techsupport@composite-arf.com

Instruction Manual

Composite-ARF 'New Rookie'

'TAVS Technology' **version: 1.0**

'New Rookie'

Thank you very much for purchasing our Composite-ARF 'New' Rookie, made with the revolutionary Total Area Vacuum Sandwich (TAVS) technology.

The 'new' Rookie is an updated and 'facelifted' version of our original kit, and includes a few significant changes which definitely further improve the great flying characteristics, shorten the assembly time ... and, in our opinion, make it it more beautiful!

Before you get started building and setting-up your aircraft, please make sure you have read this instruction manual, and understood it. If you have any questions, please don't hesitate to contact your Rep, or C-ARF directly. Below are the contact details:

Email:	**feedback@composite-arf.com**
or	**techsupport@composite-arf.com**
Telephone:	**Phone your C-ARF Rep!!! He will be there for you.**
Website:	**http://www.composite-arf.com**

Liability Exclusion and Damages

You have acquired a kit, which can be assembled into a fully working R/C model when fitted out with suitable accessories, as described in the instruction manual with the kit.

However, as manufacturers, we at Composite-ARF are not in a position to influence the way you build and operate your model, and we have no control over the methods you use to install, operate and maintain the radio control system components. For this reason we are obliged to deny all liability for loss, damage or costs which are incurred due to the incompetent or incorrect application and operation of our products, or which are connected with such operation in any way. Unless otherwise prescribed by binding law, the obligation of the Composite-ARF company to pay compensation is excluded, regardless of the legal argument employed.

This applies to personal injury, death, damage to buildings, loss of turnover and business, interruption of business or other direct and indirect consequent damages. In all circumstances our total liability is limited to the amount which you actually paid for this model.

BY OPERATING THIS MODEL YOU ASSUME FULL RESPONSIBILITY FOR YOUR ACTIONS.

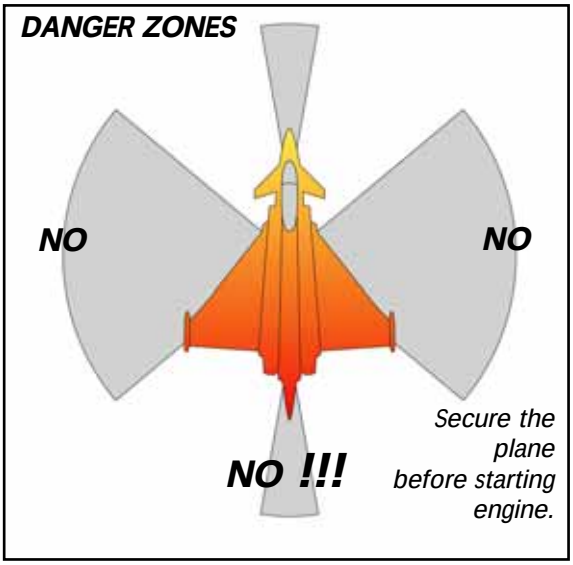
It is important to understand that Composite-ARF Co., Ltd, is unable to monitor whether you follow the instructions contained in this instruction manual regarding the construction, operation and maintenance of the aircraft, nor whether you install and use the radio control system correctly. For this reason we at Composite-ARF are unable to guarantee, or provide, a contractual agreement with any individual or company that the model you have made will function correctly and safely. You, as operator of the model, must rely upon your own expertise and judgement in acquiring and operating this model.

Attention !

This 'jet' aircraft is a high-end product and can create an enormous risk for both pilot and spectators, if not handled with care, and used according to the instructions. Make sure that you operate your 'New Rookie' according to the AMA rules, or those laws and regulations governing model flying in the country of use.

The engine, landing gear, servos, linkages and control surfaces have to be attached properly. Please use only the recommended servos and accessories. Make sure that the 'Centre of Gravity' is located in the recommended place. Use the nose heavy end of the CG range for your first flights. A tail heavy plane, in a first flight, can be an enormous danger for you and all spectators. Fix any weights, and heavy items like batteries, very securely into the plane.

Make sure that the plane is secured properly when you start the engine. Have a helper hold your plane from the nose before you start the engine. Make sure that all spectators are far behind, or far in front, of the aircraft when running up the engine.



Make sure that you range check your R/C system thoroughly before the 1st flight. It is absolutely necessary to range check your complete R/C installation first WITHOUT the engine running. Leave the transmitter antenna retracted, and check the distance you can walk before 'fail-safe' occurs. Then start the engine, run it at about half throttle and repeat this range check with the engine running. Make sure that there is no range reduction before 'fail-safe' occurs. If the range with engine running is less then with the engine off, please DON'T FLY at that time.

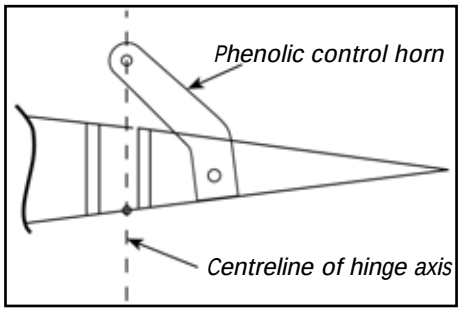
Make sure that your wing spar tube is not damaged. Check that the anti-rotation dowels for the wings are not loose. Check that the wing retaining bolts are tight. Please don't ignore our warnings, or those provided by other manufacturers. They refer to things and processes which, if ignored, could result in permanent damage or fatal injury.

Important/General Notes

Elastic Hinges:

The ailerons/elevators (and rudders) are hinged already for you - laminated in the mould and attached with a special nylon hinge-cloth, sandwiched between the outer skin and the foam. This nylon hinge is 100% safe and durable. You will never have to worry about breaking it, or wearing it out. There is no gap at all on the bottom side of the surface, and there is a very narrow slot in the top surface, where the control surface slides under the skin during 'up' throw. This means that the hinge axis line is on the *bottom* surface of the wing, *not* in the centre. This is NOT a disadvantage, but you need to program in about 10% NEGATIVE differential in your transmitter. This means that the 'up' throw needs to be about 10% more than the up throw. Why? Because the axis of the hinge is not at the centreline of the aileron/elevator, so it moves slightly in and out when operated, and the control surface gets a little "smaller" in surface area when moving up.

The slot needs some explanation, too. The cut line is exactly in the correct position so that the aileron slides under the wing skin smoothly. If the cut was a few mm forward or back, it would not work properly. So, make sure that the lip is not damaged, and that the control surface slides under this lip perfectly. It will NOT lock at any time, as long as the lip is not damaged. If damage occurs, you can cut off 2-3 mm, but you should NEVER need to cut off more than this.



Servo Screws:

Secure the all the servos to the cnc milled plywood servo mounts using the 2.9mm ø x 13mm long sheetmetal screws provided in the kit - ***not*** the standard screws supplied with your servos, as these are usually too small for the milled 2mm Ø holes.

Take Care:

Composite sandwich parts are extremely strong, but fragile at the same time. Always keep in mind that these contest airplanes are designed for minimum weight and maximum strength in flight. Please take care of it, especially during transport, to make sure that none of the critical parts and linkages are damaged. Always handle your airplane with great care, especially on the ground and during transport, so you will have many hours of pleasure with it.

To protect the finished paint on the outside of the model from scratches and dents during building, cover your work table with a piece of soft carpet, cloth or bubble-plastic. The best way to stop small spots of glue getting stuck to the outside painted surfaces is to give the whole model 2 good coats of clear car wax first, *but* of course you must be sure to remove this 100% properly before adding any paint, markings or trim. Alternatively you can cover the majority of the fuselage with the bubble-plastic used to pack your model for shipping, fixed with paper masking tape, which also protects it very well.

