

Close Encounters

Second look at the Henseleit Three-Dee NT



Wrong way up? No problem.

We take another look at the Henseleit 3-D NT... Is it so radical that it's destined to be labelled as a 'specialist 3-D model helicopter', or is it a genuinely practical model helicopter?

The 3-D NT was reviewed by an extremely impressed Jon Tanner in this year's April edition of MHW. Now despite my involvement being limited to a solitary afternoon's flying, I found myself being impressed enough to purchase an NT for myself. However, whilst I admired most aspects of the design, I do admit to having some initial personal concerns. These were mostly centred with the question of orienting the slippery canopy and to a much lesser degree, the narrow track undercarriage and how a piped 90-size engine running on straight fuel would cope on the warmer days of the year? Therefore, this follow up on the 3-D NT is based on my own experiences, findings and progress with this rather special model helicopter.

manoeuvrability and flexibility of rotor rpm, whilst being very quiet and easy to maintain. This rather demanding criteria was achieved through a radical, yet simplistic design that is based on Jan's experience with his earlier 3-D model helicopter and the current 'Rocket' design. Thus the NT is a development of existing models and for those who are curious; NT simply stands for 'New Technology'.

So the culmination of Jan's efforts, has produced a model helicopter that weighs just under 10 lb with blades and is powered by an O.S 91 FX engine, which via the advised Lötterle carb, runs on straight fuel with an oil content of just 12%. The supplied gear ratio works out at 7.7:1, thus giving a practical range of 10,000 to 15,000 R.P.M at the engine. This translates to a range of around 1300-1900 on the rotor head and to allow for usable tail power at low rotor speeds, the tail gear ratio is set at 1:4.92.

Construction of the model is for the most part, based on sheet carbon fibre and CNC machined plastic and aluminium. The layout is that of a forward mounted engine, driving a large main-gear via a toothed belt. Below the



Using half cyclic produces a respectable roll rate!

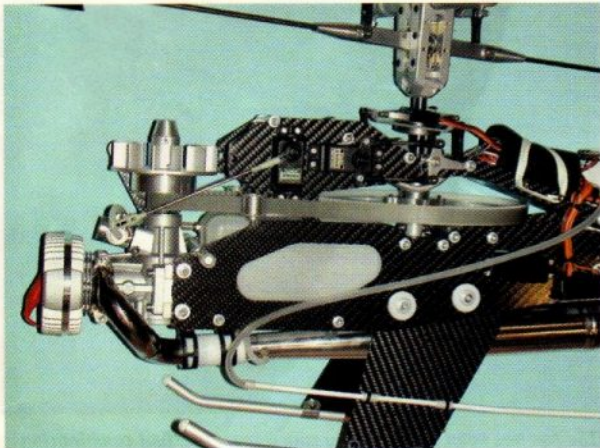
maingear, are the tail drive gears, which are used to transfer drive by 90° and on to a toothed tail belt that runs in a carbon fibre tail boom. Control over the 3-D NT begins with a fully bellcranked closed-loop CCPM system, which utilises small servo movements to dramatically reduce control interaction. From the swashplate up, a totally new 'Moving Flybar System' was developed to remove the need for conventional washout arms to compensate for collective pitch inputs. The obvious result of this technological step forward, is that of a very low overall height and of a vertical centre of gravity that greatly aids manoeuvrability.

Preparations For Flight

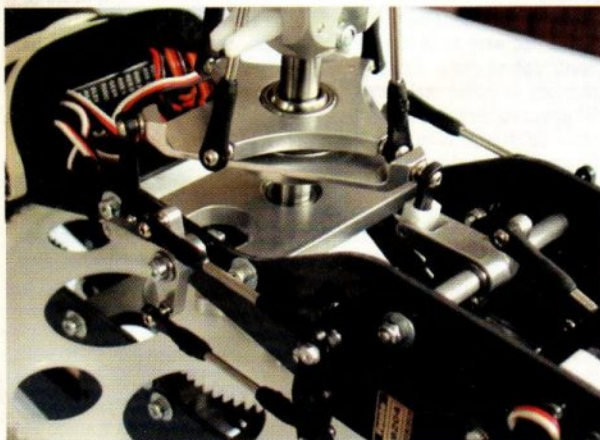
Overall, building the 3-D NT was a surprisingly swift, painless and pleasing operation. The only areas that did require extra attention, were the fly-bar guides, ball links and covering of the paddles with heat-shrink film. As Jon stated in the review, the fly-bar guides do have to be tightened carefully so that the fly-bar assembly could slide up and down smoothly, and with care this was achieved. I did find the supplied ball links to be a little too tight for comfort, but with the occasional squeeze and bit of heat, these were persuaded to become a perfect fit. As for

