Phoenixtech Flasher 600 ESP

Introduction

The Phoenixtech Flasher 600 ESP is a ‘top of the range’ 50 class electric powered model helicopter that runs 600mm main blades. The 600 ESP features a tube driven tail rotor, revised carbon fibre side frames, carbon fibre main blades, factory painted canopy, all metal rotor-head, all metal mixer arms, revised all metal e’CCPM bell-cranks and an all metal tail rotor assembly.

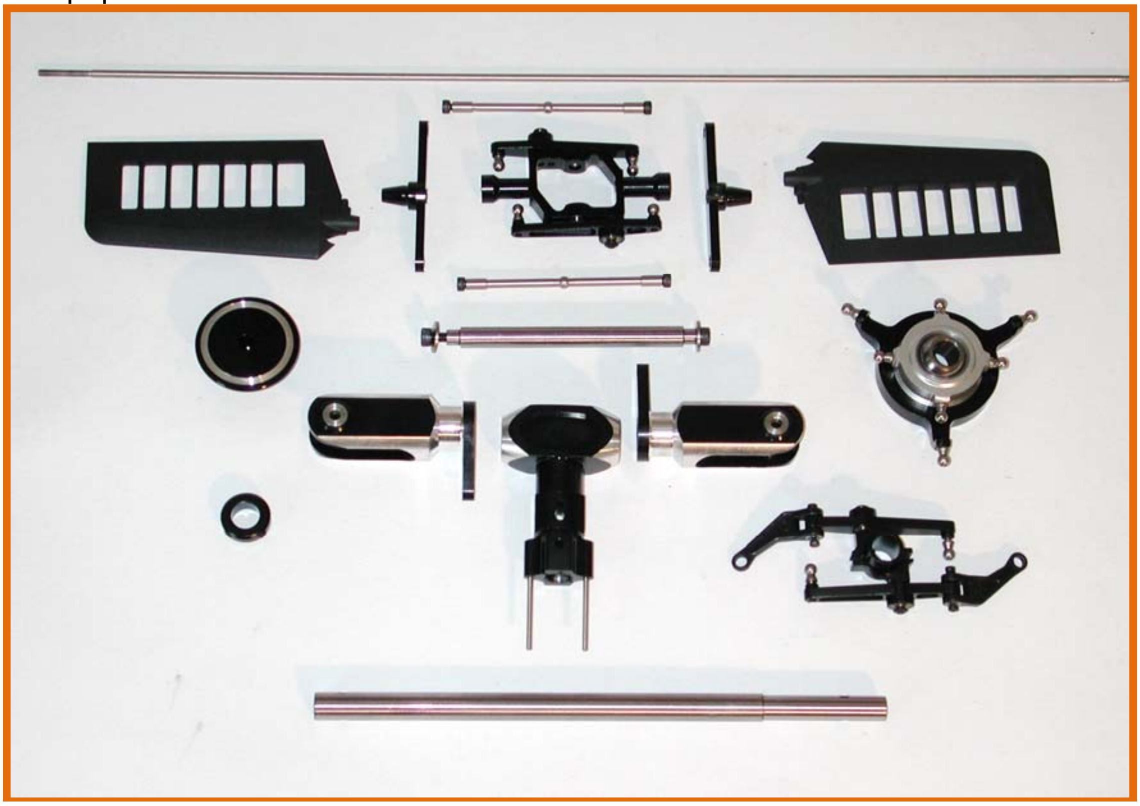
The 600 ESP was created to satisfy hardcore 3-D pilots, but the more discerning sports pilot will be delighted with this low maintenance, highly efficient model helicopter. The Flasher 600 ESP is available as ‘kit only’ allowing the Pilot to choose their preferred power system, or can be purchased as a Phoenixtech combo package. At the time of print, the Phoenixtech power system option consists of a 4035/1000 KV Motor / 100 Amp ESC 6S Lipo power set-up. The 600 ESP features an adjustable battery mount that allows for a single brick style battery, or two separate conventional style packs strapped together. So those choosing their own power system have an endless choice of set-ups from 6S right through to highly efficient 12S options.

As a general guide, the Phoenixtech 1000kv motor requires a 16 tooth pinion for spirited sports / light 3-D with a 6S Lipo. Raise the bar a little to the example of an 8S 1000kv set-up and you will need a 13 tooth for sport flying or a 14 tooth for 3-D flight. At 10 lipo cells, you will see the need for a motor KV of around 800 with a 13 tooth pinion for sports flying or a 14 tooth pinion for hard 3-D flight. Going to a 12S Lipo power will require a motor of around 630kv for sports flying on a 13 tooth pinion, or up to a 15 tooth for hardcore 3-D flight.

Many of the components are dry assembled by the factory, but the instruction manual covers the assembly of each individual component as if it was from kit form. The Flasher 600 ESP is a very simple high-quality model helicopter to assemble. Less experienced Pilots will find the following assembly guide helpful, but please be aware that this is intended to clarify the process, rather than replace the instruction manual. Be aware that any pre-assembled components must be stripped and re-assembled with threadlock as advised in the instruction manual. Also remember to take your time and enjoy the process, as invested effort will reward you with a trouble free model helicopter that functions as expected.

The Rotor Head Assembly

The rotor head is based on a traditional style headblock that supports an 8-mm floating head spindle via two rubber dampers per-side. The 600 ESP is supplied with two grades of head damper's. The softer grey dampers are to be used for slower rotor speed set-ups like sport / scale flying, whilst the harder black dampers suit higher rotor speed aerobatic / 3-D flight. The chosen dampers are inserted into the rotor block and a lightly greased spindle is then pushed through the dampers. A brass spacer is then slid onto each side of the spindle followed by the blade grips. Here I did find the brass spacers were too thick causing the blade grips to feel notchy when the retaining bolts were tightened up. So I reduced the brass spacers from 1.3mm down to 0.8mm by rubbing them on a flat sheet of 400 wet and dry sandpaper.

