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1 Introduction

The aim of this report is to cover the basis of the group project course and convey the aims and objectives that will enable us to reach each milestone within our project. The project itself is to restore a non-active Yamaha FZR1000 endurance motorcycle that is in the workshop, while we collectively work together to restore the bike, each person has their own set of goals and milestones that they wish to achieve. These goals can range from suspension to electrics, either designing entirely new parts or modifying pre-existing parts to improve efficiency and overall performance, whether that is to the motorcycle or the rider.

2 Team Members and Roles

2.1 Daniel Briggs – Safety/Sensor Technician

Daniel will be looking at the position of the sensor box and the electrics within to allocate them all into the centralized point within the bike to keep them protected and for convenience. He will also be covering the safety and regulations regarding those of our designated areas.

2.2 Oska Robertson – Regulation Technician

Oska will ensure that the bike is race ready by the end of the project following the ACU rules as the bike will be entered in a no limits category. He will be looking at Rain light, Oil Sealing, Indicators, Removing the glass and looking at the chain guard.

2.3 Moses Adair – Team Leader/Exhaust Technician

Moses will be looking at the exhaust system, potentially redesigning and testing a new system. However, he is primarily looking at the headers and collectors. He will also be examining the electrical wiring across the bike to potentially minimize the amount needed and what shielding could be done.

2.4 Finn Flye – Suspension/Engine Technician

I will be looking at the engine clearances ensuring that the values and camshafts are within the specified clearance value. After this is completed, I will shift all focus to either redesigning the old piggyback rear shock into a separate reservoir as to keep the reservoir away from the shock to reduce the heat to the reservoir so that it keeps peak performance.

2.4.1 Belbin's Model

Table 1 Belbin's model of Personal Characteristics for my area (F. Flye, 2025)

Belbin's Category	Implementer	Coordinator	Shaper	Plant	Resource Investigator	Monitor Evaluator	Team Worker	Complete Finisher
My Score	10	7	4	12	6	9	11	11
Best Fit for Role	8	8	5	14	6	7	10	12
Variation	-2	1	1	2	0	-2	-1	1

3 Group Tasks and Associated Timings

Table 2 Group Tasks and Associated timings with days and hours (F. Flye, 2025)

Task	Start Date	End Date	Duration (days)	Duration (dates)	Hours per day
Start date	13-Oct	13-Oct	1	13 Oct – 13 Oct	2
Bike disassembly	13-Oct	21-Oct	14	7 Oct – 21 Oct	1
Identifying areas of interest/improvement	19-Oct	24-Oct	14	10 Oct – 24 Oct	1
Logistics of tasks	20-Oct	14-Nov	6	14 Oct – 20 Oct	0.5
Allocating personal areas of work	30-Oct	20-Nov	15	20 Oct – 4 Nov	1
Start rebuilding of bike (engine and running gear)	01-Dec	01-Jan	31	1 Dec – 1 Jan	1.5-2
Final bike assembly	02-Jan	15-Feb	44	2 Jan – 15 Feb	1-1.5
Track testing	15-Feb	03-Mar	16	15 Feb – 3 Mar	1.5-2
Report submission / presentation	08-Mar	10-Mar	2	8 Mar – 10 Mar	3
End date	24-Mar	24-Mar	1	24 Mar – 24 Mar	1

4 Personal Tasks and Timings

4.1 Task 1. Checking Valve Clearances

This task entails removing the rocker cover and spark plugs to gain access to the camshaft and the valves to enable a feeler gauge to slide underneath. With all the components revealed, the chain tensioner will be removed as there is still tension when rotating the engine clockwise if the engine is not turned backwards. To turn the engine over the front sprocket will be used as it is the most convenient access to a part that is able to turn the engine over.

Furthermore, the timing mark cover will be removed to show the position of the pistons, once the engine is on the line between the timing marks piston one is at TDC then a half turn on the sprocket each time for each of the pistons however three and four will be at TDC before the second piston. Once at each of the TDC the feeler gauge will be used on both exhaust and inlet to evaluate if both are within the specification. All specifications will be sourced from ‘Hayes Service and Repair Manual, Yamaha FZR600, 750 & 1000 fours, 87 to 96 (Hayes,)’

4.1.1 Timing

This task will be conducted from the 22nd of October to the 23rd with 2 hours spent each day for a total of 4 hours.

