

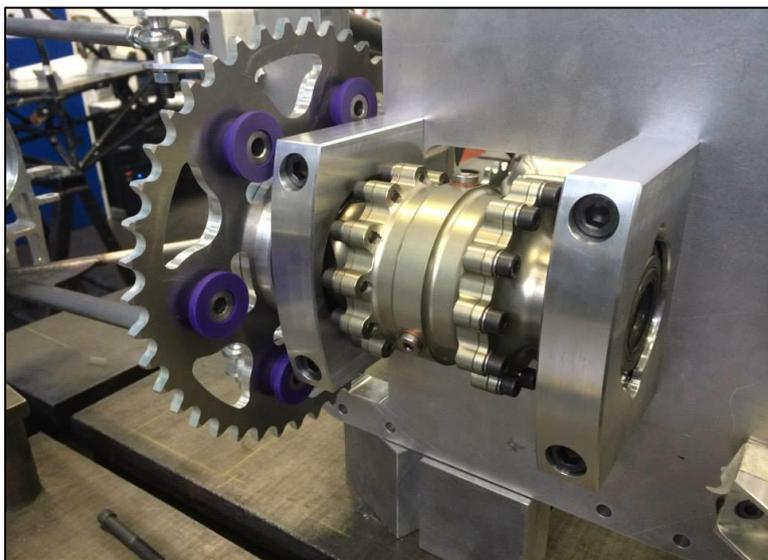
Let's Get Things Rolling: Tacking, Testing and Teaching

March has seen the team make tremendous progress towards a rolling chassis, all be it with a few hurdles along the way. Both Chassis and Powertrain teams alike have been working hard to convert their initial design concepts into hard components on the car, with rolling road testing just around the corner! With the suspension taking shape, the drivetrain system in place and a nosecone crash date booked, the team have selflessly devoted their Easter break to WR4 to allow ample time for testing in June after their final exams.

The date for our official launch event has also been confirmed for Thursday 19th June - 18:00-21:00, and will see WR4 unveiled. Food and drinks will be provided and there will be ample opportunities for networking with the team and their supporters. Please RSVP to O.Sabri@warwick.ac.uk if you would like to attend.

A few words from the Chief

The last month has seen a huge amount of progress from the team, with all of the major components now mounted onto the chassis. Confirmation of these designs in the real world has been both a relief and credit to the team members who have put in the time to design them and ensure they work on the car. With testing on the new engine underway and the first bursts of life coming out of our new KTM, the Powertrain team have been making good progress. Though the challenge of implementing the new intake system still remains, the team are yet to fall at a hurdle. With the Chassis team now hitting the major milestone of getting the spaceframe off the jigging table and ready to be fully welded, many of them can take some well-deserved time off. Having sent a number of components away for anodising, and the engine being on the dynamometer, our pit is looking a little bare! Our returned components look great and we thank John from Aluminium Surface Engineering for doing such a great job. It won't be long until we can get WR4 on the road!

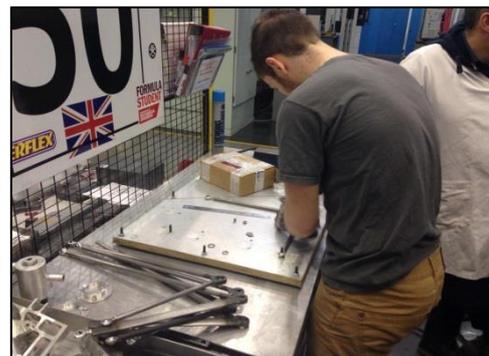


Chassis

This month has seen solid progress and saw our first sub-team submission to the IMechE for competition, the Structural Equivalency Spreadsheet validating our spaceframe. The chassis is getting ever closer to rolling as the final components of the suspension package are manufactured. With updated geometry and overhauled dampers we are expecting a drastic improvement over the ride of WR3. A new steering rack should also be arriving shortly to complete our upgraded steering package, with a special thanks going to Titan Motorsport for their valuable support and technical expertise.

