

## Breathing on a 2013 Morgan Three Wheeler.

Phil Gardner

It was the 2012 Autocar Road Test that awarded the then new Morgan Three Wheeler a full 5-Star rating that made me pay attention. I'd always been aware of the Morgan Motor Company and my favourite Trump Cards car was the Morgan Plus 8 as a kid. I knew the MMC were the UK's oldest motor manufacturer - and family run – but never quite felt I needed to spend a chunk of my money on a hand-built classic Mog. Until I read that road test of course. And then **evo** magazine came to broadly the same conclusion, in that the M3W was the perfect antidote to the relentless march of sanitised, digitised, overweight, technology-filled modern motor cars. Quite how the MMC managed to homologate the tricycle without the need for any sort of safety paraphernalia is beyond me, but the end result is a truly analogue, involving, entirely driver-focussed and driver responsible vehicle which brings the fun back into modern-classic motoring. Only a company such as Morgan could have brought the concept to life and ultimately into production and mass sale. Having taken a test drive in March 2013, the deposit flew out of my wallet and my order was confirmed.

Following a quite remarkable string of good fortune decisions, I visited the Factory on the day of my 50<sup>th</sup> birthday to see my 3-Wheeler in build. I was able to have the pedal box fitted to me, do the first engine start and then drive the car down to the next stage of the build process myself – I can genuinely say that I had a hand in the production of my own car. How many car makers would let you do that?! I collected it on 15<sup>th</sup> June 2013 and will remember that exciting drive home forever. Nor will I forget how that evening, as I left the car idling for about 5 minutes in front of the garage, when I noticed how the exhaust headers would glow dull red, all on their own. No thrashing, no high revs, just idling, nothing more. Something wasn't quite right, but the joys of a new car kept any idle thoughts of 'modifications' at bay for a few months. The issue kept buzzing round my head however and soon I had no choice but to set about trying to work out quite what was going on....

Having removed one of the exhaust pipes and pulled the header away from the pipework, the cause became very clear – not only did the headers contained a very compact and restrictive catalytic converter, but the front part of the exhaust 'silencer' sported a total-block baffle (about 20% perforated) and the rear part what looked like a pair of welded-in 2p pieces with a few holes drilled in them. In the factory's attempt to silence the engine, all the while keeping the silencers slim and stylish to look similar to the concept car, they had created quite the most restrictive, badly flowing exhaust system the world of V-Twins had seen for quite a long time. Big Singles are always a challenge to silence effectively (and of course the engine in the M3W is just a pair of VERY big singles in the shape of a V...) and typically need a very large volume silencer to ensure good flow and performance. The exact opposite of the stock system fitted to the car in fact. That red glow being caused by the very hot exhaust gases being unable to easily and cleanly exit the exhaust port, inevitably allowing the hotspot (well, hardly a 'spot', more of a hot-*length*) to develop. The localised heat build-up is enormous and causes pre-ignition (pinking, detonation) under higher loads which can be very dangerous for an engine. Not good, in so many ways....

I knew I needed to find an exhaust fabricator who could help, so trawled through my old contacts to see who was prepared to help. Whilst most offered to have a look and build a one-off, I would be doing the road-testing and without limitless funds would have to hope that they got it right, first time. In order to design and build the exhaust, they'd also need the tricycle for a long time which wasn't really practical or popular, so I continued to look elsewhere.

This is where the excellent chaps at Garage-56 came in. I'd been asking around at Autosport International at the NEC and eventually spoke to the very affable Chris Horton about all things M3W and he explained what Garage-56 could perhaps do for our tricycles. Jump forward a few months and I was the proud owner of a Mk.1 version of their newly designed Stage-1 kit which once and for all addressed the exhaust flow issues of the original. The delivered kit was beautifully presented in a wooden crate, in much the same vein as the Abarth Tuning components are packaged for Fiat.



Inside laid a pair of nicely engineered exhaust pipes, together with the Spitfire Air Cleaner cover;



Remembering that Big Singles take a lot to silence, I was not surprised to find a much bigger silencer section to the pipes, but these were of the high-flowing absorption type, not a flow-restricting baffled design. That initial awareness of a bigger silencer soon disappeared and with an OEM-matching black painted heatshield fitted, the original *look & feel* of my three wheeler was restored.