4.1.2 Cost

Due to the workshop having all tools required and with no parts needing replacement the overall cost will be £0

4.2 Task 2. Redesigning/Modifying Suspension

This task involves taking the pre-existing piggyback reservoir design that the bike is currently aiming to use and modify the original into a completely different system but with the same purpose. This will be to turn the piggyback into a separate reservoir so that it can be placed in another location away from the shock so that its unaffected by the heat radiating from the shock when traversing the course.

Initially, the original shock will be mapped out in dimensions so that a CAD model can easily be created for the base design of the shock, Data will also be collected from the damper dyno to understand how this shock functions. With the collected data this will show me what parameters there are in terms of ensuring that the shocks damping characteristics are not affected by any changes made with the reservoir design.

Furthermore, a multitude of various sketches will be drawn out to plan the design of the reservoir, and the measurements will be recorded against the bikes structure to see where available space is to allocate the reservoir. Finally, with the final design of the reservoir chosen, the finalized design of the CAD model can be created and then thoroughly tested, after this engineering drawings can be produced to display a clear visualization of the model and dimensions.

4.2.1 Timing and Cost

Table 3 Timings and Cost of Suspension Task (F. Flye, 2025)

Task	2. Research	2. Design	2. CAD & Testing & finalising
Duration	27 th Oct – 12 th Nov	12 th Nov – 31 st Dec	31 st Dec – End Date (22 nd March)
hours	1 hour per day	1 hour per workday	1-1.5 hours per workday
Total hours	16	33	84-112
cost (£)	0	26.97	8,234

The cost of the Cad section of task two comes from the yearly subscription to the professional SolidWorks system (SolidWorks, 2025)'.

4.3 Total estimated Timing and Cost

Table 4 Total estimated timings and cost of personal area (F. Flye, 2025)

Task	Hours for each task	Cost (£)
1	4	0
2	133-161	8260.97
Project meetings	13	100
Reporting	10	84.99
Presentation Preparation	12	0
total	172-200	8445.96

This table shows the total preliminary bills of my personal area. In terms of the project meetings the costs come from the fuel expenditure to enable me to attend them. Finally, for the reporting aspect the pricing comes from the cost of a yearly subscription to office 365 (Microsoft, 2025)'.

5 Milestones and Gateway

5.1 Group Milestones and Gateways

Table 5 Group Project Milestones and Gateways (F. Flye, 2025)

Project	Completion	Month	Type
Disassembly of the Bike	19 th	Oct	Gateway
Resemble engine	10 th	Nov	Milestone
Engine reinstalment	4 th	Dec	Milestone
First Bike start up	14 th	Dec	Milestone
Full assembly	10 th	Feb	Milestone
Track Test	28 th	Feb	Gateway

5.2 Personal Area Gateway Objective

This section discusses the most important gateway objective that could be applied to my area of the project, this refers to the direction and preliminaries of the CAD model design. This gateway's objective is to determine a suitable design based on the functionality, performance and overall feasibility if the part were to be made.

The significance of this gateway is due to the fact the preliminaries need to be determined before actual development as this will vastly propel the efficiency and the time in determining improvements that can be implemented when creating the finalized design.

5.2.1 Criteria of Measurable Aspects

Table 6 Criteria of Measurable Aspects of chosen Gateway (F. Flye, 2025)

