Build notes for the

Goldwing Slick 540 90E 1727 mm span

electric version

(with techniques useful for similar models)

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I bought it from the Dutch Hobby King warehouse. It came in an extremely strong box made entirely of recyclable cardboard. It was a beggar to break up for the recycling bin.

The supplied manual covers a range of models so the pictures are sometimes for other models. I think this is poor as some information is missing, the worst being how to install the elevator. There should be a manual specifically for this model. At least it was written in decent English. Note that I use English terminology. *Tailplane* means the fixed part of what the Americans and Chinese call ‘horizontal stabiliser’ and *elevator* is the moving part. *Fin* is the fixed part of the ‘vertical stabiliser’ and *rudder* the moving part.

Generally the kit is of high quality. The flat hinges are fibre glass and are very good. Hinge and horn slots are already cut. Bolt-in ball joints are used throughout and, with the thick 2.5mm steel connecting rods, make very solid connections. Nylon locking steel nuts are supplied for the ball joints. Very creditably there is a bag labelled ‘Spares’ with two wing bolts and a replacement tail wheel wire and spring. The wing bolts are M6 so easily replaced anyway.The only thing that didn’t fit perfectly was the cowl.

The smaller parts also seem to be for a range of models, particularly the horn bits. Check the bits carefully. There are single and double horn bases in two different packets. I failed to spot the second. In the one I found there are extra double ones and too few singles. I cut up some of the doubles before I found the other packet with the rest of the singles. So take the advice of the manual and lay out all the parts before you start. Note that some might have a protective film that must be removed before fitting. There is also a bag of filler pieces that fit inside the servo cutouts if you decide to use smaller servos.

Covering

After a few days in my warm house a lot of the covering film started to wrinkle. I had to use my iron set on hot to tighten it. Take care at the edges of the blue overlay. It can contract away and leave a white adhesive line. The covering used seems to need a higher than usual temperature to shrink. It is particularly important to fix down the film wrapped round the edges and on the leading and trailing edges of the control surfaces. These are easily forgotten. Don’t leave the model in a hot car. After I did that I had to shrink quite a lot of the model again.

Wheels and spats

At this point I fitted the front wheels. I used thread locker on all grub screws. However the fuselage no longer fitted on the narrow bench that I was using, so on balance I think it better to leave them off till nearer the end and instead cover the bench with a cloth to avoid damage. Some fibreglass fairings were included to fill in between the top of the legs and the fuselage. They looked good but, even after trimming back they were a very close fit and I thought the legs would get scratched, so I didn't fit them. The very neat wheel spats had slots to fit round the large wheel nuts but the slots were too small. The nuts must have their side flats vertical. Once I had opened up the slots the spats looked good so I fitted them with the supplied screws and threadlock. If they start to look damaged I can remove them without removing the wheels.

Hinges

Its a good idea to cut V-shaped recesses around the hinge slots. Before fitting the hinges I dripped some bicycle chain teflon dry oil onto the joints from both sides and worked the hinge to circulate it. After a few hours drying I cleaned up the hinge plates with meths and fine sandpaper. The oil helps to prevent the hinge getting glued up. I glued the hinges by dripping de Luxe Materials Super 'Phatic into the slots and working it in with a toothpick. I did this three times. Then I cleaned the slot recesses with cotton buds soaked with meths, not water, before inserting the hinges. I did not put glue on to the hinges to avoid it being squeezed out into the recesses. 'Phatic takes 15 or 20 minutes to set. The surfaces flop easily under gravity. This method works faultlessly and I will always use it from now on.

Tailplane

WARNING!
DON'T glue the tailplane into place before inserting the elevator through the fuselage. The elevator **MUST** go in first. There is no picture of this in the manual and it took me some time before I worked out how to insert it. It can only be done by turning the elevator over with the trailing edge facing forward. Then manoeuvre it in non-horn side first. Glue the hinges into the tailplane before fitting it. Then push in the tailplane and glue it in place. Don't try it out lots of times as each insertion will cause dents in the tailplane sheeting. I used de Luxe Materials Roket Hot squeezed into the angle and massaged into the gap with a toothpick. It is now relatively easy to move the elevator into position to glue and insert the hinges, again using 'Phatic. Once it has set you then glue in the filler pieces into the side holes behind the elevator bar. This is tricky as if the piece drops into the fuselage it is difficult to retrieve before the glue sets. The cutouts for the elevator leading edge needed a small amount trimmed from the top as the elevator was fouling under large up movement.

