Composite-ARF.com
The High Tech Discount Store
For Model Airplanes And More

BAE Hawk
INSTRUCTION MANUAL

"THE BEST FLYING PLANES ON THE PLANET"

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

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@carf-models.com

or techsupport@carf-models.com

Telephone: Phone your C-ARF Rep!!! He will be there for you.

Website: http://www.carf-models.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 & used according to the instructions. Make sure that you operate your 'Hawk' according to the 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 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 at about half throttle and repeat this range check. 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. Check that the wing and stab retaining bolts are tight, and that all linkages are secured. 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, elevator, flaps and rudder are all hinged for you. The ailerons and flaps are 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 top side of the surface, and there is a very narrow slot in the bottom surface, where the control surface slides under the skin during 'down' throw. This means that the hinge axis line is on the top surface of the wing and stab, 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 'down' 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 downwards. The slot needs some explanation, too. The cut line is exactly in the correct position so that the control surface slides under the wing skin smoothly. If the cut was a few mm forward or backwards, 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 a maximum of 2-3 mm off the lip on the wing in front of the control surface, but you should never cut off more than this.The rudder is hinged with a metal rod passing through factory fitted hinge plates. The all flying elevator hinges on a large carbon plate fitted with ball-races, which pivots on a carbon tube that requires locking in position.

Servo Choice:
We strongly advise that you use the recommended servos and equipment listed in the manual.

Servo Screws:
Fix the all the servos into the milled plywood servo mounts using the 2.9 Ø x13mm or 16mm sheet metal screws provided in the kit, not the standard screws normally supplied with servos by the servo manufacturer. This is because all the holes in our milled servo mounts are 2mm diameter, due to our CNC manufacturing process, and this is too big for the normal screws

Building Sequence:
The actual building sequence is your choice, but it is definitely most efficient to start at the back of the fuselage and work forwards, in the same order as shown below.

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 additional paint, markings or trim.

Adhesives and Solvents
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. Jet models require good gluing techniques, due to the higher flying speeds, and hence higher loads on many of the joints. We highly recommend that you use a slow filled thixotropic epoxy for gluing highly stressed joints (eg: Hysol 9462). The self-mixing nozzles make it easy to apply exactly the required amount, in exactly the right place, and it will not run or flow onto places where you don't want it! It takes about 1 - 2 hours to start to harden so it also gives plenty of time for accurate assembly. Finally it gives a superb bond on all fibreglass and wood surfaces. Of course there are many similar glues available, and you can use your favourite type.

1. CA glue 'Thin' and 'Thick' types. We recommend ZAP, as this is very high quality.
2. ZAP-O or Plasti-ZAP, odourless, or ZAP canopy glue 560 (for clear canopy)
3. 30 minute epoxy (stressed joints must be glued with at least 30 min & NOT 5 min epoxy).
4. Loctite Hysol 9462 or equivalent (optional, but highly recommended)
5. Epoxy laminating resin (12 - 24 hr cure) with hardener.
6. Milled glass fibre, for adding to slow epoxy for stronger joints.
7. Micro-balloons, for adding to slow epoxy for lightweight filling.
8. Thread-locking compound (Loctite 243, ZAP Z-42, or equivalent)

We take great care during production at the factory to ensure that all joints are properly glued, but of course it is wise to check these yourself and re-glue any that might just have been missed. When sanding areas on the inside of the composite sandwich parts to prepare the surface for gluing something onto it, do NOT sand through the layer of lightweight glasscloth on the inside foam sandwich. It is only necessary to rough up the surface, with 80/120 grit, and wipe off any dust with acetone or de-natured alcohol (or similar) before gluing to make a perfect joint. Of course, you should always prepare both parts to be joined before gluing for the highest quality joints. Don't use Acetone for cleaning external, painted, surfaces as you will damage the paint. Tip: For cleaning small (uncured) glue spots or marks off the painted surfaces you can use old-fashioned liquid cigarette-lighter fuel, like 'Ronsonol' or equivalent. This does not damage the paint, as Acetone and many other solvents will, and this is what we use at the factory. At Composite-ARF we try our best to offer you a high quality kit, with outstanding value-for-money, and as complete as possible. However, if you feel that some additional or different hardware should be included, please feel free to let us know. Email us: feedback@composite-arf.com. We know that even good things can be made better !

Did you read the hints and warnings above and the instructions carefully?
Did you understand everything in this manual completely?
Then, and only then, let's start assembling your Composite-ARF Hawk
If not, please read it again before you continue.

This list will help you chose the main additional items needed to finish your Composite ARF BAE Hawk.

Some of the recommendations are mandatory and some can be sourced and chosen by you. The items we list here are highly recommended by C-ARF, and have been tested on various prototype aircraft used during the development of this aeroplane.

1. Servos (minimum 8 high quality servos) All the main control surfaces require a minimum 11kg digital servo (two matched servos for the elevator control) such as the Gr/JR 8411/8711 metal geared servos. All the prototype Hawk models used JR 8711 servos.

2. Heavy duty servo arms are recommended, for the JR servos we used JR part JRPA215 or Graupner #Nr 3544. Two packets required.

3. A receiver power supply system like the excellent Powerbox units are recommended using two separate batteries through separate regulators. The Hawk requires some weight in the nose area, so the additional batteries all help.

4. Turbine set. Turbines in the 10-16kg (20-36lb) thrust range have been used in the prototype aeroplanes. Turbines in the 16kg (36lb) 160N thrust class should be seen as the maximum thrust for the aeroplane and should not be exceeded. Ideally a 160N turbine should be turned down in RPM 5%. Comp ARF display aeroplanes use JetCat turbines.

5. Retractable Landing Gear sets are available from Composite-ARF in sport and scale sets (C-ARF product #200500-Sport) and (#200600-Scale). The Hawk was designed specifically around the German manufactured AT high quality sets that include three units, plus specifically manufactured trailing link legs with associated ball raced wheels and high quality brake units. If you chose the sports scale gear to start with you can upgrade at a later date using scale upgrade set (C-ARF product #200650)

6. Landing Gear support equipment is available from Composite-ARF (#200550), or can be sourced by you. The Hawk requires a minimum of three air rams to operate the gear doors (four with a scale nose gear door set up). The retract valve chosen needs to operate air up/down units and a suitable method of controlling the gear door opening sequence. The Hawk has the gear doors stay open when the landing gear is in the down position. C-ARF set features high quality parts including air valves from Jet Tronic to control the gear and door opening, plus brakes. Suitable air tubing and a large capacity air tank for landing gear/door operation. Filler valves and quick disconnect joiners. We strongly recommend you use this proven high quality set.

7. A radio system with a minimum of 7 channels is needed, but C-ARF recommend a quality system with 9 or more channels to allow individual servo connections to the receiver system (talk to your C-ARF rep for advice on a suitable system) High quality extension leads are required and a guide to the sizes and quantities required are listed below.

8. The Hawk features a large cockpit area which benefits from some additional detail. Our Hawk is a perfect starting point for a scale aeroplane, adding additional cockpit detail using products like the 1:5 scale ejector seats from Graupner and canopy glass MDC from Taylor Made Decals will add to the already impressive look of this iconic aeroplane.

Thrust Tube Assembly

The thrust tube is manufactured from an aluminium outer "cool" tube and a stainless steel inner pipe rolled and spot welded for you at the factory.

This tube is designed to work with the sizes of turbine intended for the BAE Hawk. Turbines in the 22-35lb thrust class are perfect.

The tail pipe is mounted in the fuselage between the rear fuselage cut-out opening and aluminium mounting brackets provided that fix to the carbon bellmouth and turbine mounting rails.

Fig 1

The first job is to fix the carbon bellmouth to the stainless inner tube. The bellmouth is designed to go inside the tail pipe and be fixed by M3 cap head screws or pop rivets if available to you.

The thrust tube can be fitted in any orientation, but the neatest look is with the joint seam at the top when the aeroplane is on its wheels.

Fig 2

For simplicity the Hawk was designed without full ducting, hundreds of test flights in various conditions have shown perfect operation and normal turbine temperatures.