Category	Unit/Type	Target	Method
Weight Reduction	% in mass reduction	≥ 5 -10% lighter than original part	Weigh original part, then use CAD mass properties
Structural integrity	Safety Factor	Increase safety factor to ≥ 2.5 or ≤ 3	Collect data on different materials, possible FEA simulations
Rider Accommodations	Riders reach to adjuster	90 - 100% compatibility with rider	Determine with rider, ensure compatibility and that the rider has comfortable reach with the adjuster
Design Iterations	No. Design Iterations	≤ 3 iterations	Determine how many iterations of the same model to be used in case of potential data loss
Deadline Adherence's	Timing regarding schedule	95% to 100% on schedule	Efficient time management, ensuring no setbacks and keep tasks on time
Interchangeability of parts	Consistence of Parts	100% match to consistent parts	Evaluate parts in CAD software in accordance with original parts to identify if they match, to increase efficiency in time management when constructing the model
Accuracy of Dimensions	% in deviation	$\leq 1.5\%$ deviation in dimensions from notes	Finalize initial design and compare against original values
Tolerances and Interference's	No. conflicts	0 conflicts	Use tolerances found in manual and online as a basis and run it within CAD to see if any conflicts arise

This is a table that depicts the targets within the gateway that can determine the design path of the model as it has to align or closely align with these targets, which will guarantee improvements to the designed part in finalization.

5.2.2 Percentage improvements

Table 7 Percentage improvements to original values (F. Flye, 2025)

Category	Original Value	Concept Value	Improvement (%)
Mass of Rear shock	6(kg)	5-5.5(kg)	8.3 - 16.67
Safety Factor	2	2.5-3	25 - 50
Deadline Adherence efficiency	85-90%	95-100%	11.76 - 17.65
Rider Accommodations	15%	90-100%	500 - 566.67
Design Iterations	1	3 iterations	200
Mechanical efficiency	10%-30%	20%-40%	33.33 - 100

This table conveys the intended or targeted percentage improvements on a conceptual basis to the design that will be produced. Which will correlate to a physical part if manufactured, giving the bike enhanced overall performance, thus drastically improving the handling and the overall reliability and stability of the rear suspension.

To improve mechanical efficiency a multitude of different actions that can be taken, including from the measurables the weight reduction will alter efficiency as less energy is required to move components, alongside this altering the bushings and bearings to low friction variants will cause the same effect.

6 Areas of Concern

In reviewing potential areas of concern within my area of the project it has come to my attention that, when working with CAD, several risks could arise and halt or decelerate my progress of the design. This is regarding the functional aspects that can be implemented to the design to have it working properly as an assembly. The risks arise from the addition of these features, as they apply constraints and dependencies that could make the model operate in a completely different fashion from what is intended or completely halt the model and lock it in place. These risks will heavily affect the overall timing that is in place for the completion of the task if they happen to occur, to mitigate these issues, steps will be taken.

To mitigate the possibility that these risks will occur, is to further research and improve my knowledge of CAD mechanics to the best possible degree, which in turn will improve the overall design of the cad model itself. Furthermore, outside help can be acquired from lecturers or students that have a deep knowledge of the systems already to assess the current model and suggest possible ideas to minimize the occurrences of these risks.

From a Technical and data perspective there are various concerns with software and data loss, whether that be from crashes or translation from dimension notes. These induce risks such as the CAD software crashing under the load of multiple components or network issues, which will cause tremendous issues when facing the time against the clock. In terms of the data aspect, with crashes this could cause severe losses to dimensional data and overall progress in the sculpting of the model.

To mitigate the likelihood of these events occurring steps will be taken by ensuring that the file is often saved and ensuring that auto-save is active with this a copy will made in case of complete or partial loss of progress. Finally, to reduce the chances of software crashes, a pre-work diagnosis will be run to ensure that the network connection is stable and that the program is running at an acceptable level.

