

## **NOVA KIT NO. 165**

NOVA has been designed as a fun aircraft, giving relaxed sport flying with minimum investment. With .20 Sq. metres of wing area, three channel radio, a 15 R/C engine, and a healthy paint finish, the flying weight is around 1130 gm. (Wing loading 5.5Kg/m<sup>2</sup> or 18oz/sq ft.)

NOVA excels in the flying department. Take offs are excellent and require little rudder correction. Lift off is smooth with no zoom and once airborne the aircraft is very steady and predictable. With a .10 size engine, flight is slow and relaxed, however, a 15 size gives you the option of very smart performance indeed. Landings are easy with good control all the way in, and the on ground handling is excellent.

### **CONSTRUCTION**

Read instructions fully before starting any assembly. During these instructions, 3 glue types will be mentioned – white glue (any of the woodworking glues available), epoxy (any of the 5 min. varieties) and Balsa Cement – where no other specification, use C17 Cement for normal balsa work, and C23 Cement for high stress areas.

**WING:** Build the left hand wing directly over the plan (waxed paper will protect the plan) as follows:-

- 1) Pin down the leading edge, bottom main-spar and the bottom trailing edge sheeting on the plan, allowing overhang at each end of the wing for later trimming.
- 2) Fit and lay down the bottom centre wing sheeting 40 and 41 in place and glue these joints.
- 3) Locate and fit main ribs 49 and one outer centre rib 50. Do not fit the other centre rib 50 yet.
- 4) Glue all ribs fitted in place. Add the top main-spar and top trailing edge sheeting and glue in place.
- 5) When dry fit the ply brace 39 in position and white glue in place to the main-spars with clothes pegs or similar. While this is drying fit the outer front half of rib 51 and glue in place. Fit and glue in place the 3 rib webs shown (in the front of the main-spars).
- 6) Using the rib template 52, angle the centre front and back half ribs 51 and 50 and glue in place.
- 7) When thoroughly dry, carefully trim the leading edge, main-spars and trailing edge sheeting all to the angle of the rib template.
- 8) Cut the balsa trailing edge wedge in half and glue in the trailing edge, between ribs 50. Trim to centre angle.
- 9) Remove the wing when dry, check that it has remained flat and true and proceed to build the right hand wing in the same manner (omitting the brace which is already part of the left wing, and the half ribs 51). (A light coating of oil on the reverse side of the wing plan will allow you to build your right wing on the reverse side as a mirror image of the left wing if desired).
- 10) When the right wing is dry, trim the main-spar, leading edge and trailing edge sheeting until the ply brace slides fully into the right wing and all surfaces mate properly. White glue the brace and all centre joints and glue in front half ribs 51. At this time block up ONE wing tip 76mm (3") at the outer rib bottom main-spar and allow to dry fully.

- 11) When the wing is fully dry, pin down the left wing and fit the left wing front leading edge sheeting (hold in place while gluing with small strips of masking tape spaced about 60mm apart), and glue in place.
- 12) Remove wing. Pin down the right wing and glue the right hand top sheeting in place. Then fit and glue the wing top centre sheeting 42 and 43 in position.
- 13) When fully dry, remove from board and check for twists or warps (there should be none if steps 1- 12 were followed correctly). With a sharp knife and a sanding block, shape the leading edge evenly to the section shown on the plan side view.
- 14) Cut out the trailing edge centre as shown on the plan.
- 15) Trim off the trailing edges etc. at the outer ribs, and cement the wing tip blocks in place as shown on the wing tip detail. When dry, carve the tips to the contour of the air foil, and the tip shape will form automatically.
- 16) Sand the entire wing lightly and wrap the centre joint with the joining tape supplied. Coat heavily with balsa cement. This is MOST important to obtain a maximum strength joint.
- 17) The wing is now ready for covering (either Silk, Tissue or Solarfilm). Ensure no warps occur during covering. If so, they must be removed before flying if true performance is required. If warps occur during Solarfilm application, twist the warp out, and heat (gently) the area that has wrinkled.