A trial fit of the carbon bellmouth should show any areas that need sanding to allow a snug fit. The carbon moulding process will undoubtedly lead to a variation in thickness of the material. Some early tail tubes show a reduction in diameter where the lip is formed in the tail pipe tube, this needs to be worked out before the carbon bellmouth will fit. Later pipes have no lip.

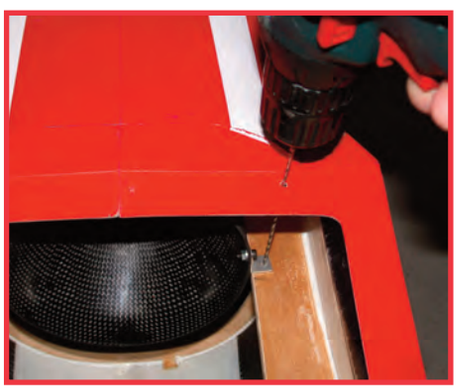

Fig 3

Once the bellmouth can be inserted at least 12mm drill four holes to suit the fixing you have chosen.

If using M3 x 8 Socket head cap screws use washers under the screw heads on the inside (carbon)

Fitting the aluminium mounting angles to the bellmouth at approximately 3 and 9 o'clock is best done after the turbine has been mounted so that the inner tube is fixed centrally on the turbine cone. This is important to avoid "hot Spots" in the pipe that can lead to tube failures. Note that on early kits the tail pipe outer "cool" tube will get very close to the elevator servo mounting plate restricting how high the pipe can be mounted at the front. Later kits will have more clearance.

Alignment by eye is accurate enough when fitting the carbon cone.

The outer tube should protrude through the fuselage rear between 3 and 5mm. This sets

the position.

Access to the two front mounting screws (2.2 x 10mm) is improved if you drill two access holes in the rear wing seating area. Holes drilled at 170mm centres approx and 10mm in from the rear edge of the wing. The tail pipe front brackets should be screwed directly to the turbine mounting rails. Be sure to centralise the carbon bell mouth between the rails as the deflector duct fits outside of the carbon bell mouth.

Turbine Installation

Mounting the turbine is very straight forward on the Hawk, with excellent access to the turbine through the wing opening. Mount the turbine directly on the bearers, higher power turbines benefit from being mounted slightly higher in the fuselage. To achieve this the motor mount could be fixed below the rails (when looking through the wing opening)

Fig 4

Modern electric start turbines remove the need for engine access hatches, as the operator does not need to attach or detach anything from the turbine during starting.

We recommend a turbine of 12-16kg thrust, the three prototype aeroplanes have been flown with JetCat P120SX and P160SX turbines.

Any turbine between 22 and 35lb thrust will give adequate performance to the Hawk. For less experienced pilots we recommend turbines over 35lb thrust have the maximum RPM reduced to limit output.

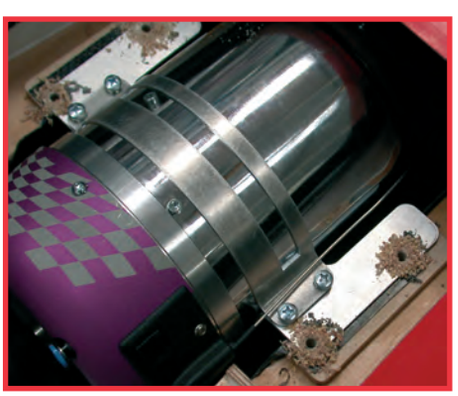

Fig 5

IMPORTANT SAFETY INFORMATION. The Hawk is designed for a maximum turbine thrust of 16kg-This must not be exceeded. All installation pictures show a JetCat P120SX, , which give more than scale performance including huge vertical elements.

Many of the turbines available now feature off-set mounts. The exact position of the turbine will affect the thrust tubes vertical position, which can affect the Hawk's trim. On very early kits the elevator servo plate is mounted 10mm lower in the fuselage, requiring a small dent placing in the outer cool tube to allow clearance for the correct bellmouth height. On the prototype model 8mm of packing was required.

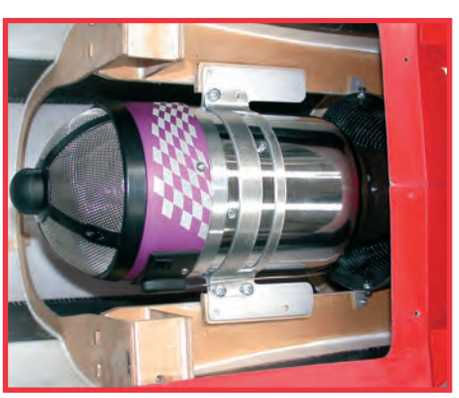

Fig 6

The exact position of the turbine fore and aft will depend on your chosen turbine. With the JetCat turbines we recommend a distance of 25mm between the back of the turbines tail cone and the carbon bellmouth/stainless tube joint. This relates to the front

of the turbine purple cover finishing just in front of the wing fixing formers.

The carbon turbine deflector guard mounts to the carbon bellmouth with three M3 x 10 Allen bolts, washers and nuts. The guard features mounting ears that sit between the turbine mounting lugs.

When you drill the fixing holes for your chosen turbine it is very important that the turbine is centred on the tail pipe tube. It is also important that the turbine is not angled so that the hot gasses are being directed onto the tail pipe walls. JetCat turbines are installed with the cable connection towards the top of the aeroplane, away from the wing. Drill the four mounting holes ø4 one at a time, adding a screw into the drilled holes in turn, help keep the turbine position. Once drilled remove the turbine and open the holes to ø5.5mm ready for the M4 T-nuts. These can be pulled into position with the M4 Allen screws and large spreader washers. The carbon deflector guard may require a hole to accept the turbine cable, with the shown JetCat turbine a single hole is required for the power cable.

Fig 7

Fig 8

Fuel Tank Setup

Composite-ARF offer an optional moulded Kevlar fuel tank of 4.1 ltr capacity, which is installed in the fuselage on the C of G and a plastic tank that can be used as a hopper tank in the cockpit area. If you wish to fit smoke some of the C-ARF team pilots have used Flash wing tanks mounted below the main fuel tank. If this set up is chosen the wing services should exit the wing through the leading edge/wing mount face, with corresponding holes drilled in both faces. The main tank is moulded with a deeper rear trough to retain fuel towards the end of the tank.

Fig 9

Before starting assembly of the moulded tank it is important that any debris left in the tank during the manufacturing process is flushed out. Washing the tank with warm water and some washing detergent works well. Ensure the tank is completely dry before you assemble it fully.

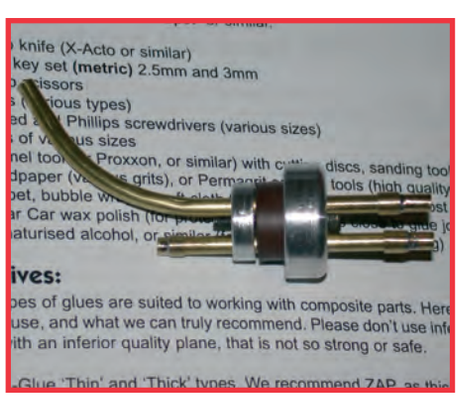

Fig 10

The tank comes factory joined and is tested in the factory for leaks. The recommended hardware is provided in the kit. Care when assembling the fuel

tank cap and tubing will reward you with a reliable aeroplane. De-bur inside the brass tubing with a new sharp scalpel blade and remove any raised edges on the outside caused by cutting. To aid sealing and help prevent the fuel tube coming off, solder the short lengths of tube provided a few mm back from each end of the feed line and on the outside of the breather line only.

Use Tygone tube for the clunk line, where the clunkline passes through the baffle insert a section of brass tube as the glass fibre edge can easily cut through the tygone tube. The supplied soft clunk will become heavier when charged with fuel and easily reach all areas of the fuel tank.

The fuel tank is designed to be easily removable, retained by the aluminium tank cap at the front and two fixing brackets at the rear. The tank cap is inserted into a 60 x 60 3mm plywood plate that is fixed to former F2. The two aluminium angles and 30 x 3 x 185mm plywood strip are bonded to the rear of the tank. Two M4 Allen screws fix these angles to plywood mounts bonded to the fuselage sides. Start by laminating the four 40 x 45mm 3mm plywood mounts into two pairs.

