XRAY NT1

Making of

Exclusive story by Martin Hudy

A typical nightmare for any designer is to work and to improve an already successful product. The customers already have the good experiences with the product they love and have kind of personal relationship with it and as such the customers are sensitive or more accurately passionate about the product. So as a designer trying to improve on an already successful product you are on a thin ice, you can hardly significantly shift the features of the product to make the product even more popular and successful but you can screw up easily and destroy the previously successful product.

To work on the new NT1 has been for me exactly the same feeling - skating in the spring on a very thin ice. The NT1 has been our most successful platform gaining multiple World, European, Asian and USA Championship titles and since the very first NT1 released 8 years ago we have continued year by year to improve the platform. In the early beginning it was my father Juraj who did the main development and he is the one who is behind the early success of the car while I took over the responsibility for the NT1 development couple of years ago. One of the reasons the NT1 has become one of the most popular nitro touring cars would be, in my opinion, the fact that we did not make any radical changes during the years and all the improvements were the logical refinements which helped to improve either the performance or reliability. This strategy has helped us to build a strong group of customers who appreciate that we continue to bring small improvements but still keeping the same platform but as usually you always have different opinions on the same matter as well.

As such on the other hand of course in the last years I got plenty of questions when an all-new NT1 will be made. It was an interesting observation that despite the NT1 was still in the lead when it comes to the performance and reliability and was winning majority of races around, still many customers were changing their NT1 with comments that there has not been any major change on NT1.

So as a designer you do not only have to skate on a thin ice but you need to be also the master of customers minds, you need to find the proper balance what amount of news is too much and which amount of news is still not enough, you need to find the balance when it is the time to bring an all-new product or when just continue with the current product. And at the end you need accept that whatever you do still you are unable to make everyone 100% happy. Not an easy task, is it?

We were internally playing around with the idea for some major change of the NT1 platform for some time already but personally I was very happy with the performance of the car and we still continued to be successful at races around the globe. In the last years we have always postponed the idea of some major update as I had to consider the fact that the nitro on-road racing class is decreasing generally worldwide and as such being always under cross-check with our sales & financial department I was reminded that we need to consider the market development and the feasibility of investment into the all-new platform with the potential return on investment as well. So despite being a die heart racer whatever I wanted

to create I needed still to prove to our sales department all the new developments to consider and analyze their potential sales success. Another not an easy task.

However sometimes things change out of your control which has been in this case the new EFRA tire rule which required hard tires with large diameter.

The break-in moment for me was definitely the last European Championship in Spain. Because we had extremely busy season with all other races we decided to skip the Euros warm-up. We had a great performing car, plenty of experiences and knowledge and a great team capable to take the win if we had the luck. Coming to the Euros I have realized already the first days that our decision was not good, actually it was quite wrong. The new tire rule was much bigger challenge than I ever expected and the lack of previous warm-up was noticeable immediately. Despite we worked very hard on the set-up we were still not with the performance at the level of other teams who had their starting set-up from the warm-up already. So instead of fine tuning the set-up like other teams we had to make from run to run some radical changes. I do not remember the last nitro touring race where we have worked so hard, literally we were sweating how hard we were wrenching. At the end we worked out all details and Alex was finally competitive to everyone else but unfortunately he collected his bad luck in semi-final when he flamed out during refueling. So it was for the first time since several years when we did not have any car in the main final which was to be honest quite a frustrating moment for me as I felt being responsible for this. I had to accept the fact that with the new hard tire rule the current NT1 does not perform as great as it was with the soft tires.

As I was personally disappointed with the things how they worked at the Euros we have stayed with Juraj for few days after the Euros for a private testing. We worked extremely hard, we drilled a lot, we cut a lot, we dremelled even more and we grilled ourselves in the sun. After the extensive work and testing dozens of different combinations we were able to get the performance of the car to the same top lap times from the Euros. So with the quick changes and tests we made we gained a lot of experiences with the hard tires and had already a clear idea what we need to change at the car.