NOTE: It is difficult to get the tailplane exactly at right angles to the fuselage axis. It probably doesn't matter if it is slightly out but if you are like me you will always notice the misalignment. The sides curve in and the the cutouts for the tailplane are not certain enough. I turned the fuselage upside down and used a try square to set the trailing edge of the tailplane by lining the try square body up along the centre of the fuselage and then moving the tailplane to line up with the blade.

Servos and horns

Goldwing suggests using alloy servo arms rather than the plastic ones usually supplied with servos. I used Tower Pro MG958 24kgcm servos for the ailerons and Turnigy Aerostar ASI-621MG 17kgcm coreless ones for the rudder and elevator, both digital types. Both are very powerful, are fast enough and are not too heavy at just over 60g. They both use

‘Futaba’ 25 tooth arms so alloy ones were readily available. I used the kind with clamping screws and locked the clamping and top screws with thread locker. The holes in the arms are usually threaded M3 as mine were. The supplied horns are not M3 threaded and don’t screw in, so the holes have to be opened out slightly with a 2.5mm drill. Ailerons and elevator both need 37mm (1.5”) arms to give sufficient throw on high rate. There is one disadvantage with using arms with an odd number of teeth. You can only have the arm at ninety degrees on one side. On the other side the arm will always be seven degrees out because of the odd number of teeth. The allen head screws on the arms proved to be a strange size, so my metric keys didn’t fit and it took some searching to find ones that fitted. When will people all switch to metric? There is even one major UK kit maker who still uses UNC screws for wing fixing.

Rudder

For the rudder there are two options supplied in the kit. You can fit the servo forward and link up using closed loop wires. The alternative is to fit the servo at the tail on the opposite side from the elevator one. The short solid rudder link is my preferred option. However servos of this kind are about 60g and might cause centre of gravity problems. Therefore I waited until the rest of the model was complete and batteries were in place to do a balancing trial before installing the rudder servo. I didn’t want to add any dead weight at the front so I needed to see if the model could be balanced just by moving the batteries. With the rudder servo resting on the tailplane and the two 4.5Ah batteries side by side at the front, the model balanced a bit nose heavy so I opted for the rear servo position.

There is a cutout ready for the rudder servo but the supplied pushrod is too short. You will need to buy some rod threaded M2.5 or cut the thread on suitably sized 2.5mm steel rod. I used threaded rod and improved the appearance by covering it with black heat shrink. Also unlike the elevator servo hole there are no pads into which to screw the servo screws, so you have to glue some on the inside. I used 6mm liteply glued with PVA and held in place until dry by small G-cramps. I hardened the surface round the screw holes with thin CA.

Fuselage

The fuselage is very roomy, and the canopy is huge, so moving the two batteries later will be easy if I need to. I made a mounting plate for the batteries out of ply. They are held on it with velcro and straps and the whole assemby is then strapped into the model butted up against a glued-on wood marker. The two batteries plug into an XT90 series adaptor into which the current sensor lead plugs and then on to the ESC with 4mm bullets. The turtle deck is a piece of foam folded over into a curve, entirely unsupported by formers except at the front. Seems very solid though.

The neat tailwheel is fixed to the underside of the fuselage with three screws and turned by the rudder through a spring that stops landing shocks affecting the rudder and servo. It doesn’t look very strong so I might replace it with a metal strip if it breaks, though wire and spring spares are supplied with the kit. The huge rudder should turn the model on the runway with dabs of power.

Cowl

The fibreglass cowl is large and well made, though the fibreglass was detached from the wood in a couple of places that needed regluing, and there were a couple of chips in the paint. I mixed some light and dark blue acrylic until I got the right hue for touching up. The cowl is fitted in place with four machine screws and plastic washers. However the cowl holes are not already drilled and it is a tricky job to get them in the right places. I held the

cowl into place and pushed a scriber through the upper two holes so it just penetrated the fibreglass. I then measured the distance to the bottom two, which was 90mm, and how far in the top two holes were. I marked the bottom two holes, pressed the scriber in to form a pop, and drilled all four holes. Drill them a little oversize as they won't all be in exactly the right place and the small movement allows you to position the cowl perfectly. You might need a spacing washer or packing on the inside as well so the cowl is flush with the fuselage profile. I needed about 1mm on the upper two holes, which I made from thin ply glued to the tabs.

