14th scale Kato NK250 25ton Mobile Crane

Built by Pete Dickinson

After the difficulty in building the Oshkosh FMTV without the aid of any drawings I began to look around at another vehicle to challenge myself.
An acquaintance owns a mobile crane company in Gloucester and I had often looked as his vehicles with a view to building a model of one. Challenged by the build of the FMTV and feeling moderately pleased with the result I decided to have a look at taking that up as another challenge.

Bill, the owner of the company allowed me to visit his depot to take measurements and photos of one of his cranes. The one I decided on was not a new crane but he had two models of it showing some of the slight differences between them. Armed with the information I decided to look for a donor model kit.

The nearest I could get was a Tamiya Globeliner but I knew that the chassis would need some serious modifications to align with the Kato Mitsibushi based crane.

I bought the entire kit as it is significantly cheaper than trying to source the various parts needed to complete the chassis and began to take detailed measurements of the kit frames finding that I needed to extend the chassis frames some 5cm front and back. I also needed to move the front axle forward to get the wheelbase correct, and this meant that the motor and gearbox also needed to be re-sited much further forwards. This then meant that the positions of the two servos, (steering and gear change) also needed to be moved, involving the repositioning of the entire front axle turning it 180 deg to avoid the steering cross member fouling the front of the gearbox.

With the gearbox moved forwards I had to lengthen the prop shaft and utilised the existing dog drives set into the correct length of stainless steel tube. I then took some time to assemble the wheels after spraying them the nearest colour I could find to the actual vehicle (Fiat Capri Blue) I 3D printed the wheel hubs to cover the Tamiya fixing nuts and then turned to the next part of the build, applying the 2mm thick styrene build plate and fixing it to the chassis with brass standoffs.

I realised that the crane section of the model needed to turn 360 degrees and decided to purchase a 60mm OD three part thrust race to take the weight of it, then 3D printed a 61mm ID ring gear to mate with a small motor and gearbox that will be mounted in the crane section.

I spent a lot of time browsing the internet for drawings and photos of the Kato NK250 and came quickly to the conclusion that there were almost more variations to them than there were vehicles. The one I was modelling had been altered by the owner to increase its driving distance and this entailed placing an auxiliary fuel tank on the deck so I ended up continuing the build from the many photos I had taken and abandoning the few (useless) drawings I had managed to find.

Fortunately I had learned from previous experience to ensure that I took many images 'dead on' to the front and side of the crane which enabled me to size them so that they would be templates for the cutting of the sheet styrene to begin the build of the two cabs.

In between building the cabs I looked at making a look-alike hydraulic ram that is used to lift the massive jib. Knowing how much load would be placed on it I decided to make it from brass and stainless steel tubing as below. The lift provided by the small motor and gearbox on the extreme left, driving an M3

stainless steel threaded rod via an M3 captive nut, force fitted into the lower end of the stainless tube, which acts as the hydraulic piston. This worked well and could extend the tube right out to the end. Since then I have discovered that the huge load imposed on the tiny gearbox caused it to wear away the small bearing under the output shaft.

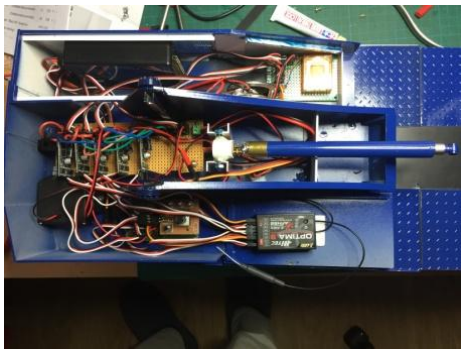
I found a source of 3mm ID thrust races and mounted a set between the brass connector and brass face of the gearbox. This thrust race now takes the entire load of the jib with no problem.

I decided to start the build of the jib which is in three sections that slide into each other. Aware that under load the plastic on plastic surfaces would almost certainly bind, I purchased a reel of 5mm self adhesive Teflon tape to line the corners of the two larger tubes. I built the main tube in 2mm styrene and then after fixing the Teflon tape carefully measured the inside of the three sided construction before cutting the sides for the next one. Once satisfied that they slid easily in and out I measured the three sided second jib after lining it with the Teflon again and this time made the last jib in 1.5mm thick styrene.