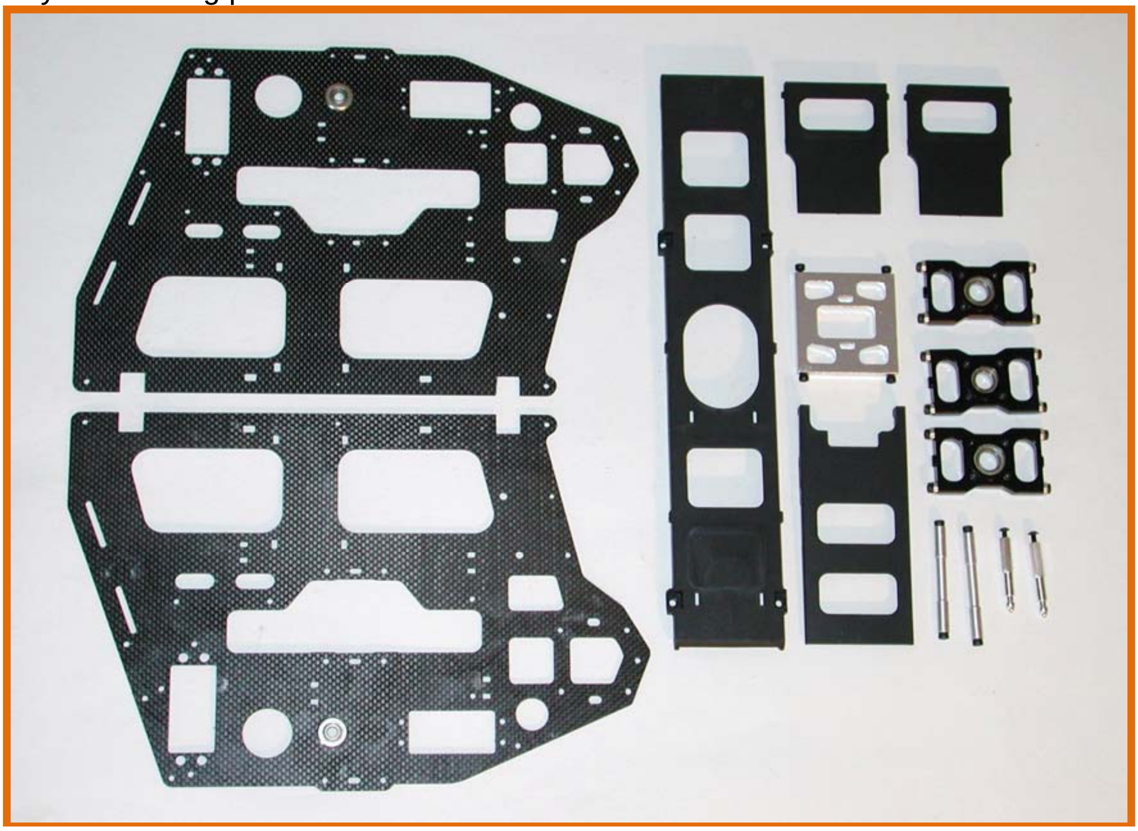


The flybar seesaw holder is now fixed to the rotorhead. Here I found that an additional 0.5mm shim under each bearing was required to ensure smooth operation. The bell-hiller mixer arms are then fitted to a choice of two mounting holes on the seesaw holder. The inner-most threaded fixing hole dictate that the flybar has less stabilising effect and is said to be more suitable for extreme 3-D flight. The outer threaded fixing hole enables more flybar stabilising effect and is said to be best suited to all other flying styles including general 3-D flight. If you are using the outer hole with maximum cyclics for aerobatic / 3-D flight, then please swap the bell-hiller control balls round so that the longer control ball is on the blade connecting side and the shorter ball is on the swashplate connecting side. This simply avoids any risk of the linkage rods fouling the flybar cradle at full collective / cyclic / flybar deflection. Also please note that when using the full collective pitch range, I found that the washout guide pins need to be trimmed down by 3-4mm and the washout arms have to run a an offset at zero pitch.

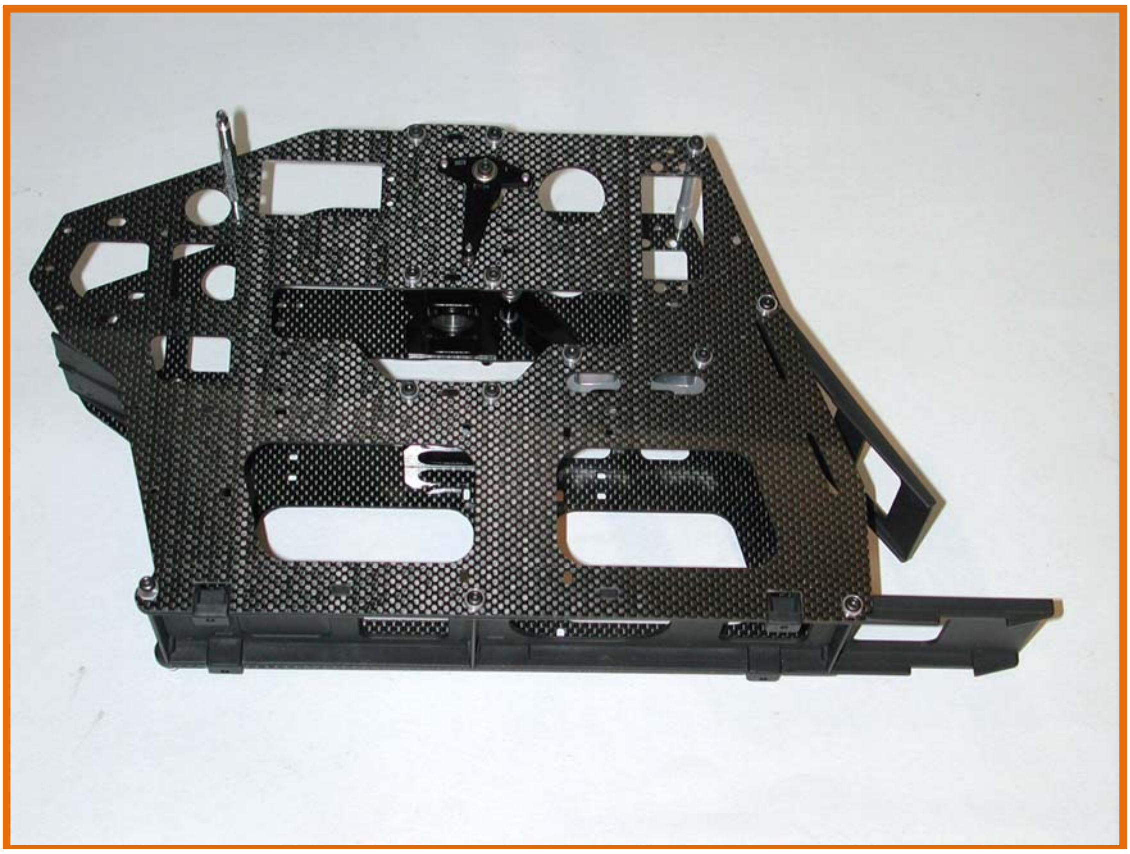
The flybar cage is now assembled around the seesaw holder and the long 440mm flybar. The stickers are applied to the plastic control paddles and they are screwed onto the flybar so that 144mm of flybar is left visible on each side. Be careful to align the paddles perfectly horizontally to the flybar control arms and then use the supplied M-3 setscrew to lock the paddles in place. The rotor head can now be fitted to the 10-mm main-mast via an M-3 x 22mm bolt and nylon nut. The washout unit is then assembled as advised and slid onto the main-mast and the swashplate follows. The mast locking collar is now loose fitted to the mast and the completed assembly is put to one side until later. Finally, assemble the main gear as shown in the manual, not forgetting a little grease on the one-way bearing shaft and put this assembly to one side.

Main Chassis

The Flasher 600 ESP chassis is a simple design based on two 2-mm carbon-fibre sideframes. The frames are initially spaced apart by two metal mast blocks above the main gear opening and one metal mast block below the opening. Be aware that the upper mast block must fitted the opposite way to as shown in the manual, or the mast locking collar will not fully seat on the bearing. An alternative to this would be to use shims under the last locking collar. To the front of the chassis is a machined motor mount and a two position adjustable moulded battery tray. On the underside of the chassis is a full length moulded baseplate. To the rear of the chassis, there is the substantial moulded tail gearbox casing, and two optional RX / Gyro mounting platforms.



All the holes and slots in the frames were found to be mostly accurate, but the edges of the carbon frames were a little sharp in places. So spend a few minutes smoothing the edges with a little 400 grade wet and dry sand paper before assembling. Also take the opportunity to smooth out any holes or edges that the servo wires may have to pass over or through. Now assemble the frames as advised in the manual with M-3 fixings and cup washers as shown. If you have any problems fitting the base plate, simply open out the slotted holes with a small file as required.



The next task is to locate the e’CCPM bellcrank control system parts and fix the control balls to the bellcranks as shown in the manual. Now position the elevator bellcrank assembly inside the frames and slide the long shaft through the bearing in one of the side frames into the elevator bellcrank and back out through the bearing in the opposing side frame. Now position the two roll bellcranks onto the stubs of the shaft and use an M-3 bolt to retain the bellcranks in place. Now gently tighten the elevator bellcrank to the recess in the shaft with an M-4 set screw as shown. The set-screw will be permanently fitted later when the rotor head is installed so that the head-phasing can be set correctly.

The 600 ESP skid set is consists of two struts, two skid pipes, four rubber landing skid nuts and four skid pipe ends. The skids are fixed to the base-plate with M-3 bolts that fit through the skids into the base plate and are held with nylon nuts that seat in the upper side of the base plate. The skid pipes are then slid into the struts and locked in the desired position with M-3 set screws. The skid pipe ends were supplied ready glued, so simply push the anti-slide skid nuts on to complete the assembly.