I thought long and hard about cooling. There are holes in the cowl and spinner to let air in but no way for heated air to get out. I cut a largish area out on the underside, 80mm square, that would not be visible normally but would allow air out for both the motor and the ESC. Care was needed to avoid damaging the surrounding cowl surface. I put masking tape around to avoid any scuffs or scratches. I drilled a hole at each corner with increasing size drills finishing with 7mm. Then I joined up the holes with a fine hacksaw blade, trimmed the edges with a scalpel and sanded smooth with fine paper. I used the same acrylic paint mix to touch up the cut edges. I glued in a spruce strip at the bottom rear with epoxy to stengthen the weakest part. The cowl isn't a perfect fit. When screwed in place the sides are fine with the packing but there is a step on the underside.

Pilot

I decided that the model looked odd without a pilot. I bought a moulded plastic115 mm high one from Hobby King which was about the right scale and very light. I had to reduce its height to fit under the canopy and I then fitted some thick balsa to provide a new base. I glued it onto a cross member which I strengthened with strips of 1.5mm liteply.

Electrics

The motor is a 4Max PO-5065-360 with a maximum current of 58A. I tested it with a 15x10 wood propellor on two old Zippy 4S 4Ah batteries in series. This produced a thrust of 4.1kg from a power of 1250W and current of 45A. The manual says the 'flying weight' of the model should be 3.5 to 3.7 kg. If that means all-up weight then it is way out. I have added no more than a few grams and get a weight without batteries of 3.6kg. With batteries it is 4.6. However, allowing for the propellor becoming more efficient in the air the thrust should be adequate, especially as I am using new 4.5Ah Nano-Tech batteries instead of the ageing Zippys. If I find I need more I could go up to two 5S batteries of lower capacity. I tried a wood 16x10 on 8S and, though I got the full 1500W on full throttle, the current rose too high and I only got a little more thrust.

The two batteries fit right to the front of the fuselage if turned on their sides. I made a battery tray out of liteply with a vertical plate with velcro stuck to it. The batteries press onto that. I cut out a space for the rear of the motor shaft. The tray is held in position by velcro and then a long velcro strap is wrapped around to make it all really secure. The big benefit of this arrangement is that the tray can be moved a long way fore and aft to balance the model. This will also allow me to use larger batteries later. To ensure that the velcro sticks permanently I coated the tray with EzeKote, acrylic primer and acrylic varnish.

The motor bulkhead has T-nuts fitted for the motor mounting screws but of course these didn't match the holes in the cross mount for the motor I used. I drilled holes for the cross mount and used M4 screws and locknuts. This was helped by the cross marked on the bulkhead. I did a trial fit and found that the motor front was in a good position without needing spacers, giving a clearance between the cowl front and the rear of the spinner of

8mm. Closer would have looked better but the gap was fine. I guess the 4Max PO-5055-595 would have fitted perfectly but it doesn't produce so much power.

I used a Hobby Wing 70/125A high voltage opto electronic speed controller (ESC) and a 150A FrSky current telemetry sensor to enable me to keep an eye on the mAh used in flight and warn me when the batteries are down to about 25%. I found that there was enough space under the front of the fuselage inside the cowl to fit the sensor and the ESC. I added a sheet of 1.5mm ply to strengthen the area, coated it with EzeKote and sanded it, to ensure that the velcro for the ESC stuck well. I fixed the tiny sensor circuit board onto a small piece of thin ply glued onto the structure near the sensor.

The ESC has no battery elimination circuit (BEC) output. In any case I prefer a separate supply for the receiver and servos for all but small models. I can always land dead-stick if I am daft enough to run the flight batteries so far down that the ESC switches off. The use of the current sensor and the Consumpt function makes this unlikely. To be extra safe I used two 2Ah NiMH packs held by velcro and a battery strap to another piece of 2mm liteply.