Adhesives

Not all types of glues are suited to working with composite parts. Here is a selection of what we normally use, and what we can truly recommend. Please don't use inferior quality glues - you will end up with an inferior quality plane, that is not so strong or safe.

1. CA-Glue 'Thin' and 'Thick' types. We recommend ZAP, as this is very high quality.
2. 5 minute-epoxy (highest quality seems to be Z-Poxy)
3. 30 minute epoxy (stressed joints must be glued with 30 min and NOT 5 min epoxy).
4. Epoxy laminating resin (12 - 24 hr cure) with hardener.
5. Milled glassfibre, for adding to slow epoxy for strong joints.
6. Microballoons, for adding to slow epoxy for lightweight filling.

It is very important to prepare all parts to be joined properly, by roughing up with coarse sandpaper and cleaning both surfaces with alcohol/acetone or a similar solvent, before gluing *any* parts together.

When sanding areas on the inside of the fuselage to prepare the surface for gluing something onto it, do NOT sand right through the layer of glasscloth on the inside foam sandwich! It is only necessary to rough up the surface, with 60/80 grit, and wipe off any dust with acetone or alcohol (or similar) before gluing to make a perfect joint.

About the ‘New Rookie’

There are several major changes between the old and ‘new’ Rookie which, combined together, make it a much more versatile plane, and much quicker to complete ready-to-fly.

1. The nose section is lengthened by about 150mm/6”, to allow for the addition of the Canards, and also make it easier to achieve the correct Centre of Gravity when heavier/larger turbines are used.
2. A pair of Canards has been added which improve the manoeuvrability and versatility of the ‘New Rookie’ at both medium and low speeds. These also allow shorter landings and take-offs - useful if you fly from a small airfield.
3. A much larger cockpit and canopy frame makes assembly and maintenance easier, and allows more space for your R/C and fuel system installation.
4. The main landing gear is now a little further behind the Centre of Gravity, improving ground handling and making ‘bouncing’ far less likely if the plane is landed too fast.
5. The new kit is much more prefabricated to save you assembly time, and has an improved hardware package. At the factory we now cut out the wheel wells, trim the canopy frame, install the T-nuts for the wing bolts, make the slots for the linkages, install the rudder servo mounts, etc, etc.

Building Instructions

Landing Gear

The plywood landing gear mount is now even stronger than the original Rookie, and is aligned with a jig in the mould before joining.

As the main landing gear is installed in the fuselage, rather than in the wings, it's a good idea to install this first, so that you can lock the gear in the 'down' position while building the rest of the model - protecting the bottom surface of the fuselage.

The cutouts in the bottom fuselage skin for all 3 retracts are already done at the factory for you, but may be adjusted to suit your retracts and leg lengths as needed. Likewise the 'U' shaped cutouts in the plywood mounting plates are of a generic size and fit many standard retract sets, but can be adjusted to suit your landing gear.

The landing gear mounts are carefully installed in the factory, but please check them anyway, and add epoxy glue to any joints as you feel necessary. If you are using a smaller retract size than the pre-milled cutouts, you can add some scrap vertical grain hard balsa or ply strips inside the 'U' shaped cutouts as needed.

No gear doors are provided, and this model is not designed to have them anyway.

Main Gear

Fix your retract units to the 2 plywood mounting plates using your chosen method. In the photos here we have used M4 bolts and T-nuts. Alternatively you could even use 15mm (5/8") long sheetmetal screws. The cutouts for the wheels are made at the factory to suit 3.5" diameter wheels. Adjust if required.

Route the air tubes from each retract (and wheel brake) forward through the holes in the main bulkhead for connection in the cockpit area later. Install the oleos or wire legs and main wheels, remembering to grind small 'flats' on the legs for any set-screws if used, and add a drop of Loctite to all important bolts. Finally set the angle of the wheels. For the best ground handling they should have a very little bit of 'toe-in' - that is the wheels should angle inwards at the front *very slightly*. The roots of the fuselage sides are almost parallel so you can use a straight edge on the wheels to set this slight toe-in. (see photo P3)

The 'new' Rookie has the main landing gear position 25mm (1") further behind the Centre of Gravity than the original Rookie/Kangaroo, which helps to prevent any tendency to 'bounce' if landed at too high speed. If flying from grass, or rough, fields, keep all the leg lengths as short as possible to reduce the bending loads on the legs.

Nose Gear

This is installed in exactly the same way as the main retracts. Bolt or sheetmetal-screw into the plywood mount as shown. Depending on which type of retract units you are using make sure that the steering arm clears the sides of the fuselage and the back nosegear mount bulkhead. The cutout in the bottom of the fuselage is already done at the factory, and can be

adjusted to suit your nosegear unit and wheel size. If necessary, adjust the nose gear leg length to have a little positive incidence when the plane is on a level surface, and we suggest about +1.5° to 2.5° degrees at the wing roots.

Steering uses a pair of pull-pull wires to the servo which is mounted in the milled plywood R/C install plate, as shown. Depending on the type of steering system used, you will probably find that you need to install the retract towards the back of the 'U' shape, so that the steering arms do not touch the plywood bulkhead. You can use 2 small rubber bands on hooks to hold the loose steering cables out of the way of the leg when it is in the 'up' position.

Experience shows that a trailing link type of nosegear leg/oleo gives the best ground handling and steering with the Rookie, and our new Behotec units come complete with a simple leg of this style, as shown below.

C-ARF/Behotec Landing Gear tips:

All the 3 wheels are double-ballraced and these are a tight fit on the ground steel shafts. Press them in carefully, using a little grease, making sure you don't push the bearing out of the other side of the wheel.

Note the orientation of main wheels and brakes - the wheel has the raised central part on the *outside* of the wheel, not the brake side! Do NOT forget the small aluminium tube spacers between the brake hub and the wheel (see photo), or the first time you use the brakes on landing the wheels will lock-up. (don't ask how we know!)

Replacement tyres will be available for this gear, and are very easy to fit.

There are 2 short aluminium tubes supplied to centre the nosewheel on the brass axle - make sure to fit them the right way round for perfect centering. (see photo right)

The nosegear unit should be installed about 7 - 8mm from the back of the plywood mount. The steering arms are fitted in the lower holes on the oleo leg, and the 2 set screws in the upper threaded holes. Don't forget to grind small 'flat's' on the steel pin and secure the set-screws with a little thread-locker.

The steel pins that are fitted in the retract blocks to connect the oleo legs are secured with a single 6mm wheel collet on top. Make sure that the steel pin does not project thru' the collet more than 1mm, or it will hit the inside of the retract unit when operated.

(above) The C-ARF landing gear set that is available as an option for the new Rookie.

(above) Don't forget to install the short aluminium tubes between the wheel and brake drum.

Vector Thrust System

The hardware for the thrust vectoring system is all included in the kit, and it is your choice if you want to use it in flight, or not. With it activated you can do all sorts of amazing tumbles and spins, and of course it also helps in short-takeoff situations. If you do not wish to use the vector system, then just install the stainless steel tube as described here, and anchor it firmly in the neutral position to one of the plywood bulkheads or engine mounting rails.

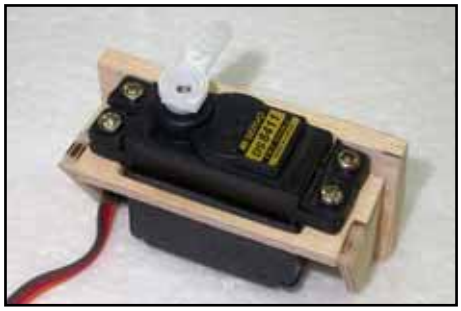
We suggest that you dry-mount your turbine at the same time as installing the vector system, to check the clearance of the thrust tube to the turbine exhaust nozzle, and adjust the positions as needed to obtain enough vector throw. Of course the final position of your turbine will also depend on what type of fuel tank you will use, and whether your turbine has an electric-starter motor fitted to the front of it. Normally, with an electric-start motor, you will need to install the turbine as far forward as it will go, with just a few millimetres clearance between it and the back of the fuel tank.