The Tail Rotor / Boom Assembly

The 600 ESP features a highly efficient tube driven tail rotor. The rear gearbox was supplied pre-assembled, so once checked for threadlock, start with the tail pitch assembly that is slid onto the tail output shaft. The tail rotor bellcrank is then added and checked for smoothness of operation. I found the internal bearing spacer was a little too short and a little too large in diameter for the bellcrank to work smoothly. I therefore removed the spacer and gently tightened the fixing bolt so the bellcrank was slop free / smooth and then locked the bolt in place with an M-3 nylon nut.

The tail rotor hub is now fitted to the tail shaft and locked in place with an M-4 set screw that seats in a recess in the shaft. I did check the threadlock on the tail blade grips and it was good, but it is always worth checking. The tail pitch assembly is then linked to the tail rotor grips via the control links and the tail rotor bellcrank is fixed in place. Be sure that everything operates smoothly before moving on.

Attention is now turned to the tube drive where a supporting radial bearing is fixed to the tube drive off centre as advised in the manual. The rubber bearing support is then slid on and the tube drive is inserted into the boom with the aid of a little oil/ grease. The rear tail gearbox / vertical carbon fin can now be fitted and clamped in place. If you find the rear gearbox is a slightly loose fit on the boom, wrap of thin piece of tape around the boom to ensure a more positive fixing. Slide the three tail pushrod guide supports and two tail rotor servo mount supports onto the tail boom and slide the boom into the front tail gearbox moulding. Adjust the boom position so that the tube drive is fully located but not under tension. Then clamp the boom with the four M-3 clamping nuts and bolts.

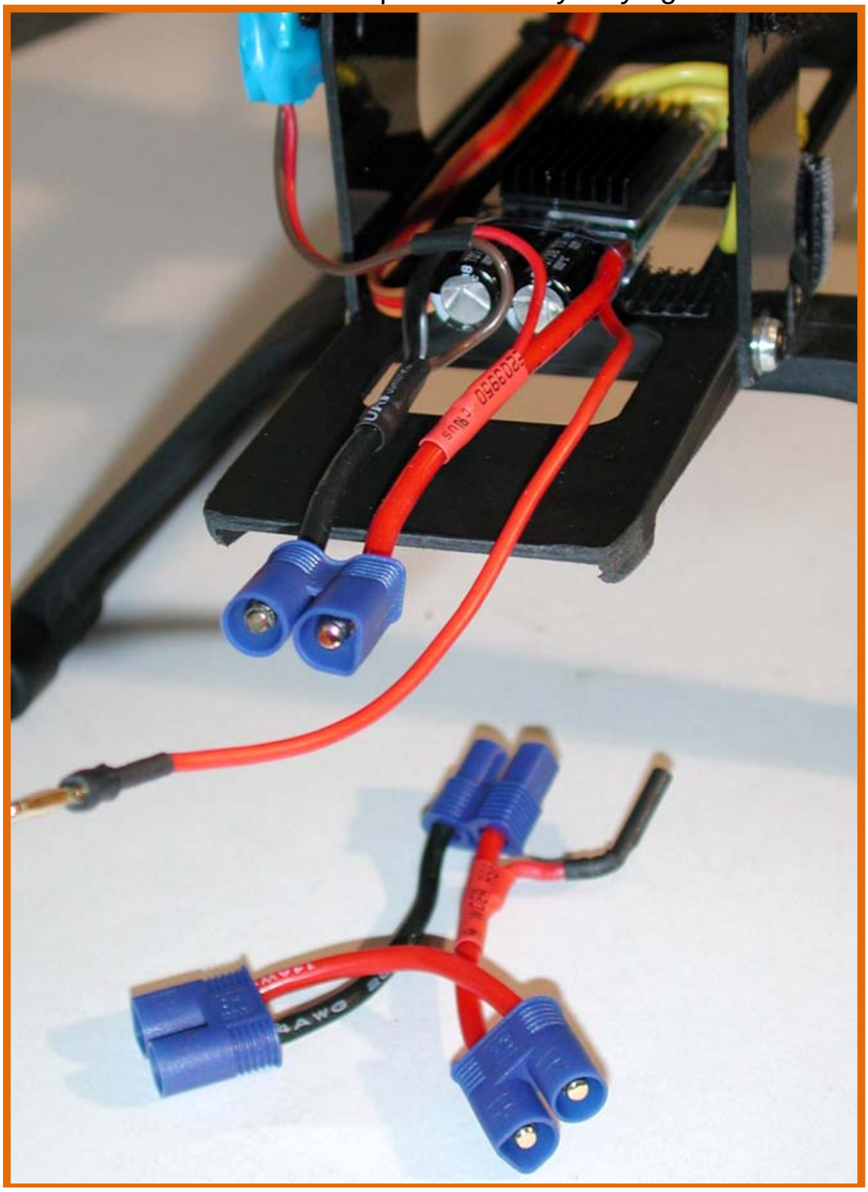
The horizontal stabiliser / clamp assembly is now added to complete the tail boom assembly. I did later find that the clamp was too loose to be effective, so I trimmed 2-mm off the top of the lower section of the clamp and added a strip of carpet tape (very thin double-sided tape) to the boom where the clamp seats. Once tightened up, the modified assembly then locked up very well. The tail pushrod wire is now fed through the control guides. The guides are then locked in place with a thick cable tie as shown in the manual and the ends are trimmed off. The complete tail boom assembly is now slid into the frames and fixed in place with twelve M-3 x 12mm button head bolts. If you have trouble with the tabs on the gearbox housing, gently open up the holes in the frames with a small file until the tabs will fully seat.

The final task in this section of the build is to slide the maingear into the opening in the frames and push the previously assembled main-mast / rotor head into position. The mast is then locked to the main gear assembly with an M-3 x 20mm bolt and nylon nut. To eliminate any vertical float, the mast must be gently pulled upwards whilst the mast collar is gently pushed down and locked in place with two M-3 set-screws. Now line up the flybar so it is dead in line with the tail boom and adjust the position of the elevator bellcrank so that the inner and outer balls of the swashplate are in line. Then permanently fix the set-screw so that the assembly is locked in the correct position.

Installing the Motor and Speed Controller

I thought that I had a nicely sized 760KV motor at my disposal for testing the 600 ESP on a 12S lipo set up . A quick calculation via 'Mr Mels On-line Head-Speed Calculator' directed me towards the need for a 13 tooth pinion to hit a 70 % governed headspeed of around 2150 RPM. The shaft on my 760kv motor was a little short, so I inverted the motor mount to help raise the height of the motor. The pinion was then fixed in place so that the end was 1-mm above the main gear.