During testing I discovered that the elevator servo behaved oddly. It worked perfectly with a servo tester but misbehaved when connected to the receiver. I decided that this was due to the servo overloading the receiver and subsequently discovered that the receiver channels had failed. No point being annoyed. To stop it happening again I decided to fit a power distribution board. The two NiMH packs plug into sockets and a single switch controls them. When switched on a panel glows faint red. The board connects to the receiver through single core fly leads and passes the control signals through. The servos plug into sockets on the board and take their power direct from the batteries with a total capacity of 30A. There are two servo sockets on each channel removing the need for Y-leads. To display the batteries' charge states you can plug a standard LED display into a spare servo socket. The fly leads have the channels with 1 on the left, the same as the FrSky X8R that I use, so the receiver can be placed face up.

Radio and throws

The FrSky X8R receiver has two aerials. I always place them parallel to the fuselage sides with one vertical and other horizontal. I was careful to place them as far away as I could from the main spar. The tube it goes through is paxolin but the spar is carbon fibre, so could cause signal loss. The throttle lead from the ESC and the SmartPort lead from the current sensor were long enough to reach the receiver without needing extensions.

I have the aileron servos on separate channels. In the manual, throws were given in degrees which is difficult to measure accurately, so I measured the control surfaces' widths at their widest and, using trigonometry, calculated the throws in mm as follows:

	Width	Low rate	High rate	In degrees
Aileron	120	50	69	25/35
Elevator	140	36	99	15/45
Rudder	210	88	135	25/40

I set the centre of gravity exactly at the front of the specified range, on the basis that slightly nose heavy is best to start with. I used Hobby King CofG stickers to mark the positions. When I am used to the model I can move the CofG to a more neutral or aerobatic position. Note my experience on the maiden flight below, particularly about high and low rates.

Centre of gravity

This should be 112 – 128 mm behind the leading edge at the root. For the 112mm starting position the battery pack needed to be about 65mm back from its most forward position. So my thought that a rear mounted rudder servo wouldn't cause problems proved correct and I have leeway to use heavier batteries if I want.

Maiden flights

The day arrived when there was a 8 kph breeze straight down the runway. I checked the CofG and lined up for a take-off using just over half throttle. First impressions were that the model was very twitchy. Remember this is my first 3D capable model. After a few circuits getting used to it, I decided to land and reduce the throws. Low rate ailerons and elevator went down by about 30% and I increased the expo to 40. That did the trick and the next flight was much better. It still did flick rolls but everything was much smoother and I did loops, rolls, reversals and cuban eights very much as I would with my Acrowot. The FrSky mAh telemetry proved very effective and useful. I didn't have the courage to take my eyes off the model to see what current I was drawing in the air. Must ask someone to look for me. I think I am going to like this model.

It looks as though the motor is a bit over-propped. At full throttle the current is exceeding the 58A maximum. I obviously have to get the motor speed up either by a smaller prop or one with a lower pitch. I am not using full throttle at present so it is not urgent.

If this is your first 3D model I suggest that you do not set the radio up for high rate throws to start with. It is very responsive even at low rate. Move the rods further in on the servo arms to give low rate at full servo throw. Then add a lower rate on your rate switch. This will allow you get the feel of the model and practise landings. When you are ready you can switch to low rate. It might be a while before you are ready for high rate throws.

150A FrSky telemetry sensor

I have now had a chance to test out the current sensor and through it the Consumpt function. This tells me how many mAh I have used and alerts me by voice when I reach a level that means I must land before long. For the 4500mAh series batteries I opted for 3500 as the safety limit. On my last flight I landed with about 3000 showing as used. This means that the batteries should be down to 33%. When I tested both after the last flight the meter showed that each was 30%. So once again FrSky telemetry proves accurate, with a confidence of plus or minus five percent or better.

Setting up the Hobby Wing Platinum ESC

Calibrating the ESC:
Switch on Tx and move throttle to maximum
Connect batteries
After two seconds: two beeps shows that high on throttle range is recorded
Move throttle to minimum
One beep for each cell (8)
A long beep shows that low on throttle range is recorded

Normal start up:
Set throttle to zero
Connect batteries
A tune then beeps, one for each cell – eight in this case