## **FUSELAGE ASSEMBLY**

- 1) To the right hand fuselage side, cement doubler 24 in place. Place ply strut 12 in position next to 24, but DO NOT CEMENT YET. Using 12 as a spacer, cement doubler 25 in place. Place ply strut 14 in position next to 25, but DO NOT CEMENT. Using 14 as a spacer, cement doublers 26, 27 in place.
- 2) Remove 12 and 14 and drill 3mm holes where pin marked. Next fit 4.5mm square supports at the bottom of the fuselage.
- 3) Struts 12 and 14 can now be white glued in place, butting up to the 4.5mm square supports at the bottom of the fuselage.
- 4) When dry, complete the upper cabane area by pre-drilling part 38 where marked and white glueing to the top of the struts 12 and 14 as shown. White glue parts 35, 36 and 37 in place and fit and cement cross brace 13 in position. Allow to dry fully. Do not fit parts 8, 9, 10, 11 or the dowel joiners at this stage. Ensure the top of the strut area is flat.
- 5) Repeat steps 1 to 4 for the left hand side (make sure you build one left and one right side).
- 6) Epoxy formers 1 and 2 together, and drill the engine mount holes where marked with a 3mm drill. Break out the fuel lines clearance area. Break out part 54, and where marked, drill with a 3/16" (4.5mm) drill, then carefully shape these holes to accept the 1/8" w nuts provided (as tight a fit as possible). Fit the 1/8" x 3/4" bolts and 1/8" w nuts supplied in the mounting holes, locking the nuts firmly on the back of the former 2 with part 54, and epoxy nuts and subformer 54 in place (apply grease to the bolt before assembly to prevent the epoxy sticking to the bolt whilst setting). These epoxy joints must be good, as later access to these nuts is very difficult. When dry, remove the bolts, drill the engine mount where marked with a 3mm (1/8") drill and check the mount for fit. Remove the mount and bolts and proceed with the assembly.

- 7) Using the notches in this composite former, white glue in place on the R.H. Fuselage side. White glue one gusset in place to ensure the former is square and glue the tank floor supports in place as shown. Make sure the assembly is square.
- 8) Cut 2 – 80mm lengths of the cross brace material and glue in place in the notches at the front of former 3, adding former 3, and checking for square off the flat R.H. Fuselage side. Glue all joints.
- 9) On the L.H. Side, white glue the front gusset (behind the notches of former 1 and 2) in place, and glue the tank floor supports in position. On both sides, epoxy the plywood gussets 53 in place (total of 4) as shown in section EE (these are for the Radio Access Panel mounting later).
- 10) White glue the tank floor in position on the R.H. Side ensuring it is square with the fuselage side, and then fit the cockpit floor (20) in place, once again squaring with the fuselage side and the cross brace.
- 11) If using the plywood servo tray, screw the two bearers onto each end of the tray, and epoxy the BEARERS ONLY to the R.H. Fuselage side and to former 3.
- 12) Carefully remove the dash (part 19) from the die-cut sheet, and glue to the block top as shown. When dry, chamfer off the edges of the dash, and sand smoothly.
- 13) Place the pre-cut block top in position on the fuselage side and mark the location of strut 14. Remove and neatly cut out clearance for 14. Mark and remove the same amount of material for the opposite fuselage side strut. A small amount will need to be removed from the dash panel area to allow the block top to sit flush with the outside edge of the fuselage side. Do this for both sides of the block.
- 14) When satisfied with the fit, sand the block top smooth and cement in position on the left hand side, once again ensuring the block top is square to the sides, and fits neatly around the top of former 1, 2.
- 15) Check the L.H. side for fit with the R.H. Side.
- 16) Fit and cement the R.H. Fuselage side onto this assembly, ensuring that ALL mating surfaces are well glued, and fit tightly. Allow the whole assembly to dry, ensuring that all formers are square etc.
- 17) When fully dry, remove the servo tray, and cut out the servo locations and switch mounting hole.
- 18) Dope or fibreglass resin the tank compartment area.
- 19) Fit formers 4 and 5 with the cross braces as done for former 3, and ensure the rear of the fuselage is square (this can be checked by marking the centre of formers 1,2,3,4 and 5 and the rear of the fuselage and lining up by eye). Cement part 6 in place.
- 20) Next take parts 21 and 22, chamfer the bottom edge slightly to suit the angle of the curvature of the formers 3, 4 and 5 cement in place as follows:-  
 First using strips of masking tape, cement and hold firmly in place the lower edge of 21 and 22. Do not attempt to wrap the sides to the curve of the formers yet. Ensure the fuselage side / parts 21 and 22 joints are fully flush. Allow to dry fully.  
 NOTE During drying times on this model you can be doing one of the other assembly operations e.g. trimming out the plastic parts, or assembling the wheels to the under-cart etc.