A Little Background

Jan Henseleit designed the 3-D NT to be low in weight, have a stunning performance on low cost fuel, great



OS 91 FX with the Lötterle carb works surprisingly well with 12% oil and no Nitro fuel. Note the sliding flybar rotorhead.



Extensive use of carbon fibre and CNC machined aluminium and plastics are used.

covering the paddles with the supplied heat shrink, then I do have to admit that I only had access to a heat gun that was designed for stripping paint! So unsurprisingly, I did not manage to obtain good results without a sudden meltdown of the covering material in the open sections of the paddles. Thus, I ended up using some self adhesive film and simply sealed the edges with a dab of cyano.

Installing the radio control equipment was also found to be a simple operation, but because of simple logistics, I did deviate from the advised choice of servos. I installed three JR DS-8231 digital servos for CCPM control, a JR NES-517 for throttle and a JR DS-8417 on tail rotor. The only other deviation was to install the Rx battery on the rear tray, thus moving the C of G of my painted model to somewhere close to the main shaft. When all was in and connected up, I then followed the set-up procedures stated in the instruction manual and in half an hour, the mechanics were ready for action, just requiring me to spray the sleek canopy. For this, I masked off the areas I wanted left black with

insulation tape and after a whisk of cellulose primer, blasted the rest with 'Flair Spectrum' orange. Then after a few days to allow the paint to dry, I removed all the masking tape, cleaned up the occasional rough edge and promptly polished the paint up to an acceptable finish. After a few weeks, I finally decided what effect I wanted to achieve and attacked the canopy with a combination of stick on trim and suitable stickers from a variety of sources.

Life With The 3-D NT

The initial flights were obviously biased towards the need to run-in the ringed OS 91 engine carefully. This was successfully achieved using a mix of 15% EDL/straight methanol and keeping the engine a little rich with a main rotor speed around 1500 rpm. After a gallon of this mix had been put through the engine, fuel with 12% oil was subsequently used and the mixture was then adjusted so that the engine ran just clean across the whole range in Idle-up. At an estimated rotor speed of 1700, I began to

carefully explore the model capabilities in a very relaxed manner, thus slowly overcoming the envisaged orientation problems. However after some initial apprehension in overcast weather conditions, I quickly gained confidence and began to feel quite at home with orienting the model.

In flight, the model has a light responsive feel to it and despite the rapid control response, I find myself flying in a relatively relaxed style of 3-D aerobatics. In doing so, I tend to use only partial cyclic control for the majority of manoeuvres, thus leaving full stick for areas of 3-D flight that can get bogged down by wind or slow airspeed. Thus once you become adapted to this, it is possible to ensure that manoeuvres are constant in rotational speed, or you can of course, simply use full stick for visual effect! Indeed, when generalising about the control response, the 3-D NT does tend to do exactly what you tell it to and when you tell it! So whilst accuracy has its obvious advantages, when coupled to a swift response rate, it can also have a slight downside. Thus if you make a mistake with the amount of control, the 3-D NT will not show you much in the way of sympathy and tend to visually highlight the fact you have made an error!