Complementing the exhaust was a free-breathing air-filter cover in the style of a Spitfire oil-cooler air scoop – very neat. The original was very restrictive, with little more than an inch or so of a slot opening, through which the intake air could be drawn. All part of the (clearly, in my view) intended design to keep the potentially rampant S&S under firm, restrictive control.



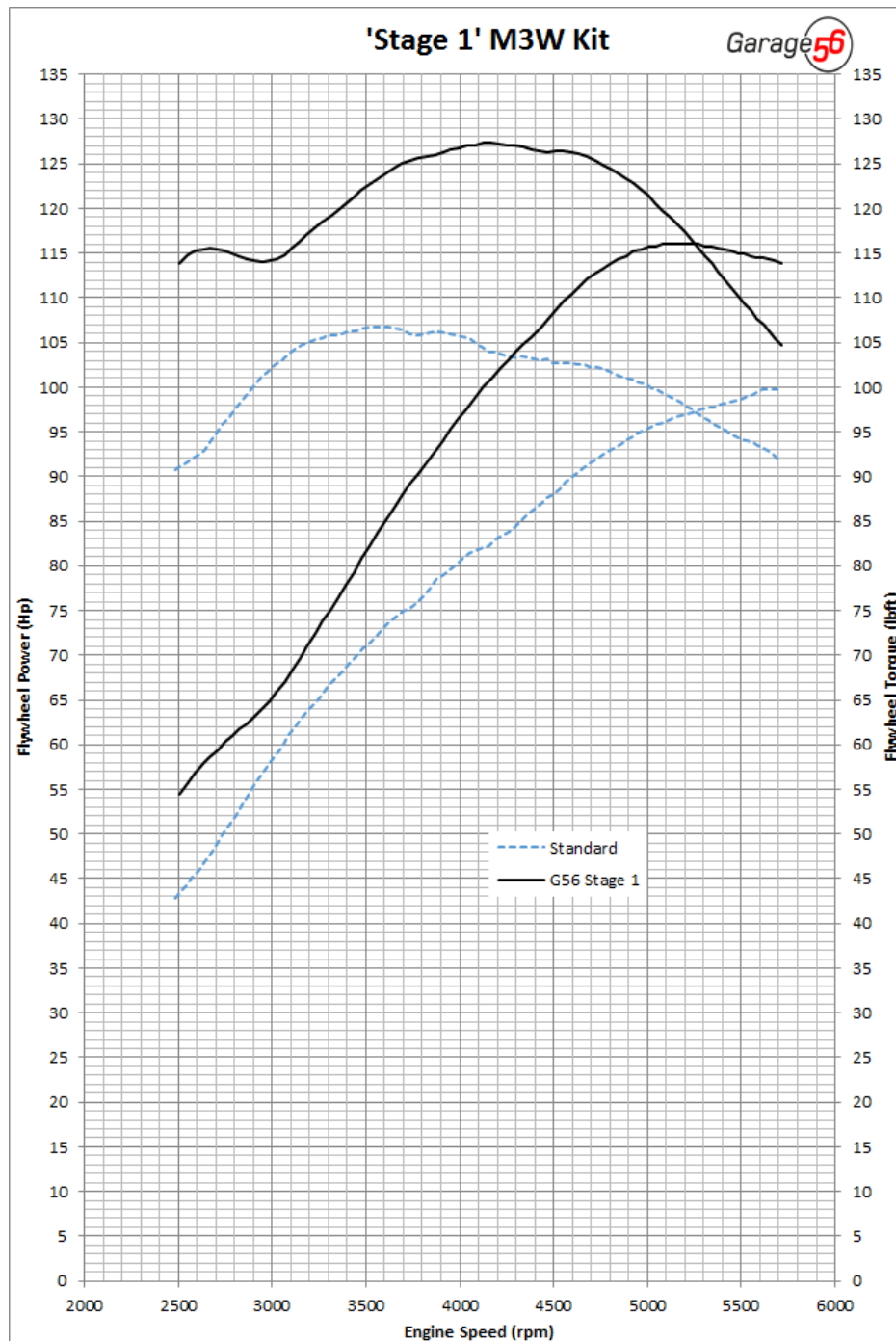
That first **start** was eagerly anticipated and I was not disappointed – the new setup was not overly loud, despite the straight-through nature of the new exhausts. That was my first concern, as having heard M3Ws with open pipes, the noise in my opinion was excessive and would have become annoying to both driver and the general public before too long. The Idle was smooth and it was immediately clear that the heat build up in the headers was no longer present – a very good sign of things to come.

