important **as** the thrust line is used **to line up the doublers and later** to check out the decolage.
2. Using the thrust line as a guide, glue down 3/32 balsa doublers F-2, F-3, F-4, F-5, F-6 and F-6A. When dry sand flat to insure good gluing surface for motor support blocks and motor mounts.
3. Trim ends of triangular longerons to length and glue to sides, top and bottom. Glue on parts F-14, F-15 and F-16.
4. Cement engine mounts and motor support blocks to fuse sides leaving a 3/32 space from the top longerons for former F-7. Glue on servo rails. Attach plywood parts F-10, F-11 and F-12.
5. Glue formers F-7, F-8 and F-13 to one fuse side making sure they are square and true. After these are dry the two fuse sides are ready (or joining. They should be joined while lying on the ir sides.
6. After the fuse is dry set it up vertically. Then draw the ends of the tail cone together and glue in tail post F-17. If difficulty is experienced in pulling the tail cone together, the top triangular longeron may be saw cut slightly or notched just behind F-8 for easy bending.

It is important that the tail cone be pulled together true. This may be checked by stringing a line from the center of F-7 to the center of tail post F-17 and measuring at intervals along the tail cone.

7. Formers F-18, F-19, F-20 and F-21 may now be glued in place. Glue in 3/16 x 1/4 bottom center longeron. When dry, run a sanding block along the top of the fuse to insure a good contact for top block. Shaped top block may now be glued in place. Sheet bottom of fuse.
8. Shaped top nose blocks are next attached. A piece of 1/4 sheet is joined to top nose blocks in front of F-13. Glue hatch jams in place and cut out top hatch block. At this point all other blocks may be glued in place. Be sure to drill the engine mounts and install the blind nuts before attaching the bottom nose block in place.
9. During drying periods on the fuse, construction on the stab should proceed. Stab should be built over the plan. Use a piece of waxed paper over the plan so that the glue will not stick to it. It is important that stab be built on an absolutely flat surface. (See suggested method under WING section.)
10. Pin shaped stab, leading and trailing edges and 5/16 tips to plan. Glue plywood braces in place. Glue all 3/32 x 5/16 diagonal ribs in place. Glue on top spar and die-cut center section planking. When dry remove stab from plan and glue on bottom spar and planking. After sanding stab, bevel diagonal ribs near leading and trailing edges as shown on plan. Cover with silk leaving center section uncovered where stab **attaches** to fuse.

Sand elevators to shape. Cover with silk.

Assemble fin by gluing R1, F1A and R2 **down on a flat surface**. Do likewise for rudder pieces R3 and **R3A**. When dry sand to shape.

The stab on the ORION is glued permanently **in place**. Be sure to work on it simultaneously with the **fuse in order** that completion of the fuse will not **be** delayed.

11. Before attaching stab to the fuselage, the fuse should be carved and sanded to shape. A long blade "Xacto" knife can be used to rough it to shape. For sanding use 3M Production Finishing paper — #80 for roughing and #150 for finishing.

Contours should be as close to the plan as possible. A good way to sand is to place the fuse between the knees, resting the tool cone on a chair. Use a piece of sandpaper about 4x11 as though using a shoe polishing cloth. By this method any contour can be developed.

12. After fuse is sanded it is ready for the stab attachment. Set fuse thrust line level with a *flat* bench top and fit stab plot-form to the 3/16 positive incidence shown on plan. This is most important. It is equally important to get a good fit for a good glue joint. After this is done the stab may be double glued to the fuse. Be sure the elevators are assembled to the stab before attaching stab to the fuse.

13. Assemble fin ports R-1, F-1A and R-2. When dry, sand to contour, fit to stab and fuse and glue in place. Care should be taken that the fin be installed true with the center line of the fuse. This can be checked by stringing a line from the center of the fuse at F-7 around the fin and back to F-7. After the (in is dry fairings R-4 may be fitted. Wetting the outer surface helps bending. Use a piece of scrap block to fill space between top decking and rudder. Use balsa putty to blend contours.
14. After the fuse is finish sanded, give it two coats of clear dope and then sand lightly. The fuse and fin now can be covered using dry silk and doping through the silk.