With regard to vertical and forward flight, the model is undeniably swift and to the unsuspecting, can give the feeling of having a real 'tiger by the tail'! However, by running a constant rotor speed of around 1700, rotor-head stability at high speed is excellent and by making full use of softened pitch curve, the rate of knots can be controlled more easily. From a purely 3-D perspective, this model clearly excels in large manoeuvres, or where a swift roll/flip rate is desired. Thanks to the slippery canopy/OS 91 combination, the NT does have exceptional penetration in all forms of loops and when pushed into large diameter examples, it is more a case of your own personal limit - rather than the models! The same can be said for stall turns and vertical rolling manoeuvres, where the NT certainly gives the impression that it is going to keep climbing and climbing forever. However, what I did find particularly impressive, is that due to its low weight, the model does not descend vertically at an alarming rate. Thus it is relatively easy to give the impression of constant speed manoeuvres, rather than the usual slow



Backwards loops are as big as you want and can be performed at a surprisingly consistent speed.



The light weight produces superb auto performance with a slow descent giving time to think!

haul on the way up and fast acceleration on the way down.

Moving into more relaxing scenario's, the NT is actually very stable at low forward speed/hover situations. Also, the very low weight/inertia of the model definitely enhances all stationary manoeuvres and as such, has a surprisingly unstressed feel in all wind conditions. When pushing the model into sideways and extreme pirouetting modes of flight, then the large side profile of the canopy does give the feeling of being slightly restrictive and whilst performance is still extremely commendable, it is not as clearly exceptional as in the linear directions of flight. Thus, good sized sideways loops are practical, but just don't expect them to be like the real 'sky munching' diameters that are easily released in fore/aft directions of flight. With regards to pirouetting manoeuvres, then in all stationary modes, like pirouetting flips and fast moving chaos manoeuvres, the NT swirls around in a very smooth and predictable fashion. However, when forward motion is combined with the 'on-load' direction of pirouetting, the NT copes very amicably, but is once again not in its best mode of flight.

At an all up weight of 10 lb with rotor blades and a tank of fuel, the 3-D NT does clearly surpass in auto-rotations! Conventional autos are an absolute breeze with this model and descent rates can be safely adjusted from fast to incredibly slow, with the blades ticking over at under 1000 rpm with zero loss of cyclic control authority. When flaring from a high-speed descent, you are in the position of being able to hover and then touch down, or touch down, take



The NT is at its best in forward/backwards manoeuvres, the large side area slightly limits sideways loops.



Fast forward flight is, well, very fast but the missing horizontal fin does make it pitch up!!!

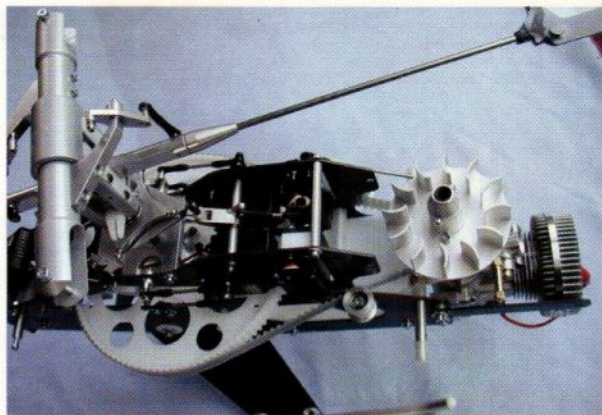
off again and touch down safely. From a slow feathery descent, there is obviously nowhere near the same margin of error. However, in all but the stillest of wind conditions, the NT can be brought in at an incredibly slow rate of descent 'all the way down' and still give a safe flare and touch down. Whilst I am not the best person to explore the aerobatic autorotation capability of the 3-D NT, I have found it both very forgiving and capable within my mild interpretations and with a such an efficient slow rate of descent, the process does feel refreshingly more comfortable.

Observations And Possibilities

As I am a bit of rebel and suffer from a substantial amount of natural curiosity, I have naturally experimented with certain aspects of the 3-D NT. My first concern was with the ability of the short narrow undercarriage to cope with the undulations of my local flying site. So I utilised a slightly taller heavy-duty skid set available from Revolution Models and also made use of longer skids, which has dramatically increased ground stability. However, by the time you read this, a rough field undercarriage will be available direct from the manufacturer, thus providing a much more assertive solution to the problem of our bumpy flying fields.