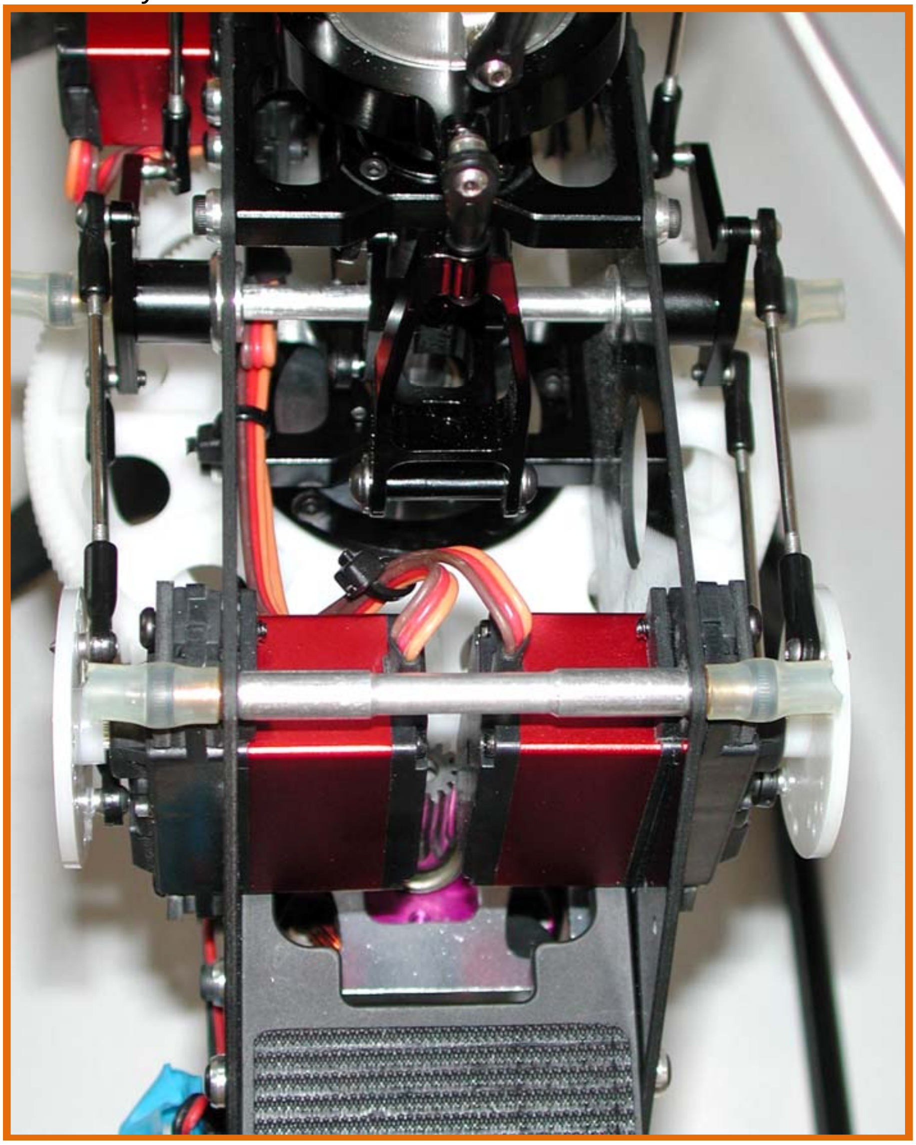
The motor was loosely positioned in place on the motor mount via 2 M-3 fixing bolts and steel washers. I then carefully slide the motor up to the main-gear so that the gears were fully engaged. The motor was then moved back very slightly before gently tightening the fixing bolts to check the gear mesh. The best way to describe the correct mesh for a 12S set up is that there should be zero amount of backlash (free-play) between the two gears at the tightest point. So check the backlash over a full turn of the main gear and find the tightest spot. Then re-adjust so that there is little to no backlash at this spot and finally fully tighten the motor bolts.



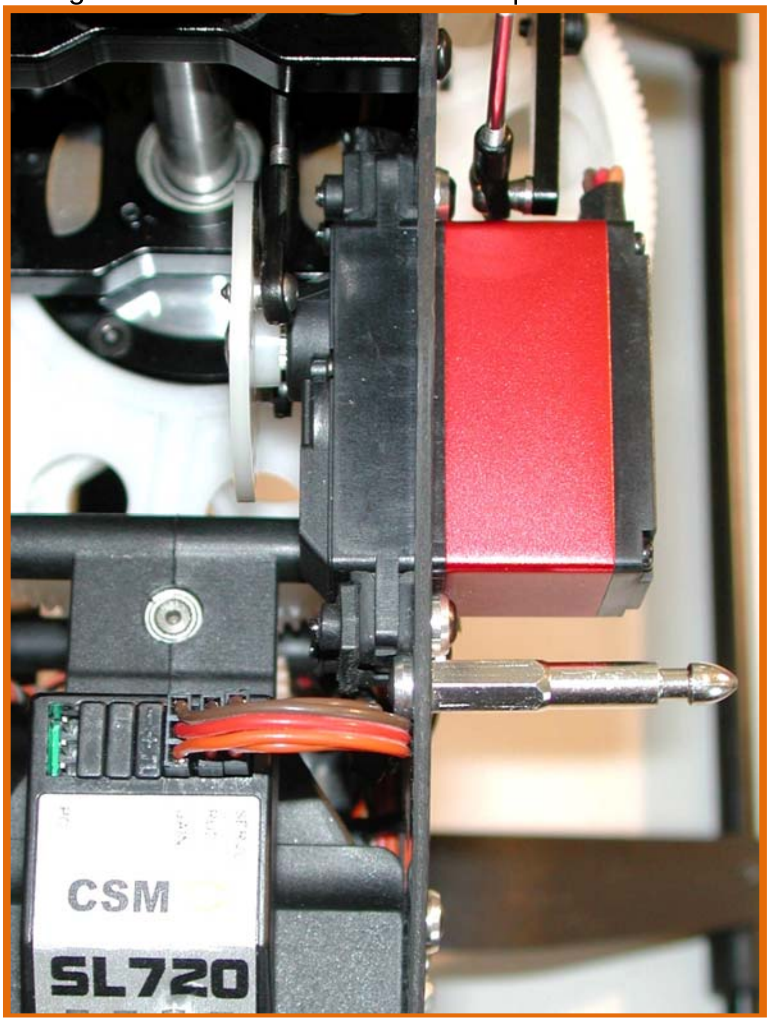
The Electronic Speed Controller (ESC) was mounted to the front of the lower base plate with velcro as shown below. The motor wires were then connected to the ESC and held out of harms way with a small velcro strap. The additional small red-wire is an anti-spark feature of the YGE 60 HV ESC. If you have ever connected a 12S Lipo, you will know just why this feature is included!

Radio Installation

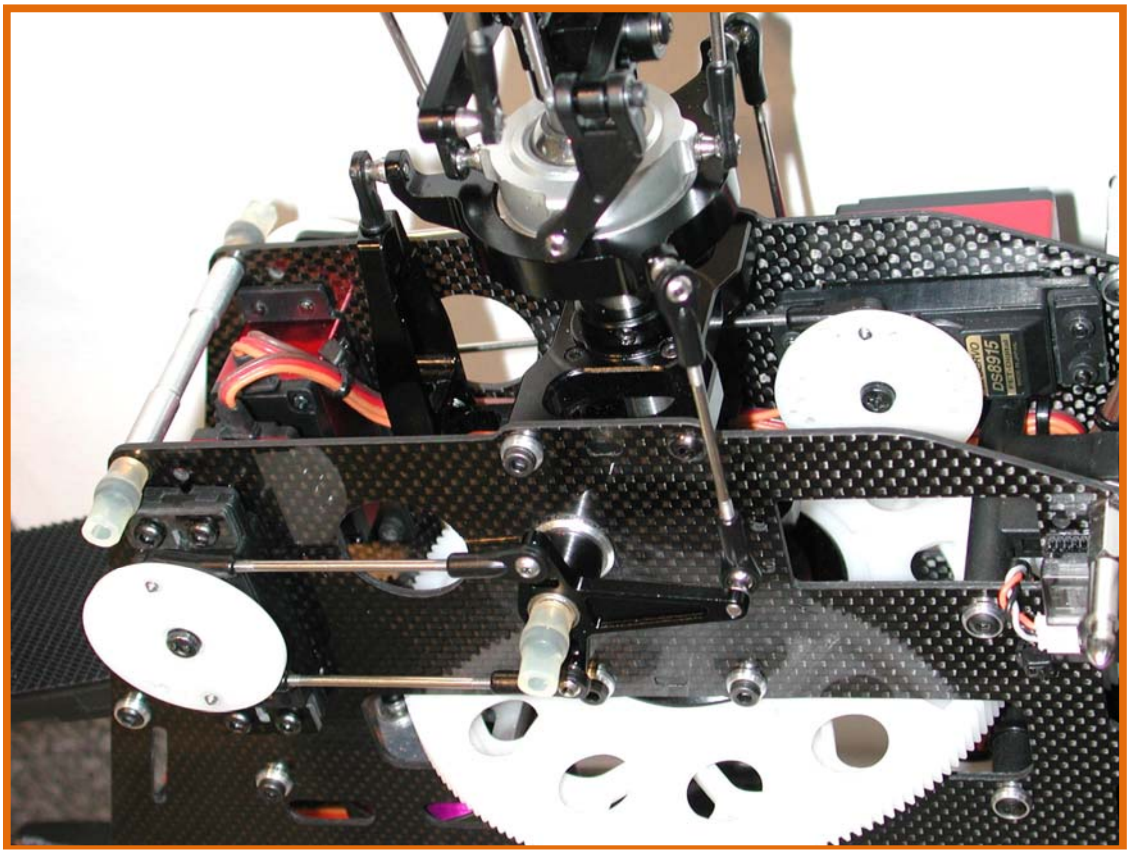
The 600 ESP requires three full-size size cyclic servos and one full-size tail rotor servo. Due to the bellcranked e'CCPM control system, all servos can be mounted on their supplied grommets to enhance their operational life. The tail rotor servo is also best mounted on its supplied grommets to the carbon tail servo plate, which is then fixed to the rudder servo mounts. The aileron and pitch cyclic servos mount vertically in front of the main mast, whilst the elevator cyclic servo mounts horizontally behind the main mast.



