The Anatomy of a Time Attack Car – Stage 2

The Real JDM is a monthly column written by Ben Schaffer of Bespoke Ventures. Bespoke Ventures operates a number of JDM related businesses including: Bulletproof Automotive, Top Secret III, Ings+1 USA, VARIS USA, HyperRev USA and Bespoke VIP. Visit www.bespokeventures.com for more information.

In last month's issue we introduced Time Attack, explained its importance and discussed the dream of custom building your own personal super car using a mass production vehicle as a platform. Last month's column left off with advice on how to select a worthy base vehicle and this month we'll discuss what can be done once that platform has been selected. As we dig deeper into how to build a high performance time attack car you'll see a clear connection between this column and many past The Real JDM columns. Often The Real JDM highlights a particular topic that affects a car's performance; building a time attack car must use all of the previously mentioned techniques to extract the most performance. To review any past columns you may have missed, you can download them for free at www.therealjdm.com

When beginning the building process of your time attack car it is first important to recognize your goals and plan accordingly. The events that you drive in often significantly shape how the car should be modified. Each event usually will have clearly defined competition classes with rules and restrictions. Building a winning car can only be done if you build it according to the regulations of your class, so it is important ahead of time to understand what modifications are and are not allowed. See www.redlinetimeattack.com for an example of how they set up their classes for their national 2006 season.

When planning the build, also consider whether you are going for the fastest lap time on one particular track or if you are building your car for use on multiple tracks. Surprisingly, this does make a difference. For one of many examples: if building a car for a particular track, you can study the track and learn what the optimal gearing is. This way you can avoid falling out of the peak power band in the corners, or worse ... running out of gearing and bouncing off the rev limiter on the straightaway.

Another key upfront goal is budget. Obviously, building the fastest time attack car is not cheap. Clearly knowing your budget will allow you to make the best choices of parts to use without falling into the trap of having a car that is overbuilt in one aspect and under built in other areas. You don't want to end up with a 500+ HP engine and no suspension work done. Having an unbalanced car is one of the greatest limitations when it comes to time attack.

A car's balance is crucial because when driving on a circuit all driver inputs are often done simultaneously. For example, you could be trail braking into a corner while turning and then transition from braking to acceleration for the corner's exit. During that process the car is consistently doing at least two vital functions at once. This is unlike drag racing for example where lateral grip and braking are not a factor. Driving a time attack requires consistent precision to maintain the car consistently at its limits for the entire lap, everything must be smooth and everything must be balanced.

To have a balanced horsepower specification a few things must be considered. First off the power should not greatly exceed the car's available grip, in short, when upgrading power always upgrade suspension and tires equally to cope with the added power. Secondly and perhaps more importantly, the torque curve of how the power is put down to the ground is crucial. All lag is your enemy, and often it comes in the form of turbo lag. Lag makes situations like gentle throttle modulations mid corner extremely difficult to do smoothly without upsetting the car's traction. On a side note, this is also one of the reasons why many turbo rally cars have misfiring systems to keep the turbo spooling and reduce lag. Also with naturally aspirated cars equipped with variable valve timing it is extremely upsetting to find the car out of the peak power range with laggy response exiting corners, so going with higher final drive gears can often fix the problem by keeping the engine at peak RPM more often. An optimal engine has a flat torque curve when looking at a dyno sheet, this would ensure that at any RPM you can expect consistent power to be transferred to the wheels. JUN is famous for doing this with their Hyper Lemon EVOs in Japan which put out peak torque at roughly 2500rpm and hold that torque figure until near redline.

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Balance in braking is also key. It may surprise some to find that higher piston counts on calipers is not simply for more braking power, it is for precision. The purpose of ultra high end calipers like Endless's 12 piston caliper is to provide the most consistent and well transmitted pedal feel by using more pistons in nearly the same sized caliper (no, you don't need to run DUBs to fit them in the wheels). Keep in mind that braking is not about clamping power, you can lock up your wheels and you won't stop any faster. Expensive brake products like those 12 piston calipers and high end racing brake pads are all about reliability, feel and consistency. Another key to consistency is cooling and reducing the effect of brake fade. Reducing brake fade will give you the confidence to consistently use your brakes to the maximum, like threshold braking at the last second before corners to get the edge on your competition. Reducing brake fade is something that can be done by changing a variety of contributing factors such as improving brake fluid, improving brake pads and calipers, using slotted and or drilled rotors, increasing brake size and using aerodynamics and ducting to better cool the brakes.

Aerodynamics is nothing new to this column, we talk about it often because over recent years there have been so many breakthroughs in aerodynamics within our industry. Consistently it has been proven that using functional aerodynamics yield significantly faster laps. Just recently ASM in Japan piloted one of their S2000's to 57.9 seconds at Tsukuba, all while putting down 300 HP naturally aspirated. No sub 400 horsepower cars have come close to that lap time. ASM's budget of beyond $50,000 on aero parts and body panels is one of a few key reason that it was possible. In short, well-engineered aerodynamics offer a few significantly tangible benefits: weight reduction, increased down force, reduced lift, and improved cooling of brakes and engine. All of these benefits result in better high speed stability, more reliable braking performance, more consistent engine power and much faster lap times.

By far the best bang for your buck when building a time attack car is investing in a set of great tires. Although high performance tires like ADVAN A048R or Bridgestone RE55S are far from cheap, they single-handedly offer the most extreme lap time reductions for the money spent while still keeping street legality. Using advanced materials to produce the stickiest of compounds, it is common to experience unreal traction using even the same sized tire. The added traction leads to quicker braking, faster cornering speeds and creates more useable horsepower. To a certain extent if you have 225 width tires, upgrading to a 225 width A048R may actually give you the same traction as upgrading to a 255 width regular tire. The gains are even more extreme when using increased width high performance tires. Tires are essential to a time attack car and as more power is added, tires should be upgraded and widened accordingly.

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There are countless tuning tricks for building time attack cars and they could never be adequately summed up in these pages you are reading. So rather than conclude a topic that could never be adequately explained in such a short time, I'd like to leave it open ended and share just one last technique which is my personal favorite technique. I simply love seeing cars with radiators relocated to the trunk. Although this shouldn't be done with intercoolers because the lag would be tremendous, moving the radiator to the trunk offers many advantages. For starters, it frees up space in the front bumper to allow more ducting and air to cool the intercooler. Secondly it shifts the radiator's weight to the back of the car which is crucial because usually on front engine cars it is harder to reduce weight from the front of the car than from the rear. Lastly it allows for custom ventilation and body work in the trunk which can provide extremely good air flow if done effectively. This setup is a true mark of a serious time attack car.

Send your feedback to: TheRealJDM@modified.com