

Project Planning

Engineering Management (ACHA5012)

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Introduction

Within our group project we have 3 separate projects delegated between the 3 group members, all focused on the Aprilia RS660 in the motorcycle workshop. The 3 projects are, chassis stiffness analysis, which is being done by Brody, the group leader and project manager, a self-supporting seat unit, and variable inlet stacks, which are assigned to myself and our other group member, Sam, respectively.

The purpose of each of these projects and the group project as a whole is to modify and hopefully improve Brody's RS660 in a way to push for an edge against competition for the future of his races, while staying within the regulations of club racing. Additionally, it gives us, as group members, an opportunity to find a field in which we can enjoy, and work hard in, without pressures of focusing on learning an entirely new area outside of our goals for the future.

Our way of assessing the success of our projects will be a test at the end of the academic year in Catalunya, where Brody will test the bike for the performance from Sam's area, and the weight reduction and functionality both his new chassis and my seat unit.

Roles & Responsibilities

Our group of three is comprised of Brody as the project manager and lead, with Sam and I as secondaries, working on the self-supporting seat unit and variable inlet stacks, respectively. As group lead, Brody has assigned roles and responsibilities within our specified areas, namely, primary focuses and goals, with milestones and gateways presented for us all. My main role is to focus on each stage of my own project and feedback with relevant updates in meetings and aid with ideas for planning the direction we will continue to follow. As for Sam, his role in essence the same as my own, with focus on his own task with the variable inlet.

Regarding Belbin team roles, my team roles are the complete finisher, plant and resource investigator. This combination gives a variety action-oriented, thought-oriented, and people-oriented roles, respectively. This means, I can

work in many different scenarios while managing to focus on my own areas diligently. When referring to the Belbin team roles, personal strengths that can be applied to my role are:

- “Painstaking, conscientious, anxious. Searches out errors. Polishes and perfects.” (Belbin Ltd)
- “Creative, imaginative, free-thinking, generates ideas and solves difficult problems.” (Belbin Ltd)
- “Outgoing, enthusiastic. Explores opportunities and develops contacts.” (Belbin Ltd)

All of which are consistent with my experience the results of my own use of the ‘Belbin’s’ model assessment.

An additional role that would be of use for my position in this project would be that of a shaper. This is due to the fact that people who fit this role maintain momentum and drive for task they are both focusing in the moment and tasks to come in the future (Belbin Ltd).

Overall Tasks

Task	Description	Start Date	End Date	Responsible Member(s)
Initial CAD Models	Develop base CAD needed for frame and seat unit	Nov 1 st , 2024	Dec 10 th , 2024	Brody, Jay
Data Collection	Gather Required data for chassis and seat	Nov 4 th , 2024	Dec 10 th , 2024	Brody, Sam
FEA and Design Iteration	Perform FEA analysis and update CAD models	Dec 10 th , 2024	Jan 10 th , 2025	Brody, Jay
Prototype Development	Prototype manufacturing and iterations	Jan 10 th , 2025	Mar 1 st , 2025	All members
Parts Manufacturing	Manufacture components for the final build	Mar 1 st , 2025	May 1 st , 2025	All members

Personal Tasks

Task Overview

This project will require me to redesign the seat unit in a way that eliminates the rear subframe of the motorcycle while maintaining support for the rider, sufficient storage for electrical components, and areas for adjustable weight distribution. In order for me to do this, I need to gather measurements from the rear engine mounts for positional referencing, and the dimensions of the old rear fairing, along with the fuel tank as this will be important for the front section of the unit.

The purpose of redesigning the tank section is to work alongside a new fuel storage method which will remove the need for the old tank design allowing much more freedom to the rider/group leader in regard to design preference for comfort.

Task Descriptions

Task	Description	Projected Hours
CAD Modelling	The CAD modelling stage consists of the initial measurements from the fairings of the current factory model. After taking all of the measurements, I need to use them along with reference images and prototype frame design from Brody, to make the first model of the seat unit.	20
Prototype Manufacturing	For the first stage of prototype manufacturing, I will be required to make a full-size model using high density foam. This will be achieved using the CNC router in the workshop, with the initial CAD Model	20
Prototype Adjustments and Manufacturing	With the initial prototype finished, I will then need to finalise the design and identifying any areas that may need altering towards a better and more functional final product. With plans for alteration plans in line, I will likely be able to either cut and reshape the foam model or move to the next stage.	25
CAD Finalisation	CAD Finalisation will be the process of taking measurements from key points on the body after altering to the desired specifications and modifying the CAD design to fit the new specification.	40
FEA Testing and Validation	FEA Testing and Validation will consist of running tests in my CAD program and use the information from the test to validate calculations used to find estimates of the forces and how the product will behave in its predicted environment.	25
Mould Design	With everything else completed, the final stage before full carbon manufacturing the mould needs to be developed using the CAD model.	15