- 21) When these sides are fully dry, dampen the balsa with water and a small brush until it curves steadily without cracking. Do not cement. Tape sides at the top so that all the curves on the former are followed. Allow the water to dry out, remove the tape and cement the pre-curved sides fully in place (use masking tape again).
- 22) When dry, trim off the excess balsa at the top of the sides to allow the top rear block to fit flush with the tops of the formers and the sides and overhang the sides 21 and 22. Glue in place. When dry, with a knife or balsa plane, shape this block to suit the curve as shown on Section EE plan. Sand to a smooth finish.
- 23) Next white glue part 33 in place as shown on the plan, checking the location by fitting the bottom block and cementing in place. Cement the 3/16" sq. supports for 33 in place at the same time.
- 24) When dry, white glue parts 31 and 32 in place, fitting but not fixing under-cart at this time. Ensure the point of the V in this assembly is to the rear of the fuselage.
- 25) Fit and cement the 3/16" sq. reinforcement to the mil ply access cover by lightly taping the reinforcements to the ones in the fuselage and then glueing only the hatch reinforcements as the hatch is located in position. Allow to dry, pull to remove and remove masking tape. Recheck fit of cover. When satisfied with alignment, drill small holes through the cover into parts 53 for the fixing screws.
- 26) Cement the tailplane assembly 7 and 48 squarely in place, having first fitted the Mylar hinges\* and the elevator, the control horn, having rounded off the edges of the tailplane leading edge and elevator trailing edge. (Also ensure the join between tailplane and elevator is as small as possible but still allowing free movement).  
\*NOTE The fitting of Mylar hinges will depend on the type of covering to be used. If painting model, toothpick method can be used (as shown on plan), and the tailplane and fin can be fitted and glued in place.  
Temporarily fit hinges to obtain alignment for push-rods etc. then remove, fit hinges fully into rudder and elevator only, and sand ready for painting. When model is ready for final painting, then fit the hinges fully into the fin and tailplane. If Solarfilm or similar is to be used, TACK CEMENT fin and tailplane into place for push-rod alignment as well as rudder and elevator, then remove and sand ready for covering. When the model is complete for final covering, the covered tailplane and fin are refitted, the covering removed from the areas to be cemented, and the parts cemented together. The Mylar hinges can then be fitted by piercing small holes in each end 3mm of the hinge, and glueing with small amounts of epoxy cement (after covering is complete).
- 27) Bend the right angle leg of the tail-wheel wire, and fit into the rudder (under the control horn). Epoxy in place, and fit the control horn to act as a clamp. The horn can be removed after the epoxy is set. Tin the wire for soldering where it protrudes from the bottom of the fuselage. Cement the fin in position on the tailplane, drill the hole for the tail-wheel wire and temporarily fit the rudder. Ensure the fin is square to the tailplane and in line with the centreline of the fuselage. Fit the two tapered fairing blocks and carefully shape to suit the line of the fuselage. Sand smooth and when satisfied with the fit, either cement in place (if painting the model) or cement the blocks to the FIN ONLY if Solarfilm covering. The fin and tapered blocks can then be removed for Solarfilm covering if desired.
- 28) The radio gear servos can now be installed temporarily or install servo trays as recommended by the manufacturer. The push-rod heights can now be obtained. Mark and drill the holes for the pushrod outer sleeves through the formers, keeping the sleeves as straight as possible, and exiting from the fuselage at the points shown.

