

# V O Y A G E R E

## Introduction

The Voyager E was developed by JR to give people an affordable electric helicopter that did not need expensive batteries and equipment to support it. Designed to be sold as a complete package in the home market with almost all the equipment required to fly it, the Voyager E has been a successful introductory model to electric flight.

The design of the Voyager E allowed it to be flown using standard aircraft 7 cell battery packs, and therefore standard inexpensive model car chargers. Being a JR Heli Division product though it is very well engineered, and it wasn't long before the more advanced pilots started to see what they could do to extract every last bit of performance from the design of the model. Most of these changes revolved around fitting expensive brushless motors, which whilst effective, also made this an expensive model. I decided therefore to see what I could do to make the model perform as well as it could, but without having to spend a lot of money on it.

Presented here is the state of my modified Voyager E with all the tips I have collected along the way, and some of my own modifications. The enhancements outlined have provided me with a fully aerobatic electric helicopter that I can throw in the back of my car and fly nearly anywhere!

## Problems & Solutions

The Voyager E is designed to fly off 7 cells and therefore has a very powerful electric brushed motor as standard. With 7 cells the model can only swing a specified rotor disc size without overloading the motor or speed controller. This coupled with the slight over engineering of the basic design means that the Rotor Disc to Weight ratio is not ideal for aerobatics as the disc can be stalled too easily. Although it does have the added benefit of making the model very steady in the hover! To counter act this I set about shaving as much weight as possible from the Voyager E, with out resorting to expensive upgrades.



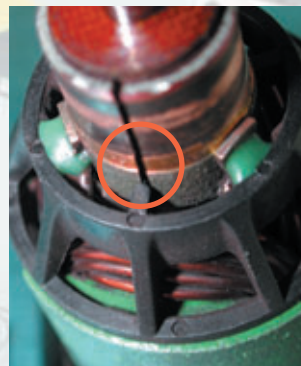
Mini Servos & Adaptor

The first area to look at is clearly the radio installation. Using miniature servos instead of standard size servos is the best decision to make when equipping your Voyager E. Next I removed all but one of the tail rotor pushrod support guides. This, plus the removal of the horizontal fin, lightens the rear of the model therefore removing the need for any nose weight. For good measure I also attacked the vertical fin with a knife to remove as much plastic as I could! The same was done to the canopy, every cut freeing up some useful grammes.



Lightened Tail

The next target of weight was the battery pack. This is the undoing of every electric model. Current batteries just don't give the required power to weight ratio that us helicopter pilots are looking for. Luckily though battery improvements are advancing all the time and we now have courtesy of Sanyo some very good 4/5-size cells. These cells, as well as being smaller, are lighter too. This allows you to run an 8-cell pack that weighs pretty well near the same as a 7-cell pack with the added benefit of an extra 1.2 volts! The downside to this is the standard speed controller in the kit is not verified for use on 8-cells. I know of people who have used 8-cells with it, but I wouldn't expect it to last long. For this reason I recommend purchasing a higher rated speed controller!



Fan Mounting Points

Now we've lost some weight and gained some more power, what can we do about the motor? Contrary to popular belief you will struggle to better the standard motor unless you buy a brushless version. This however is an expensive route, and we plan to do this for as little as possible! By preparing the standard motor correctly, and looking after it, the motor will provide you with good power, and good reliability over a number of flights. Please follow these steps in preparation of your motor: **(Tip originally by Ian Williams)**

- 1) Open up the can (noting the timing position) and extract the armature from the can.
- 2) Using some needle nose pliers, remove the little plastic mounting points of the fan. Otherwise carbon dust can build up underneath and short the commutator causing a loss of power.
- 3) Reassemble the motor, and run it on a low voltage (e.g. 4.8V) for around 15 minutes. This will allow the brushes and commutator to bed in correctly.
- 4) Remove the brushes, and blow out any carbon dust.

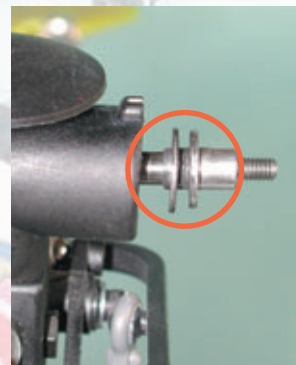


Points Removal

**If you don't bed the brushes in, you will find that they wear very badly, and you will not get optimum performance!**

## Rotor head preparation

The final hurdle is to put this extra power to use through the rotor disc. As blade movement adds drag to the system, and therefore drains power from the motor and battery, I decided that there needed to be some big changes to get the required control power for aerobatic flight.



Damper Washers

The standard dampers are very soft, which give excellent hovering stability, but restrict fast forward flight. As the model is now running a higher head speed (8-cells Vs 7-cells) we can afford to tighten the damping considerably. To do this I removed the little metal "cups" that sit in the dampers, and added a small M4 washer to it. This effectively squeezes the damper more when you assemble the head, causing stiffer damping.

To make the model have purer reactions on the cyclic controls I wanted to remove the entire Delta 3 from the rotor head. To achieve this, simply put a couple of M2 nuts behind the ball on the blade grip. This will extend the ball nearer to the centre of the head, like on the Vigor CS, removing the Delta 3 offset.

I also wanted to get sharper cyclic response, but without driving up the travel any further. More travel equals more blade movement, and therefore more drag. Therefore I opted to fit a set of K&S 30 size 3D paddles. These paddles are much bigger than the standard fit items, and allowed me to reduce the cyclic throw by 10% all round! I used a set of wheel collets as flybar weights to tame the response of these "oversized" paddles.



Delta 3 Removal

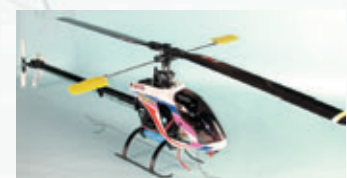
## Final tweaks

The above changes transformed my Voyager E from a gentle circuit model into a full on inverted flying aerobatic helicopter. However I still had more that I wanted to achieve! To aid stability and control response I wanted to remove as much "slack" as possible from the rotor head. To do this I removed all the bearings from the blade grips, and reinserted them with a small amount of cyano. This positively locked the bearings in the grips, and removed a lot of free play. I also used a small amount of thread lock on the feathering spindle and bearings to lock them together.

For those who want to go a bit further still it is very easy to stretch the Voyager E and put longer boom and blades on to it. What you require is a Venture 30 boom, a Venture 30 tail rotor pushrod a set of MS Eco 8 blades and an Ikarus ECO 16 tail belt. You will need to cut the Voyager parts down to length, but will effectively gain an extra couple of cm's on each blade. This will give you more lift, and less drag as less pitch will be required. And finally I recommend dropping a tooth on the pinion to allow the motor to rev a little freer on the extra cell.



K&S Paddles



Finished Model