To get the largest angle available for the thrust vectoring, and therefore the most effect, you need to mount the vector tube as far back as possible so that it can travel the largest angle before it touches the turbine exhaust nozzle, or the fuselage. Actually, you can make a small crescent shaped cut out in the front top and bottom edges of the vector tube to get a little more clearance and angle if you wish.

Mark the centreline of your turbine on some tape on both the sides of the fuselage, using a straight edge laid on the mounting brackets (see photo). Bolt the axles onto the thrust tube using the 2 countersunk M3 bolts from the inside of the tube, with some Loctite. Scuff up all faces of the 4 phenolic discs, and glue together with thin CA to make 2 pairs. Sand an angle on one face of each pair of discs to approx. Match the angle of the inside of the fuselage where the axles of the thrust tube will be positioned. Then, with the phenolic discs on the ends of the axles, trial fit the thrust tube in the fuselage, with your turbine in place, to check the exact position of the axles from the back of the fuselage. Normally this is about 20mm.

Drill a 3mm hole in both sides of the fuselage, on the centrelines you marked, for the M3 bolts that secure the axles. Sand the inside of the fuse where the phenolic discs will be glued, apply some slow epoxy and milled fibre mixture to the discs, install and bolt in position with the M3 bolts until the glue has cured.

The thrust vectoring system is controlled by a servo that is normally mounted immediately in front of the rear main bulkhead, glued to the bottom fuselage skin between the main wheel cutouts, on the milled plywood servo mount supplied in the hardware pack. Make up the mount in the same way as for the wing servos. You will need to glue this servo mount onto a 6 - 8mm thick hard balsa or plywood plate to pack it off the fuselage bottom as much as possible (without it touching your fuel tank), and therefore give you the longest possible servo arm length for the greatest vector thrust movement. Fit the servo in place, and glue firmly to the ply bulkhead and bottom fuselage skin with slow epoxy.



(above) The milled ply servo mount supplied for the thrust vector control servo must be glued to a 6 - 8mm thick balsa plate.

Using the long M3 all-threaded rod supplied make up the linkage to connect it to the vector tube with the steel clevise, and drill a 6 - 8mm diameter hole thru' the ply bulkhead just off-centre so that it will align with the servo arm. Depending

on your turbine you may have to make a shallow bend in the back end of the M3 rod so that it clears the turbine in the full deflected position. If needed you can stiffen this linkage by gluing a length of 4mm brass tube over it.

Servo choice: The vector nozzle must be controlled by a powerful servo, and we recommend at least 9kg torque. Used in this example is a digital JR8411 servo which is strongly recommended for this control.

The thrust tube is oval in shape, and you can adjust it finally by bending slightly to make it symmetrical behind the turbine nozzle.

Note: An alternative position for the thrust vectoring servo is at the side of the turbine behind the plywood bulkhead (see photo). This position does give a shorter linkage, but you will need to bend the metal tab on the thrust tube a little to be in line with the servo arm for steel clevises, as you cannot use a plastic ball link on the thrust tube because of the temperature.

(above) Drill a 8mm Ø hole thru' the rear bulkhead for the thrust vector linkage as shown.

(above) This is an alternative position of Vector Thrust system servo.

Engine Installation and Hatch

Turbine installation is very simple with easy access thru' the large bottom hatch. Mount your motor using the manufacturers brackets, and bolt onto the plywood siderails, using the supplied M4 bolts and T-nuts underneath the ply rails. Make sure it is straight and in line with the flying axis of the model, and also the Thrust vector tube. Some brands of turbine have slightly offset mounting brackets, (eg: JetCat) and in this case you should pack them up off the ply mounting rails with scrap plywood spacers to get the turbine in the vertical centre of the height of the opening cut in the back of the plane.

We recommend a turbine with a thrust in the range between 7 - 12kg for the 'new Rookie. The photos in this manual show an electric-start AMT Netherlands Mercury HP.

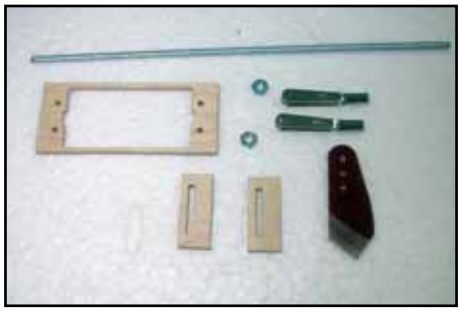
As this is an 'open' engine installation, rather than a fully-enclosed type, be very careful to securely fix all the cables and tubes that go to your motor, as well as the rudder servo cables so that they cannot be sucked into the engine.

The large hatch is already cut loose for you in the factory, and only needs the plywood stiffeners to be glued to it, the 0.8mm plywood lip added around the opening and 2 hatch catches to secure it. First add a small (3 - 4mm wide) lip around both sides and the back edge of the hatch opening, cut from the 0.8mm plywood strips supplied. Sand the underside of the fuselage around the opening first, and then glue in place with thin CA. (see photo P4 and P8)

The 2 slightly curved plywood rails should be glued to the inside of the hatch, about 10 -12mm in from the edges, with the radiused end at the front. Use 30 minute epoxy and micro-balloons mix for this, and tape the hatch in the closed position while the glue dries - otherwise you can be sure that the shape of the hatch won't fit the fuselage shape afterwards! You can apply some balsa sticks CA'd onto strips of paper tape while the glue dries to make sure the shape stays perfect if you wish. (see photo P10)

Finally mill 2 small slots and glue the 2 supplied hatch-catches in position against the inside edges of the plywood stiffening rails (photo P11). Prepare the catches and hatch surface first by roughing up with coarse sandpaper, fix with one drop of CA to check position, and then 'trap' the catches in place with some thick epoxy and milled fibre mix.

Speedbrake

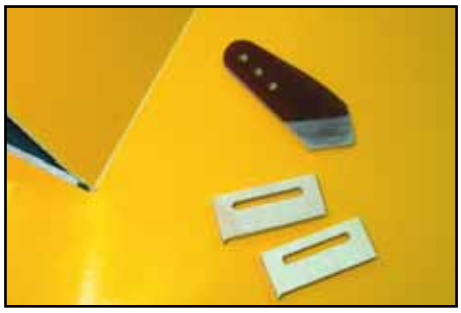


(above) The parts supplied for speedbrake linkage and servo mounting.

We recommend that you cut out the speedbrake quite early during the assembly, as it makes access to some parts and the R/C installation easier through this opening.

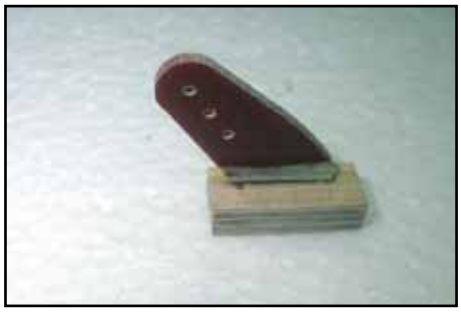
Note: Note that if you decide to use the canards as a speedbrake (see page 21) you don't need to install the speedbrake assembly and can omit this section.

Mark the position of the elastic hinge line using a pin pushed thru' the fuselage from the inside. Apply tape to the bottom of the fuselage and accurately mark the size of the speedbrake on it, nominally 60mm x 230mm wide. Very carefully cut out the back edge and sides *only* using a very sharp knife or a fine razor-saw blade (max. 0.5mm thick). A piece of double-sided tape applied to the bottom of your steel straight edge prevents it slipping, and keeps your fingers out of the way of the knife!