Drill ø 4.1 holes centred on one each of the aluminium angle faces. Drilling small holes in the opposite face will help improve the bond to the Plywood spreader plate and a small screw can be added for additional security. Assembly of the rear mount is simplified if you tack glue each part in position with a spot of Slo Zap cyanoacrylate glue. Start by fixing the plywood cross piece to the rear of the tank. Gently lay the tank in the fuselage with the 60 x 3 x 60mm front mount in plate to set the for/aft position of the tank. Even moulded Kevlar tanks expand slightly during filling, so it is important that the tank is not pushed down into the fuselage before fixing. Tack glue the 40 x 45 x 6mm side mounts to the fuselage side against the former F3 approximately 8mm down from the fuselage contour change, using a few spots of thick CA glue. Tack glue the aluminium mounting angle to the plywood spreader plate with the ø 4.1mm hole against the plywood mounts. Using a pen, mark the fixing position on the 40 x 45 x 6mm plywood plates. Remove the tank and break free the angles. Mark the

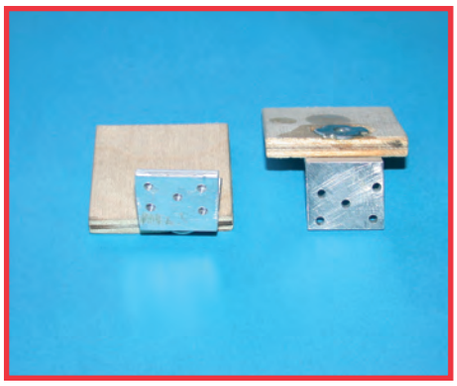

Fig 11

Fig 12

Fig 13

Fig 14

plywood spreader position on the rear face of the tank and sand the area ready for bonding. Break free the side mounts and drill the marked position ø5.1 to accept M4 T-nuts. The T-nut face will require recessing slightly to allow the mounts to fit flush on the fuselage side. Bond the T-nuts in position with a small amount of CA or epoxy, squeezing the nuts fully home in a vice. Ensure you make a pair. Bond the plywood spreader plate to the tank and allow it to dry.

Mix enough epoxy to fix the 40 x 45 side mounts and aluminium angles in position, put a small amount of grease on the M4 x 10 Allen head screws to stop them sticking to the T-nuts. Loosely screw the angles to the side mounts and place the tank in position locating the angles against the spreader plate and the side mounts against the fuselage side and former. Tighten the screws enough to hold everything in position while the glue sets.

Remove the tank and reinforce the mount as required.

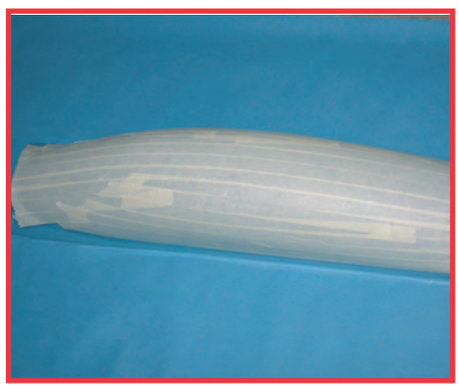

Fig 15

Canopy Frame and Canopy Glass

The moulded canopy frame has been factory trimmed and the retaining system completed. The BAE Hawk features a large canopy where the fixing and canopy rigidity is critical. A pair of canopy hooks at the rear and a single M4 cap head screw at the front holds the canopy in position with two location tabs halfway along the frame.

The fixing nut is factory installed and the frame test fitted before leaving the factory.

The Hawk canopy glass is quite large, this makes fitment a little harder.

Fig 16

It is important to sand the inside gluing surface to remove any high spots and it is worth looking along the frame edge to check for any areas that have been moulded thicker than ideal. Pay particular attention to the joint seam line where additional tape is added. This should be thinned with a Dremmel type drum sander before the clear glass is fitted.

To ensure the clear glass meets the canopy loop, the front edge contact lip contact should be kept to a minimum.

To protect the clear glass, it is good practice to cover it completely with masking tape. This protects the glass while it is being trial fitted and makes it easier

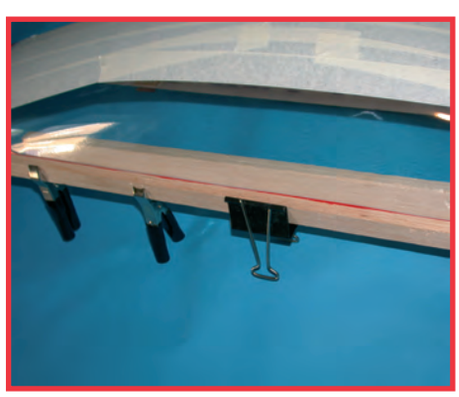

Fig 17

to mark cut lines on.

Trim the front and rear end plate areas off the clear glass with a pair of curved cutting scissors.

Tip, do this when the canopy has been sitting in a warm room for some time.

Lay the canopy glass carefully over the canopy frame and mark the rough cut lines with a marker pen. Mark this line level with the lower edge of the canopy frame-this will ensure a little excess is left.

Test fit the glass inside the canopy frame and note any areas that need further trimming. Small notches might be required around the canopy hooks and tabs.

Many modellers have their own favourite method of gluing the canopy glass in position. We have had good results with Zap 560 canopy glue and or Zap CA Note: Do not use kicker which generates excess heat and can cause the clear glass to fog.

The long sides on the Hawk frame are flat, this allows the use of straight edge packers to help clamp the clear glass against the frame. We cut a length of scrap balsa to use inside the glass and charger power clips to clamp the glass in position while the glue dried.

Fig 18

Tailplane Assembly

The Hawk features an all flying tailplane (elevator control) that is easily removable for transport.

Access to the tailplane mount/hinge support is through a factory fitted rear fuselage hatch held in position by two pins at the front and a single M4 screw at the rear. Removal of the cover requires the tail being manually driven to the full up position, allowing clearance to slide the cover back around 12mm to disconnect the front carbon pegs.

Fig 19

The carbon tail mount and bearing support are factory installed, making tailplane installation easy. The carbon pivot tube is not fixed to allow removal during the build. The method of fixing this tube is left to the builder as there are several options open to you. A small cross pin inside the bearings is one option.

Four M4 x 25 Allen screws hold the tailplane in position, the mounting holes are drilled and fixing nuts factory installed on the carbon mount. On early kits the two double control horns require fitting. Later

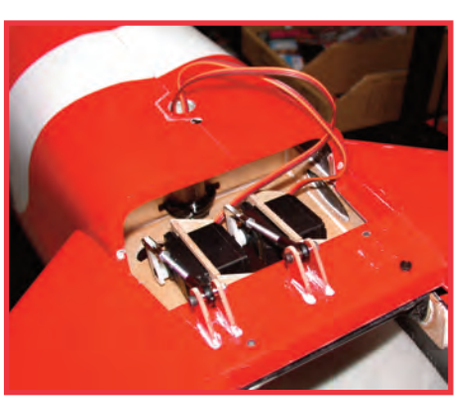

Fig 20

kits will have these factory installed.

Fitting the horns on the early kits is a straightforward job, requiring four slots cutting in the top surface of the cross brace. This brace is hollow in the centre where the centre pair of horns fit and filled where the outer pair fit. The centre pair of horns should protrude through to the lower skin. The outer pair should be inserted a minimum of 10mm.

Mark the control horn centres, working from the left hand pair of mounting holes mark a line parallel to the two holes 8mm to the left. Then measure across and mark a second line 51mm to the right. These lines match the pushrod line from the centrally positioned ball ends. The control horns are fixed with an 8mm gap between. Mark 4mm either side of the two lines you have made. Outside of these, mark two more lines allowing for the thickness of the horns-approx 2mm. You will slot between these two lines. The fore/aft position is measured from the front edge of the cross brace, mark a line 17mm back from the front edge and a second line a further 17mm behind this. Slotting the brace is easy using either chain drilled holes or a Dremel type cutter.

The control horn centres should be 16mm above the top surface of the brace and 18mm back from the front face, these figures are not as critical as the two sets of horns matching.