A few more hours of welding are required, but we hope to have the car out for some testing very soon! Our energy absorbing nosecone will undergo final crash-testing at MIRA next week, with huge commendation to KS Composites for manufacturing both a mould and multiple specimens in such a timely manner. Hopefully we've got our calculations spot on and we won't just have a very light and fancy paper weight!

The bodywork design has been finalised, our bulkhead is set to undergo final machining for weight saving and our seat and headrest are coming together. A special mention to Johnson Controls Inc. for their financial support this year and their assistance with our carefully crafted headrest. The coming weeks for the team will be very exciting as we draw closer to our first day of testing with WR4.



Powertrain

Now midway through the Easter holidays, the team have put a huge effort into assembling all powertrain systems during the past three weeks.

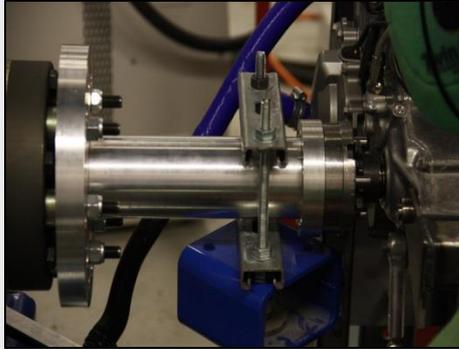
The drivetrain system is complete and can be fitted to the vehicle as soon as the chassis is signed-off. This is very exciting as the novel anti-shock sprocket system and new engine-bay layout should provide WR4 with a truly competitive edge at this year's competition.

Real-world testing on an engine dynamometer has started in a world-class test facility situated within the Warwick campus. The aim is to tune our new engine, the KTM 450 SX-F, to allow us to maximise the performance of the powertrain prior to track-testing.

Our long-awaited hand-clutch and shifter system has been fabricated and welded to the spaceframe. Testing has confirmed that the design delivers impressive ergonomics and feel, whilst being situated to deliver far superior driver response times than the system implemented on WR3. Furthermore, the manufacture of the induction system is well-underway by testing carbon lay-up strategies, confirming the process will be used to further strengthen the component

without adding much weight.

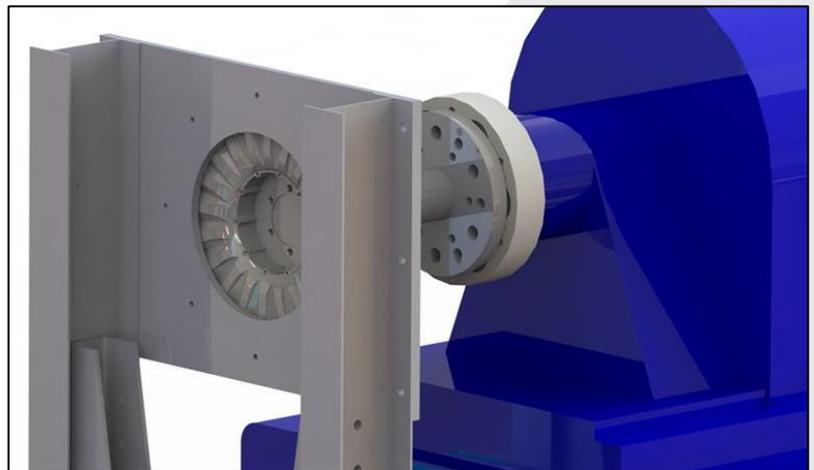
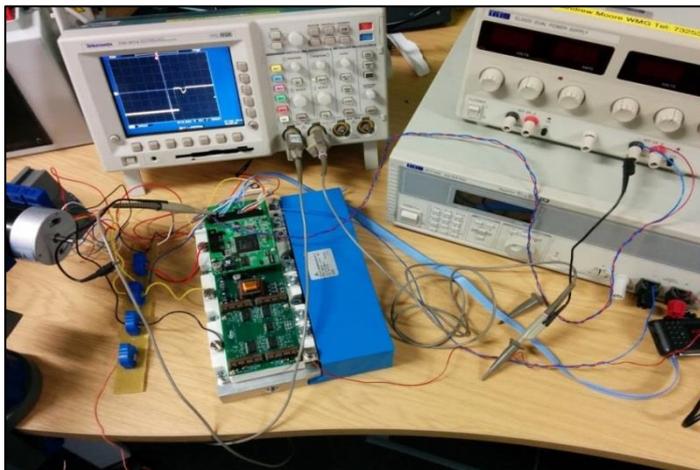
Whilst the opportunity to have a race car that is ready for track-testing by the end of Easter may be optimistic, the determination of the Powertrain team will ensure that WR4 is complete within a time frame that allows adequate testing prior to competition in July.