(above/below) Prepare the bottom of the phenolic horn as shown, and glue into the 2 slotted plywood parts securely.

Finally score the front hinge line carefully, just one time, with the ***back*** edge of a modelling knife, or a very small triangular needle file (photo P15). This just breaks through the outer layer of fibreglass cloth (not the hinge tape that is underneath it) and makes for a much smoother movement of the elastic hinge - which also puts less load on the servo. When you have cut it out, the first time you open the speedbrake it is quite difficult, and you may even hear a slight 'cracking' noise which is just the outer skin (don't worry!), but after that it becomes easier.



Sand the edges of the opening and speed brake slightly for a good fit, with about 0.5 - 0.75mm gap all round. Add some narrow strips of the 0.8mm plywood supplied around the ends and back to act as a stop for the door, glued in place with thin CA. Fit your servo in place inside the fuselage, in the milled plywood plate provided, and glue the plate firmly into the lattice rail on the right side as shown in photo P17. You should use a powerful servo for the speedbrake control, and we recommend at least 8kg torque. JR8411 shown here.

Re-shape the bottom of the phenolic horn as shown in the photo above, scuff up the gluing surfaces and glue into the 2 small plywood parts with the slots in them. Make sure that the phenolic horn angles forwards about 45 - 50 degrees to get the necessary throw.

Glue the supplied horn and block onto the inside surface of the speedbrake, exactly in line with the servo arm, using slow epoxy and milled fibre. Make sure to prepare both surfaces properly first. Make up the short linkage using the M3 all-thread, locknuts and steel clevises provided

and connect the speedbrake to the servo output arm, which should be of the heavy-duty type. In the 'closed' position the servo arm should angle forwards at about 45 - 50 degrees.

Wings

The wings (and vertical fins) are mounted using a 16mm OD thick-wall aluminium tube (800mm/31.5" long), and a pair of 6mm diameter brass anti-rotation pins in each wing. They are retained onto the fuselage, trapping the vertical stabs in between, with a pair of M6 x 40mm allen bolts that are fitted into the plywood wing roots, and screwed into T-nuts that are factory-installed in the fuselage.

The elastic-hinged control surfaces have already been cut out for you. The slots in all 4 control surfaces have also been milled for the phenolic horns at the factory. The servos are installed from the bottom of the wing, with the linkages on the top wing surface. The vertical stabs also have the elastic-hinged rudders cut loose for you, but you need to mill the slots for the phenolic rudder horns to suit your servo location and linkage.

Install the aluminium tube spar into the fuselage, trial fit the 4 brass anti rotation pins into the holes in the plywood wing roots and trial fit the wings onto the fuselage, without the vertical stabs. The top surface of the trailing edge of the wings should be level with the top surface of the trailing edge of the fuselage (see photo P21). A little adjustment of the holes in the fuselage roots may be necessary, which can be done with a small round file. The brass pins should be a tight fit in these holes, if they get a bit too big you can fill them with a slow epoxy and micro-balloons mixture and re-drill.

When satisfied, glue the 4 brass pins permanently into the roots of the wings, leaving 22 - 24mm (7/8" - 15/16") projecting past the wing root (P20). Don't forget to scuff up the ends of the brass tubes to get a really good glue joint into the plywood root ribs and balsa blocks behind them. We highly recommend that you use a slow epoxy and milled-fibre or microballoons mixture, or a filled thixotropic epoxy like Aeropoxy/Hysol 9562. Tape both wings firmly in position on the fuselage and check that the trailing edges match while the glue cures.

Fit a M6 x 40mm bolt into the hole provided in each wing root, and fit an M6 lock-nut on the outside. This nut must not be tight - it is just to prevent the bolt coming out and being lost when the wings are removed (photo P22). Refit the wings again, this time with the vertical stabs sandwiched in between the wings and the fuselage and check that all holes align properly. The M6 T-nuts for the wing bolts have already been installed in the fuselage at the factory, and you can access the head of the wing bolts with a ball-ended allen/hex key through the milled slots in the bottom of the wings.

Note: Please make sure that the M6 wing bolts thread into the T-nuts at least 4 full turns. There is some tolerance in the distance of the T-nuts from the wing roots, and we have now increased the length of these bolts to 40mm for extra security.

Install the 4 phenolic servo horns provided in the pre-milled slots in each wing. Tape the outer and inner surfaces together in the centres, tip and root at neutral. Make the milled slots a little deeper, until they almost reach the bottom wing skin. Sand an angle on the bottom of the phenolic horns as shown, so that the top linkage hole in all the horns is about 20mm (7/8") from the top wing surface, and about 3 - 4mm behind the hinge slot. Scuff up the surface of the phenolic horns where they will be glued into the control surfaces to give a good gluing 'key'.

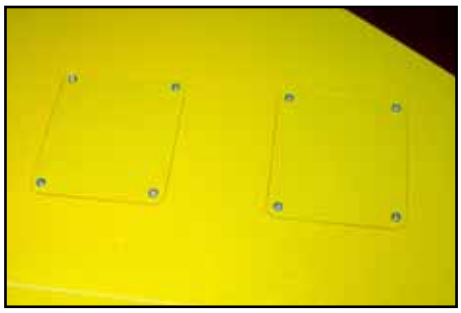
Important: The new Rookie is designed to be flown using ***both*** surfaces on each wing as

'elevons' - *not* as separate elevators and ailerons. You should fit 2 servos in each wing, one for each surface, and this does give some extra safety in case one servo should fail in flight. We are aware that some customers joint the 2 surfaces in each wing together, and use a single servo for each wing, but we strongly recommend that you follow our instructions and use 2 servos and separate surfaces as shown here.

Servo Choice: The new Rookie is really quite fast and has large elevon surfaces, and therefore we strongly recommend that you use high quality servos of at least 8kg torque on each control surface. If fitting a powerful turbine please use hi-torque digital servos like the JR8411's shown here. It is also wise to fit heavy-duty servo output arms, as shown.

To get equal throws on each surface all 4 horns must be glued in with the same angle and with the holes for the clevises the same distance from the wing. Therefore, just glue in *one* horn to start with. Use a slow epoxy and micro-balloons mixture. Protect the wing surface with plastic tape and some clear wax, and cut thru' with a sharp knife to expose the slots. This makes the clean-up easy after the glue is dry. When dry make a template of the 1st horn with some scrap ply wood and an old 1.6mm (1/16") drill or short piece of wire, carefully marking the hinge slot line on the template, and use this to glue in the other 3 horns (see photos P23, 24 and 25)

(above) Shows the tapered and parallel top servo mounting rails. (below) Hatch covers secured with 2.9 Ø x 10mm screws.



Each wing has servo hatches in the bottom for a pair of servos, one to control the outer surface and one for the inner. Assemble the milled plywood servo mounts as shown, and screw your servos into position using the 2.9Ø x 13mm sheetmetal screws provided in the kit - *not* the standard ones that come with new servos. Note that 2 of the servo mounts have tapered top rails, which are for the *outer* servos to make sure that they clear the wing top surface, the narrowest part towards the trailing edge of the wings. The 2 with parallel top rails are for the inner servos. We advise that you mark each servo hatch at this stage. (eg: 'right inner', 'right outer', etc).

Trial fit the servos into the wing with the servo hatches and adjust the position so that the servo arms line up exactly with the phenolic control horns. Rough up the inner surface of the hatches carefully with 80 grit, and glue the servo mounts on with a drop of CA. Check position, and when satisfied glue them on securely with a good fillet of epoxy. These are important joints so make sure to prepare the surfaces well before gluing together.