Two matching elevator servos are required. Composite ARF recommend the JR 8711 servo for this important control. Careful matching of the two servos using your radio or a servo tester is imperative. Using the recommended super servo arm (JRPA215, JRC46015 or Graupner Nr 3544) it is possible to match the servo neutral very closely by checking the mould numbers on the underside of each arm and trying both 180 degree positions. The different moulds (5) feature different spline positions reducing any sub trim required.

The two elevator servos mount in milled wood frames mounted on a CNC milled removable plate that is held in position with three M4 Allen screws. It is important that the centre screw is not over long as it will touch the tail pipe outer tube. The two servos are mounted with both outputs facing the left hand side of the aeroplane and positioned to the rear of the fuselage. Use the supplied 2.9 x 13mm sheet metal screws to mount the servos-not screws supplied by the servo manufacturer. When you have finished the set up, be sure the servo arm screws are fully tightened with a suitable large Phillips screw driver.

The twin elevator linkage is assembled from two pieces of M3 all-thread fitted with a steel 3mm clevis and lock nut at each end. It is important that the two servos do not fight each other as the servo current draw is increased massively in this situation and will lead to early servo failure. The tailplane neutral position is with the TE underside 6mm above the cover split line.

Fin and rudder

Very little work is left for you to complete on the vertical fin and rudder, the single M4 Allen screw fixing is completed in the factory and the rudder servo mount, control horn and hinging are all factory installed for you. The fin will accept any standard size servo

with a minimum torque of 8kg. We highly recommend a metal geared servo like the JR 8411/8711. It is important to use the screws supplied in the kit and not the screws provided with the servos, which are too small in diameter to provide resistance to movement.

If you received one of the early kits the servo cut-out in the lower skin may not have been completed. The cut-out should be made 32mm forward of the fin spar centre and be 60mm in length, leaving a 5mm lip along each edge.

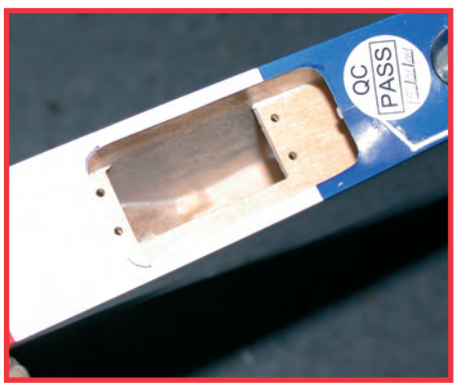

Fig 21

Before installing the servo you need to cut a slot for the rudder servo horn. The easiest method of locating the arm position is to fit the servo with a short arm that will just make contact with the fin skin when turned.

Fit the servo mounting grommets and eyelets before installing the servo with four 2.9 x 13mm sheet metal screws with the output closest to the rudder. Mark the servo output spline centre position on the left hand skin, before rotating the arm enough to defect the skin. Mark the horn centre line with a pen and remove the servo. Draw two parallel lines 5mm apart centred on this mark and the rudder horn position. Cut a slot 5mm wide and 30mm long

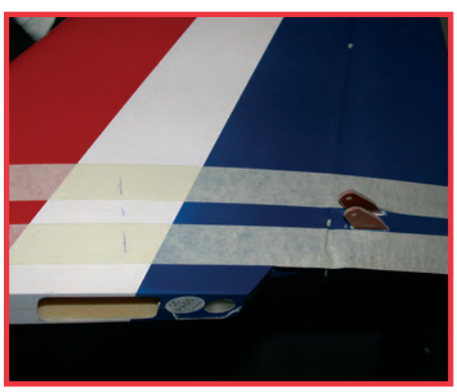

Fig 22

The rudder linkage is made up from a length of M3 x 100mm all-thread fitted with a steel M3 clevis and locking nut at the servo end, and an M3 ball-link fixed by an M3 x 16 Allen bolt and locknut through the dual control horns.

If the fin is to be regularly removed the servo extension lead socket could be mounted in the fuselage top using a scrap piece of plywood.

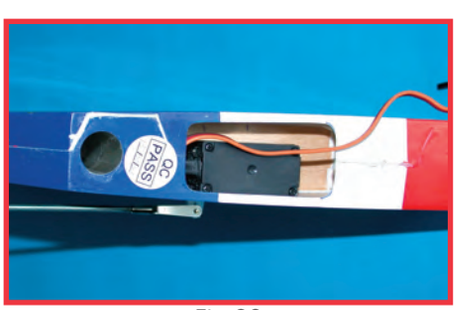

Fig 23

Fig 24

Fig 25

Wing

The wing fixing system has been completed for you in the factory. Two carbon pegs locate into the fuselage front wing former, and two M4 x 60 high-tensile steel socket head caps screw into the pre fitted wing fixing nuts that are bonded into the wing fixing loop formers.

The aileron and flap surfaces are cut free and hinged ready for installation of the servos and linkages. Wooden mounting rails are factory installed to accept the Composite ARF Hawk gear which was specifically developed for the Hawk. The design allows either Scale or Sports sets to be installed with minimal adjustment. The landing gear openings are factory cut, but may require a small amount of trimming to clear the struts or wheels. Pre cut gear door covers are pre painted to match your chosen colour scheme.

The aileron servos are screwed into CNC milled plywood servo mounts that must be bonded to the servo covers. The Flap servo mounts are factory installed as part of the wing structure. All commonly used servos will fit the openings in either mount. If you use the recommended JR servos two 650mm long leads are needed for the aileron servos and two 180mm leads for the flap servos.

Assemble the ailerons servo mounts from the milled plywood parts provided. Ensure you bond the frame onto the cover plate making a left and right plate.

We strongly recommend JR 8411/8711 servos for the ailerons. Before fitting the servo frame prepare the servo and fit with a JR super servo arm to allow accurate positioning of the servo arm in the pre cut slot. Use your radio or a known servo tester to centre the servo arms before installation. JR servo arms can be rotated 180 degrees to gain better centring with minimal sub trim use.

Before bonding the mounts onto the cover plate sand the gluing area to provide a good key. Tack glue the frame in place with CA and test fit the servo to ensure correct positioning. Once satisfied, reinforce the joint with 30 minute epoxy or Hysol.

The servo should be mounted with 2.9 x 13mm sheet metal screws provided (not with the servo manufacturer supplied items) Some servos require a small amount of the frame support gusset trimming to

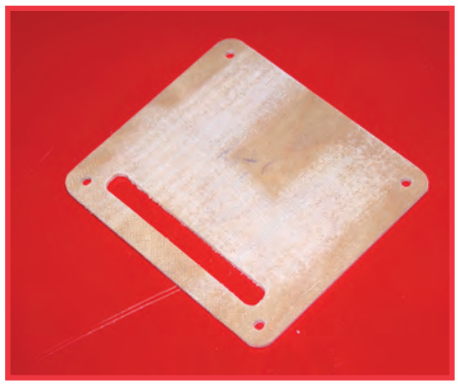

Fig 26

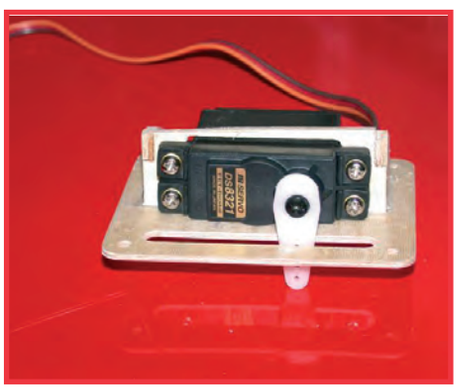

Fig 27

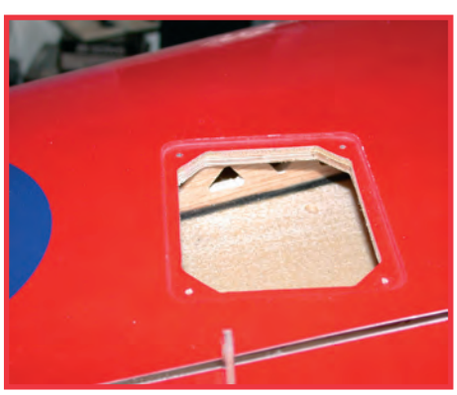

Fig 28

Fig 29

clear the servo wire as it exits the servo case.