Electric

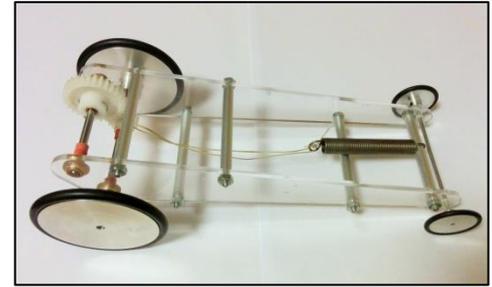
March has been an exciting month, with an elaborate series of ups and downs to its name. We are delighted to announce that our air cooled Lithium-Ion Hard Carbon battery modules have been ordered from the States with a delivery date expected in May. A deal for collaborative efforts towards the development of a bespoke Battery Management System has also been secured locally. Our test rig, mentioned in February, is illustrated below and has been successfully manufactured.

Development of the overall vehicle controller, courtesy of National Instrument's CompactRIO, is underway and the inverter/motor controller has been wired to a scaled down rig of the final motor. The generation of simulated drive cycle signals using the front-end interface to this motor has posed the biggest challenge and has had the team working round the clock to solve the problem. Parallel to the controls framework, the mechanical design is racing to completion with the drivetrain CAD complete and optimisation of the spaceframe and respective mounts in its final stages. Therefore, despite the tough track as the tally stands, vehicle architecture, controls, mechanical design and testing are all on their final laps with the chequered flag well in sight.



Outreach Programme

The Warwick Racing team has been busy going out to local schools this month to undertake more Outreach activities. These activities are designed to encourage pupils to choose STEM (Science, Technology, Engineering, Mathematics) subjects for GCSE and A-Levels, and subsequently to consider studying an Engineering degree at a Higher Education institution. In March we went to **Avon Valley School** (Rugby), **Caludon Castle School** (Coventry) and **Nuneaton Academy**.



The goal of the Outreach days is to illustrate the utility of the mathematics and science taught at school to tackle real-world problems and to support the process of designing a product. To achieve this, we took along small dragster cars, powered by a spring which is stretched by wheeling the car backwards. These dragster cars were redesigned after an initial Outreach day in November at Champion School revealed that the 3D-printed structural members were not strong enough to withstand the loads applied by over-keen school pupils! The new design replaced the weaker members with laser-cut acrylic side panels and aluminium tubing, which proved far more resistant to any over-stretching of the stiff spring. However, we found that cracks sometimes propagated in the side panels when the dragster cars suffered particularly bad crashes, which suggests that yet more improvements are needed for next year.

The Outreach days have helped us develop our own communication and engagement skills with a range of different audiences, ranging from Year 7 to Year 11. Ironically, the most challenging task was to think of how to explain the principles behind gearing and springs in a simple enough way for everyone to understand. Interacting with school pupils also made us realise the importance of our activities, in order to deal with:

- The general confusion between the role of a mechanic and an Engineer.
- The disparity in knowledge about Higher Education, and the commonplace myths about university, such as: “You have to be a geek to be able to go to University – just like Sheldon in the “Big Bang Theory” television series!”.
- The pupils’ generalised preference for arts subjects such as Art, Drama, English and PE.

On the other hand, we were all very impressed with the attitude, interest and enthusiasm of all the pupils. Some individuals also particularly stood out by their thorough understanding of the mechanisms of the dragster car, their judicious questions and their clear passion for science, engineering, and in one case, for fluid dynamics! All in all, the Outreach days were a successful and rewarding way of promoting our passion and giving back to the local community.