The first **drive** was very revealing, as from the moment I moved out onto the road it was clear that the overall engine response and smoothness was hugely improved. The torque was delivered with amazing progression, the driveline ‘shunt’ and ‘chuntering’ was almost entirely removed and the driving experienced transformed beyond all my expectations. And all of this whilst driving gently below 3,500rpm. Once the traffic cleared and I was able to use more throttle, any doubts I had about the cost of the kit evaporated into the hurricane strength wind that was now blowing me about. The S&S motor now pulled cleanly and strongly through 4000, 4500, 5000 and onto 5500rpm waaaay quicker than before. And most importantly of all, there was no sign of detonation induced pinking at all. Job properly sorted as far as I was concerned.

It should be noted that all of this was on the stock MMC ECU which, as it is designed to run Closed-Loop for the majority of the time, was able to adapt the fuel trims accordingly, to keep the exhaust smelling sweetly and the engine running smoothly. The only *potential* impact would be for those gradually stabilising fuel trims to move beyond the available range scope of the stock ECU

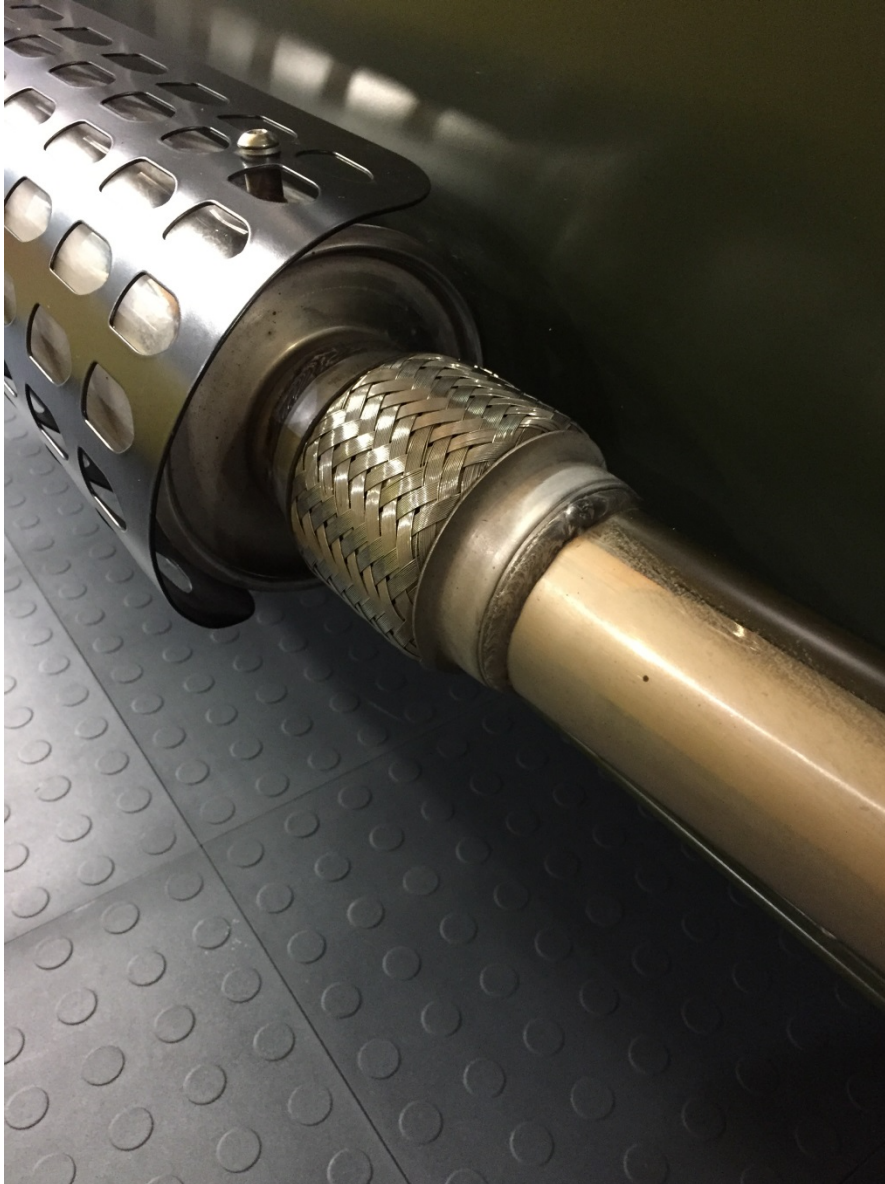
parameters, which might just have been able to fire an Engine Light, given time. I experienced no such issues during the 1,600 miles I had the car in this particular specification (more on this later).

