

FLYING A MULTI-MULTI- BLADE HEAD



— Gary Richardson on serious fly-bar-less flying. —

I have flown model helicopters for about 17 years now (ever since they became available). In this time I've had a few attempts at flybarless machines but have always discarded them.

There was the Revolution, Kavan Jetranger and Kavan Lockheed. The Kavans flew alright in standard form at lower rotor speeds but my Lockheed went into violent oscillations when running at higher revs with glass blades.

For the last 2 years Paul White has been importing PEKA rotor blades into the UK and had flown all the Multi-blade heads available. As he was having success I let him talk me into giving them a try.

The equipment I got was Hughes 500E, 4 blade head with Heim mechanics and all controlled by my trusty JR Apex Computer radio. This transmitter allowed me to use CCPM to eliminate all the free play in the control linkages (direct connection from the servos to the swashplate with the mixing done by the Transmitter).

The engine is a Webra 61 with a ringed piston and it was set to push the rotor head around at about 1500 rpm.

First attempts were in calm conditions with a new engine and a careful pilot. Hovering tail-in showed very precise control on cyclic but a little insensitive on collective. Something in my head left me afraid to try to fly it nose in or do tail rotor turns. I felt it would not take kindly to some twit who

Super model. It might seem expensive but remember the woodwork is ready bonded in and you don't have to paint it. Oh and its made with Kevlar.

had not flown for six months, pushing the stick in the wrong direction.

Gentle flying was next. I soon found out that this is the most difficult mode of flight, it requires more concentration than hovering or fast flight.

My gentle flying then changed to high speed circuits, figure 8's and stall turns.

Other characteristics of the rotor system now began to show themselves, ie. fast flying required continuous forward cyclic to prevent the model

Gary's model. Super finish is ex-factory with a few decals added.

from climbing, the faster the flight the more forward was required. For a climb to a stall turn I just needed to centre the stick.

When stopping a model, you bring it in tail down and as it stops push forward to straighten it up. The flybarless models I've flown seem to hesitate at this point. This was a problem to me until Paul



pointed out that an application of up collective will start the forward cyclic working again.

It is interesting to bear in mind that all the flying characteristics I mention will also apply to flybar equipped machines but in most cases they are hidden by the effects of the flybar. Albeit it may be possible to improve the way a flybar model flies. You could try applying power in the turns (mentioned later) and power to help straighten the model up after a fast stop.

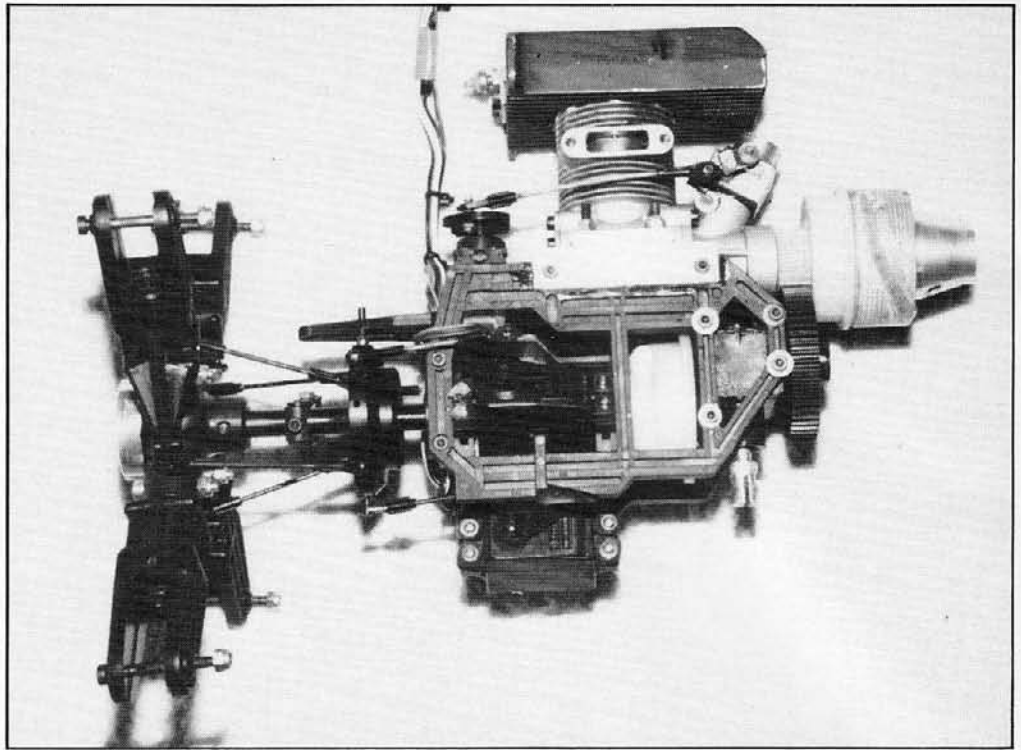
Control with the Multi-blade head and the CCP, linkage system is very precise. I feel very happy doing low level beat-ups with the tips of the skids 6 inches off the ground or lower. I stopped doing this when a friend added up how much money I had airborne — frightening.