## WING

The wing is the most vital part of the ship. A true wing is a must for a contest ship. Generally speaking, the overage work bench top is not true enough on which to build a wing. A wing panel can be no truer than the surface on which it is built.

The best method to get a truly flat surface is to use a piece of 3/4 plywood at least 12 x 36. This may have a slight warp or twist in it. By shimming and clamping the plywood to your work bench until every portion of it is level, a flat surface will be obtained. This is absolutely essential. Use a good sensitive level.

1. The wing is built in two halves and joined later. Laminate the four spars as shown on the plans.
2. Pin bottom spar down on the wing plan. **Be** sure it is pinned down absolutely straight.
3. Without gluing, place all the ribs in their respective positions and check for alignment. By sighting down the wing panel, any rib that is out of alignment can be readily seen and should be sanded or shimmed at its contact point to bring it in line.
4. Glue ribs down to bottom spar keeping an eye on the alignment.
5. After the glue sets, the top spar may be dropped in place and glued.
6. The shaped leading edge is added next, making sure to glue only to nose of rib and not to the alignment lugs.
7. After the glue is firmly set, the bottom 3" trailing edge sheet is slipped in place. This can be pinned and shimmed into position. Next add the aileron area vertical spar W30.
8. After the bottom trailing edge sheet has been set up, rear spar W16 should be glued in place. This will require a little fitting with a sanding block to conform to the contour of the wing. Rib part W2B is then attached. When this has set for a while, glue the top trailing edge sheet in place which should be beveled slightly to fit the bottom sheet.

9. The top aileron area sheeting W22 and W18 should now be glued on.
10. Add the top leading edge sheet. Now glue on the rib cap strips. *Important;* add the cap strips before the wing is removed from the bench as they stiffen the wing considerably. Center section sheeting is not put on until the wing is joined. After wing panel is removed from plan, bottom aileron area sheeting is glued on.
11. After both wing panels are built they are ready to be joined. This is the most critical operation and care must be taken to be sure both panels are joined true. Good glue joints are especially important at this point.
12. When wing is dry, glue in plywood rib doublers for the landing gear. Formed landing gear wire is now assembled to the 3/8 square gear spar. This unit is then installed in the wing. Here again, a good glue job is essential. After the glue has set, break off the rib alignment lugs, then add the bottom leading edge sheet. Cut a 1/2" diameter hole in this sheet to clear the landing gear wire. When gluing this sheet on it is important to prevent any twists from developing in the wing. A twisted wing is useless on a contest model.
13. Bottom cop strips are added next.
14. Bottom center section is then affixed. At this point bell-cranks and control wires are attached. Top center section sheeting is now glued in place. Servo opening is cut out after top sheeting has dried. Wing tip is then added.

## AILERONS

**FRISE AILERON**— The ordinary type aileron produces an unbalanced drag and adverse yawing condition. To overcome this the FRISE aileron is used. When the trailing edge of the Frise aileron is raised, the leading edge drops below the undersurface of the wing. Some of the air which would normally flow under the aileron now flows over it. The drag or raised aileron is increased so that it is almost equal to the drag of the one that is lowered; thus equalizing the drag and preventing any yawing condition.

Pin down bottom leading and trailing edges on the plans. Glue all ribs in place. Glue down W25—26—27. Add top leading and trailing edges. Add top cop strips. Remove from plan and glue on W31. Add bottom cap strips. Trim and sand. Install nylon hinges as shown on plan, then attach hinge fittings. Ailerons may now be fitted to wing. This is a matter of sanding and fitting. Top aileron sheet W22 maybe beveled and sanded to give the clearance shown on the plan.

## COVERING AND FINISHING

1. After all parts are added to the wing it is ready for sanding and covering. The wing should be carefully sanded. Apply two coats of clear dope and sand lightly. Cover with silk only, put it on *dry*, doping through the silk. It is important

when covering bottom of wing to bring covering around W30. This adds strength to this area. After wing is covered spray lightly with water to shrink silk. Be sure that the silk is not too tight so that the wing will not be warped.