Of course none of this running performance should have been a surprise, as the new pipe design was absolutely correct in engineering terms for the M3W – good flow, good sound absorption and in my view, good looks too. The dyno graphs published by Garage-56 speak for themselves and really are a perfect reflection of the way the car now drives. This is a road car and spikey torque plots are not what a road car requires – it's the area under the graph that matters after all – and the progressive swell and breadth of torque is the real game-changer here. It doesn't matter where the revs are when you need to pull away (even down to 2000rpm if the driver is able to exercise first-rate throttle control), the torque is always there in support.





The support I received from Chris and Terence at G56 was simply second to none – a more customer orientated organisation I have yet to meet – quite, quite outstanding. As I was the first customer of the new setup, development of the solutions were continuing back at Garage-56 base, where they had invested in their own M3W upon which their development process could be exercised, which really showed their commitment to this new line of business. They soon established that it might be wise to introduce a second flexi-coupling in the pipe run and soon sent me through an updated system for me to try. Mk.2 pipes soon fitted.



The build quality was even better than the first set and the fitment equally accurate, supplied complete with new body mounting brackets to suit the newly revised factory HEX Anti-Vibration bobbins. As my M3W was a 2013 car, they very helpfully supplied a set of HEX AV bobbins too – perfect.

One very clear observation is the almost total lack of silencer ‘wobble’ following use of that second flexi-joint – on the Mk.1 and of course stock MMC pipes, the rock & roll of the engine caused huge movement in the pipes and inevitable premature failure of the original small bobbins. Such a simple solution and one I am amazed not to see on factory pipes by now.

As mentioned above, I was able to enjoy the new found smoothness, responsiveness and fulsome torque/power for some 1,600 miles before my tricycle's next catastrophe. During this time I realised how much more economical the car had become – probably a solid 8-10% improvement, undoubtedly due to the improved flow and efficiency. For what it's worth, over the car's 11,500 miles I have averaged precisely 31.7mpg, measured religiously at each tank fill. Who said there was no such thing as a free lunch?!

All was going swimmingly well until I hit the classic Rectifier Issue on the way home from Thrill on the Hill 2016. I noticed that the voltage was all over the place and on occasions read nearly 16.5v at times. I switched on just about every electrical device available (including the engine fan I'd installed the previous month) and made it home OK. The idle had become somewhat erratic however, but I put the Morgan away and set about swapping out the OEM rectifier and fitting the HD unit I'd been carrying around for a couple of years. All good, or so I thought ..... until I tried to start the car next time and it was almost impossible to get it to fire. When it eventually did, the idle was running at about 3000rpm, the engine light was on and clearly something was very wrong. Diagnostics showed a failed Idle Control Valve, but further investigation identified a fried ECU as well – I guess sensitive electronics don't like high voltage spikes. So a new ECU and ICV were both required now.....

The cost of another stock MMC ECU was slightly more than an unlocked, Garage-56 unit which would come complete with a map setup specifically for my now Stage-1 S&S. A perfect opportunity to optimise my engine setup and save a little money into the bargain. A quick call to G56 and a new unit was couriered to me very quickly.



It was of course a simple fit and the car fired up first time, with the same lovely smooth idle as well. The difference between the stock ECU and the G56 version is subtle, but my overall impression was that the mapping at low revs was better – the car would pull even more smoothly from 2000-3000rpm – and the vigour with which it reached its 5,700rpm soft limiter was very impressive.