Next in line was to simply assess just how the model could be tamed down to suit less demanding operation. This began by experimenting with partial pitch/throttle settings and here I found the carburation to be extremely effective. In a 'Normal' flight mode of around 1500 rpm, I found throttle the could easily be limited to around 70%, with about 9° of collective pitch. Thus it is perfectly feasible to de-tune the model to a chosen level that would allow a less experienced pilot to cope with the 3-D NT. Then as familiarity/experience grows, the pitch/throttle settings could be slowly increased to release more performance as required.

Further to this line of experimentation, flybar weights, less effective paddles or the option holes on the Bell/Hiller mixing-arms can also be utilised to de-tune the cyclic response if required. Flybar weights were first and these obviously allow you to fine-tune the existing response/stability of the rotor head. This is simply done by sliding the weights out for less response/more stability or in for the reverse effects. For those who care to compare, then you will find the stock paddles to be surprisingly powerful in comparison to most other paddles. Thus, less effective paddles could be fitted to reduce cyclic response, but do note that you are advised not to use paddles that exceed 35 g each! Last on my short list were the option holes on the Bell-Hiller mixing arms and by moving the control ball to the inner hole, you change the relationship of Bell to Hiller mixing. In this instance, by moving to the inner hole, there is a slight increase in 'Hiller control' (flybar authority) and



The fan has been developed to suit the engine/fuel combination and few signs of overheating have been seen.

slightly less 'Bell control' (direct input to main blades). Thus you will generally find a slight decrease in immediate cyclic power and a slight increase in hover stability. However, where you may notice more difference is in extreme fast forward flight and here, I found control response to be smoother and more predictable.

Apart from the above, the only other experiment I have tried with the NT is to fly it without the horizontal stabiliser and to further hollow out the vertical stabiliser. To my surprise, the horizontal 'half stabiliser' is actually much more functional than I expected and has the clear effect of keeping the model flying straight and level in fast forward flight. When omitted, the NT does pitch up noticeably in forward flight and generally felt much less stable in the horizontal axis. Also of a worthy note, is how much you come to rely on the horizontal stabiliser for orientation in vertical manoeuvres. If it shows on left side of model, the rotor disc is facing you, whilst on the right - the disc is facing away from you. Thus it does give you a clear hint of which way round the model is and as such; I promptly re-fitted it for both of the above reasons!

Regarding the vertical stabiliser, then I decided to hollow out the underside to allow as little restriction in the yaw axis as possible. Here I did actually find a slight improvement and as such, those who subject their NT to vigorous backward flying and prolonged pirouetting manoeuvres, may find the same benefit as I did.

A Final Summary

Overall, the model works extremely well and is a real joy to operate and maintenance is practically non-existent. The engine has really purred however warm the weather was

and has retained all the initial settings. In fact, it appears to be running so happily, that it is difficult to distinguish if it has ever been run at all! The piston shows only the slightest hint of bedding in marks, the liner is in perfect condition and on the exhaust side of the cylinder head, only the slightest tinge of brown coloration can be detected. As for glowplug life expectancy, then this has also been surprising and appears to be around 8 gallons of 3-D usage.

Indeed, like every other engine I have come across, it is not impossible to upset the engine if abused in the air. So, if set too lean or run too fast and driven down hard in idle-up, the engine can over-run its practical rpm and become upset. However, when set up correctly, recovery is practically instant, thus indicating that the choice of gear-ratio, cooling system, carb, fuel and tuned pipe and are key features to success with the OS 91 FX engine. As to how audibly quiet the model is, many have quoted that at a low head-speed, the model could be easily mistaken for an electric model helicopter. As for 3-D rotor speeds of around 1700 on the rotor-head, the NT is genuinely unimposing and by far the quietest 3-D model I have come across.

In the air, the model is a truly high performance 3-D model helicopter and in the vast majority of flight modes clearly exceeds all expectations. However, due to the low running costs, low noise and wide rotor speed range, it is likely that the NT will find plenty of less demanding usage. Indeed, as long as the model is set-up accordingly, I can not see any reason why it could not be used and thoroughly enjoyed as such. Overall, I think the 3-D NT when used with in the advised format, is an extremely competent, reliable, refreshing and thoroughly enjoyable package.