The aileron servo extension should run along the wing in front of the main wing spar before passing through the spar around the centre section. The extension lead must be restrained where it runs past the flap linkage.

The Aileron linkage is assembled from the 42mm length of M3 all-thread fitted with a locking nut at each end and an M3 steel clevis. Fit this on the outer hole of a 20mm radius arm.

Finally fix the servo cover plate using four 2.9 x 10mm sheet metal screws.

Fig 30

The flap servos are mounted into the servo cut-out pre cut in the wing rib accessible through the main gear opening in the wings lower surface. The servo is mounted with the servo arm nearest the wing trailing edge.

We recommend a servo with minimum 9.0kg torque as the Hawk flaps are quite large and the actuating horn offset from the hinge point is relatively small.

C-ARF strongly recommends using the JR 8411/8711 servo for the flaps, fitted with a heavy duty servo arm. Very little movement is needed for total flap travel, so

Fig 31

Fig 32

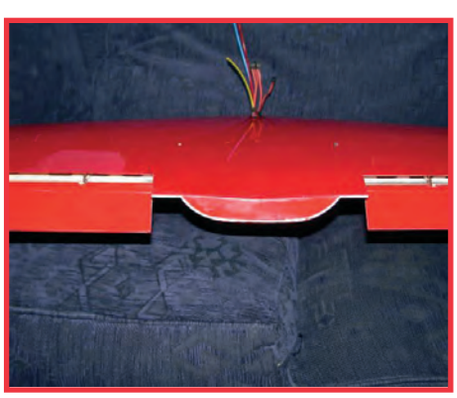

Fig 33

the arm can be cut leaving only the inner two holes.

The flap servos are fitted using four 2.9 x 13 sheet metal screws-note do not use the stock servo mounting screws

Some time should be spent cleaning up the factory cut openings for the flap linkage with a file to remove any material left around the opening. This will stop any binding of the linkage during flap operation. At least 60mm of flap movement is required in landing mode.

The flap linkage is assembled using two M3 x 200mm all-thread rods fitted with a locking nut at each end and a steel M3 clevis. This benefits from some additional

support in the form of a tube slipped over the all thread between the clevis fixing nuts.

On early kits, the factory linkage access hole through the main wing spar needs adjusting for pushrod clearance. Fitting the linkage from the flap control horn will show you the required direction of slotting to allow clearance. It is possible on early kits that the control horn will also need adjusting if it does not align with the servo arm. This is simple using a pair of large grips to crack the horn into position, before rebonding with

Fig 34

Fig 35

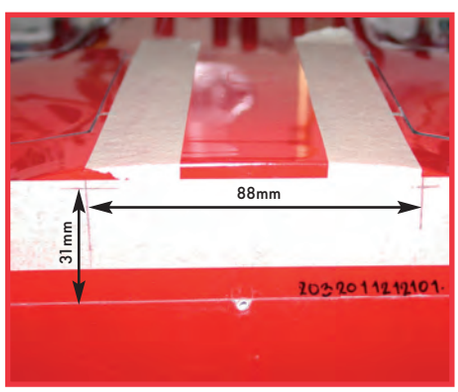

Fig 36

Fig 37

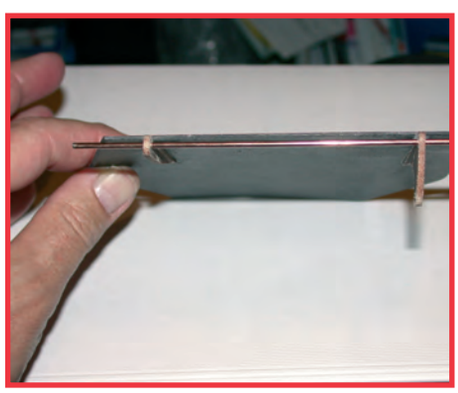

Fig 38

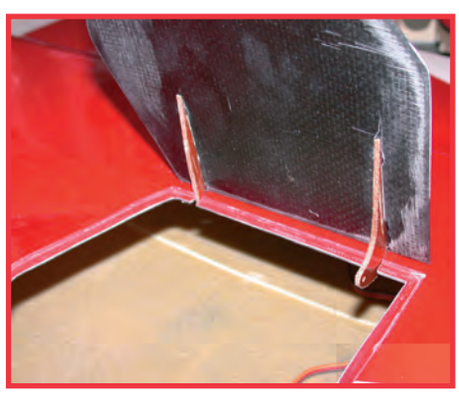

Fig 39

Hysol.

To allow perfect flap operation it is important to set the two flap servo arm neutral (take off Flap) from your radio in the centre position of any control switch or lever.

Main gear door installation.

The main gear doors are supplied moulded in one piece. These should be separated into three pieces, the larger inner section is hinged using the milled phenolic hinges and the supplied rod and tube. The centre section will be fitted to the struts and the small base piece notched to clear the strut, or hinged if you chose.

Fig 40

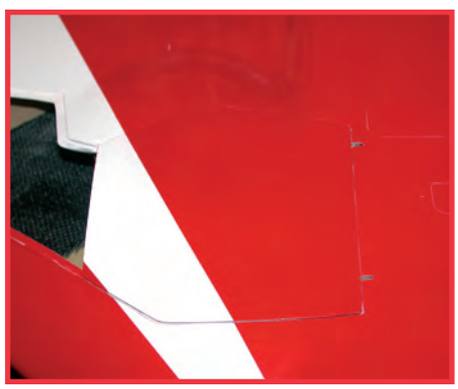

Fig 41

Fig 42

Fig 43

Fig 44

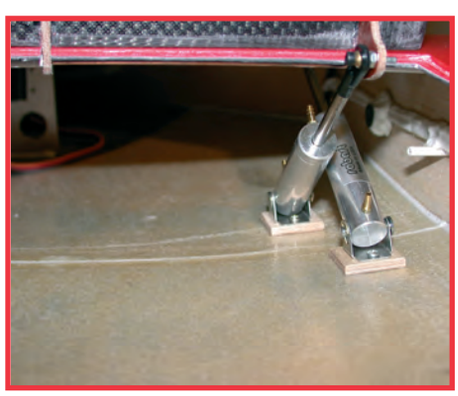

Fig 45

Operation of the inner doors requires two large bore approx 1.5" stroke air rams. These can be bought as part of the optional Composite ARF air pack #200550 or sourced individually. We recommend Robart 3/8" air cylinders F-RB165. These are angled and overlap each other in the wing centre section.

The hinges need separating from the phenolic sheet and the retaining tags sanding off. It is good practise to tack glue the hinges and tubes in position to allow easy adjustment

and ensuring perfect operation before final fixing.

With the door pieces separated spend some time sanding the door recess to remove any high spots and chamfer the door edges so that they seat fully in the recess.

Fig 46

Fig 47

Fig 48

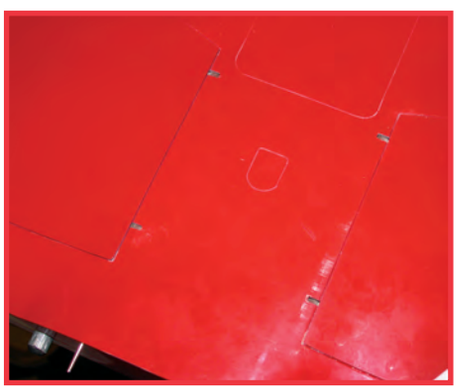

Fig 49

For the doors to operate properly the hinge tubes need to be bonded to the wing skin directly. The moulding process means it is possible that the foam skin could encroach into the hinge tube area. This is no real problem as the foam easily sands away using a round file.

Access to the hinge wire is through the wings leading edge centre section. Drill two 3mm holes at 88mm centres and 31mm down from the wings seam/joint line.

To check the foam board position use a small mirror, if necessary clean away the foam to allow the plastic hinge tubes to be bonded onto the wing skin.

Tack glue the hinges onto the gear doors with the rear hinge 13mm from the back corner and 82mm between the two hinges.

The hinges require slots cutting in the wing gear door shut. Use the doors complete with hinges as a reference and mark the wing slot positions.

