

UWTSD

WISA



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Project Planning

Engineering Management

ACHA5012

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Contents

1	Introduction.....	1
1.1	Justification	1
1.2	Aims	1
1.3	Objectives	1
2	Team Members Roles.....	2
2.1	Team roles.....	2
2.2	Personality Traits and Skills.....	2
3	Group Tasks	4
3.1	List of Group Tasks	4
4	Individual Tasks.....	5
4.1	My Tasks	5
4.2	Bill of materials	6
5	Milestones and a Gateway	7
5.1	Milestones	7
5.2	Gateway	7
6	Risk Management.....	9
6.1	Risk.....	9
6.2	Risk Mitigation	9
7	Gantt Chart	10
8	References	11

Table 1 - List of team roles	2
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Table 2 - List of group tasks.....	4
Table 3 - List of individual tasks.....	5
Table 4 - Bill of materials/ Specialist equipment.....	6
Table 5 - Group Gannt chart.....	10
Table 6 - Personal Gannt chart.....	10

1 Introduction

1.1 Justification

In this report Charlie, Dylan and I will be working on a few different projects to improve the overall engine performance of the Honda NSF250 Moto3 bike. We are doing this to help the NSF250 to be more competitive within the Open 500 class which is the championship the bike competes in. The only regulation of the championship is that the bike must be under 500cc, which gives us a lot of freedom to do what we want.

1.2 Aims

The aims of these projects are to use different methods to increase the performance of the engine through various techniques. We will be mapping the engine through the ECU software, changing the gearbox's internal gear ratios, using different final drive ratios and improving the flow rate from the throttle body to the manifold of the engine.

1.3 Objectives

The end objective of the project is to make the NSF250 engine perform better for the next racing season compared to last year. Other objectives will include successfully implementing modifications to the gearbox and the motorcycles ECU. This will be measured by improvements in lap time, higher top speeds in the speed traps and potentially higher finishing positions.

2 Team Members Roles

2.1 Team roles

Table 1 - List of team roles

Member	Team Role	Task
Reuben	Team Member	Reuben will be modelling the NSF250 engine in Ricardo wave and changing different parameters within the model to try get the best power and torque of the engine. Once the model has been finalised, it will be mapped on the ECU and analysed.
Charlie	Project Leader	Charlie will coordinate the Project. As well as this, she will be developing the gearing for the internals and externals of the bike. Whilst analysing race and dyno run data, she'll be looking at which gears are used most to give the best power advantage and seeing if the external gearing will be affecting that as well.
Dylan	Team Member	Dylan will be conducting research and testing on multiple intake tracts to conclude the best design for optimum airflow into the revised and ported cylinder head for the NSF250 race bike.

2.2 Personality Traits and Skills

Meredith Belbin's research showed that the most successful teams are made up of people with a diverse mix of behaviours. Belbin came up with nine team roles to maximise performance (Belbin, 1981).

Expanding upon my roles, I believe a personality trait of mine is that I am an implementer. Some of the key skills I have is being practical, reliable and efficient. These will be key in my area of the project. For example, being efficient whilst creating the engine model in Ricardo Wave will mean that

the changes made within the model to gauge what the best performance achievable is will be more accurate when implemented onto the ECU of the bike. As well as this, being practical goes well alongside this as the work done on my area of the project will be as realistic as it can be.

3 Group Tasks

3.1 List of Group Tasks

Table 2 - List of group tasks

Task	Task Description	Time to complete task
Group meetings	We will be meeting every week to discuss how everyone's area of the project is going, what needs to happen in the coming weeks, and if any group tasks need to be done such as presentation planning.	60 hours between October and March
Dyno Runs	We will need to run a few dyno sessions on the NSF250 to measure how our changes are affecting the bike's performance	10 hours
Track Testing	Once we have finalised prototypes of our areas of the project, we need to test them at Pembrey to see how they perform in a dynamic setting close to what the bike is going to run in.	2 test days in early 2026, 16 hours.

4 Individual Tasks

4.1 My Tasks

Table 3 - List of individual tasks

Task	Task description	Time to complete task
Map varying fuel injector heights	Using the DOPE software, I will be testing different fuel injector heights to see how this will affect the power delivery of the NSF250 and see if we can improve power delivery throughout the rev range and see if we can increase torque in the lower end of the revs to help with drive out of corners.	20 hours
Implement the DOPE Traction Control System	I will be looking back over the 2025 season race data, and I will be going through Ian's best lap from each circuit. I will then go through each lap and look at areas such as the wheel slip and how smoothly Ian was able to apply the throttle. Where needed, I will map in areas where traction control is needed.	20 hours
Engine Brake Strategies	Whilst I'm analysing the 2025 data, I will also be looking at how the engine braking affected the bike and in what way it can be improved.	12 hours
Model Engine in Ricardo Wave	Before modifying the ECU, I will model the engine in Ricardo Wave as accurately as possible in comparison to the bike's power curve at the beginning of the project. This will take some fine tuning to be accurate, but once the power curves match, I can then start making changes to the model to see if we can increase areas such as the top end power and torque from the engine.	40 hours
Map ignition timing	I will be advancing the ignition timing in the Ricardo Wave	15 hours

	model to find the optimum power output without causing damage to the engine. Once the optimum ignition timing is found, I will map it into the ECU and test it on our dyno runs.	
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4.2 Bill of materials