Make up the linkages using the M3 all-thread rod, steel clevises and lock nuts provided. Remember to Loctite the clevise on one end (see photos). Adjust the milled slots in the wings to clear the linkages at full throws. The hatches are finally secured to the bottom wing surface with 4 each of the 2.9Ø x 10mm sheetmetal screws provided.

The servos in each wing are connected together using a 'Y' lead, and a standard 'Delta wing' mix in used in the transmitter to give you pitch and roll control.

Please take careful note of the control surface throws recommended for the new Rookie at the end of this manual, at least for the first flights, as they are reduced from the original Rookie due to the powerful pitching effect of the canards.

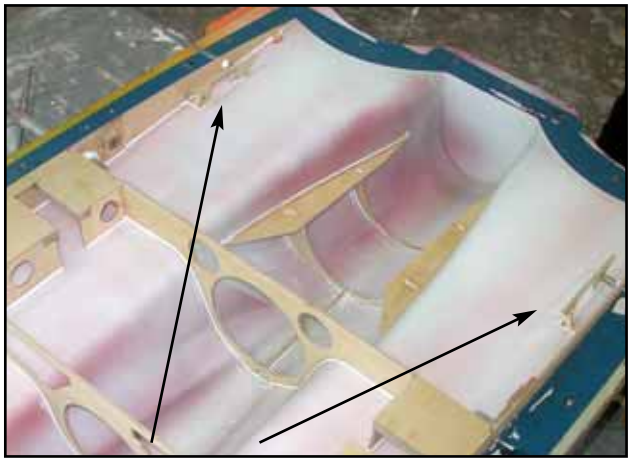
Vertical Stabs

The pair of standard sized rudder servos have to be installed in the fuselage in plywood mounts that are factory-installed during the joining process, and access is through the sides of the engine bay hatch. Note they are installed 'inverted', with the screws inserted from the engine hatch side, which means that you should reverse the brass eyelets in the servos. Use the 2.9Ø x13mm sheetmetal screws provided and a long X-head screwdriver as shown. The servo arms are fitted towards the front of the servo, and project thru' the milled slots in the top of the fuselage. You will need quite long servo arms for this, and again we recommend that you use heavy-duty types. (see photos P29 - 32)

Servo Choice: We recommend that you use servos of at least 5kg torque on each Rudder, and here we have used JR DS5391 economy-digital servos.

Mill slots in the rudders for the small phenolic horns provided, as shown. The position should be about 30mm (1.25") up from the bottom of the rudder surface. The horns should be at an angle so that they are parallel with the top of the fuselage.

Important: Note that the vertical stabs are fitted to the fuselage with the sealed side of the rudder elastic-hinge *outwards*, and the rudder horns on the *inside* surface - behind the hinge slots. Use the same method to make the slots and glue in the horns as for the wings. The outer hole in the phenolic horn should be about 14mm (5/8") above the rudder surface, and about 2 or 3mm behind the hinge slot.



(above) Milled plywood rudder servo mounts are installed during the mould joining process.

Make up the linkages from the 200mm long M3 all-threaded rod, steel clevises and locknuts as shown. With the small rudder movement angles it is not necessary to use a ball-link on these surfaces, and the clevises make it easier to take the model apart for transport or storage.

Connect the 2 servos together with a 'Y' lead to your rudder channel.

If you regularly remove the stabs and the clevises for transport, use a short length of tubing over the clevises to keep them tight for flight.

Canards

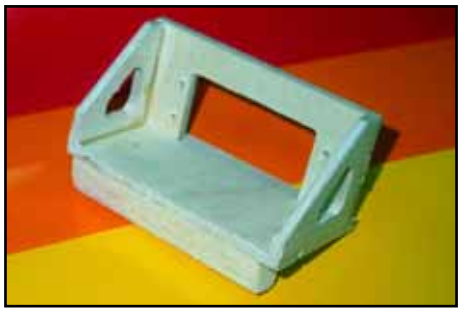
The canards are 99% finished at the factory, with the shafts already glued into them at the correct angles in a jig. Trial fit them into the factory-installed carbon tubes in the fuselage and check for free rotation. Slight sanding of the shafts with 600/800 grit sandpaper may be needed for a perfectly smooth movement and you can apply a little silicone grease to each shaft if you wish. Alternatively, if you find that the shafts are a bit too loose in the tubes, you can spray a couple of layers of 2K clear-coat on them to increase the diameter slightly.

Lightly sand the roots of the canards to get a perfect match to the fuselage shape if needed. Cut

the inner ends of the carbon tubes inside the fuselage (using a fine-toothed razor saw) to leave a 52mm (2") wide space between them. This is the width of the metal canard arm, plus the thickness of 2 of the 6mm I.D. nylon washers supplied. (see photo P34 and 35)
Check for smooth fit of the shafts again. Check that the roots of both canards clear the sides of the fuselage with about 25mm up and down movement, and adjust with extra plastic washers if needed. Leave a gap of 0.75 - 1mm between the roots of the Canards and the fuselage.

Fit both canards with a plastic washer against the inner (cut) ends of the carbon tube, and join with the machined metal canard arm provided. The control arm should be on the left side of the fuselage, pointing upwards and angled about 25 - 30° degrees backwards from the vertical position - towards the tail of the plane. Secure the carbon shafts by tightening the 4 small M3 bolts. The 'neutral' position of the canards is when the roots align with the moulded 'eyebrow' profile on the fuselage sides. (see photo P36)

The canard servo can be fitted on the left side of the fuselage, making sure that the servo output arm aligns with the ball-link on the canard arm. We have included a milled plywood servo mount for this, which can be glued against the side of the fuselage and the top of the plywood 'lattice' rail. Use the 10 x 10 x 70mm balsa block, glued onto the bottom of the ply mount and sanded to the fuselage shape to get a good gluing area. (see photo right)



Servo choice: We recommend that you use a high quality servo of *at least* 8kg torque for controlling the canards, for example the digital JR8411 shown in the photos. It is also wise to fit heavy-duty (or metal) servo output arm, as shown. At neutral the servo arm should angle backwards at approx. the same angle as the canard arm (25 - 30 degrees).

Note: If using the canards as a 'speedbrake' you will need to adjust these angles for the 'neutral' position, and use a longer servo arm to obtain the larger throws needed.

Make up the linkage using the M3 all-thread rod supplied with the M3 steel clevis (and M3 nut) to connect it to the servo arm, and the single M3 ball-link bolted to the inner side of the canard control arm, with the M3 x 16mm bolt and locknut provided. Put one M3 washer on top of the ball-link (under the head of the bolt) to make sure that the ball-link cannot come off in flight.

The hole in the bulkhead that supports the canard shaft tubes, and the nosegear mount, is large enough to insert medium sized air tanks through if you should need, but if necessary you can enlarge it a little at the top and bottom. With the longer nose of the 'New Rookie' you should not need to position Nicads etc in the nose, even if you have a heavier turbine at the higher end of the thrust range.

For the 1st flights, we strongly recommend that you restrict the canard throws to 15 - 20mm trailing edge 'down' (mixed with 'up' elevator), and 10 - 15 mm trailing edge 'up' (mixed with 'down' elevator), until you are experienced with the very powerful effects on the flying characteristics of the plane. If you chose to use combined Canards and Vector thrust at high speeds we recommend you use a 'low rate' of canard throw.

Cockpit Frame and Canopy

The all-new moulded fibreglass canopy frame has already been trimmed at the factory, and you only need to complete the canopy frame fixing system, and trim and glue in the clear canopy.

Everyone has their own favourite method of holding the cockpit in place for flight, and this is your choice. However we have included all the hardware needed for several different methods. You can use a plywood tongue at the front, and an M6 plastic bolt and Tee-nut, or a hatch-catch, at the back as on the original Rookie - and these parts are included.

