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Project Planning

Engineering Management (ACHA5012)

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1. Project Introduction

The aim of this project is to modify the university's Honda NSF250R to optimize the motorcycle for racing in the Open 500 Class. The Open 500 class allows a wide range of modifications to be made to the vehicle, with the primary restriction being engine size. The frame must also remain mostly unmodified, although some modifications are allowed to be made to allow for safety equipment and specific components.

As well as this, active suspension systems are forbidden, with the regulations exclusively allowing mechanical suspension systems. The front suspension should also restrict the movement of the wheel to one plane¹. Riding Aids such as Traction control and anti-lock braking systems (ABS) are also disallowed.²

The bike must also feature a red safety light on the rear to alert other riders of its presence³. As well as this, the volume level of the exhaust should not exceed 105 dB.⁴

2. Team Roles and Responsibilities

Within this group, I am responsible for the design of new Rear Sets for the motorcycle. This will include creating a new set of rear hangers for the machine that will be adjustable as well as lighter than the original parts. As well as this I will be redesigning the rear pegs of the bike to fit the new hanger design as well as the specifications listed previously. I will need to consult the technical regulations for the racing series to ensure that the new parts are compliant with existing regulation.

I chose this role because I personally enjoy and am effective at designing components from a given specification and making them a reality. In this case, I must make the new part fit into the existing geometry of the motorcycle as well as designing a part that will improve performance. Because of this, the Belbin Model would describe me as an 'Implementer'⁵

Other members of the team include Olly as Group Leader as well as developing the Bellmouth, Injectors and mapping, Harry creating adjustable Yokes, Jake developing new intakes, Harvey developing aerodynamic fairings, Megan investigating alternate fuels, Aaron developing a new fuel tank and Ed designing a new airbox.

3. Group Tasks and Timing

The first task for Olly is to acquire, install and test the new ECU for the motorcycle. He will then move on to optimising the fuel mapping for the motorcycle to achieve maximum performance. He will then move on to Researching and designing the new bellmouth and secondary injectors. After this the components can be moved into prototyping and testing. After a satisfactory design is created, a final part can be produced and fitted for final monitoring and adjustment.

Harrys first task will be to examine the original yokes of the vehicle and analyse any shortcomings. After this he will research ideas for developing the new adjustable yokes. After this, the design and testing of a new yoke can be performed, followed by a prototype and its testing. Finally, a complete part can be developed and put into real-world testing. This can then be monitored and adjusted.

Jake will start by researching the requirements for a new intake. This can then be designed, prototyped, and tested with any adjustments made along the way. After this a complete intake can be built and tested. Next, it can be taken for real-world testing and changes can be made if necessary.

Harvey will be designing a new aerodynamic fairing which will start with research. He can then scan the existing fairing and modify it using CAD to make any necessary adjustments. A prototype of the faring can then be produced to ensure proper fitment. This can then be tested and adjusted.

Megan will be working on alternative fuels and injection. This will need heavy research as the data for different fuel types will need to be acquired. This research will then need to be applied and tested, as well as new fuels being acquired. After the new fuel and mapping are in place, the system will need real world testing.

Aaron will start by researching fuel tanks and deciding the position for the new one. He will then move on to designing and developing the new design. This can then be moved to the prototype stage and then be produced and fitted to the bike. This can then be taken for real world testing and further development.

Finally, Ed will be developing the new airbox. He will first have to familiarise himself with the existing cad designs for the airbox. He will then research further developments and continue the development of the airbox. The completed airbox design can then be prototyped and put into production before being fitted to the bike for real life testing and adjustment.

4. Personal Tasks

My first task for this project is to gather the dimensions of the rear set. This is important for two reasons. The first reason is to get a baseline idea of the components size. This is important because a dramatic change in the size of the component will lead to the part being nonfunctional as it will not be the right size for the rider. However, the aim of this project is to make the rear sets adjustable, so this will be less of a concern for the later stages. The second reason to study the existing geometry is to create a new part that will fit through the existing bolt holes for mounting. I will also be using the same fasteners to hold it together, so these will need to be confirmed as well. To measure the dimensions, I will need to visit the bike in the workshop and use a vernier calliper to gather all the dimensions I will need and then note them on a sketch so I can recreate the parts in CAD. For this project I will be using Autodesk Fusion, as it uses cloud processing and has built-in fasteners. These files will be compatible with the rest of the teams SolidWorks files using STEP files to transform them. I should need about 2 hours to gather the measurements necessary to proceed with the project. The costs for this stage of the project are low as I only need vernier callipers, drawing supplies and basic workshop tools to disassemble the rear set to analyse the parts and holes. Overall, the price of these supplies should be below £50.