Coming home from the Euros there were no more internal questions but a simple a straightforward goal – to adapt to the new tire rule we had to make a major update of the NT1 platform. As usually we had to start to define what will remain and what has to change. Considering the experiences from the recent Euros we had fairly clear idea what needs to be changed and what can remain the same. We put down the list of details which will remain which included:

- Suspension geometry
- Suspension materials & flex
- Drive train
- Gearing & ratio
- Clutch
- Shocks
- Fuel tank & electronics placement

All these were the parts and areas which were working great and did not require any changes. The main goal was to find the optimal flex characteristics for the hard tires but still

to keep the proper balance and compromise between the traction and steering while keeping the car easy to drive and stabile like it has been until now.

The composite bulkheads used until now were of course softer than the aluminum bulkheads that most of the competition has been using and the soft composite created a great amount of the flex which was great for soft small diameter tires but has become one of the main obstacles for the large diameter hard tires. So the task was very clear – to change the flex of the car by changing for the aluminum bulkheads and to redesign the main framework of the car which is the main source of the chassis flex. Sounds easy but the opposite has been the case. If I was designing the car from a scratch then it would be much easier and faster as there would be no limitations. But considering that we wanted to keep most of the working parts from NT1 same it was a real challenge as I was all the time under restrictions and limitations. With all the limitations I had to face I spent much longer time behind the computer than normally I should. However I had very clear idea what I wanted to achieve and had a lot of previous experiences with the aluminum framework from the T4 platform so the main challenge for me was mainly to combine the existing parts with the new ones.

With the hundreds of hours I spent designing the various T4 aluminum bulkheads and having long term experiences with manufacturing possibilities I had a very clear idea what I need to do for the NT1 aluminum bulkheads and how to do. To make the bulkheads with an easy access to diff and parts was obvious but what was extremely important was to remove the suspension holders from bulkheads and to mount them directly to the chassis. The independent suspension mounts in front ensure the best flex while providing maximum steering and the independent suspension mounts in rear provide maximum traction to the car. And of course to have suspension mounts separated from the bulkheads allow for higher flexibility when it comes to further development as I can play around and move the suspension mounts in and out or front and rear.

The more complicated area which was also fairly challenging and required several various prototypes was the front suspension arm mounting system. The front upper arm mounting on a pivot ball suspension has a significant influence on the flex of the suspension. I wanted to ensure that the holder will be easy to mount, easy to work with but must first of all have the proper flex. When brainstorming what else I should incorporate to the new suspension mounts I got back with memories to last year’s Euros and Worlds which both brought situations when we were looking for less caster but reached the limits. At Euros we wanted to have less caster to gain better steering response and more in corner steering while at the Worlds we wanted to get less caster to eliminate traction roll. So I knew I need to make the suspension mount 2mm longer so the upper arm can have a greater range of movement and as such caster angle adjustment which should cover also any special situations.

I have created several different upper arm mounting designs which were each produced in several pieces and sent them to the team for testing. Luckily all the drivers confirmed my favorite design which I was expecting will work best so I could finalize the front suspension. To be able to control and adjust the flex in front of the car I wanted to find the way to mount the suspension holder to the bulkheads and connect it to the radio plate but still have the ability to adjust how stiff or loose the assembly should be to control the flex. I did again several different prototypes and tested the influence on the steering and forward traction and was looking for the design that would be the best compromise of both of these characteristics. At the end I chose the design where the suspension mount is mounted with one screw from the side to the bulkhead and at the same time the suspension mount is connected with 2 screws to the radio plate. This design allows me now to change the flex very quickly since I can easily remove one of the upper screws which has immediate influence on the flex characteristics.

While the early stage of the NT1 development was running fairly quickly I got into typical situation when my priorities had to be shifted to other projects. I had to finish some details of the new T4'15 which had to be ready on time for winter season and after that I was locked for a long time on the X1 project which we had a definitive deadline to get the car to the customers before Xmas. So the development on the NT1 had to be postponed but anytime I could find a small space in my schedule I got at least partially back to NT1.

After the release of the T4 in autumn we had to take a serious decision either we will work ultra-hard on the NT1 to get a full preproduction car ready for the coming World Championship which would mean to postpone the X1 project or to travel to the Worlds with the current car and the work instead on the X1. At first moment I was not completely satisfied that we decided to put the priority on X1 and to go to Worlds with the current car but knowing the Worlds will be run on small diameter tires I was then easily convinced. At the end I was very happy that we made this decision as Alex was able to win the World Championship with the current, soon to be retiring platform. That was a very nice "good bye" gesture with the previous platform.