Carefully cut the slots, ensuring they are only fractionally wider than the phenolic hinges. Cut three pieces of the white 3mm dia plastic tube provided, one long length to match the distance between the hinges fitted to the doors and two 20mm long lengths for outside each hinge. The Hawk has such a large gear opening and thick wing it is easy to work on one door at a time and access the hinges through the opposite door opening. The use of a mirror will help with the hinge tube installation.

When satisfied with the hinge positioning, and opening angle, the hinges and tubes can be fully bonded in position. On a Hawk the main doors open to around 85 degrees.

To aid cylinder clearance fitting ball link ends will allow one cylinder to be attached to the inside and the opposite attached to the outside of the hinges. The Robart cylinders require 2-56 threaded studs and suitable ball ends. The bases of all Robart cylinders are conveniently fitted with a mounting base. This should be screwed to a scrap of 3mm plywood approx 20 x 20mm.

The air cylinders should be fully extended and the gear door open position set before bonding the cylinder mounts to the wing upper skin. This process should allow the cylinders remaining stroke to act on the gear doors holding them shut against air pressure in flight.

Main Landing Gear installation

Fig 50

Fig 51

Fig 52

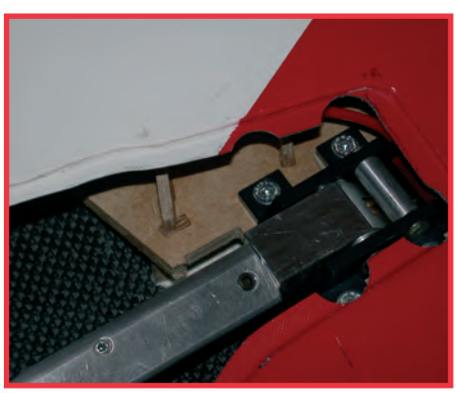

Fig 53

Assemble the struts and retract units leaving the pin loose enough at this time to allow adjustment of the wheel alignment.

The main units are installed with the cylinders pointing towards the wing tips. Slide the units along the mounting rails until the wheels clear the door opening edges. The scale struts feature larger diameter 114mm wheels than the sports struts, which have 100mm wheels. If you think you might upgrade to scale struts allow for the additional 7mm clearance required.

The close proximity of the gear opening may require trimming and half round notches filing for mounting screw access. Drill the four mounting holes ø4 in the wood mounting rails and remove the retract units. Open the four holes to ø5.5mm to accept the M4

T-nuts.

Some of the T-nuts will require trimming for structure clearance. Before installing the nuts apply a small amount of grease into the threads to stop glue locking the screws in

Fig 54

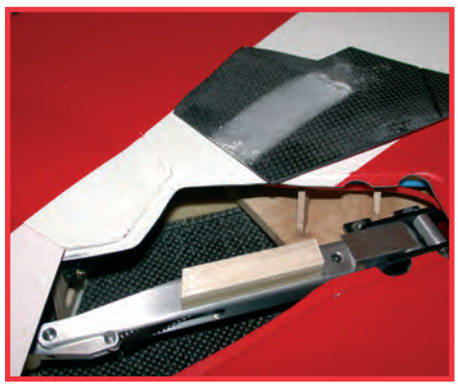

Fig 55

position. Apply a small amount of 30 minute epoxy onto the nuts and partially pull into position using an M4 x 15 cap head screw and a large M4 washer. Do not pull them fully home to allow final seating with the retract units in position. Working quickly re install the units and pull the T-nuts fully home by tightening the retract units fully. Allow the epoxy to fully cure before removing the units.

The steel retract/oleo pins require flats grinding to stop the hardened pins slipping in the oleo leg. Insert the pin leaving 18mm protruding from the oleo leg and mark the four grub screw positions to aid grinding the flats. Ensure the flats do not have sharp corners as these create stress points where the pin can crack.

Use a thread locking compound like loctite to install the four set screws in each leg. Install the oleo legs back in the retract units and nip the clamp screw just tight enough to hold the leg in position.

With both legs installed 'eye ball' the wheels and use a straight edge held on the

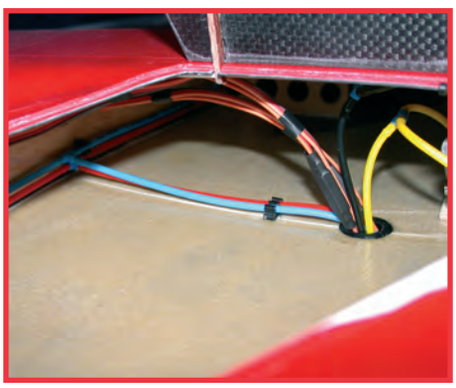

Fig 56

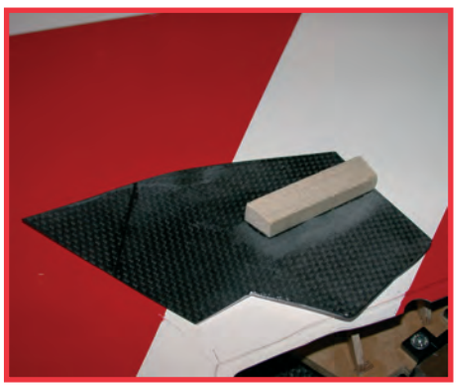

Fig 57

outside edge of the tyre to check alignment.

Aircraft tracking is better with a very slight 'toe in" on the wheels, but straight wheels are better than 'toe out' which can lead to instability on the ground. Test the wheel clearance during retraction and check that the main wheels clear the gear doors when

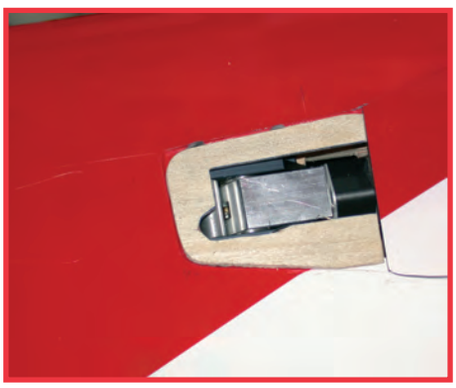

Fig 58

Fig 59

fully retracted. If tyre clearance is tight a thin plywood shim under the retract unit to lower the wheel when in the retracted position should be added. Once you have found the perfect position fully lock the legs by tightening the lock screws fully.

The wing structure features convenient openings to allow the air tube to be easily routed through the wing to the centre section. The services (air and servo) can exit the wing either through the top surface, or if you may fit a smoke system it is best to exit the wings leading edge between the wing pegs.

The lower leg gear door covers are mounted using a shaped piece of wood glued to the gear door with epoxy, and bonded to the oleo leg using a silicon adhesive. Additional security is gained by drilling through the door and spacer and tapping the alloy leg M3 to accept two M3 screws.

The small door that covers the retract unit can either be notched to clear the leg or hinged as the full scale Hawk.

Nose gear

The nose unit on the Hawk is specially designed with a large strong mounting frame, perfect angles up and down, plus a positive, slop free and snag free steering system.

Fig 60

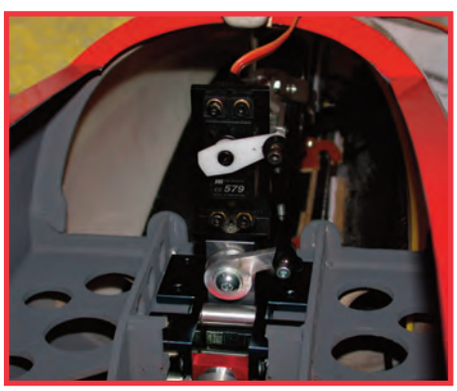

Fig 61

The steering servo moves with the nose leg removing the chance of snagged steering cables and twisted jammed legs.