- Be sure to check the direction of throw of the servo with relation to the rudder and elevator movement, to ensure there is no binding of any links or cables.
- 29) When satisfied with the push-rod layout, fit the outer sleeves through the formers and epoxy cement in at least three places. The sleeving should protrude at least 25mm out of the fuselage and at least 40mm into the radio equipment. Excess is trimmed off later.
  - 30) Using the small wedge block supplied, drill a clearance hole for the tail-wheel leg, and glue the block in place into the rear of the fuselage. Drill and fit part no. 47. Next solder a small thrust cup washer hard against this part on the tail-wheel wire (this takes the shocks of landing and not the rudder hinges). Bend wire and fix tail-wheel in place with small washer supplied.
  - 31) Close in the rear bottom of the fuselage with parts 28 (2 of) part 29 (1 of) and part 30 (1 of). When dry trim off edges with a sharp knife, and cement parts 45 in place in the engine compartment.
  - 32) Mount the engine on the mount supplied by either drilling and tapping or drilling clearance holes for the 1/8" bolts and nut supplied.  
NOTE If using a .15 (2.5cc) engine, the mount may have to be filed slightly to clear the engine crankcase. Fit the motor so that the end of the mount lines up with the front of the mounting lugs of the motor.
  - 33) Carefully cut away the block top as you slide the motor and mount into its location or you may wish to cut an opening for the motor head only, and have a fully enclosed look. The choice is yours. Note there must be clearance for the muffler as well as the needle valve and carburettor opening.
  - 34) Mount the motor temporarily and check for clearance all round – line up the throttle linkage (if used) and drill a 3mm hole in former 1,2 for the throttle cable (keep adjacent to the fuselage side where possible). Fit and cement the throttle cable outer sleeve in place glueing in at least three places and running as straight as possible to the throttle servo.
  - 35) Leaving the motor in place, chamfer the edge of the bottom front nose block (to mate the bottom block) and glue in place. When dry, trim the nose block to suit the motor shaft and prop clearance, and glue in place. (Note that the motor still must be able to be removed readily – cut accordingly). Cement two gussets in place at the nose block – part 45 joint.
  - 36) Remove the motor and mount, and shape the nose and bottom blocks to suit the lines of the fuselage. Drill a drain hole in the bottom of the engine compartment and dope or fibre glass resin coat the whole engine compartment.
  - 37) Cement in place the balsa filler pieces 8, 9, 10, 11 on the cabane struts and add and cement the spacing dowels in these struts (ensure that the spacing of both struts is equal).

## **FINAL ASSEMBLY**

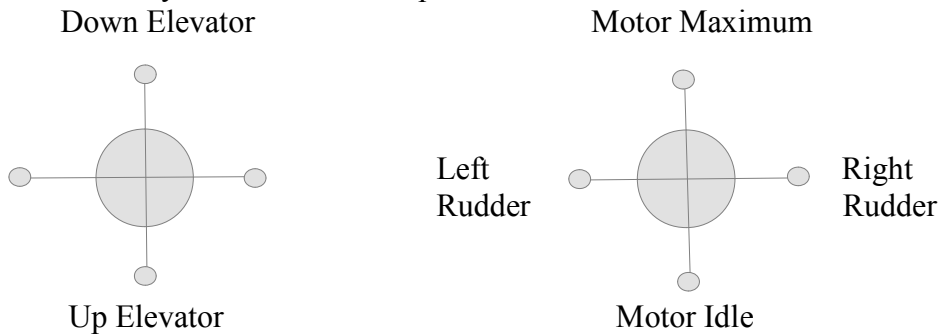
- 1) Carefully trim the wheel spat halves, noting that a left and right hand pair are needed. On the inner half of each an indentation is marked. Cut a 3mm slot from this to the base of the spat to enable the spat to be removed for rough field flying.
- 2) Cut out the wheel openings where shown and cement in part 44 into the inner spat where shown. Continue trimming and mating the two halves of each spat until a good fit is achieved with the outer half sliding over the inner by about 3mm.