Now I began to work out the electronics needed to enable the jib to extend the larger section first, followed by the smaller last section. This was achieved by using some self adhesive copper tape along the inside length of one side of the jib to which four brushes on the next section make contact. This enabled me to have just one three way switch on the transmitter, centre stopped, up extend, down retract. Using cuts in the copper tape and micro switches to sense the extremes of travel I eventually placed two of the small motors and gearboxes into the main and second parts, which drove long brass M2 threaded rods in captive M2 threaded bosses. Checking that it all worked as intended I finally sealed the open side of the jib sections and then sprayed the entire extended assembly.

The build began in earnest now and I started to make the crane cab, drivers cab and some of the other items that adorned the deck. The crane unit had to be mounted on a large thrust race to allow it to turn. I printed a large ring gear and a matching pinion which surrounded the thrust race and continued to build up off the build plate.

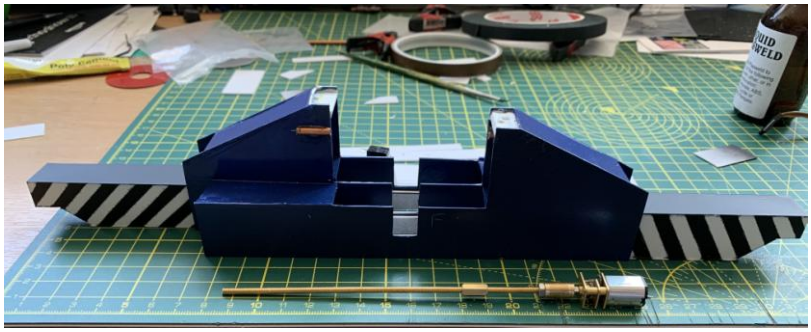
It soon became apparent that the thickness of the thrust race raised the crane unit far too high leaving a rather unsightly gap between the build plate and the crane unit, so I dropped the thrust race down by cutting the build plate which now made the crane cab sit correctly.



The rest of the top build went according to plan and after installing all the various esc's, receiver, switch system and sundry electronics into the crane body there was very little room for anything else. It looks a bit of a 'rat's nest' but is all functional. The only electronics outside of the crane section is the main drive ESC which is situated under the vehicle driver's seat.

With the crane part almost finished I turned my attention to the four stabilisers that emerge from under the vehile chassis. The rear ones presented no problems but the front ones had to be carefully designed to allow the lengthened prop shaft space. I used the same method of miniature motors and gearboxes driving long threaded rods to move the arms out of the assembly.

This is the front assembly with the centre cut out to accommodate the prop shaft. The drive mechanism is in front of the unit and these will be contained inside the extending arms.



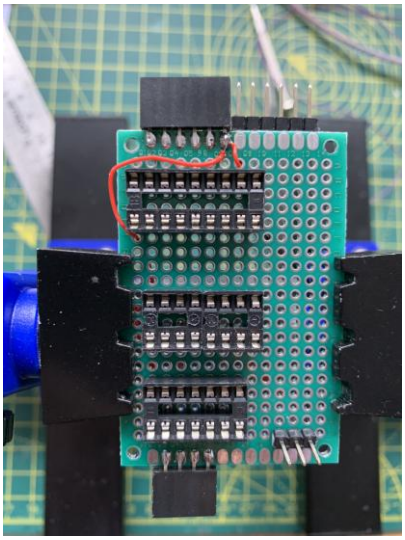
The rear unit is identical, apart from the lack of the cut out. The gap in the centre is the width of the chassis and the tops are fixed to the underside of the build plate.

I spent a lot of time trying to get the various logos to look right on the crane. The main problem was the background colour that surrounded the white lettering. In the past I have always used either gloss or matt vinyl self adhesive sheet to adorn my models and after attaching them would spray the finished part with clear or matt varnish.