My first flights were with stiff rotor blades and at high speed I would run out of forward cyclic and have to dump collective to prevent the model from climbing. You could also say that if I left the cyclic where it was and reduced the pitch, the model would nose down. This nearly ran it into the ground on a gentle pull-out from a 30° dive. I was dumping collective at the same time as applying back cyclic. The net result was straight flight until the adrenaline level increased and I pulled a handful of back cyclic.

Turns, I've found to benefit from power. As well as pulling the nose round it holds the speed up so that the model does not side-slip in.

Windy conditions showed other characteristics. After trimming the model for the wind, any change in wind speed required retrimming, remember the nose up effect with increasing speed. If the nicely trimmed model is put tail into wind, the stick has to be moved quite dramatically to just hold the model on station. Eventually I got used to looking at the model and holding the stick position that produced the desired results.

After about 4 hours flying I felt happy enough to do tail rotor turns and fly the model nose-in. I also got some of the new PEKA blades. These are very flexible along their length and in the twist. They have reduced the effect of most of the characteristics I've mentioned so far as well as making the hover more comfortable.



The most dramatic effect however is that they have increased the top speed of the model by perhaps 10 mph or more, while reducing the amount of forward cyclic needed. The rotor system must be quite efficient as while at the 1988 Woburn fly-in I was asked if the model had an 80 engine in it.

It's quite surprising that a big fat Hughes 500E moves so fast, it must be very streamlined and the slim-line pod/boom models a lot more draggy than I ever thought.

I have been told that the Hughes with the rounded front (the 500D) does not fly as fast as mine with the pointed front end.

Though the cyclic power is high this does not mean fast. Around neutral it is relatively slow, as if it had built in exponential. I fly this model with a linear response selected on my transmitter though I use exponential on my flybar models.

The overall speed of response can be changed by decreasing the swashplate movement. The slow response limit would be when you start to run out of stick travel while just coping with the trim changes caused by going from head on to wind to tail upwind. Fastest response is probably when the swashplate jams up on full stick deflection, but that may cause damage in the linkage or even worse in the servos. I'm using

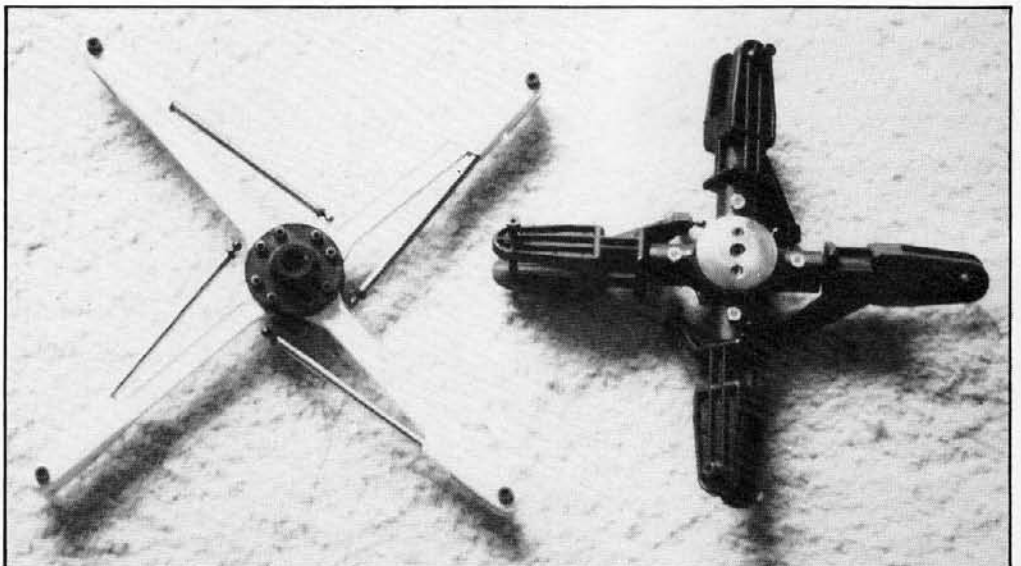
Heim mechanics with the 4 blade Multi-blade head and the replacement CCP sideframes.