- 3) Cut the grooved long section, cut to length of the tapered fairing pieces, and trim until the grooved piece fits snugly inside the tapered piece. Do this for both left and right hand sides (note: spare fairing pieces are supplied in case of cutting errors). Trim the tapered pieces and with the inside grooved piece in place, sand the edges smooth so that a small return piece occurs on the tapered fairings, as shown on the wheel pant detail.
- 4) Cut out the heavy grooved piece that matches the inner spat, trim to shape, lay on the inner spat flange and drill two 1/16" holes for the spat mounting screws.
- 5) The upper fairings can now be epoxied to the undercarriage, checking that they clear the fuselage by 2mm or so.
- 6) Next fit the wheels supplied with washers soldered or epoxied either side, at the same time checking the clearance and fit of the spats.
- 7) Finally fix the spats to the undercarriage by locking up the PK screws supplied. When satisfied with the fit remove ready for painting.
- 8) The radio control equipment can now be temporarily fitted (servos, switch, battery, receiver), and connected. Check the direction of the throw of the servos and make up the cable push-rods to move the control surfaces in accord with the recommended convention. (Right stick on transmitter gives right rudder when model is flying away. Up elevator – pull stick back towards body, etc.) The cable push-rods are made as follows:- on the servo end, epoxy a kwik link end to the cable, on the other end, epoxy or solder a threaded coupling so that with a kwik link screwed on half thread a neutral position is obtained, throttle cable adjustment can be at the servo end if this is more practical.
- 9) Remove the radio gear, drill the holes for the undercarriage fixing plates, and epoxy the nuts inside the fuselage (grease the bolts to prevent locking up).
- 10) When dry, remove the bolts and sand the whole model completely to the finish desired.
- 11) If painting the model, remember **MINIMUM WEIGHT IMPROVES PERFORMANCE**.  
Cover the fuselage where possible with tissue and give two coats of dope. Sand smooth, and dope again. Sand smooth again and paint as desired. If Solarfilm is used this preparation is not necessary although a smooth finish is desirable. We suggest you paint the cabane strut area as this is impossible to film cover. Fit all hinges etc.
- 12) Trim the pilot halves supplied. Cut a former from 1/8" scrap balsa to fit the joining line, cement together and paint as desired. Epoxy in place. Cut out the instrument panel from the plan and cement to the dash if desired.
- 13) After painting fix the windshield in place with small touches of epoxy or instant glue.
- 14) Make up the clunk tank as follows:- the clunk weight fits on the flexible tubing and the tubing fits to one of the feed pipes which should exit straight from the tank for about 15mm. The weight should be free to move in the tank. The drain or pressure pipe must be bent to almost touch the inside top of the tank, and exit straight for about 10 to 12mm.
- 15) Feed two lengths of about 150mm of silicone fuel tubing through the fuel opening in former 1,2, from the front, and fit into the tank pipes. Slowly feed the tank into its location and when fully forward, pack in place with foam rubber. Note which line is the drain or pressure pipe.