2. Ailerons can be covered in the same manner.
3. Four coats of clear dope will usually fill the silk. Sand with a felt eraser and #150 3M Production Finishing paper, being careful not to cut into the silk. One or two more coats of clear dope and sanding should give a smooth surface for color doping. Depending on the color, two or three coats will cover quite well.

## TRIMMING

After ship is finished it should be set up on a flat bench for a final decalage check.

1. The thrust line should be set up parallel to the bench top. At this point the stab should have  $3/16$  positive in 6" as shown on the plan. The wing should have  $1/2$ " positive incidence in 12". This gives a decalage of  $1/8$ " or about  $1/2^\circ$  of incidence. This check out is extremely important. The wing platform should be sanded until the proper decalage is obtained.
2. The servo radio gear, engine batteries, etc. can now be installed. Servos should not be positioned until all components are installed. Servo board can be shifted fore and aft to obtain the  $4-1/2$ " location shown on the plan.
3. Wrap receiver in sponge rubber, and take care not to install it too tightly. The length of the reeds should be parallel with the piston travel so that the engine vibration will not operate the reeds.
4. Before flying the model a vibration check should be made. Run engine full speed having someone hold each wing tip lightly with the receiver switch on. Watch for any unwanted control movement. Be sure all controls are wired for proper direction.
5. If decalage setting is correct the model should fly right off the board. First check for straight flight. Model should groove as though on a railroad track. With neutral elevator model should fly flat with no climb or dive. If it climbs, leading edge of wing should be shimmed down until proper flight is obtained. It is important that the elevator be at absolute neutral, also that both elevators be on the same plane with no twist. Any right or left tendency would be caused by rudder or ailerons not being neutral or by wing warp.
6. Next try inside loops. They should be round and right in the groove. Any left or right drift in the loop would be caused by rudder or ailerons not being neutral or by the elevators being out of line.

7. Outside loops are tried next. Again, they should be round and true. Before entering inside or outside loops be sure wings are level. True straight flights, inside loops and outside loops are obtained by compromise settings of rudder and aileron neutral. Do not be satisfied with the performance of the model until straight flights and inside and outside loops are perfect. If problems are encountered be sure to check the fin alignment.
8. Next thing to flight check is the ailerons for yaw. Do an Immelman directly over head. Model should reverse its direction exactly 180 . If it is off this heading, ailerons need more or less differential. If the model drifts to the left on a right roll-out, more differential is needed; that is, more up aileron than down. This can be accomplished by moving fulcrum point further forward on the phenolic aileron horn. Horn position on plan is correct but may vary from model to model.
9. Gear position on plan is correct for average condition. For grass flying, if model noses over, gear should be bent forward. If model bounces on a hard surface, gear should be bent back. Generally speaking, gear should be about 3/4" further back for a hard surface than for grass. Gear position is important and is determined by trial and error. Wheels should have a slight toe out. Be sure to lubricate wheels, as any wheel chatter will cause ground looping.
10. It is important to spend all the time necessary to trim the model perfectly. This will pay off in contest wins. A properly trimmed ORION will achieve a new standard of contest performance for you.

## RELIABILITY

On the plans you will notice wood strips fore and aft of the servos. This is an important detail. With this system the servos cannot drift forward or backward, thus maintaining better trim. The servos should not be tightened down to a point where the rubber grommets are compressed solidly thus destroying their usefulness. All screws and nuts should be safetied by tacking with glue. This is especially important on the aileron parts.

With modern radio gear and servos there is no reason why your ORION should not last for years. Experience shows that most crackups are caused by poor wiring. We recommend only "Bonner 19" strand wire or equivalent. Solder joints are important. All solder joints should be bridged with plastic spaghetti tubing. This includes connections to battery box, switch, and plugs.

The rest is up to you, the pilot. The general thinking is that for a winning contest team it is 35% airplane and 65% pilot. We feel sure you will have a ball while flying the ORION.

Good Luck,

*Ed Kazmirski*