I did have to file the holes in the frames so that the rectangular servo fixing plates could be fitted to the inside of the frames. Also be aware that the rear elevator servo installation differs from that shown in the manual and should be mounted to the right-hand frame as shown in the photo below.



The cyclic servo wires are then fed inside the frames, along and down into the area underneath the front tail gearbox casing. The gyro wires were then fed down inside the right hand frame to join the cyclic servo wires on route. This chosen Spektrum 7600 receiver was fixed via velcro to the inside of the right hand side frame.



The speed controller lead was then fed along the bottom base plate, up inside the carbon frames and into the ‘throttle’ output of the receiver. The right hand cyclic servo was then connected to the ‘aileron’ output, whilst the left hand cyclic servo was plugged into the ‘Pitch’ (channel 6) output of the receiver. The remaining elevator cyclic servo was plugged into the ‘elevator’ output of the receiver. The tail rotor servo plugged into the tail output lead of the gyro and the rudder lead from the gyro was connected to the ‘rudder’ output connection of the receiver. The final connection was for the gain control lead of the gyro which I plugged into the ‘gear’ channel output of the receiver. Any excess wiring was then carefully folded up and fixed to the inside of the frames with a cable-tie.

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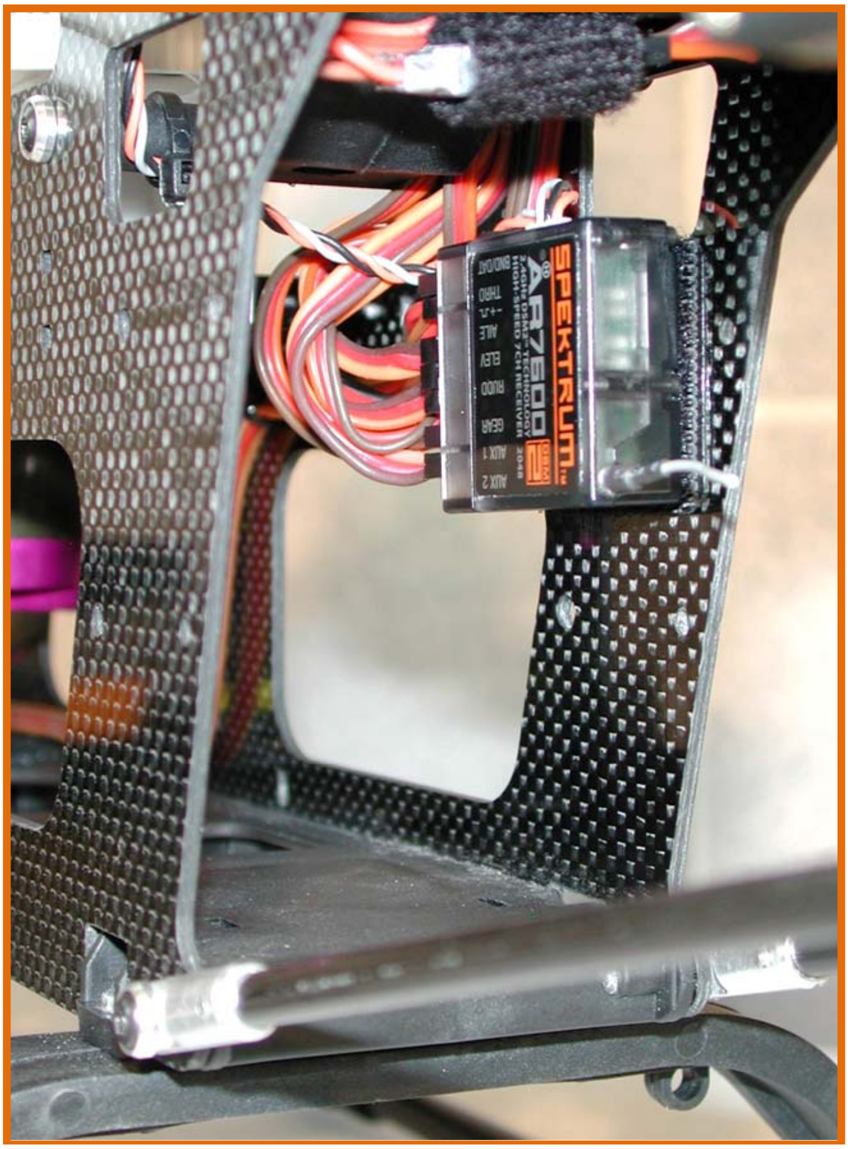
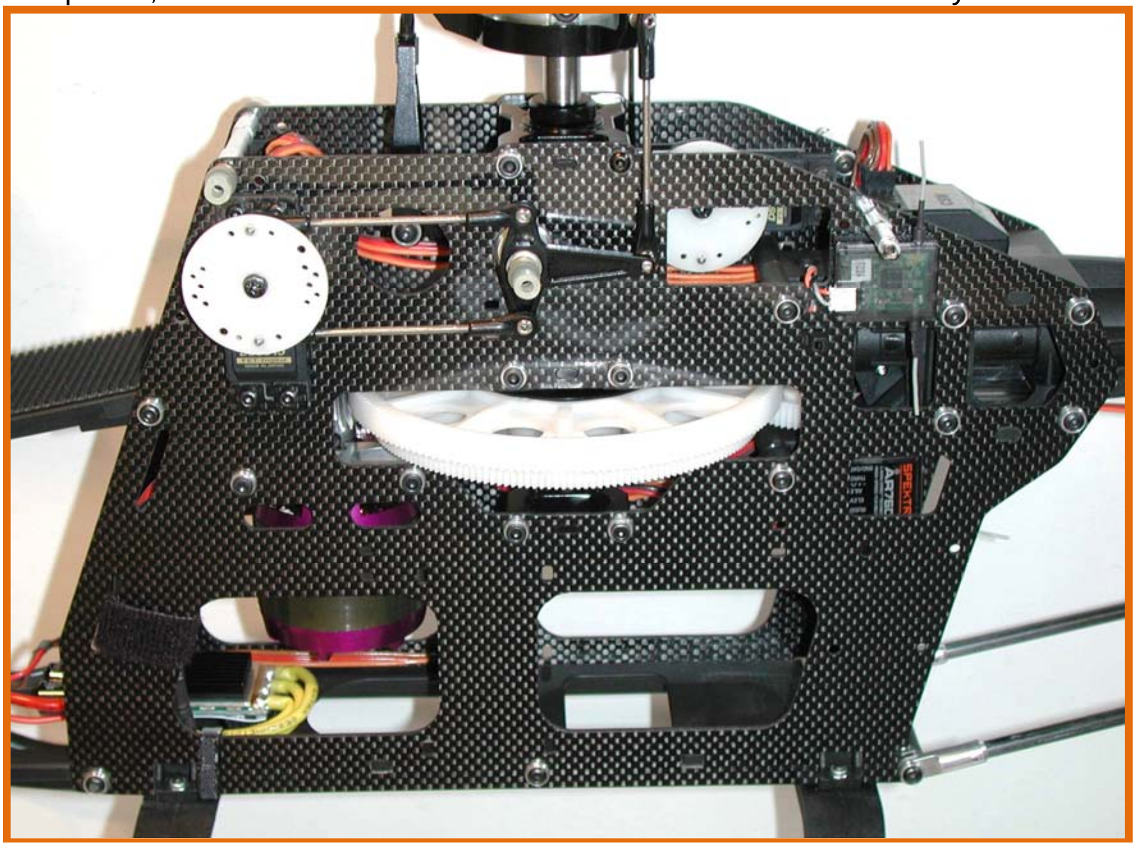