We prefer to use a pair of phenolic hooks (facing backwards) glued into the side rails of the canopy frame, which locate into slots in the fuselage about 25mm (1") from the back. Tape the frame firmly and accurately in place, and start the slots with a cutting disc. Remove the frame and adjust the slots in the fuselage for a tight fit on the phenolic hooks. Lengthen the slots in the fuselage *only* towards the front of the plane by about 20mm. Adjust slots with a fine flat file. Trial fit the hooks - we suggest that you fit and glue one at a time to get them perfect. Make the slots in the fuselage a bit wider at the front ends to make it easier to locate the finished cockpit. (see photos P43). The phenolic hook glue joints to the canopy frame are reinforced with the small milled plywood parts with the slots in them (see photo P40, 41 and 42), and the slots in the fuselage are adjusted for perfect fit using the 'U' shaped phenolic parts underneath the side rails so that the hook holds the canopy down firmly.

As the canopy frame is quite long we have also included a small strip of phenolic sheet, from which you can cut a couple of small tongues and glue into the canopy frame to locate the sides perfectly into matching slots in the fuselage side rails. The photos should explain it adequately.

It's your choice of fixing methods at the front of the frame. You can use the M6 plastic bolt and the T-nut or, as shown here, the hatch catch which is included in the hardware pack. Cut the slot in the fuselage and glue to catch in place with the fuselage upside-down - working thru' the nosegear wheel cutout. Make sure to prepare the fibreglass and catch surfaces well with coarse sandpaper and glue in with one drop thick CA. Check position and then 'trap' the catch in place with thick epoxy and milled fibres. Drill a matching hole in the front lip of canopy frame, a bit small at first, and open up slowly with a small round file until a perfect fit (photo P37). If necessary you can reinforce/extend the front lip of the canopy frame downwards a little with a scrap piece of phenolic or plywood as shown (P38), to give a stronger area for the catch to go into.

Fitting clear canopies is always a little bit tricky, but this is the method we use: Sand the inside edges of the fibreglass canopy frame (and especially the fibreglass joining tapes) carefully with rough sandpaper, to ensure a perfect fit of the canopy inside. Lay the clear canopy on top of the frame, and mark the rough shape with a felt pen or wax crayon. Cut the outer border of the clear canopy with sharp scissors, about 12mm (1/2") too big all around. When the canopy fits inside the frame roughly, mark the final cut line on the clear plastic. Then cut to exact shape with a 6 - 8 mm overlap all around. Do this in a warm room so that you don't split the clear canopy.

Make several hand-holds with paper masking tape (see photo) to make holding and positioning the canopy easy. Push the canopy up tightly inside the back of the frame and fix the bottom 2 back corners with one small drop of slow CA each (ZAP-O or Plasti-ZAP recommended).
Note: Do NOT use any CA accelerator/kicker - you will immediately 'fog' the clear canopy!

Tape the front of the canopy to the frame temporarily. Mount the canopy frame to the fuselage and tape the back of the canopy frame tightly to the fuselage. Using the masking tape handles to pull the canopy outwards firmly against the frame, working from the back towards the front,

glue the edges of the canopy in place in 2 more places each side, with just a single small drop of CA at each position, all the time checking that the edge of the canopy is tight up against the frame at the front. (see photo P45)

Visually check from the front and back to make sure sure that the canopy is straight. Now that the canopy is fixed in position and cannot twist anymore, you can carefully glue the rest of the canopy firmly in place. You can either complete the gluing from the outside, allowing the CA glue to wick into the joint between the frame and the clear plastic or, as we prefer, you can carefully remove the canopy frame from the fuselage, and use a 30 minute or 24hr epoxy and micro-balloon mixture for gluing all the edges to the frame on the inside surface. Even if you use the CA glue method, we recommend that you also glue the inside edges with the the epoxy mixture to be sure that the canopy cannot come off in flight.

An alternative method for holding the clear canopy in place while tacking it to the canopy frame is to apply a little positive air pressure to the inside of the whole fuselage (seal up the openings with tape), using a vacuum cleaner to blow the air in (connected in reverse).

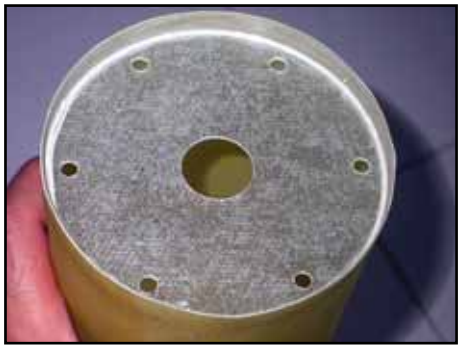
Composite Fuel Tank

Available shortly will be a choice of 2 moulded composite fuel tanks, one in kevlar and the other in fibreglass, to fit the 'New Rookie'. Actually, by slightly enlarging the diameter of the holes in the 2 main bulkheads these can also be retro-fitted to original Rookies. Both tanks come with an internal baffle to prevent to prevent fuel surge and C of G changes during high G manoeuvres.

(above and below) The new kevlar and glassfibre tanks for the New Rookie, with capacities up to 3.2 litres, both have fuel baffles to prevent fuel surge.

The full kevlar moulded tank has a capacity of 3.2+ litres and is already joined at the factory, ready to install, with the baffle and aluminium sleeve for the stopper hardware also fitted. Included is the required kerosene stopper, aluminium cap and brass tubing.

The fibreglass tank comes in 'kit' form, ready for you to join, with instructions. By cutting the length of one half before joining, capacities of between 1.6 and 3.2 litres can be achieved - to suit your choice of engine and required flight times.



With the larger cockpit area in the 'New Rookie' it is easy to fit the fuel tank from the front thru' the cockpit opening, making installation and maintenance very simple. Full details will be on our website shortly.

R/C and Gear installation

We have supplied a cnc milled plywood plate that locks into the slots on top of the lattice rails that connect the front main bulkhead to the rear nosegear/canard former. This is identical to the original Rookie, but can be extended forwards if you need extra space for a more complex gear installation. The back edge of the board is trapped in the 2 small slots in the top of the

lattice rails, and the front end secured with 2 screws or bolts.

There are several tabs in various positions on the board to allow you to use multiple rubber bands or cable-ties to secure the main components, such as the turbine ECU and Receiver. Of course the main items will need to be positioned to set the correct centre of Gravity, but normally you will not need install any heavy items (or lead) in the nose the achieve this.

The nosegear steering servo is best positioned at the front of this board, and you will need to make up a small plywood plate to position it here. In the next production run we will add this milled plate, or modify the main board to give a cutout for a standard sized servo in this position.

Note that you will almost certainly need to remove the main board to allow removal of the fuel tank for maintenance etc, so try to make this as easy as possible with your fixing method.

The hole in the nosegear bulkheads is large enough to install your air tanks in the nose if you wish.

Setting Up Your Aircraft

Depending on the turbine and R/C set-up used, and whether you use normal Nicads (1 or 2) or lightweight batteries, your completed 'ready-to-fly' Rookie will weigh between 8 - 9.5 kg.

Centre of Gravity

For the 1st flights set the Centre of Gravity at 125 -130mm in front of the front edge of the aluminium wing tube, with main fuel tank empty and any hopper tank (if used) full, and the landing gear in the 'down' (extended) position.

This is about 30mm in front of the CG position for the original Rookie, and is required because of the surface area of the canards in front of the centre of pressure.

Control Throws

NB: All control throws are measured at the root /trailing edge of each surface

Elevator:

Set 30mm 'up' and 25mm 'down' initially. These can be increased later for 3D flight after you have some experience of the plane. If you use rate switches set about 70% of these throws for 'low' rate. We recommend that you add about 25 - 30% exponential to elevator throws, to reduce the sensitivity around the neutral stick positions.