more normal amounts of movement and it is aerobatic enough for me.

Gusts will disturb the model more than a flybar machine but it can easily be corrected.

I did not wish to try autorotations to the ground and risk chopping the tail off my £560 fuselage until everything was just right. So on my first fly round I switched out the idle-up and then pulled the collective/throttle down to low.

This clearly shows the difference between the NBS and the Multi-blade systems.



model dropped at a reasonable rate, the rotor blades held their speed and when I flared with cyclic at about 20 ft it stopped descending. I opened up and flew away knowing an autorotation to the ground was possible if I had an engine failure. Later when I was more familiar with the machine and there was wind to give extra lift, I tried some dummy autos down to 15 feet. A vicious dive was found to be due to the bottom end pitch being too low. This was corrected then I tried it for real, no trouble at all and it hung about for ever at 6 inches. This was partly because the top end pitch was set too high as I found out at the Woburn fly-in.

rotor speed drops the phase angle shuffles off round the disc."

Regarding the engine, if you use a ballraced clutch on Heim mechanics you need a strengthened crankshaft, mine was the standard type and the gyroscopic forces broke it on its threads.

Before the engine broke I was exploring loops, reversals, downward half-rolls and other silly things as yet unnamed. There seems to be enough potential to keep any 'Hot dogger' amused for a long time.

When flying these manoeuvres I remember how narrow the blades are and try to keep them flying quietly afraid I

3. A competent pilot is required unless it is flown in calm conditions and at low revs. The pilot should not push the cyclic control the wrong way and expect to get away with it (see 1 above).

4. Flying at a distance is not recommended. When doing this with a flybar equipped machine the stick centre can be used as a reference as to how much control you are sending to that grey spot over there. As I have already said, you tend to fly with the stick away from the centre on a flybarless model and you need to know what corrections to apply.

Get a Hughes 500E — it's a big big model.

over to:

Jim Fox Models, 6 Eastgate, Beverly, East Yorkshire.

Multi-blade heads use symmetrical section blades and can be used for either direction of rotation.

Replacement blades? — Return one good blade for replacements to be matched to it.

Rotor heads available:

Multi-blade heads — these use ballraced blade holders.

Available from 2 to 6 blade systems.

Price of 4 blade system complete with blades — £259.80.

5 blade — slower response, good autos.

3 blade — ultimate hot dog! Fast response and stable.

2 blade — can respond very fast, specify your own blade weight to get the required response.

NBS — No bearing system:

The blades are supported by flexible elements instead of blade holders and bearings. These must be operated by powerful servos (5 Kg output) — Takes a high load from the battery. They have to be run at 1600 to 1800 rpm plus, which can be a bit wearing if you spend most of your time hovering and you do not have a good silencer.

This system is a bit more delicate than the Multi-blade, ie. don't leave the blades on the head when left in a hot car (I mean when the sun is out).

The NBS flies a bit nicer than the Multi-blade, probably because of the soft vertical flex of the blade supports. The blades have a static droop and the head is small and scale looking.

Price of 4 blade system complete with blades — £246.49. NBS is not available as a 3 blader.