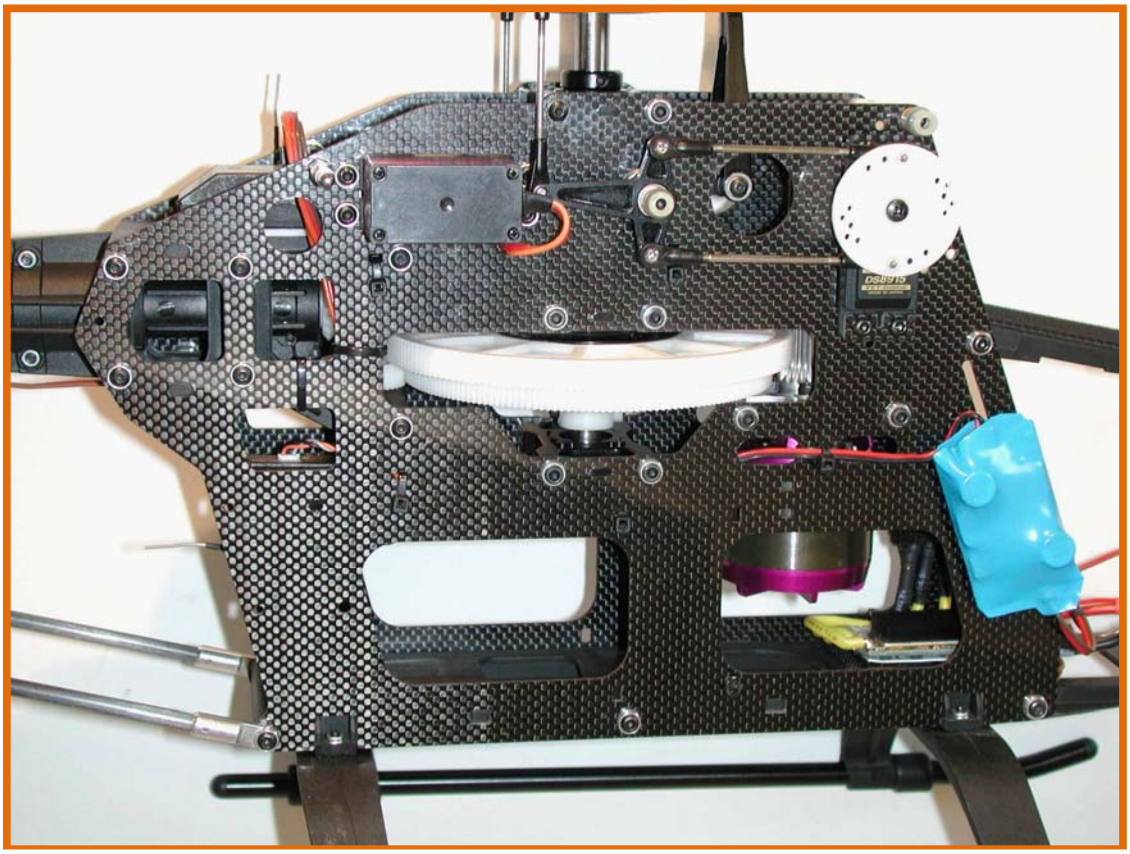
The Initial Cyclic Servo Set up

Setting up the radio begins by selecting a new model memory and selecting 120 degree e’CCPM control in the advanced section of the transmitter program. Now take the temporary safety measure of un-plugging the motor wires to remove the risk of an accident. Where applicable, insert the binding plug to the receiver and connect the lipo battery to the ESC. Now bind the transmitter to the receiver as instructed in your radio handbook. Also be aware that you should later re-bind the transmitter to the receiver once the servos have been set-up. This is to ensure that the correct advised ‘fail-safe’ position of low throttle and zero cyclic / collective pitch are selected.

Now make sure that all sub-trims / transmitter stick trims are centred and the ATV’s (servo travel) are set to 100% each way. Then make sure that all the pitch curves are set to 0-100%. Now check the servos are travelling in the correct direction or switch the servo direction via the transmitter ‘reverse’ function and plus or minus values in the ‘Swash Mix’. The trick here is to get the servos working in the correct sync to each other via the servo reversing and if required, then change the overall collective and cyclic pitch directions via plus or minus values in the swash mix.

Now position the throttle stick at dead centre (50% throttle / Pitch) and select servo arms that have holes at 14.5 mm from centre. Position the servo arms on each of the three servos so that they are as close to vertical as possible. Only use the transmitter ‘sub-trim’ function to make adjustments as a last resort to fine tune the arms to vertical. Be aware that sub-trim values of up to 10 points are usually acceptable, but values above this can lead to an in-accurate control system.

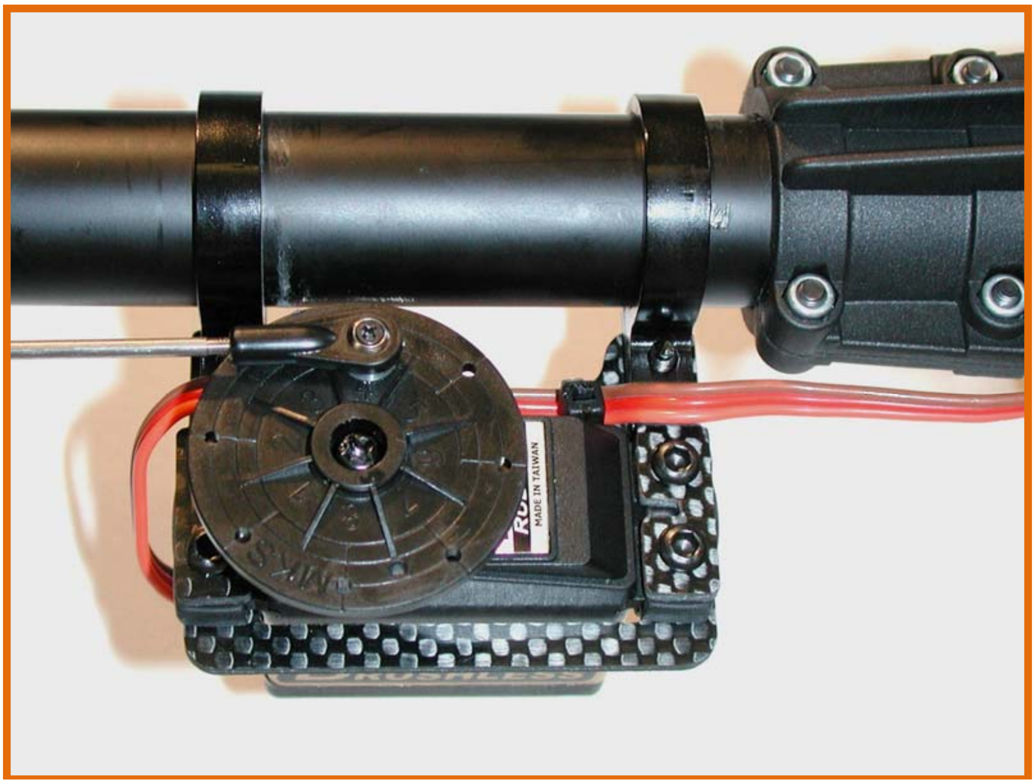




Once the three servo arms have been set up correctly, fix two control balls per servo horn and re-position the servo arms. Note that screw type control balls are supplied for all the cyclic servo horns. I found that these did work fine as long as the correct size pilot hole was drilled. Now secure the servo arms to the servos with the servo fixing screws. Then make up the linkages as advised in the manual and connect the servo arms to the bellcranks and the bellcranks to the swashplate with rods made up to the advised lengths. Now work up towards the rotor head adjusting the linkage rods so that all the mixer arms are level at centre stick and the blade grips are at zero pitch.