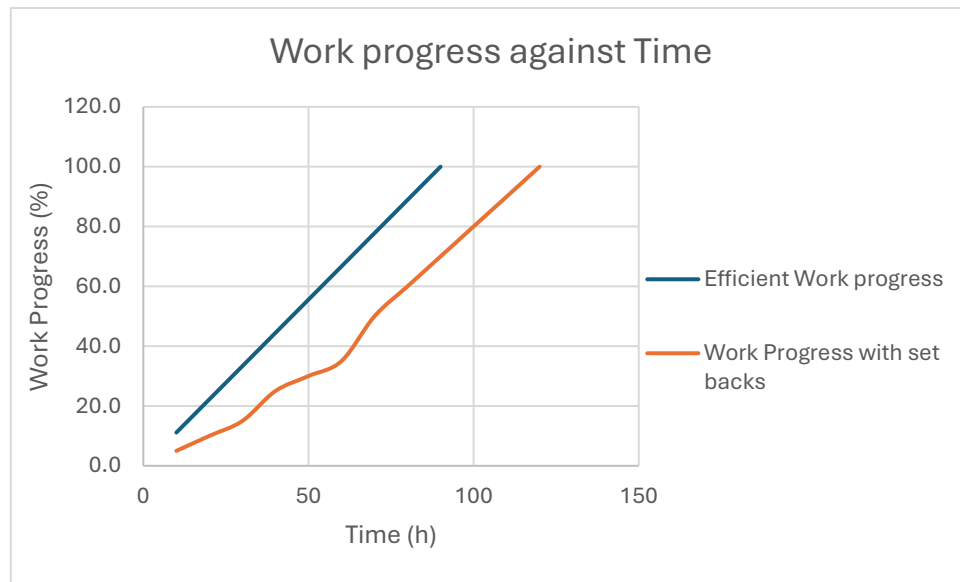


Figure 1 Graph showing Linear efficient work progress against work progress with common setbacks (F. Flye, 2025)