Stuff used

Motor	4Max PO-5065-360
Propellor	15” x10” wood
Aileron servos	Tower Pro MG958 18kgcm 0.18s (4.8V)
Rudder and elevator servos	Turnigy Aerostar ASI-621MG 17kgcm 0.15s (4.8V)
Power distribution box	‘Red’ box from 4Max (‘green’ out of stock)
Receiver	FrSky X8R
Current sensor	FrSky 150A telemetry current sensor
ESC	Hobby Wing 70/125A Platinum high voltage opto
Batteries (x2)	Turnigy Nano-tech 4.5Ah 4S
Rx batteries(x2)	Eneloop NiMH 2Ah 4.8V
Cyanoacrylate glue	de Luxe Materials Roket Hot
Hinge glue	de Luxe Materials Super ‘Phatic
Wood glue	EvoStik weatherproof PVA
Thread locker	EverBuild Stick2 medium
Pilot	Hobby King Resin civilian pilot PIL-P27

Weights and wing loading

Weight without batteries	3.5kg
Four batteries	1.2kg
All up weight with batteries	4.7kg

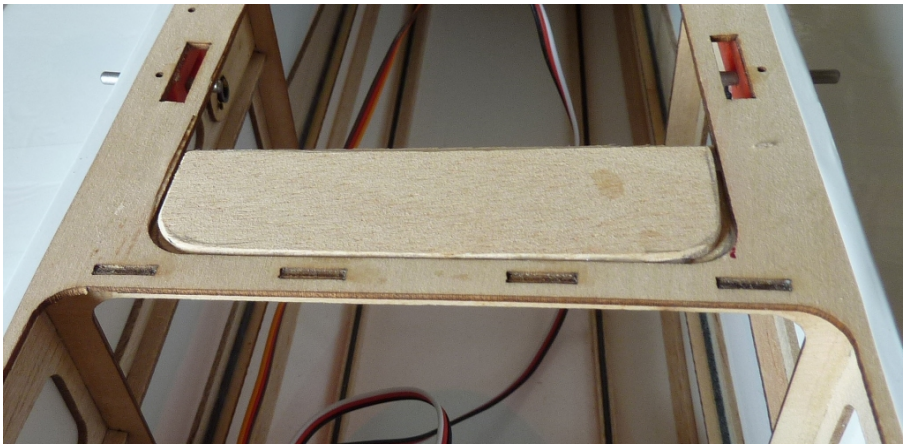
The wing area is 57dm^2
The wing loading is 4700/57 = 82 gdm^{-2}.

And the price of the kit? Amazingly good value at £259 from Hobby King Holland, though it is now only listed on the Hong Kong site.

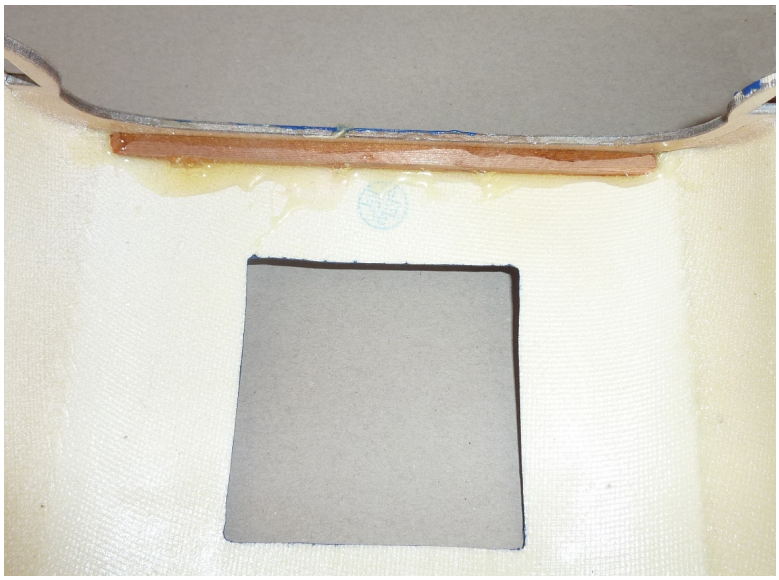
Pictures

FrSky current sensor and circuit board.