The Initial Tail Rotor Set Up

Select a tail rotor servo arm with a hole at 10mm from centre. With the gyro in ‘normal mode’ and the servo at neutral, position the arm at 90 degrees to the servo. Then re-position the servo arm one spline (position) toward the nose of the helicopter. This ‘off-setting’ of the servo arm at neutral induces a mechanical differential that helps balance out the left / right servo travels within the gyro. This has the effect of improving the balance of left / right stops and helps de-sensitise the gyro gain. Now fix the control ball in place fix the arm to the servo with the fixing screw.



The next step is to link up the tail pushrod wire and adjust the length of the wire so that the tail blades have approx. 8 degrees of right tail pitch at servo neutral. Now straighten up the pushrod guides so that the tail linkage rod is a straight run when viewed down the end of the tail boom.

Setting up the Gyro

Those using the GT 90 gyro should start by ensuring the Transmitter rudder ATV is set to 100% eachway. For sport flying, aim for a safe starting point of 62% 'Dual Rate' and 80% Dual rate for 3-D flying. The Transmitter gyro gain value can be set to a safe value of 46% for both gyro modes. Now connect the supplied 'Interface' unit and program the following (safe) settings into the gyro:

SERVO TYPE: 152-33
GYRO DIRECTION: NORM (dependant on tail servo used!)
MID TRIM: 0
L-LIMIT: 180
R-LIMIT: 180
R-PIRO GAIN: 160
L-PIRO GAIN: 140

RUDD GAIN: 100
ACC-EXP: 015
DEC-EXP: 005
DEAD BAND: 006

Now double check that the tail blades look like the below image when they are folded back and the tail servo is at neutral. The blades should have approx. 7-8 degrees of right tail rotor

Now make sure that the lower folded back tail blade moves to the position below when the rudder stick is moved to the right. If the blades do not move to this position, then us the TX rudder ‘Reverse’ function and re-test. Now make sure that the lower folded back tail blade moves to the same position when the nose of the helicopter is moved to the left when the gyro is in ‘Heading Lock’ mode. If the blades do not move to this position, then use the Gyro’s ‘Reverse’ function and re-test.

Now make sure that the lower folded back tail blade moves to this position when the rudder stick is moved to the left and when the nose of the helicopter is moved to the right.

Finally, make sure that the tail servo is not binding or buzzing in any way at full left / right travels as this will damage the servo. If any binding is detected, reduce the gyro travel limits via the interface unit / dial as required.

Setting up the Pitch and Throttle Curves.

Due to many external influences, It is unlikely that the following advised settings will replicate perfectly into your Flasher 600 ESP. These settings should therefore be used as a starting point from which the values will have to be adjusted to suit each individual model / pilot expectations.

The Phoenixtech 100 Amp ESC features a 'Governor Mode' which works well with the Phoenixtech 4035/1000 KV motor. To activate 'Governor Mode', switch on your Transmitter and place the throttle stick to full power. Then connect a battery to the model and switch on the ESC arming switch. The ESC will now enter programming mode and run through a long series of tone patterns as shown in the ESC instruction manual. You will basically allow the ESC to work its way through all the options until you reach the last option which is Helicopter Governor Mode High. When you hear the correct tone sequence, move the throttle stick to full low power and the ESC will now store this setting.

The next step is to adjust all the throttle curves as highlighted below. The way that ESC governor mode works is that the percentage of throttle selected dictates the rotor speed setting. The speed controller then self adjusts to maintain the rotor speed regardless of load. The best way to think of 'Governor Mode' is to liken it to 'Cruise Control' on a motor vehicle. You set the speed, take your foot off the accelerator and the cars computer adjusts the power to keep the car at the same speed. 'Cruise Control' will not completely nail the cars speed as if you were giving it your full attention in manual control, but 'Cruise Control' does reduce the drivers workload. The more we can reduce our workload, the better we can concentrate on flying the model helicopter. I do however need to warn you that 'Governor Mode' is not so kind on the batteries as 'Normal Throttle Mode' as you get very little warning that a low battery condition is approaching. So I can only recommend using 'Governor Mode' if you are very good at adhering to a timed flight or you have the latest generation of high performance Lipo batteries that can better withstand deeper discharges.

When programming the Idle up 1 and 2 throttle curves, your Transmitter should display a flat horizontal line that is constant in value from low to high stick. When setting the normal throttle curve, the values will be programmed so that they quickly ramp up to the desired rotor speed and then adopt the flat line values. Therefore, low throttle stick will retain a zero throttle value, but 1/4 stick position will be raised to 35% throttle value. 1/2, 3/4 and Full throttle stick will now be programmed to the same 35% value.

One very nice feature of the ESC governor mode is that it features a very smooth soft start. So for aerobatic pilots, you can simply engage idle up from a standing start and the ESC will spin the blades up smoothly. Be aware that the soft-start does dictate that the rotor speed will take about 6-8 seconds to slowly ramp up to the desired speed. So be aware that aborting an autorotation will be more difficult. Also be aware that this 'Governor Mode' is what I would call a soft governor. It is smooth and predictable, but there is a slight delay in rotor speed retention when faced with sudden collective / cyclic demands. So those of you who are into hard 3-D flying, will probably prefer the standard throttle option and program throttle curves / cyclic - throttle mixing into the Transmitter.

The lowest successful safe setting was found to be around 35%, which enabled a rotor speed of approx. 1650 rpm. If you wish to hover at a lower head-speed, then I would advise you to fit a 15 tooth pinion and use throttle values of 35-40%.

A flat-line 'Governor Mode' TX throttle value of 39% in Idle-Up 1 released a rotor speed of around 1820 rpm. This rotor speed suited spirited sports flying and aerobatic flying very well. The governor mode is a little soft, but does retain head speed safely through all loops, rolls and stall turns etc.

Raising the Transmitter throttle curve value to a flat-line 45% in Idle-up 2 saw a rotor speed of around 2000 rpm. The 'Governor Mode' worked well for gentle 3-D flying, but was not as punctual as the standard 'Throttle Curve' mode for aggressive 3-D flight. So I would recommend that you test both options and see which suits you best.