After the dimensions are gathered, I can create the existing component in CAD. I will use this as a reference when designing my own parts as I will be able to change one part of the design at a time while still having it fit into the bigger picture of the whole project. This should result in a lower risk of parts misaligning as they will be based on the parts that already exist on the motorcycle. This stage of the project would typically require a subscription to the CAD software, but I am using a student account so it will be free. However, this will typically cost £660 per year.⁶ This stage will require about 10 hours of work to complete to a satisfactory standard.

After this I will move on to researching the needs for my design. This will include researching the forces the component will be under, so I know where I can remove material to save weight and wear to reinforce. I will also be able to gain some inspiration from other designs on different bikes. I will also need to study the regulations for the Open 500 class so I can ensure the design will be allowed to be used in competition. The costs for this section of the project are mainly time related, with any other research materials such as books costing a maximum total of £30. The time required for this section will be about 3 hours.

Once the research is completed, I can progress to designing my rear set in CAD. This will be one of the longer tasks in the project as I have multiple parts that need to be redesigned to create a full rear set. I will need to design symmetrical rear hangers, footpegs, and plates for mounting the sets to the bike. I will also need to design a system to make the sets adjustable while also keeping them locked in place and lightweight. I will also have to ensure existing hardware such as the rear brake cylinder, Shift lever and exhaust mount still attach to the rear set and function correctly. For these designs I will likely need 110

hours. The costs associated with this will mainly be a Fusion CAD licence, but this will already be purchased as it is needed in an earlier step of the project.

After the design is finalised, I can move to the prototyping stage of the project. During this phase I will be 3D printing my components with PLA to make sure all the pieces will fit together and function correctly, as well as ensuring compatibility with the designs of other members of the team. This is less of a concern for my contribution as it does not interact with most other components of the bike, but there is still a risk of mismatch if other parts are larger than the original design. Printing and fitting should require 32 hours, with this time including extra time for redesigns if an issue arises. My parts should not require too much filament for printing, so the cost will be about £15.⁷

After the prototyping stage is successful, I can have the final part created out of the chosen materials which will likely be Aluminium, with the heel guard made of carbon Fibre. I can then install this part onto the bike ready to be tested. I can also make final modifications at this stage if an issue arises during production. I will also need to acquire any necessary fasteners. This stage should require 29 hours and cost about £500 in materials and production.⁸

Finally, my fitted parts can be taken to the track to test their real-world functionality. I can also go back and make changes if any issues arise at this stage. This final section of the project will require about 15 hours until the project is declared complete. The costs with this section will mainly be involved with getting the bike on track and will be about £400 including transporting the bike to the track and getting on the track.⁹

Overall, this project should take around 220 hours and cost £1700.

5. Significant Milestones

The significant milestones for this project will be similar to the items listed above in my personal tasks. This will include a completed sketch of the existing dimensions as well as the CAD design for the existing part as this will be required to move on to my own designs.

The next milestone will be the completion of my research as this will guide my design for the rear set and will include some important data.

After this I will be aiming to complete my design for the project. This is possibly the most significant milestone as it requires the most development and will have the most influence on how my project will ultimately turn out. I will need to take particular care to ensure that this section is completed on time.

Following this I will also need to ensure that the prototyping is completed on schedule, with the contingency time built into this section.

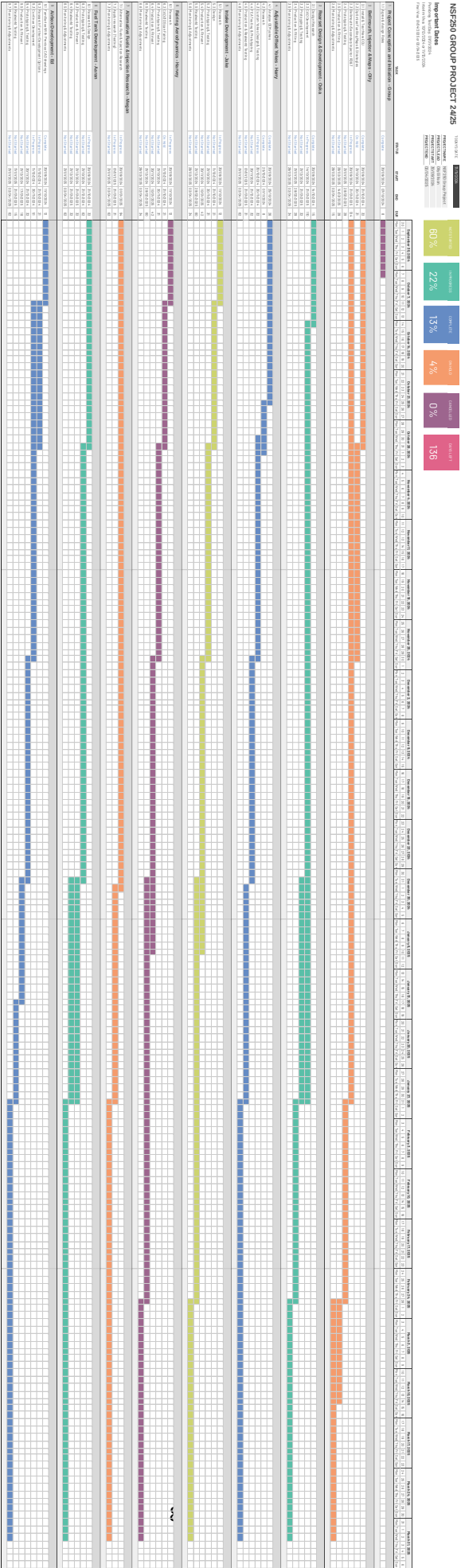
My final Milestone will be the production and fitting of the part onto the bike for testing as this will mark the end of the project once the rear sets have been proven to work on track.