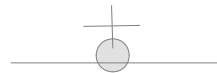
- 16) Mount the motor finally using a washer to give right thrust and fit the fuel feed line to the needle valve inlet. The other fuel line either goes to the muffler pressure nipple (if desired) or down to the oil drain hole. Connect the throttle cable to the carby arm, and mount the muffler.
- 17) Fit the radio gear finally, packing the receiver and battery pack in foam and plastic bags for fuel proofing and rechecking all servo directions to ensure correct operation and no cable "buckling". Hook up all linkages. Fit the completed undercarriage, rubber band (at least 3) on the wing, and check the model for balance. Adjust position of battery pack and weights to ensure the balance point is met to within 4mm only (no further back) and check balance in the other axis. Add small nail weights to the light wing tip as necessary. When balanced, the model should hang slightly nose down when supported at the balance point with your finger either side of the wing saddle underneath the wing. Note: rubber strip on the strut tops will protect the wing surface.

### R/C INSTALLATION NOTES.

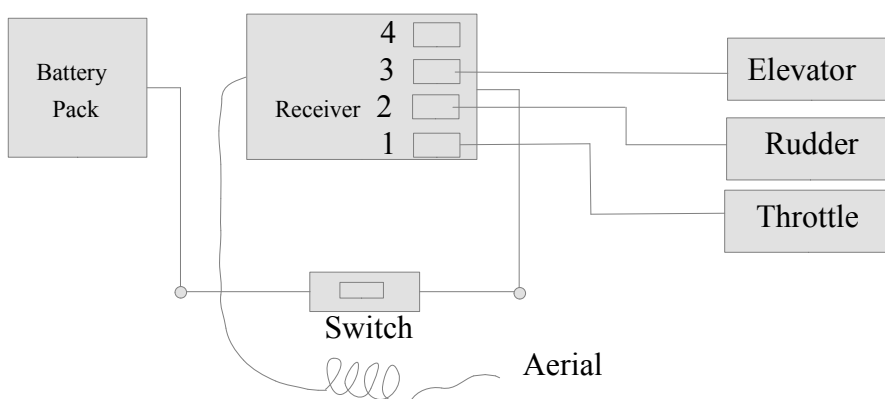
Normal Transmitter layout for 3 channel operation.



Relative to model flying away from transmitter



Receiver – Servo Layout.



- 19) When ready to fly, we suggest you obtain the help of an experienced flyer or if this is not possible, we suggest you buy a copy of the "Radio Control" manual from your hobby shop and read up on the techniques of R/C flying.  
The original Nova was fitted with Sanwa R/C gear, an O.S. 15 R/C engine, the wing was Solarfilm covered, and the fuselage and tail were painted....

## **FLYING YOUR MODEL.**

### Check List:-

- 1) Check all plugs properly plugged in and secure.
- 2) Insure full battery charge.
- 3) Check all control surfaces for security and freedom from binding.
- 4) Check all surfaces for proper alignment and freedom from warps. Make sure there are enough rubber bands holding on surfaces.
- 5) Check CG for proper position.
- 6) Obtain authorisation to use your frequency.
- 7) Check radio range and proper functioning of all controls including DIRECTION.
- 8) Check fuel system and fill fuel tank.
- 9) Check engine, throttle and propeller for proper security and operation.
- 10) Check engine at high throttle holding the nose high to make sure the engine isn't too lean. Check control operation with the engine running at high throttle.
- 11) Taxi test the air plane if the field is suitable and steering is provided.
- 12) Check transmitter antenna is fully extended and properly seated; check out meter.
- 13) Check the wind and traffic pattern, then apply power smoothly, taking off into the wind.

Allow the plane to climb gently straight ahead until well above all obstructions and make a gentle left turn to get it pointed back toward the field. Level the air plane and trim it using the trim levers on the transmitter. If the plane was built accurately and the CG and thrust line are correct, very little trim should be required. If electronic trim is insufficient and you have to hold some stick in to maintain level flight, bring the plane around, reduce power and land into the wind as quickly and safely as possible.

Note the position of the trim levers and re-set the clevises on the push-rods to put the same amount of trim into the control surfaces as you put in with the electronic trim. Neutralise transmitter trim levers and try another flight. Keep trimming mechanically until the plane will fly straight and level with all transmitter trim levers centred. Now you're ready to learn to fly.