If I am honest, I think this was for me the best balance between value and performance, as far as the cost-effective modifications were concerned. Remembering that this journey had started to address the potentially engine damaging factory setup and reliability issues - and not primarily a quest to find more power and torque - the fact that these benefits came as a by-product of the new setup was a very compelling justification for the project though. I could argue that maybe 80% of the improvement to this point could be attributed to the Garage-56 Stage 1 kit, then the final 20% down to their matching ECU. All in all a very good place to have your M3W in my view.

\*\*\* 3,500 miles later \*\*\*

More recently I have moved things on a little further, with an upgrade to the G56 Stage-2 setup, which introduces the S&S 569E cams and a matching engine map for the ECU. In my case I elected to have the map setup specifically on my car by the fine fellows at Krazy Horse in Bury St Edmunds, so I know that everything is right and proper with my particular S&S. Having sat in the excellent Krazy Café, directly above their dyno-cell, with my cups of tea shaking as they would in a Richter-4 scale earthquake, I can confirm the ferocity of a Stage-2 S&S when poked with a stick.

It took a while, but the results are outstanding. Firstly the idle is a little more shall we say, assertive. The car starts just as easily, but settles to a slightly more abrasive chunter, reflecting the more aggressive cam profiles. Moving off and all things feel similarly smooth to Stage-1, but there is definitely more torque available at lower revs and this comes with much more progression than with the stock cams. It's hard to put into words the difference in the 2000-3500rpm range, but I might suggest that a 2.5 litre version of the S&S might feel as strong as this. It's not chalk & cheese, but clearly more powerful and responsive. As I made my way back to the M11 the traffic was fairly heavy and I was not able to bring the engine revs up beyond 4000rpm until I was on the dual carriageway leading up to the motorway. That first full throttle pull through the gears was quite a surprise – once the engine hits 4000rpm the exhaust note hardens noticeably and the engine pulls really strongly through that final 1500-1800rpm up to the rev limiter. My word this is a strong engine now, but so smooth with it. The 569 cams clearly let the engine breath better, provide that much improved torque throughout the operating range and are very much the icing on the cake as far as I am concerned.

The drive home was fuss-free and I very quickly became accustomed to the new characteristics and the engine setup now feels entirely homogeneous, in that it feels as though this is the way they were designed to be in the first place, with all parts working together, as one. Which I guess is indeed the case.

The economy of the car has not changed, unless of course the improved performance is enjoyed too much, the engine is as smooth as it has ever been, there are no flow issues, no detonation, no risk of fractured exhaust pipes, a new cambelt and knowledge that the setup on my engine in my car is optimised for my driving and my own benefit. What more could you ask?!

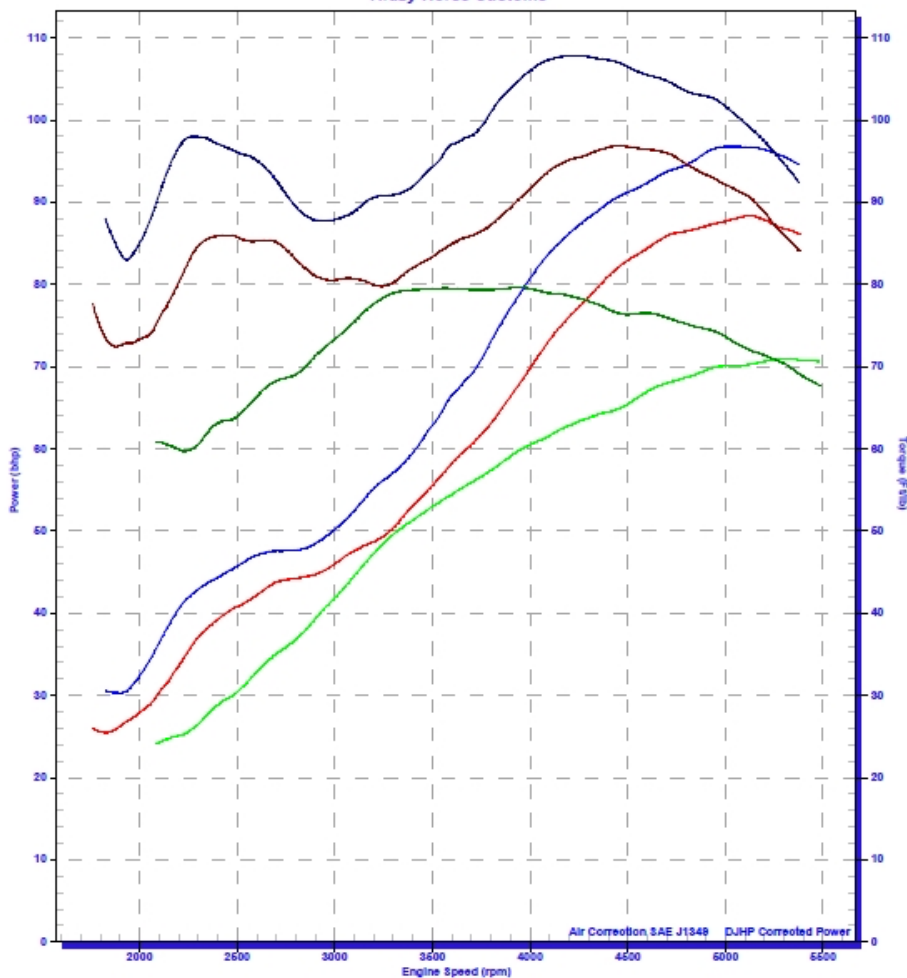
Here are the dyno plots from my session at Krazy Horse, the 'stock' plot being one from another customer car, which I am told is very representative of the standard breed. The gains are clearly obvious and this illustrates the way the car feels very well. The scales may be a little odd, but the traces are like-for-like comparable, which makes it easy to read.