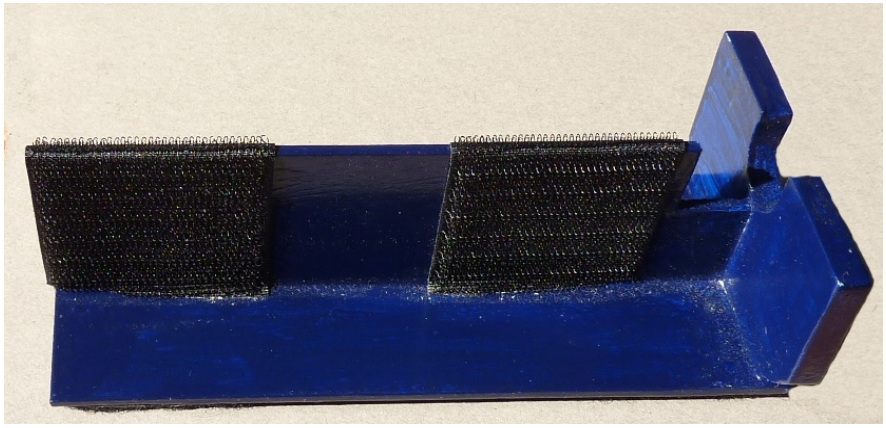
Pilot – should I put on some worry lines? He looks too calm for my flying.