Friends of Warwick Racing



This year Warwick Racing faces its biggest challenge yet with a multitude of new and exciting challenges to overcome. In December 2013 our Australia contingent participated in the Formula SAE-Australasia competition and represented the only British entry there. Furthermore, next year Warwick Racing will be implementing an electric powertrain for the very first time, designed over a two year cycle. However, to ensure that successive teams are reading off the same page and to facilitate greater knowledge transfer between these teams, we hope to enter additional Formula Student competitions in Europe and take as many first – third year students as possible. This will give prospective members invaluable competition experience and enable them to learn as much as possible from the WR4 team before we depart, as well as giving Warwick Racing the opportunity to see how we fare against fierce international competition. Warwick Racing has also initiated an outreach programme in local schools this year, with the aim of promoting STEM subjects and encouraging pupils to pursue a career within engineering.

However, entering two additional competitions in the space of one year poses a huge financial burden on our team. We are thus desperately in need of additional funding to ensure that the WR4 race car is successful and to facilitate the progress of our electric entry next year by competing in further competitions.

Warwick Racing is thus extremely grateful for any financial contributions our friends, family and fans can offer us, to aid us in making this year the most successful year to date. We welcome financial donations of any size, no matter how seemingly small, in our efforts to raise approximately £26,000 worth of financial and in-kind contributions. Many of our donors receive our monthly newsletter detailing the team's progress and attend many of our events, including our prestigious launch event in the summer, where they have the opportunity to meet our team and see our race car.

If you would like to donate to our team please follow the link to our donation page below and enter 'Warwick Racing' in the gift direction section: <http://www2.warwick.ac.uk/giving/donate/online/single>

Alternatively please make cheques payable to 'University of Warwick' and post them to Omar Sabri using the Warwick Racing address on the following page. Should you have any further queries please do not hesitate to get in touch using the details overleaf. Finally, we would like to take this opportunity to thank the friends, family and fans who have donated to us so far, your contributions are invaluable and greatly appreciated.



Coming Up in May...

With final year examinations looming in May, the Warwick Racing team will be taking some well-deserved time off to concentrate on their personal preparations. Stay tuned for a two month update in May:

- Prospective WR4 Progress.
- Countdown to Formula Student UK.
- Monash Motorsport Arrival Preparations.

Monash Motorsport-Warwick Racing Alliance

This month has seen exciting progress in our partnership with Monash Motorsport. The Monash team have confirmed they will be shipping their car at the start of May and then flying their 30-strong team out at the end of June. Earlier this month, our presentation from our 'Warwick Racing Return from Australia' event last month, and both the Warwick Racing and Monash Motorsport competition videos were shown at the Monash-Warwick Alliance Student Roadshow at Monash University. This was received to great acclaim and also saw the debut of our joint video showcasing the success our partnership brought us in 2013. To further the reach of our alliance, we have recently agreed to partner up with IGGY, a social network established at Warwick to help young people aged 13-18 realise their full potential. We're excited what this will bring and we're looking forward to having further updates for you as we get closer to Monash landing!

Sponsorship

First of all we'd like to take this opportunity to thank all of our partners for their sponsorship and continued support throughout this year, without which much of our progress may not have been possible. As you know, Formula Student is a fourth year engineering project at the University of Warwick and is funded almost entirely by external sponsors. As such, we are extremely grateful for any support you can offer us and in return we can offer you a number of benefits including promotion of your company brand on our WR4 car, throughout our assembly area and on our website, as well as promotional opportunities within our university and access to our highly sought-after graduate recruitment market.

Warwick Racing welcomes support of any kind, whether it be direct financial or in-kind contributions, expertise, advice, materials, use of manufacturing facilities or assistance with testing.

If you would like to sponsor Warwick Racing or if you have any further queries, please do not hesitate to get in touch using the details below. Furthermore, our new Sponsorship Opportunities 2013/14 brochure contains a brief summary of our history, our core design philosophies for the WR4 car and a look at our diverse range of sponsorship packages.

Link to brochures:

http://www2.warwick.ac.uk/fac/sci/eng/meng/warwickracing/fs/sponsorship/formula_student_wr4_brochure_2013-14.pdf

http://www2.warwick.ac.uk/fac/sci/eng/meng/warwickracing/fs/sponsorship/formula_student_wr5_brochure_2013-14.pdf

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