7 Gantt Charts

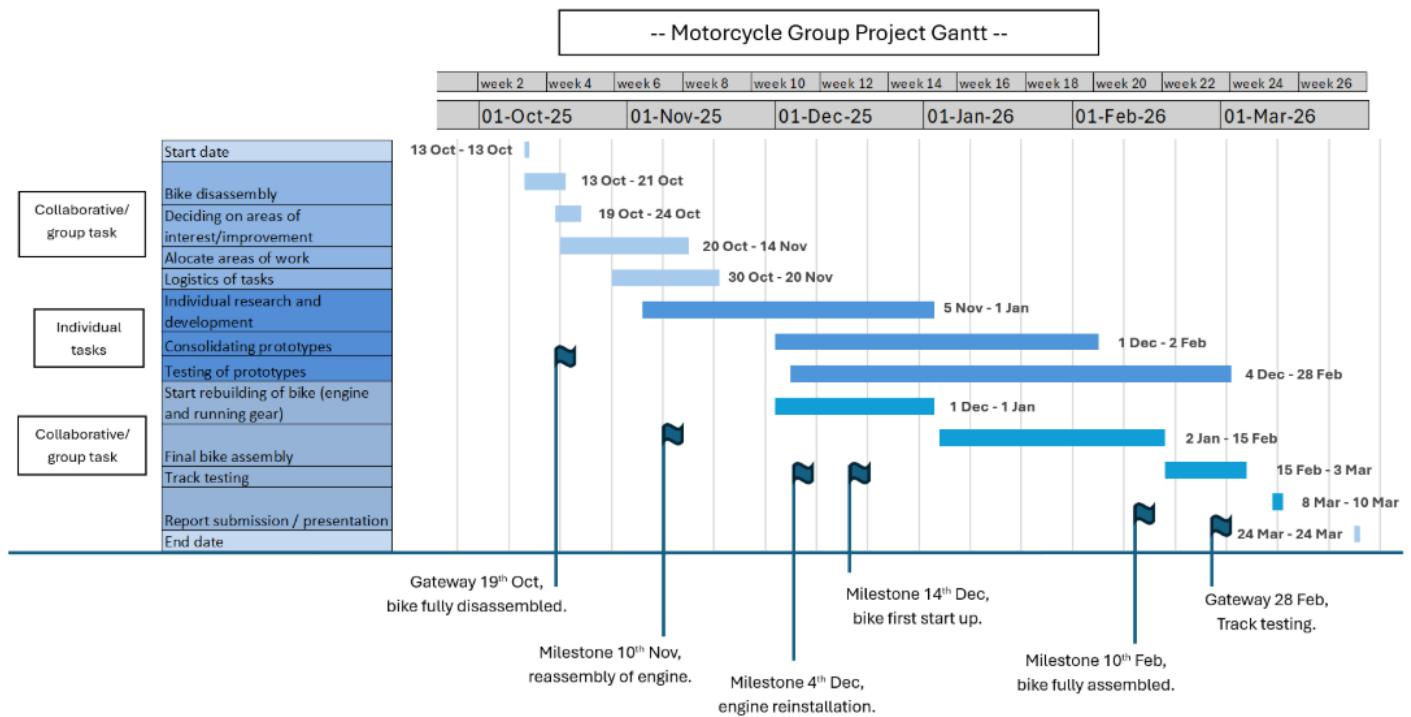


Figure 2 Group Project Gantt chart showing the times, milestones and gateways of the project (M. Adair, 2025)

7.1 Personal Area Chart

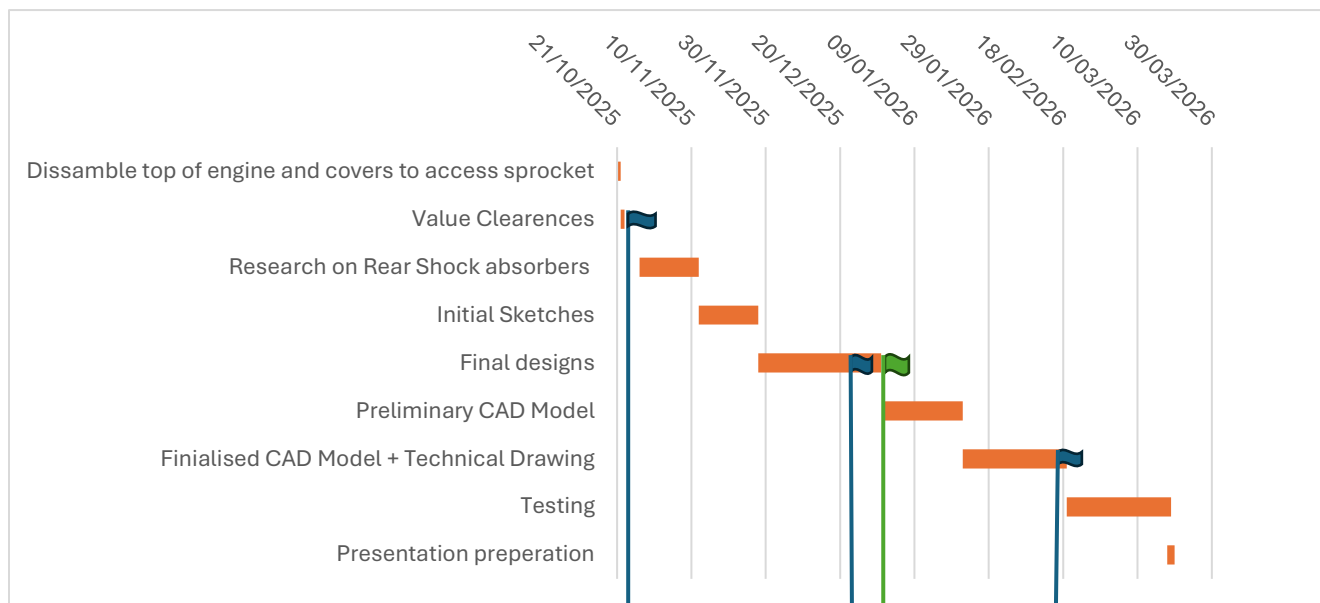


Figure 3 Personal Gantt Chart for allocated tasks, with milestones and gateway objective (F. Flye, 2025)

Table 8 Table showing the specific milestones and gateway objective at the allocated times they will be completed (F. Flye, 2025)

	Milestone	Dates
1	Value Clearances Checked and corrected, ready for the engine to be reassembled in the bike	23/10/2025
2	Final design chosen with last momentary changes	23/12/2025
3	CAD model finalised and ready to be tested in the CAD software and possible simulations	17/02/2026
	Gateway objective	
1	Preliminary CAD models and design path being tested to see the functionality of different roots that will align with the measurable criteria and guarantee the percentage improvements estimated with the final design.	01/01/2026

8 References

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