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Krazy Horse Customs



- 286-Gardner 83.Dpr. Gardner 83. 11/06/2017, 10:47:30  
 Air Temperature 22.5°C, Air Pressure 996.4mBar, Humidity 29.3 %, RAD 94.97%, SAE J1349 C/F:0.998  
 Max Power 88.45 bhp @ 5122.7 rpm, Max Torque 96.9 Ft/lb @ 4470.2 rpm  
 Test and tune for 559 cams, pre runs and post runs
- 317-Gardner 83.Dpr. Gardner 83. 11/06/2017, 16:00:41  
 Air Temperature 32.6°C, Air Pressure 996mBar, Humidity 15.8 %, RAD 91.95%, SAE J1349 C/F:1.017  
 Max Power 96.8 bhp @ 5006.7 rpm, Max Torque 107.84 Ft/lb @ 4243.2 rpm  
 Test and tune for 559 cams, pre runs and post runs
- 218-Stock M3W.Dpr. Stock M3W. 16/10/2014, 11:11:18  
 Air Temperature 18.5°C, Air Pressure 1019.1mBar, Humidity 41.1 %, RAD 98.56%, SAE J1349 C/F:0.964  
 Max Power 71.04 bhp @ 5307.5 rpm, Max Torque 79.7 Ft/lb @ 3941.8 rpm  
 Stock Air Filter, Stock Exhausts, Stock ECU



So to summarise my journey, I would describe the incremental stage improvements as follows;

- **G56 Stage-1 kit** – absolutely vital if you want to enjoy a smoother, free breathing S&S that doesn't suffer detonation and will make the car 100% more enjoyable all round. I believe this is a better solution than the MMC Stage-1 kit, as the latter use slim, low-profile pipes with internal baffles, which will inevitably impact flow performance a little and cannot silence as well as a large absorption baffle. They are however smaller and therefore easier on the eye for some.
- **G56 Stage-1 ECU** – not obligatory, unless you suffer OEM ECU failure, but if you do it's an easy decision. Replacing a fried ECU with another locked unit from the factory just restricts you in future in my view.
- **G56 Stage-2** – the 569 cams and matching Stage-2 ECU from G56 (pre-programmed with a matching *general* map for their exhausts and 569 cams) realises the full potential of the S&S, but the improvements are moving somewhat further along the cost:benefit scale I think. For me it was worth it, as I now have an engine that feels strong and drives as I imagine it was designed. It's smooth, torquey and without the usual signs of shunts or jerkiness as the car gathers speed. It's a wonderful thing, albeit one that costs a decent chunk more than the already excellent Stage-1. I'll be leaving it just like this now however, as it is simply great to drive and a joy to own.



\*\*\* END \*\*\*