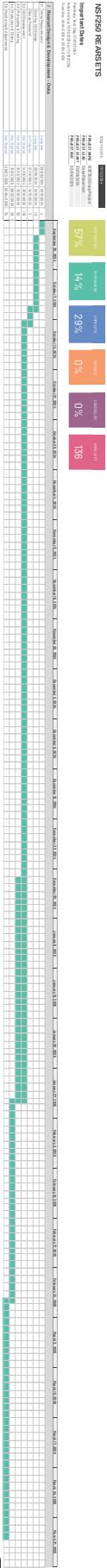
6. Areas of Concern

One area of concern for me in this project will be ensuring the correct fit of the components to the motorcycle. This is because the holes to attach my rear sets to are already in place and cannot be change. To ensure that this concern is not an issue, I will have to carefully measure the mounting points and hardware to ensure all parts will fit together correctly.

Another area of concern within my project is ensuring the durability of the adjustment system. This is because I will have to design this system myself, and I need to ensure that whichever method I choose for adjustment is able to hold its integrity under intense load as well as the original footpegs. To avoid this becoming an issue I will have to do testing on the component as well as calculating the expected load on the rear sets.

7. Gantt Charts





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8. References

- 1 – Autocycle Union (2024) '19.5 Suspension' *Road Racing Standing Regulations* Available at: <https://www.acu.org.uk/Uploaded/1/Documents/2023%20Library/2023-Road-Racing-Standing-Regulations-v2.pdf> (accessed 13/11/2024)
- 2 – Autocycle Union (2024) '18.23 Traction Control' *Road Racing Standing Regulations* Available at: <https://www.acu.org.uk/Uploaded/1/Documents/2023%20Library/2023-Road-Racing-Standing-Regulations-v2.pdf> (accessed 13/11/2024)
- 3 – Autocycle Union (2024) '15.10 Red Rear Warning Lights' *Road Racing Standing Regulations* Available at: <https://www.acu.org.uk/Uploaded/1/Documents/2023%20Library/2023-Road-Racing-Standing-Regulations-v2.pdf> (accessed 13/11/2024)
- 4 – Autocycle Union (2024) '14.8 Control of Exhaust sound level' *Road Racing Standing Regulations* Available at: <https://www.acu.org.uk/Uploaded/1/Documents/2023%20Library/2023-Road-Racing-Standing-Regulations-v2.pdf> (accessed 13/11/2024)
- 5 - Belbin (2022). *The Nine Belbin Team Roles*. [online] Belbin. Available at: <https://www.belbin.com/about/belbin-team-roles> (accessed 13/11/2024)
- 6 - Autodesk.com. (2021). *Buy Autodesk Software | Get Prices & Buy Online | Official Autodesk Store*. [online] Available at: <https://www.autodesk.com/uk/products> [Accessed 15/11/2024].
- 7 - Crealityofficial.co.uk. (2024). *Creality Hyper PLA Filament 1/2/4/8/10KG*. [online] Available at: https://www.crealityofficial.co.uk/products/creality-hyper-pla-filament-for-high-speed-printing?campaign=pmax&campaignid=15351390184&campaignname=Sales-PMax-Feed-1123&gad_source=1&gclid=EAIaIQobChMIxbT-ja7eiQMV_JdQBh09fj3gEAQYAiABEglwEvD_BwE [Accessed 15 Nov. 2024].
- 8 - Team, G. (2022). *The Cost of Custom Aluminum Extrusions: 5 Key Factors*. [online] www.gabrian.com. Available at: <https://www.gabrian.com/cost-of-custom-aluminum-extrusions/>.
- 9 - Sports, D. (2022). *Motorcycle Track Day Guide and UK Circuit Info | Motorbike Track Days*. [online] Trackdays.co.uk. Available at: <https://www.trackdays.co.uk/useful-info/motorcycle-track-day-guide/> [Accessed 15 Nov. 2024].