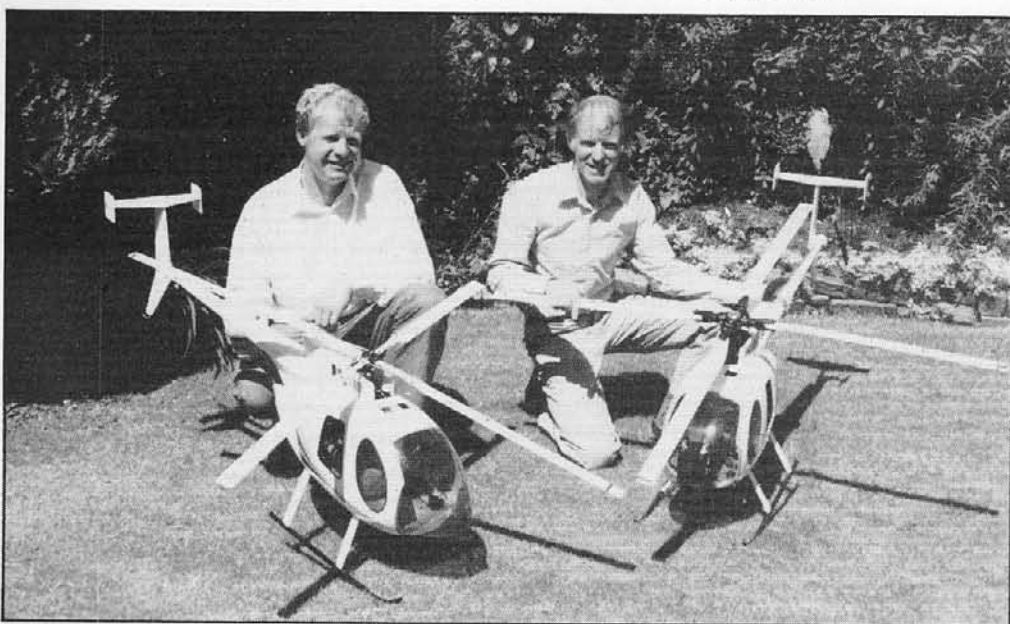
General:

Do not use these heads unless you can remove all the play from your cyclic/collective system. Mechanics should be solid, remove rubber damper mounts, use NHP long tail blades as a fair amount of torque is developed by pushing 4 or 5 blades around.

And Finally...

I would like to thank Paul White for the inspiration, not only for this article but for my flying while I have known him.

Look out New Zealand you don't know what's going to hit you. □



Gary (on the right) and Paul White pictured here just before Paul's departure to Kiwi Land. Two extra brownie points if you spotted Gary's opposite rotation.

When flying at Woburn the engine started to scream after the clutch and fan assembly fell out of the bottom of the helicopter. This was an autorotation for real and it wasn't very close. I flared and held off with collective pitch to let it sink slowly on to the ground (wherever that was) in its own time. I heard cheers from behind but because of a hump in the ground they could not see the model tip over as the skids touched down. As it fell over it cracked one of the blades, they were almost stopped.

I presume the blades were stalled due to excessive pitch and low speed. Alternatively it could be as Paul says, "When

could damage something, I've got a lot of money up there. For example on the last quarter of a loop I dump some collective pitch and this will stop the blades from barking. I'm probably being over cautious but it does no harm.

For anyone really interested in aerobatics, higher rotor rpm would be an advantage. Alternatively if scale is your interest, lowering the revs will make the model very docile but if this is overdone you could have problems coping with gusty conditions.

How does it compare with a flybar model?

1. Cyclic power is very high. A wrong input could cause a roll rather than a bank and slide that occurs with a flybar.

2. Holding the last position is good (if not disturbed by outside influences), ie. gusts or inadvertent stick movements, remember you probably do not have the stick at the centre.

Subjectively

It has a predictable feel that inspires confidence. I know that if the engine keeps going all I have to do is shove the sticks in the correct directions and it will perform perfectly.

Who would want a flybarless head? — Hot doggers or scale flyers.

Who would want a flybar head? — Anyone who flies large manoeuvres; FAI pilots; beginners; and anyone who may push the stick in the wrong direction.

Will I keep flying it? — Yes, Yes, Yes.

Other Information

Manufacturer:

Peka-Lufttechnik, Indenatzenbenden 45, Haaren, Achen, West Germany.

British distributor:

Paul White is now residing in New Zealand and has handed