Final Product Manufacturing	With the mould set and ready, I will be able to begin laying the carbon fibre onto the mould and curing it in the auto clave. After it's manufactured, along with the other areas of the project the final thing to do is get the bike reassembled and ready for testing.	60
Meetings	During each semester, we will have weekly meetings for around 2 hours each, to cover plans, and progress from week to week	52
Total Hours		257

Image References for CAD Model:



Fig. 1 (Kalex Moto 2)



Fig. 2 (NTS Moto 2)

Task Duration

Task	Start Date	End Date	Total Duration (Days)
CAD Modelling	1 st November 2024	10 th December 2024	40
Prototype Manufacturing	10 th December 2024	10 th January 2025	31
Prototype Adjustments and Manufacturing	10 th January 2025	1 st February 2025	31
CAD Finalisation	1 st February 2025	15 th February 2025	14
FEA Testing and Validation	15 th February 2025	1 st March 2025	14
Mould Design	1 st March 2025	15 th March 2025	14
Manufacturing	15 th March 2025	1 st April 2025	17

Bill of Materials				
Materials	Unit Cost (£ per kg)	Amount (kg)	Cost (£)	Lead Time (Days)
Carbon Fibre (According to (Weager))	30-100	2	60-200	3-7
Resin (through (Easy Composites Ltd))	13.26-30.50	0.8	13.26-16.85	3-7
High Density Polyurethane Foam (through (Easy Composites Ltd))	14.11	7	84.25+	3-7
Gel Coats (through (Easy Composites Ltd))	33.45-42.25	1	33.45-42.25	3-7

Equipment and Costs

Equipment Required	Use and Description
SolidWorks	The most likely equipment/machinery that will be needed throughout this project are a quality computer aided design software that enables me to apply a design to either a scan of the other required sections or separately developed model, of the bike to limit guess work when designing the initial model.

CNC Router	With the CAD work out of the way, the next major piece of equipment I will need for this project is the CNC router, which was mentioned previously. The router will be necessary to model the first prototype seat unit and potentially the mould for the final product. It will be used to shape the polyurethane foam to the desired design based on the first rendition of the seat unit.
Autoclave	The final piece of equipment required is the autoclave, this is required for the final stage of the project in order to make the product usable from its inter-production form.

Milestones and Gateway

There are many milestones for each member of the group throughout this project. However, the important milestones for the entire project are, first and foremost, the interim viva during the week of the 9th of December. After which, the important milestones will be the goal date for all parts to be manufactured (1st May 2025) and the bike being reassembled (1st June 2025). And later the shipping (1st July 2025) and final testing of the bike in Catalunya (11th-13th July 2025) as, after the bike is set to be shipped, there will no longer be opportunities for quick modification to any issues.

My personal gateway has been set to be at the point in which I have completed all CAD work and everything is ready for production. The goal that will signify reaching this gateway is to have an approximate weight reduction from the original rear section, of 50-70% along with complete FEA testing and validations. With all previous materials considered this should be a fair target as my project is focused on removing the rear subframe, fairing, and the old fuel tank all made up of either steel or plastic and replacing these components with a single carbon shell to fill the space left from the removal of the components. Having this gateway will give a solid end goal prior to full production and keep the anticipation up for what is to come in the future.

Potential Issues & Solutions

Issue 1 – Limited Resources

One major issue that may arise is simply the scarcity of carbon fibre of sufficient quality, this may be due to the fact that, although we have the opportunity to use donated carbon fibre at hand, it is not yet known whether it is of a suitable standard for such a core weight bearing component, and would require further investigation of the material.

If it is confirmed that the carbon fibre provided is of a suitable level, then it will simply no longer be an issue, however, if it does turn out to be inadequate, the main, if not only solution would be to acquire it through a separate purchase, either through the engineering department, or in a worst case situation from our own pockets as a group/team.

Issue 2 – Calculation Inaccuracies

Another major stepping stone for this project is, the ability to complete and validate FEA testing on the component in question. The main danger with this issue is that, if the calculations do not line up with the results of the digital testing, then I stand the risk of having to redesign the entire seat unit and repeat all the previous steps on the redesign. If this were to happen it could be detrimental to the project as FEA testing is one of the final stages for each of our projects, meaning, if an error occurs at this point, my section of the project could potentially become nullified and scrapped for a later date.

The main solution to this is to pre-emptively FEA test the model throughout the process and have people with more knowledge of the process to double and triple check any calculations that may be inaccurate. In addition to having others check over the

calculations, regular question, and conversations with Brody (project manager) will allow for discussions on any potential errors during the process, as well as helping diagnose issues early in order to prevent them from going unnoticed until too late.