After I have finished the X1 project and hand it over to our marketing and sales department I could finally get back full to the NT1 project. Meanwhile plenty of things have gathered in my mind so I had a more clear vision which was to go with the next development and actually the development was running from that much faster.

While finalizing the design of the bulkheads I could not miss the opportunity to integrate the ball-bearing equipped anti-roll bars mounted directly into the bulkheads. We have a lot of positive experiences with this anti-roll bar system from T4 and I really wanted to have this great feature at the new NT1. The ball-bearing equipped anti-roll bars make the work on the car much more comfortable and you can much faster adjust the anti-roll bars which also work more precisely. What it was a pain before is now super easy, using just 2mm hex tool you can install and adjust the anti-roll bar without need to disassembly anything. To remove any wobble and play of the anti-roll bars and allow them to work ultra-precisely I have redesigned the bulkheads which hold the ball-bearings so the anti-roll bars move smoothly and without excess play.

Once the bulkheads and lower and upper suspension mount designs were chosen I had to finalize the radio plate. I had several different radio plate designs and the only differences were just in the different flex and the way how the flex was achieved, nothing else. I still remembered the recent Euros where we were looking for more steering and removed the screws which connect the radio plate to the front bulkheads. At the Euros we experienced a lot with the screw that connects the radio plate to the steering system and I remembered how much significant change these made to the car. As such one of the designs of the new NT1 radio plate I made had a new flex bushing used to mount the steering system to the radio plate. When you need to have the car stiffer you use the flex bushing which eliminates the radio plate flex. If you are looking for more steering you make the car more flex by removing the flex bushing and connecting the steering post directly to the radio plate.

All these changes were felt immediately as the improvement with the large diameter hard tires so I was very confident and satisfied with the progress. However I was still not perfectly happy with the steering, the new aluminum framework made the car to react differently than I was used with the composite bulkheads and the steering was still not according my likening. From the electric touring car experiences I knew that I need to work on Ackermann and bumpsteer. I wanted to keep and use original steering blocks and steering system but when working around I have always hit a limitation or restriction somewhere. One of the solutions was to update the bulkhead design but that would have influence on many other parts so I

decided to go with an easier way - to make an update to the steering block design and to remove the rear fixed part and replace it by graphite extensions so I could have flexibility in moving the Ackermann position and the linkage position. At the end I ended up with 4mm lower bump steer position, 3 Ackermann positions and the adjustable bump steer which has a great influence on the steering characteristics. With this combination of the new steering system I was finally happy, the car had again the same responsive feeling and reactive steering to which I was used to at the previous NT1.

To make sure that it is not only my personal feeling I arranged the new steering system prototypes to the team and was anxiously waiting for the feedback. Luckily everyone confirmed the same behavior and everyone liked this configuration so I could approve the mould modification for mass production. As we had to rework the mould, which is by the way the most expensive part of any project, I decided to use the opportunity and to integrate to the steering block also the mounting for Aero disks which we successfully used at the RX8 already which makes the care more stable and increase traction. With this new feature I was forced to update also the rear uprights to integrate the Aero disks as well, so I had to defend the requirement for more investment into the moulds but I was convinced that in some particular track conditions the Aero disks will help the performance of the car greatly.

As the time was running very fast I needed to finish the specs of the new kit quickly so the production could start. The prototypes were still running and I was collecting feedback and some other ideas and suggestions from the team most of them were tiny but still nice features that makes especially the work on the car more comfortable. I was though very happy that the parts I defined at the beginning which will not require any change have successfully went through the testing phase on the new prototype and everyone confirmed my early prediction. End of February I have approved to production most of the parts and early in March the last details. The production has been now full running with a scheduled deadline to start shipping the kits end of the March, so it seems another industry record when it comes to the speed of production.

Finally I am fairly satisfied with the overall specs of the new car. I am sure that once we will get the 2015 season running that again there will be some new ideas and things to try but now with the aluminum bulkheads I have much greater flexibility with the further development as well much faster production of samples. So I am very confident that with the new platform we will be able to be even faster with everything and as such to provide our customers always the best of the best. I am more than excited to see you all at the race tracks with your new NT1, remember come to see me with any your questions or comments.