TX Swash Mix (14.5mm Cyclic Servo Arms)	**AIL**	**ELV**	**PIT**	**EXP**
	66%	76%	58%	ACT

Normal flight Mode: (Hovering) Rotor Speed: 1650 rpm Approx. Flight Time: 8-9 Mins TX Dual rate: 75% TX Expo: 22%	**LOW**	**1**	**2**	**3**	**HIGH**
ESC Throttle Curve Mode	0	55	65	70	75
ESC Governor Mode	0	35	35	35	35
Pitch Curve	50	60	68	80	88
Pitch at main blades	0	+4	+5.5	+7.5	+8.0

Idle up 1 flight Mode: (Sport / Aerobatic) Rotor Speed: 1800 rpm Approx. Flight Time: 5-6 Mins TX Dual rate: 90% TX Expo: 26%	**LOW**	**1**	**2**	**3**	**HIGH**
ESC Throttle Curve Mode	78	75	78	88	100
ESC Governor Mode	39	39	39	39	39
Pitch Curve	-25	50	70	84	100
Pitch at main blades	-5.5	0	+5.5	+8	+10

Idle up 2 flight Mode: (3-D Flight) Rotor speed: 2000 rpm Approx. Flight Time: 4-5 Mins TX Dual rate: 100%	**LOW**	**1**	**2**	**3**	**HIGH**

TX Expo: 30%					
ESC Throttle Curve Mode	100	95	93	95	100
ESC Governor Mode	45	45	45	45	45
Pitch Curve	6	28	50	72	94
Pitch at main blades	-9.5	-5.5	0	+5.5	+9.5

Optional Cyclic - Throttle Mixing (To Maintain Rotor Speed)	Left / Forward	Right / Back
Aileron - Throttle	+15	-15
Elevator - Throttle	+15	-15

Optional Cyclic- Cyclic Mixing (Correct Rotor Head Phasing)	Left	Right	Forward	Back
Aileron - Elevator	0	0	0	0
Elevator - Aileron	0	0	0	0

Control Rod Lengths (Centre - Centre)	
Linkage Rod A	30mm
Linkage Rod B	38mm
Linkage Rod C	65mm
Linkage Rod D:	60mm
Linkage Rod E:	48mm
Tail Pushrod	558mm

Flying the Flasher 600 ESP

Normal Flight Mode: At a main rotor speed of around 1650 rpm and the advised settings, the 600 ESP is a very smooth sweet hovering machine. The model is capable of riding the roughest of winds with solid predictability and has a large clearly visible footprint in the sky. The model responds progressively to all collective, cyclic and tail rotor inputs. The tube driven tail is quiet running and very positive. This flight mode is very easy going on the batteries and flight times can be up to 9 minutes.

Idle Up 1 Flight Mode: The 600 ESP makes a superb sport / aerobatic model. The machine is rock steady in all aspects of flight and has a surprisingly fast but controllable turn of speed. This sprightly performance can be used to make some seriously long straight vertical climbs to a stall turn where the positive tail rotor system makes for a very defined reassuring feel at the point of turn. Rolls are dead straight and the model does not lose momentum through single or multiple examples that can be made to extend from one side of the field to the other. Loops track perfectly and can be small cheeky ones or show stopping large diameter examples. In this format, I felt the quoted set-up was perfect, allowing for rotor speeds of around 1800 -1900 as desired by the Pilot. The large outrunner motor is powerful without being racy and makes good torque. Motor, Batteries and ESC all ran barely warm every test flight. This clearly indicates the drive system is well within it's operational range, thus promoting a long service life. Flight times range from a extremely spirited 4.5 mins of aggressive high speed flight, up to around 6.0 mins of combined aerobatics and hovering. Speed freaks would seek the higher headspeed range or make use of flybar weights to keep the head in check at Mach-9, whilst the lower headspeed range suited my best 'attempts' at precision hovering. For this style of flight, I was surprised that I did not find 6S set up restrictive in any way and re-charge times for the 6S 5200 Lipo battery was around 25 mins on a Fusion L702B Pro (two Port) charger and 88AH Leisure battery.

Idle up 2 Flight Mode: For 3-D flight the 600 ESP needs a rotor speed of around 2000 for general 3-D flight and 2200 for extreme 3D aerobatics. A 16 tooth pinion will suit (non-governed) 3-D flight at around 2000 headspeed providing 4-5 mins of flight times. The motor, ESC and Batteries all run barely warm on a 16 tooth pinion, so I would expect this power system to stand up to the test of time. Moving up to a 17 tooth pinion (non-governed) gets the headspeed up to the desired 2200 range for extreme 3-D flight and the motor and ESC run only a little warmer. This change in load and the enhanced flying ability of the model did however raise the Lipo battery demand to what would be perfectly acceptable for the latest very high C-rated lipos, but would be unkind to older generation batteries. Using the same (governed) 17 tooth pinion dictated a little more motor heat, but very short flight times of around 3.5 - 3.7 mins and higher batt temperatures. I would therefore recommend that if you feel the need to punch huge aggressive 3D holes in the sky, you look towards an 8, 10 or even a highly efficient 12S set-up. That said, in stock format right out of the box, the 600 Sport makes a superb 3-D model helicopter that is capable of highly advanced manoeuvres. The flip and roll rate are fast, yet sensible and the collective response is punchy without being snatchy. The tube driven tail is extremely positive and responds instantly to all pilot requests. As tested with Phoenixtech power system, I felt that the 600 ESP would make the perfect 3D trainer. The batteries are basic in requirement, so a simple lower cost 6S charger is sufficient, the power output is well within the motor / ESC limits and the flight times are sensible. Performance is good without being so hot it gets you into trouble and the model is easy to maintain.

The motor I had sidelined for testing the 12S set-up was quoted as 760 KV. On the first spool up in 'set governor mode', It became very obvious that this was not the case and I can now vouch for the structural integrity of this model for a short burst of something over 3000 rpm main rotor speed. Re-checking the maths leads me to believe that the motor was incorrectly labelled and was in fact more like 980kv. The smallest pinion I had to hand was an 11 tooth which dictated a set governor mode value of 62% for 2100 rotor speed. This did allow me to test the model in this set-up, but the combination felt far from optimised as the motor was running warm on 12S. It did however prove the efficiency of the 12S Lipo power system as flight times were in the order of 20% longer than the 6S Lipo set-up. A quick static test revealed that zero pitch at 2100 rotor speed only drew about 20 Amps. Full negative pitch and a wiggle of cyclic revealed a max Amp draw of around 44 Amps for 1998 Watts of power. So my suspicions were correct on the lack of optimisation for a power set-up, but it was re-assuring to find that the max burst load was a very low 18 C load on the battery. After flight, the motor was found to be running warm, but the batteries and ESC were almost cool to the touch. This brief experiment has therefore shown that the additional cost of a 'High Voltage' ESC and external BEC can be offset against additional flying time and a much improved battery cycle life expectancy. 12S test results will be updated as and when more suitable motors become available.

Verdict	**Points out of 10**
Presentation of the kit	7.0
Quality	8.5
Ease of Assembly	8.5
Ease of Radio Installation	9.0
Ease of setting up	9.0
Hover stability	8.0
Sport flying Capability	9.0
Aerobatic Capability	9.0
3-D Flying Capability	9.0
Accuracy of Flight	8.5
Performance (6S)	7.2
Flight Time	7.5
looks	7.5

Component	**We Used**
Transmitter	Specktrum DX7
Receiver	Spectrum 7600
Speed Controller	Phoenixtech 100 Amp ESC
Motor	Phoenixtech 4035 /1000 Kv
Pinion	16 Tooth
Cyclic Servos	JR 8915
Tail Rotor Servo	MKS BLS 980
Gyro	Phoenixtech GT 90 / CSM 720
Main Rotor Blades	Phoenixtech 600 mm kit blades
Tail blades	NHP 95mm Carbon tail blades

Recommended Lipo Battery	Phoenixtech: 2 X 6S 2600 (wired in parallel to make 6S 5200

Specifications	
Height	400mm
Length	1160mm
Main Rotor Diameter	1350mm
Tail Rotor Diameter	252mm
Motor Drive Gear	15-17 Tooth (6S)
Main Drive Gear	170 T
Autorotation Tail Drive Gear	180T
Tail Drive Gear	40T
Tail Drive Gear Ratio	1: 4.5
Weight (w/o power system):	Approx. 1500g
Actual Flying Weight less Battery	3248g
Actual Flying Weight (2 x 3S 2500 Lipo Battery)	3648g

Remember that I can be contacted to clarify any points about the model or this review via the Help Desk Hotline

I would like to wish you the best of luck and safe flying with your Flasher 600 ESP!

Russ Deakin.