Mount the steering servo in the CNC machined frame using four M3 x 12 Allen screws

with the arm furthest from the steering arm. The steering servo requires a strong servo arm at least 18mm between centres, using your radio set the servo arm neutral position parallel to the steering arm fixed to the nose leg, with the wheel straight. Assemble the

Fig 62

Fig 63

linkage from two plastic ball-Links and a single length of M3 x 30 all-thread. Fix the ball-links to the steering and servo arm with M3 x 16 Allen screws and M3 loc nuts. The mounting plate is notched to clear the up line air connection nipple. Some units have been assembled with the nipple on the opposite side, you can either notch the mounting plate or switch the cylinder over. There are six mounting holes in the retract frame, but only four are required. Before drilling the mounting holes place the nose leg in the down position and check there is 2-3mm clearance between the back of the leg and nose former. Drill four holes ø 4mm adding a screw into each hole as you drill, this helps ensure the holes all match. Remove the nose unit and open each hole to ø5.5mm ready for M4 T-nuts. The position of the rear fixing close to the nipple notch may break into the cut-out, in this case the T-nut will require part of the flange removing. Install the T nuts with some slow setting epoxy glue, pull them partially home with an M4 screw and washer before installing the nose unit and tightening until fully seated. Installation of the nose unit is made easier if you remove the rear nose former cross link section of

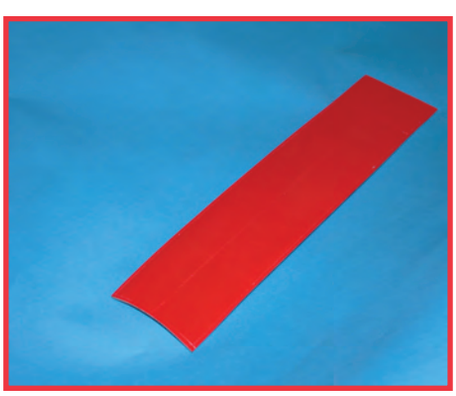

Fig 64

Fig 65

wood.

Nose Gear Door

The Full scale Hawk features twin “bomb” door style nose doors, plus a single small “leg” door. Your Hawk kit includes sufficient hinges to allow the scale set up to be

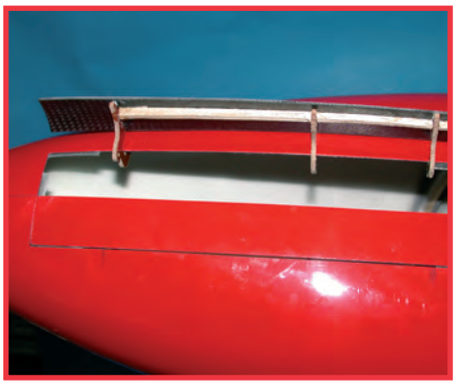

Fig 66

Fig 67

produced.

This method will require two nose gear cylinders for operation, and a spring to close the small door. As the Composite-ARF Hawk is intended as a sports scale aeroplane many of the team have decided to use a single nose gear door, hinged on one side only. This method is much simpler than the twin set up and in flight the appearance is not changed.

The process and hinges are the same for either set-up, you could even split the door at a later date and add a cylinder to drive the second door.

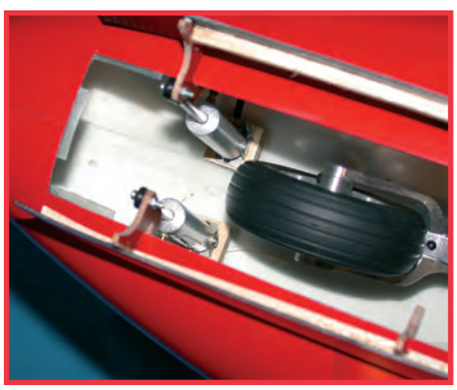

Fig 68

The first job is to clean up the nose gear opening, filing the two sides to be parallel just outside of the panel line marks. The nose door is supplied moulded to shape with a double curve front section to match the nose area. Cut and sand the door near the marked lines and then finally sand the door to fit inside the opening with a 0.5mm gap all-around. If the door is to be split cut the end small leg door off and then cut down the centre marked lines and sand to leave the same 0.5mm gap once the doors are hinged. Fabricate some door close stops from scrap material and place around the nose opening. These should protrude no more than 3mm to avoid fouling the nose leg and wheel during operation.

Before fitting the hinges it is worth opening the nose unit/leg enough to allow marks to be made denoting the areas to avoid with the hinges. On the airframe shown the hinges

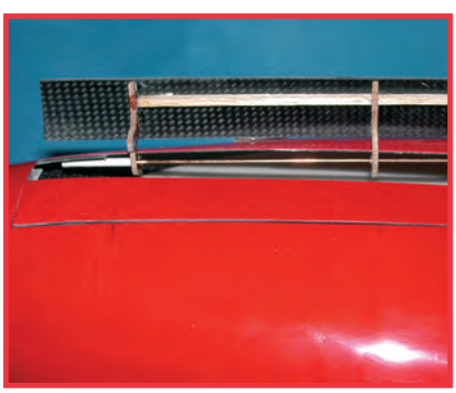

Fig 69

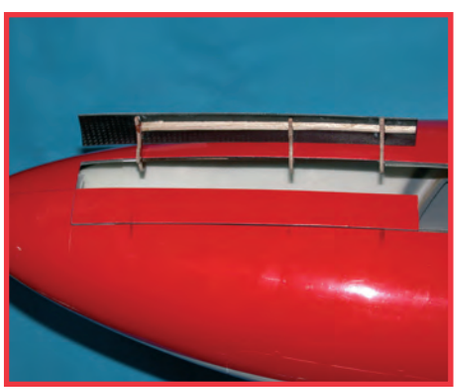

Fig 70

are positioned at 35mm, 126mm and 180mm back from the front edge with the nose cylinder attached to the front pair. It may be necessary to trim the rear hinge to clear the nose wheel steering servo which sits in the door opening in with the leg in the down position. This depends on the depth of servo case on your servo choice. The curved nature of the nose door may require some additional bracing to maintain the shape. We used some scrap 3mm hard balsa as shown. The supplied hinge rod should remain straight even though the nose door area is heavily curved. The front and rear hinge tubes will touch the fuselage skin, the centre tube will require supporting with some scrap balsa. By design the Hawk doors must move away from the fuselage immediately they start opening to guarantee smooth operation and clearance while opening. Sanding a small radius on the inside edge of all doors will reduce the chance of them catching on the fuselage surface.

The recommended Robart air cylinders can be mounted near vertical in the height of the

Fig 71

Fig 72

Fig 73

Fig 74

Fig 75

Fig 76

fuselage. Whether you chose a single door or scale twin doors the cylinders base mount to the top inside face of the fuselage shell. The angled face will require a packing piece approximately 10mm thick before shaping. The cylinders should be fully extended with the doors open, this will leave a few mm of travel when the door (or doors) close, helping to resist opening from air pressure in flight.

Inlet ducts

The intakes are moulded separately for accurate scale appearance and allowing additional access during the construction. Your chosen scheme will be factory painted to match the fuselage detail making the job of fitting very simple. The fuselage shape can benefit from a fixing screw adding in the splitter front corner. Use a piece of scrap wood

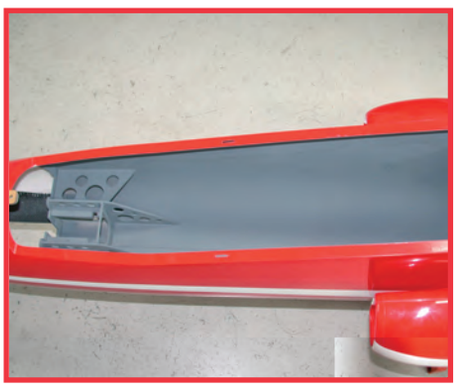

Fig 77

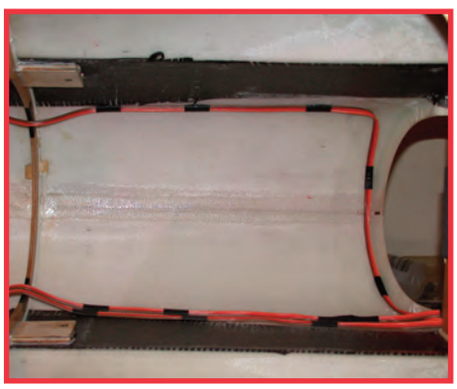

Fig 78

from the provided sheet and add a single self tapping screw from inside the cockpit. The rear face of the inlet is glued with epoxy after removing the shine from both surfaces. Note the lower 40mm or so does not require glue as it forms part of the front wing joint.