Platform for pilot



Cowl hole and reinforcing

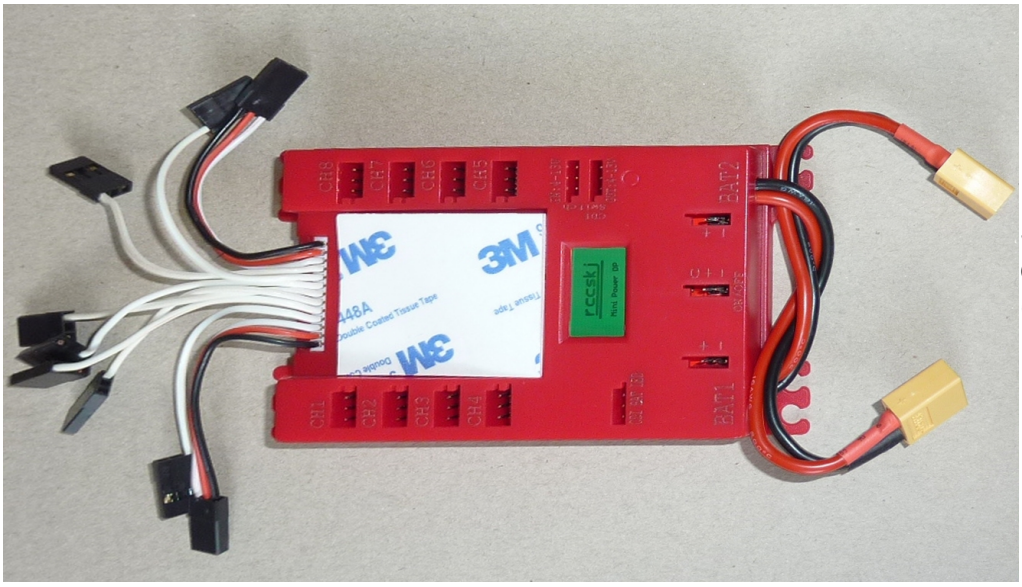


Battery tray

Batteries in tray

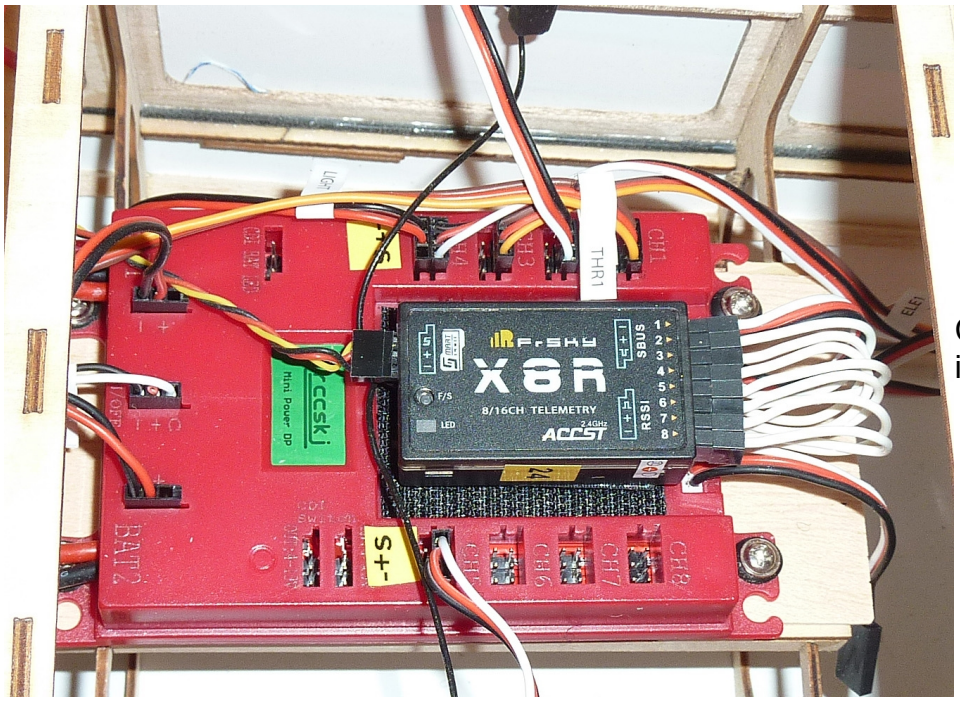
Batteries in model

Electronic speed controller and current sensor from below



Servo power distribution board (box)

Switch and display



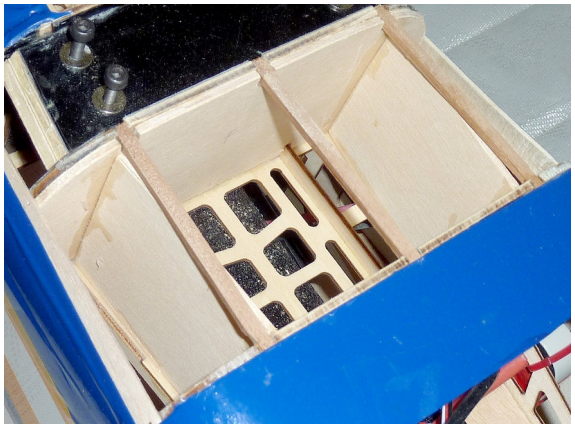
Completed radio installation

Hard landing

This model is typical of its type. The fuselage is fretted out of ply and carbon fibre. It has to be landed gently. And I didn't. So the wheels came off. Nothing terrible so I took the opportunity to strengthen around the undercarriage with some liteply and new sheeting. I replaced the balsa longerons with spruce. I was careful not to make it too strong or it will simple break out and destroy more of the fuselage if (when?) I am careless again.

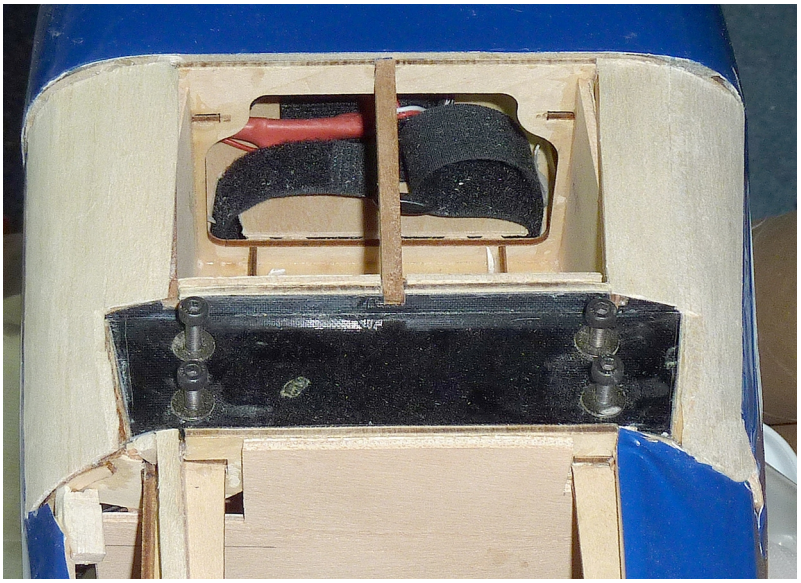
Goldwing supplied some spare covering film of all three colours, so I think the repair hardly shows. The film is excellent. It is easily tacked, on a lowish temperature, onto existing film as a patch or onto structural members. It shrinks well at a higher temperature. I just wish there was a little more supplied or spare on offer to buy. I used all the blue on the repair.

From the front



From the rear

New sheeting ready for hardening with EzeKote and then covering.



Here is the repair complete.