Depending on your set-up and Centre of Gravity you might find that for level flight the elevon trailing edge needs to be reflexed 'up' by about 1mm.

Aileron:

Set 20 mm 'up' and 'down' for 1st flights. If using rate switches you can set the 'low' rate to 70%. We recommend that you add about 25 - 30% exponential to aileron throws, to reduce the sensitivity around the neutral stick positions.

Rudders:
It is not possible to get a lot of throw on the rudders, and they are not terribly effective anyway, although enough for 'knife-edge' flight - so just set the throws to the maximum you can get, which is about 20mm (3/4") each way. They are useful for take-off in cross-winds, because there is not much weight on the nosewheel, and of course in some countries working rudders are mandatory because of the law.

Speedbrake:
Set the travel to give you at least 80 degrees, and 85° or 90° if possible, to get the maximum braking effect for landing. The (optional) speedbrake gives very little pitch-up effect, and you will probably not need any elevator mixing with it.

Canards:
The Canards have to be mixed with the elevator function of the elevons so that the trailing edge of the canard goes 'down' when the trailing edge of the elevator/elevon goes 'up', and vice versa. For first flights we recommend that you limit the canard throw to 15 - 20mm 'down' and 10 - 15mm 'up'.

After you have some experience you can increase the throws to 25mm 'down' and 25 mm 'up'.

You can also use the Canards as a 'speedbrake' for landings, instead of the speedbrake under the fuselage. Set them on a separate 'landing mode', or switch, so that the trailing edge deflects 75 - 80 degrees 'up' which gives a very powerful speedbrake effect for landing. Of course you must *not* use a slow travel for this - it needs to move to this position very quickly. Slow the plane down to 'landing circuit speed' before applying. You will get a 'pitch up' effect for a couple of seconds, and then the plane settles back into almost horizontal flight, so you will not need any 'down elevator' mixed in. Use throttle to maintain your required angle of descent. Unless you are using a powerful turbine with a lot of residual thrust at idle, you will *no*t need to combine this with the speedbrake under the fuselage, which can be switched off. If you want to use this option you will probably need a longer servo arm to get the throw needed.

With experience you will find that you can perform some amazing manoeuvres using the canards and increased throws, mixed in with the Thrust vectoring, but we strongly recommend that you take care when using combined vector thrust and canards at high speed as the forces on the airframe are enormous.

Thrust Vectoring:
Set the throw for as much movement as possible, and add about 50% reverse exponential, so that with 50% stick movement for the elevator function you already have 100% vector thrust nozzle deflection for the maximum effect.

Make sure that you can switch 'off' the thrust vectoring system for high speed flight, above about 120mph (190kmh), because it is so powerful that you could fold the wings - especially when combined with the canards.

Warning
The 'New Rookie' is quite fast when powered with a turbine with a thrust of 8 - 12 kg, which is the maximum recommended. Of course the speed at which you fly it is up to your skills and experience, but we highly recommend that you use a speed limiter to prevent exceeding 220 mph (350 Kmh). With care you can use the Vector thrust and the Canards together at high speed, but we recommend that you use a 70% low rate for the canard throws if you are going to do this, as

the combined effect of both is very strong.

Advanced Tips

The 'New Rookie' is capable of some truly amazing manoeuvres, using the canards and Thrust vectoring, and some of our 'Reps' and experienced customers have already been 'pushing the envelope' with the first few planes delivered.

For slow, hi-alpha and 3D flight, with the thrust vectoring active, you can use a high-rate canard setting to increase the canard throws to about 35mm 'up' and 'down'. The 'neutral' position remains the same as normal, in line with the 'eyebrow' mouldings on the side of the fuselage.

If you feel that the high-angle canard-speedbrake set-up (above) is too powerful for your flight mode, then you could just set a 'landing' position of the canards instead. Mix them with the speedbrake on full deflection (80 - 85 degrees) so that the neutral position of the canards is adjusted to about 10 mm trailing edge 'down', giving a 'flap' effect. You may need to mix in a little 'down' elevator with this set-up, depending on the speed of the plane when you apply it.

If you choose not to use the thrust vector system, you can use about 20 - 25 degrees of the under-fuselage speedbrake to help rotation for short take-offs.

As we receive more feedback and Tips we will try to update this information on our website, or in these instructions.

We hope you like this new style of instruction manual, with separate A3 photosheets that you may stick on the wall of your work room for quick reference if you wish.

We have tried to make this airplane as complete as possible, and with good feedback from customers you will help us to continue making good things even better. We appreciate your comments very much. Email: feedback@composite-arf.com

Thank you!
Your Composite-ARF Team

(above) The contents of the kit

Appendix:

Kit Contents:

Quantity	*Description*
1	Fuselage
1	Right wing
1	Left wing
1	Canard with shaft (right)
1	Canard with shaft (left)
4	Servo hatch covers (colour of bottom wing)
1	Right vertical fin
1	Left vertical fin
1	Clear canopy
1	Canopy frame (fibreglass)
1	Aluminium wing tube 16 x 2 x820 mm (T6061 alloy only)
1	Stainless steel vector thrust tube
1	Hardware bag (for vector thrust system)
1	Hardware bag (for canards)
1	Hardware bag (general)
1	Milled wood and phenolic parts bag
1	Instruction manual and photosheets (English)

Wood/Phenolic pack:

Quantity	*Description*
1	ECU/Rx and gear mounting milled plate (3mm plywood)
3	0.8mm plywood strips (30 x 350mm)
2	Milled 3mm ply strips for hatch (curved)
2	Plywood servo mounts for wing (tapered top edge)
2	Plywood servo mounts for wing (parallel top edge)
5	Large phenolic horns (elevons and speedbrake)
2	Small phenolic horns (Rudders)
1	Milled 3mm ply servo mount (for Speedbrake servo)
3	Milled 3mm plywood parts (for alternative canopy mount)

Canard Hardware set:

Quantity	*Description*
1	Ball link M3 (canard linkage)
2	Washers M3 (canard linkage)
1	M3 Allen bolt x 16mm (canard linkage)
1	All thread M3 x 150mm (canard linkage)
1	Lock nut M3 (canard linkage)
2	Nut M3 (canard linkage)
1	Canard arm joiner metal (with 4 x M3 grub screws installed)
1	Throttle servo mount set - milled plywood (canard servo mount)
4	Sheetmetal screws 2.9 Ø x 13mm (canard servo mount)
4	Plastic washer 6mm I.D. (for canard shafts)
1	Balsa block 10 x 10 x 70mm (for servo mount)
1	Clevis steel M3 (canard linkage)

Hardware bag:

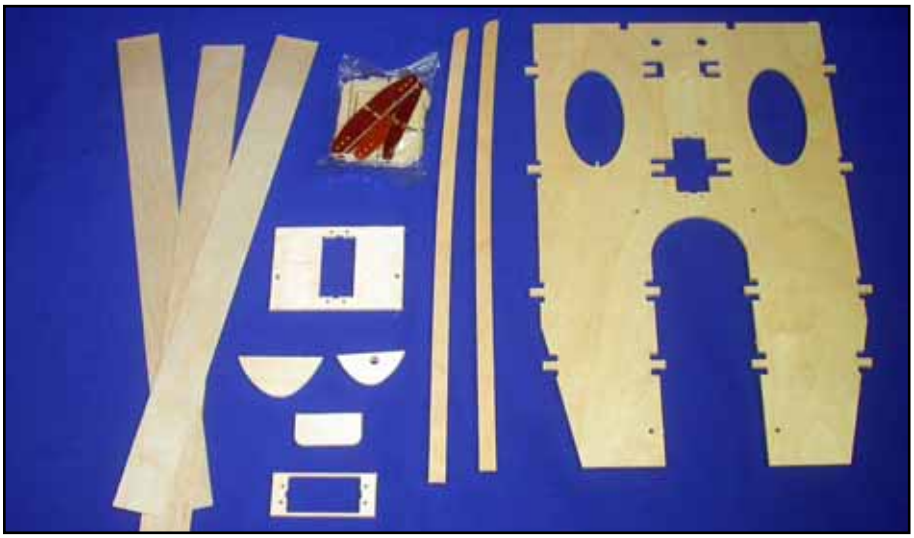
Quantity	Description
4	Brass tube 6mm Ø, 40 mm long (wing dowels)
2	All thread M3 x 200 mm (for rudders)
1	All thread M3 x 60mm (for speedbrake)
4	All thread M3 x 100 mm (for elevons)
4	M4 x 16mm Allen bolts (engine mounting)
4	M4 T-nuts (engine mounting)
1	Plastic bolt M6 x 20 mm (for alternative canopy mount)
2	Allen Bolt M6 x 40mm (for wing fixing)
2	Locknuts M6 (for wing bolts)
2	Washers M6 (for wing bolts)
1	T-nut M6 (for alternative canopy mount)
14	Clevis steel M3
14	Nuts M3
3	Hatch Latches
28	sheet metal screws 2.9 Ø x 13mm (servo mounting)
16	Sheetmetal screws 2.9 Ø x 10mm (servo hatch mounting)
6	Plywood slotted plates (canopy frame & speedbrake horn mounting)
2	Phenolic hooks (canopy frame mount)
2	Phenolic 'U' (canopy frame mount)
1	Phenolic strip 15mm x 60mm (canopy frame mount)
1	Pull-pull cable (1 metre)
4	Crimp tubes for pull-pull cable

Thrust Vector Hardware Set:

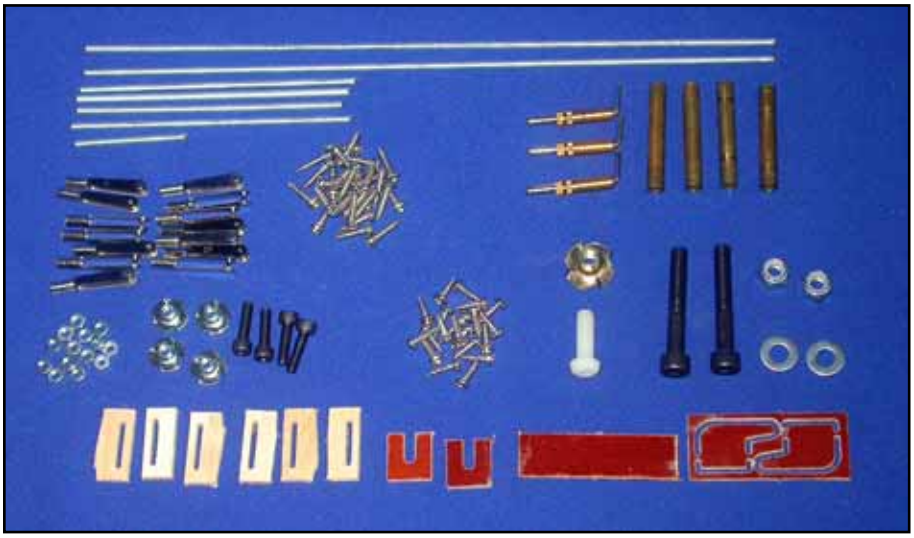
Quantity	Description
1	Stainless vector thrust tube
4	Phenolic washers
2	Clevise steel M3
2	Bolts M3 x 8 mm, countersunk
2	Bolts M3 x 12mm, allen
2	Washers, steel M3
1	Milled plywood servo mount
4	Sheetmetal screws 2.9 Ø x 13mm (vector servo mount)
1	All thread M3 x 365 mm. For Vector Thrust tube linkage
2	Aluminium axles for Thrust vector tube
2	Nuts M3

Available Accessories:

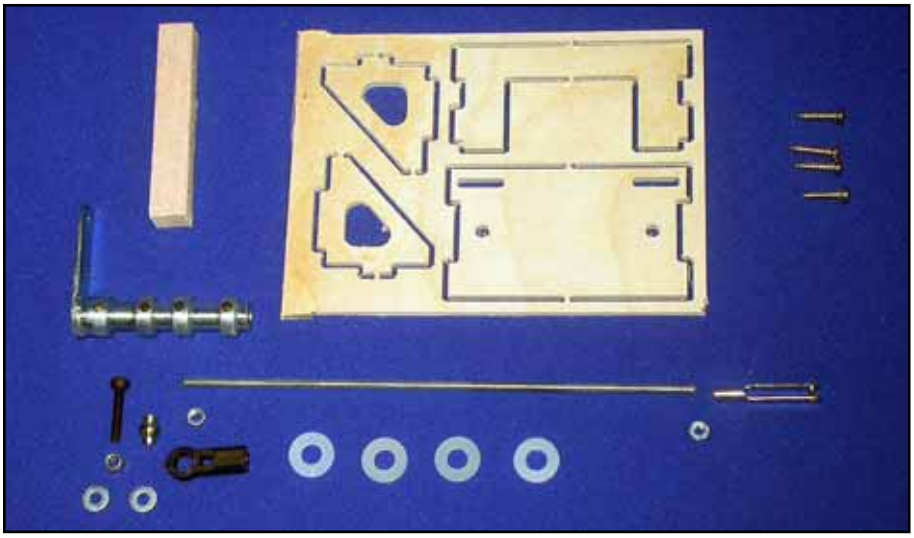
Landing gear set (Behotec C-36)
Kevlar fuel tank (assembled)
Fibreglass fuel tank (kit)
Jetcat P80 or P120
Jet-tronics electronic retract and brake valves



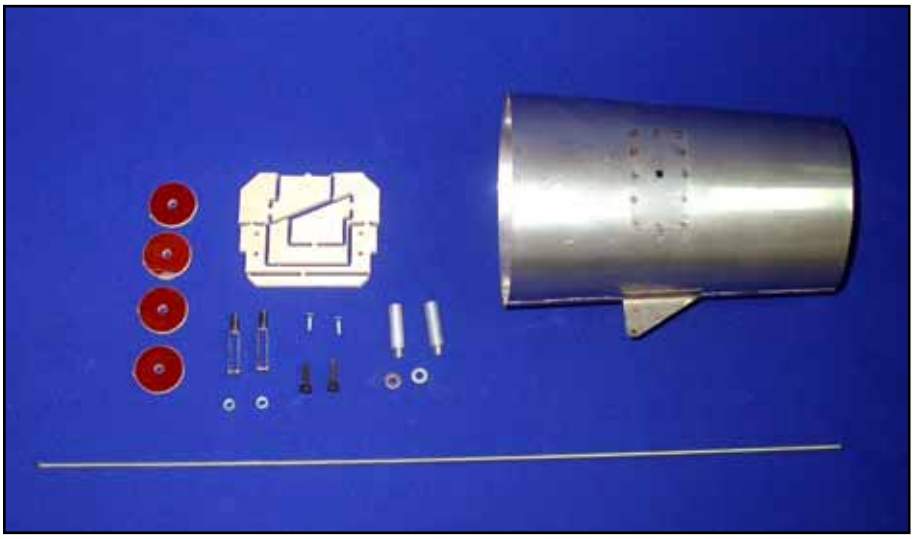
(above) The contents Wood/Phenolic bag



(above) The contents of the General Hardware bag



(above) The contents of the Canard Hardware bag



(above) The contents of the Vector Thrust set