Gantt Chart & Personal Responsibility

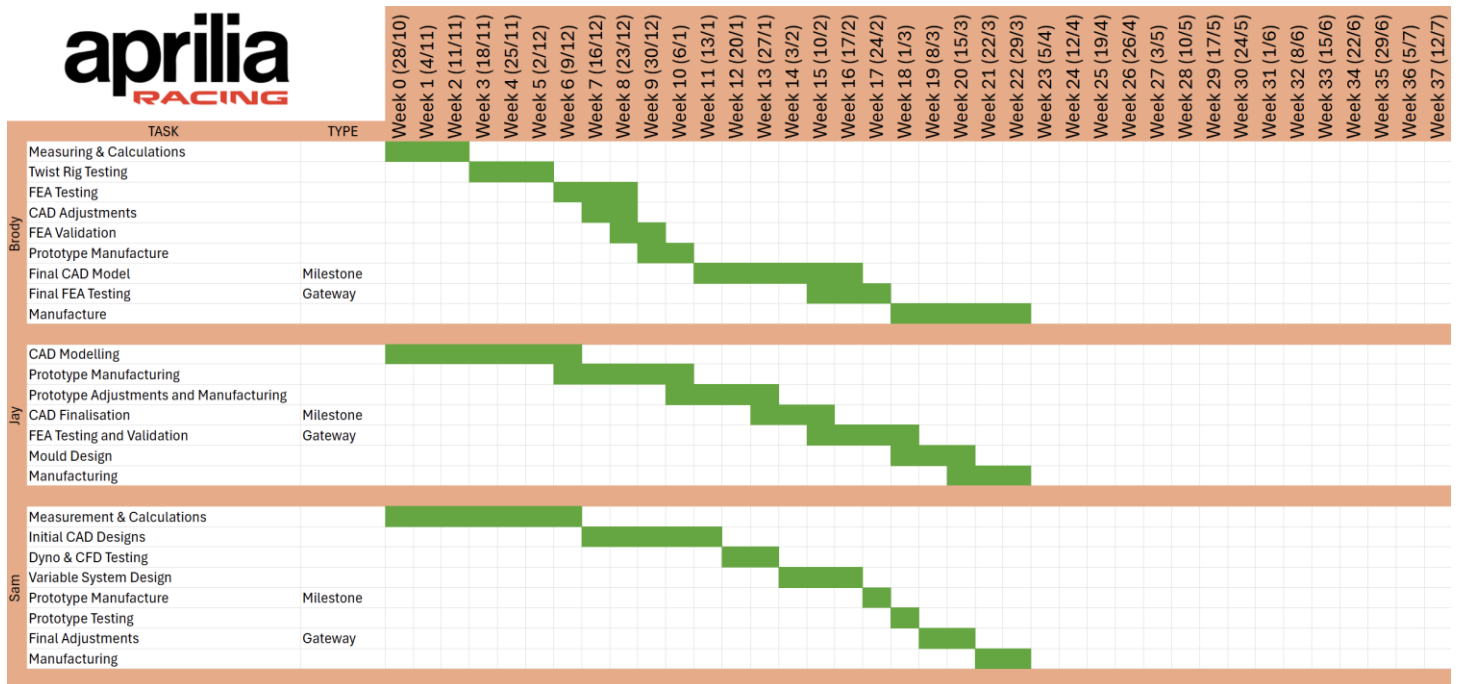


Fig. 3 (Group Gantt Chart)

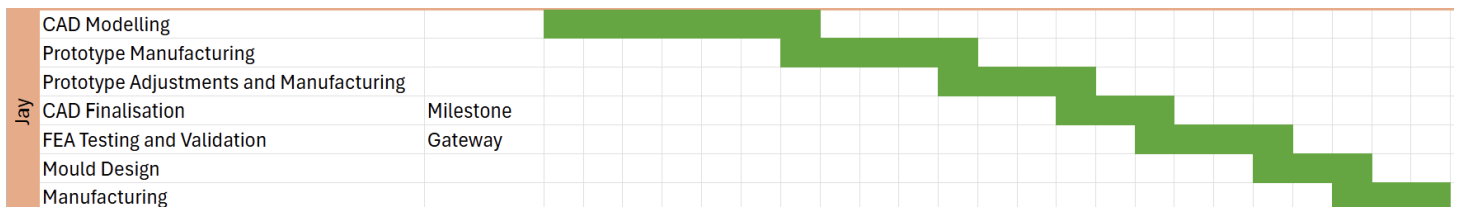


Fig. 4 (Personal Section of Gantt Chart)

References

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