Table 4 - Bill of materials/ Specialist equipment

Product	Cost	Lead time
RJ45 to Ethernet cable	£5	2-3 days
Internal Gear ratios	£300	1 week
Use of UWTSD dyno	F.O.C	4 weeks
Ricardo Wave software	Needs a licence obtained from UWTSD	1 week
Intake ports	£100	2 weeks

5 Milestones and a Gateway

5.1 Milestones

Project Milestones are specific checkpoints when activities have been completed, or a new phase of the project has started (Thai, 2025)

The first milestone for my area of the project will be creating the first successful engine model in Ricardo Wave. The model will be based off the initial dyno data from the NSF250, and the model will put out a similar power curve to the actual bike. From here, different areas of the engine such as varying the injector heights can be modelled in Ricardo Wave to see how much the performance can be improved before being implemented on the ECU. This will then lead to the initial changes made before the first dyno run.

The next milestone for the group will be after the NSF250 has done its first successful dyno run after the initial changes are made, which will be towards the end of January 2026. After this has been completed, we can pull the data from the ECU and analyse it and see how the changes to the mapping and flow to the engine have affected the bike. From here, it will give us a clear idea in what direction to progress. We will then do a couple more dyno runs to refine the initial modifications.

Another milestone will be the first track test of the year, which will likely be at the end of February 2026 at Pembrey. In the first track test, we will be able to see how our changes affect the bike in a dynamic setting. The data pulled from the ECU will give us a clear indication as to how the Honda is performing with the alteration's we have made, and whether it has improved on lap time and top speed compared to the same test that took place at Pembrey in 2025.

One other milestone will be the first race weekend of 2026 which will be at Brands Hatch, which lands on the weekend of the 22nd to the 23rd of March. This will be the true test to see whether our changes have helped improve the overall performance of the bike, as it will be competing in the same championship against the same bikes as last year. If the NSF 250 can finish higher up in the finishing order and improve on the lap times set at last year's meeting at Brands Hatch, it will show what affects our changes have made.

5.2 Gateway

A project gateway is a decision-making checkpoint in a project's lifecycle.

One gateway for our project will be before the first dyno run. This will be the first point where all our initial changes will first be seen on the Honda NSF250. At this point, this will be the first opportunity

where we can see how all our initial prototypes perform. For this first dyno run, we expect to see improvements in our different areas. For example, in my area of the project, I would like to see an increase of 5% in horsepower at the top end of the rev range to help give the bike some extra pull, which will be beneficial on tracks with longer straights. For Charlie's area of the project, she might hope that my changing the internal gear ratios could give another 1Nm of torque in the lower end of the rev range. This would mean the bike will have more punch out of corners and would lead to overall better drive. For Dylan's area, he might expect to see a 10% increase in airflow, meaning more fuel can be burnt quicker which will help the NSF have more power.

If we are able to hit these objectives, it would give the project a positive direction before reaching the next milestone. If not, it gives us a clear indication on where to improve our individual projects.

6 Risk Management

6.1 Risk

One area of risk within my area of the project could be that the changes made to the ECU from the Ricardo Wave model could make the overall performance of the engine either worse or not improving by the target set. If this is the case, it will mean spending more time on the Ricardo Wave model potentially refining it further, which would lead to less time being spent on other areas of the ECU such as the traction control system.

Another area of risk for my area of the project could be the UWTSD dyno not being available or it having to be closed for maintenance. This would mean we would have no way to test our changes on the dyno before taking it out for a track test, meaning if we had to go straight to a test day we would very much be in the unknown. This in itself is a big risk as the bike could potentially not run well with the modifications made, which means we would have also wasted a test day, reducing further the amount of time we would have to successfully implement our individual projects before round one of the season.

6.2 Risk Mitigation

One way of mitigating the risk of the dyno being unavailable is to allow plenty of time before other milestones are approaching to get the bike ran on it. This gives us enough space to move our dyno session within a space of several weeks if needed. If the dyno is unavailable closer to the time other milestones need to be met, we may have to outsource and look other dynos in the area or even travel a couple of hours as a very last resort. Although this would incur an extra cost, it would be worth paying to use another dyno rather than sending the bike straight to the track.

A way of mitigating the risk of the changes to the ECU being unsuccessful could be to have regular checkpoints for review and having it peer-assessed by experts. Peer-assessment could point out some particular flaws with either the model of the engine or the actual mapping of the ECU. Having these imperfections pointed out means they can be rectified before moving on with the project, meaning that there would be a lower chance of the risk that the engine does not perform as well.

7 Gantt Charts

Table 5 - Group Gantt chart

Task / Phase	Oct '25	Nov '25	Dec '25	Jan '26	Feb '26	Mar '26
Start of project						
Group meetings						
Designing first prototypes						
Planning for first Viva						
Presenting first Viva						
First dyno run						
First track test						
First race weekend						
Planning for final Viva						
Presenting final Viva						

Table 6 - Personal Gantt chart

Task / Phase	Oct '25	Nov '25	Dec '25	Jan '26	Feb '26	Mar '26
First Ricardo Wave Model						
Ricardo Wave Model with 95% accuracy						
Implementing TCS on the ECU						
Map Varying fuel injector heights						
Map ignition timing						
Map engine brake strategies						

8 References

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