Equipment bay installation

Experience with the three prototype Hawk models confirms that the Hawk benefits from as much weight kept forward in the cockpit area as possible. You are aiming for a balance point between 190mm and 200mm back from the fuselage/wing joint. If you intend using a scale cockpit set some adjustment of the battery position maybe required.

The equipment tray provided can be positioned to suit your preferred set-up, but is probably best kept towards the front of the cockpit opening. With such a large canopy glass area painting the cockpit area in a dark colour will help give the impression of a scale cockpit, even with minimal detail added.

The radio plate has several cut-outs factory cut. The notch in one end can either be used for a header tank or ECU battery placement on the floor. Either side of this, slots and holes are formed for the Rx and turbine ECU allowing Velcro ties to secure them firmly. If you are fitting the recommended Powerbox unit (Evolution, Competition or Champion) the plate includes two cut-outs for the unit and wiring.

Composite ARF recommend that you fit a Powerbox unit using a true duel battery system and featuring signal boosting electronics. This product is available through C-ARF.

We placed the header tank in front of the wing former to keep the tube from the main

tank to the header as short as possible. If you chose to fit the tank at the forward end of the tray ensure large bore tubing is used to keep the pump load low.

If your intention is to fit a scale cockpit, thought should be given to keeping the equipment mounted low within the cockpit area. The Hawk features staggered pilot seating with the rear pilot mounted higher than the front, this allows you a little more height close to the inlet area of the cockpit.

The photos included in this section give you several ideas on the equipment layout, but the many different turbines available will require specific requirements.

A semi scale cockpit is available from C-ARF , this can be ordered through the CARF-models site. Several manufacturers offer full scale cockpit sets that could be fitted should you wish to "scale" the Hawk up.

If you intend fitting a cockpit now or possibly in the future it is a good idea to fit the air tanks serving both the undercarriage and brake system above the main fuel tank as there is ample space.

The plates either side of the undercarriage nose formers make perfect platforms for mounting the receiver system twin battery packs.

Even with 2.4 GHz systems it is good practise to keep a reasonable separation between ECU, fuel pump and valves. Avoid crossing the receiver aerials with power cables.

When you plumb the fuel system, keep all tubing as short as possible. Ensure the tube ends are cut square, especially when used with any quick connect device. When using larger tube like Tygone, cutting a short (5mm) length and sliding this over the tube end by stretching with pliers will improve the seal by adding additional grab.

Fit the fuel system overflow outlet in the fuselage just in front of the wing break former, positioning to one side will lessen the chance of damage in the event of a touch down without landing gear.

Additional Fences and covers

Your Hawk kit includes various parts cut from a colour coded glass sheet. The wing fences are an important feature on the Hawk. The glassfibre fences are fitted to the wing leading edge just outboard of the aileron/flap break line. If you project a line forward from the aileron inner edge there is a rectangular panel approximately 12mm wide and 60mm long marked 45mm back from the leading edge. The wing fence is mounted centrally on this panel using thick CA or epoxy.

Another feature of the Hawk are the fuselage fins mounted either side of where the airbrake would be positioned. Two parallel lines are marked on the fuselage making installation easy. The fins are given additional support by cutting two slots to accept the location lugs. The fins should be firmly fixed using epoxy. The fins should be fixed with an angle of approx 115 degrees on the inside edge.

To hide the openings in the tailplane cover sides around the elevator joiner, two shaped cover plates that attach to the cross brace are provided. Ensure these plates cannot

cause binding with full and free movement on the tailplane.

The remaining vanes and plates are optional in their fitment, study a full size Hawk to position these scale additions.

Setting up and Balancing

The final weight of your Hawk will vary with your turbine and radio equipment choice, the prototype models varied between 11 and 12.5kg dry.

Set the Centre of Gravity at 190mm from the fuselage/wing break for the first flight with the main tank empty and the header tank full. Further improvements in flight performance will be seen if you laterally balance your aeroplane also.

Control throws

Experience has shown us that different pilots prefer different response “feel” so the movements and expo figures quoted should be taken as a guide only. The all flying tailplane (elevator control) requires extra care setting up the twin servo linkage. If you carefully matched your servos in the earlier steps, little or no binding should occur. Note when using digital servos some noise is normal when the control surface is moved, the pitch of the sound will raise if the servos are under extreme load. A good tip is to operate the elevator control with each linkage in turn only connected and listen to the servos. When you connect the second linkage the sound should only change slightly. Using a Powerbox unit with matchbox facility allows additional adjustment through the centre and extremes of movement. A range of Powerbox products are available through C-ARF.

Starting point movements

Aileron travel 16mm up and 18mm down Expo 25-35% (Positive JR/Spectrum-Negative Futaba)

Elevator travel 30mm up and 25mm down 25-45% (Positive JR/Spectrum-Negative Futaba)

Rudder 35mm left and right 15-35% (Positive JR/Spectrum-Negative Futaba)

Flaps. Take-off 25mm and Landing 65mm with the recommended Centre of Gravity there is no elevator compensation required with flap deployment.

All dimensions are measured at the root trailing edge of any surface.

BAE Hawk Hardware Bags
Rear Fuselage/Rudder/Stab

12	Sheet Metal Screw 2.9 mm	Servo screw
3	M4 x 12 allen bolt	stab servo frame mount
3	M4 washer	stab servo frame mount
3	M4 T-Nut	stab servo frame mount
6	Control horn (3mm hole) (later will be installed)	stab and rudder
3	Ball links M3	stab and rudder
3	Steel Clevises M3	stab and rudder Servo
3	M3 x 16 mm allen bolt	for ball link fixture
3	M3 lock nut	for ball link fixture
4	M4 x 25 allen bolt	for stab mounting
1	M3 all thread (100 mm long)	rudder linkage
2	M3 all thread (60mm long)	elevator linkage
1	200 x 100 mm fiberglass sheet	stab spades (covers)
1	M4 x12 allen bolt	rear hatch mount
2	2mm steel pin 250 mm long	gear door hinging
2	3mm plastic tube 250 mm long	gear door hinging
1	milled phenolic board	nose gear door hinges
4	M4 x 16 allen bolts	gear mounting
4	M4 T nuts	gear mounting
2	M3 ball link	nose gear steering
1	all thread M3 (25 mm long)	nose gear steering
2	M3 x 16 mm allen bolt	nose gear steering
2	M3 lock nuts	nose gear steering
1	M4 x 16 allen bolts	canopy fixing screw
	carbon axle, ball bearings and carbon stab mount are pre-installed in fuselage	
	Allen bolt M4x20 for fin fixture is pre-installed in fin	
	milled wood parts for stab servo frame, not assembled	

Wing

16	Sheet Metal Screws 2.9 mm	Servo screw
8	sheet metal screws 2.2mm	Servo hatch screw
8	steel clevis M3	aileron and flap linkage
8	M3 nuts	aileron and flap linkage
2	all thread M3 (42 mm long)	aileron linkage
2	all thread M3 (200 mm long)	flap linkage
2	servo hatch (maybe taped on the wing?)	aileron servo
2	M4 x 60 mm allen bolts	wing bolts
4	allen bolts M3 x 20	gear door leg cover mount
1	aluminum tube ID 3mm, 100 mm long	gear door leg cover spacer
1	2mm steel pin 250 mm long	gear door hinging
1	3mm plastic tube 250 mm long	gear door hinging
1	milled phenolic board	main gear door hinges
8	M4 x 16 allen bolts	Gear mounting
8	M4 T-nuts	Gear mounting
2	servo hatch wood mounting frame	part of CNC wood plate

Turbine installation

4	M4 x 20 allen bolts	Turbine mounting
4	M4 T-nuts	Turbine mounting
4	2.2 mm sheet metal screws	thrust tube mount
2	Small aluminium angles	Bell mount mounting angles
3	M3 x 10 allen screws	Carbon deflector fixing screws
3	M3 nuts	Carbon deflector fixing nuts
1	Carbon Deflector Duct	
1	Double wall tail pipe tube	
1	Carbon Bell mouth	


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