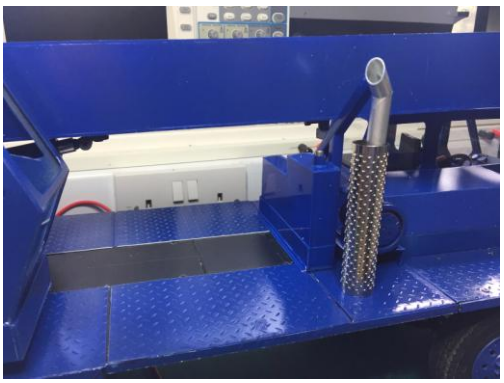
This was to protect the printing from moisture. The problem here was while the colour looked correct when placed on the crane, as soon as I sprayed it it went several shades darker. It was then I noticed that the pack of A4 vinyl said it was waterproof.

I put a spare print out in a bowl of water and after several hours the print was still perfect, so the crane was adorned with unprotected logos and they look quite good.

The rest of the construction continued without problems. I turned my attention to the construction of the lighting control. I needed to have :- sidelights, dipped beam and main beam headlights, winkers, reversing and brake lights and last of all work lights.

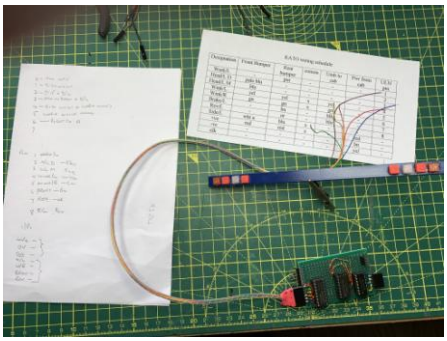


I made up a board to enable this to happen and wired it up. There is a channel dedicated to switching this and I took a single wire to the finished board. This is the board prior to wiring it up. I use sockets for the I/Cs as it is very difficult to remove a faulty one from a board with plated-through holes.
The plug and socket at the top of the board go to the front and rear lights.



The board is accommodated in the centre of the truck between the chassis rails and under a removable section of the chequered plate that covers the whole top of the build plate.
You can see the area in the left photo before the centre plate is in place.

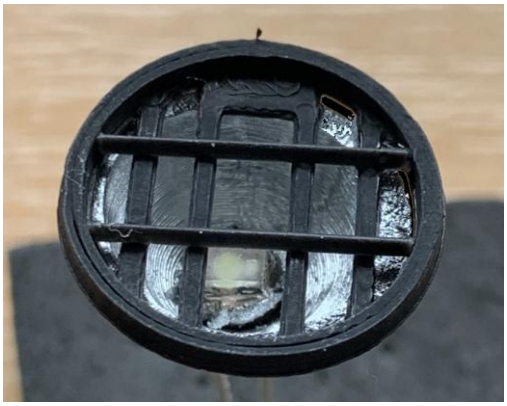
The rear light cluster bar was then made up and populated with 3D printed lenses. A small hole behind each lens was drilled to accommodate the SMD led and padding resistor and an umbilical cable was made up to go back to the lighting board. On the right is a photo of the completed rear light cluster connected to the lighting board to check everything works as intended. The paperwork is the wiring information just for the lighting system.



The front fender was made up and on the real vehicle the makers name is displayed in the front grill. I tried cutting letters out of sheet styrene but couldn't make it look right so I found a website that specialised in 3D letters and downloaded a file for Aerial Black, resized the letters to fit and 3D printed them in white. The fender was made up and populated with various LEDs. I use 10mm LEDs for the headlights and before mounting them I turn off the rounded end and polish the resultant flat surface. This makes the emitted beam quite directional like a full size one would be. The side lights are 3mm white LEDs and the winkers are 3MM orange ones.

I attached an umbilical cable to the fender and mounted the finished assembly to the front of the crane after checking that everything worked as intended.

There now remained sourcing some 14mm guarded work lights but none were available commercially so I 3D printed them from a file that was for a full size VW fog light.



The file was resized and printed as two separate pieces. The inside of the bowl was painted with silver paint before a hi-bright LED was inserted from the back. Then the protective grid was stuck onto the finished bowl.
You can just make out the LED in the photo on the right.

The crane is now completed and the last images below are of it taken outside in the sunlight.