

University of Wales Trinity Saint David

School of Engineering

Technical Report

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BEng Motorsports Engineering Year 1

3 December 2023

ACHA4011 : Workshop and Practice

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1. Introduction

This technical report is written in order to comply and validate certain criteria regarding the topic, Motorsports Engineering. The main subject matters being expressed are, health and safety with the help of valid risk assessment(s) signifying the measure of risks associated with it, an engineer's role in society, problem solving areas of knowledge which engineers or engineering teams use and include in regards to the issues they face in the work field, and a personal review regarding different types of team structures embracing the pros and cons of how it works.

According to the government of UK, Motorsports Engineers can be classified as:

- Design, testing or production engineers
- Engineers working on the field in regards the term 'racing'.

Motorsports engineers carry the responsibility to configure vehicles in order to comply with specific track and weather conditions. They oversee various data related to racing as well as supervise certain domains such as engine speed. These engineers make precise adjustments to optimise vehicle performance and also provide technical instructions to drivers (National Careers Service, no date). They conduct post-race inspections which are also referred to as 'after-tests', which help identify potential signs of damages or destructions concerning the vehicle frame and motor (National Careers Service, no date).

2. Research

1. Health and Safety with Risk Assessment

Health and safety in the field of engineering demonstrates high responsibilities in the development of an organisation. A particular activity that compromises of high health

and safety requirements is the assembly and the dismantling of a vehicle's engine. Some mandatory requirements which are technically basic while working in a lab, in order to build engines or take them apart, are personal protective equipments. These equipments mainly include a lab coat, steel boots, safety goggles, gloves and so forth.

The designated responsibility for health and safety within a sizeable organisation is to typically assign a manager with the expertise to ensure that both, the company's policies and its legal obligations, are paid closer attention to by employees and staff as well as visitors (Martyr & Rogers, 2021). Powertrain test amenities are generally not subjected to specific health and safety regulations. But instead, they categorise under broader workplace safety and environmental protection laws. Nevertheless, the implementations of these overarching industrial regulations may occasionally result in unforeseen outcomes and operational difficulties (Martyr & Rogers, 2021).

Employers should understand that it is crucial to comprehend with certain obligations and they need to implement measures in order to safeguard the well-being of employees as well as the safety of citizens (Healthy Working Lives, no date). The regulations set forth in the PPE at Work Regulations 1992 aim to guarantee that that PPE is identified and utilised appropriately whenever the situation can not be managed effectively by using alternative measures (Healthy Working Lives, no date). Furthermore, employees are also meant to follow certain guidelines regarding the usage of PPE. Some specific guidelines include:

- After using PPE, take it back to the designated storage unless it has to be taken out of site.
- Prior to usage, visually inspect and inform superiors if any damages are detected.
- Take appropriate precautions for the supplied PPE and refrain from engaging in maintenance unless you are properly trained and authorised to do so. (Healthy Working Lives, no date)

Employers use Risk Assessment Matrix which proves to be very liable when it comes to situations relating to PPE legislations.

Motorsports Engine Assembly Health and Safety Assessment Matrix:

Likelihood / Consequences	Low	Medium	High
Rare (1)	L	M	H
Unlikely (2)	L	M	H
Possible (3)	M	H	H
Likely (4)	H	H	VH
Almost Certain (5)	H	VH	VH

Severity Levels:

L : Low

M : Medium

H : High

VH : Very High

Likelihood Levels:

Rare : Event may occur only in exceptional circumstances

Unlikely : Event is possible but not expected

Possible : Event could occur at some point

Likely : Event will probably occur in most circumstances

Almost certain : Event is expected to occur in most circumstances

Example Risks in Engine Assembly:

	Likelihood	Consequences
Chemical Exposure	Possible	High
Incorrect Torque Settings	Likely	Very High
Lack of Personal Protective Equipment	Unlikely	Medium
Fire Hazard due to spillage	Possible	High
Inadequate Training on Equipment Use	Unlikely	Medium

Interpretations:

Low Risk (Green): Monitor but doesn't need immediate action

Medium Risk (Yellow): Requires attention and mitigation measures

High Risk (Orange): Immediate action and comprehensive mitigation needed

Very High Risk (Red): Critical, urgent action and strict control measures are imperative

2. Engineers role in society

In the field of Motorsports, engineers have a crucial role in society. Not only is it important in the field of Motorsports but it is liable in majority of Engineering related courses such as Civil Engineering, Marine engineering, Mechanical Engineering and so on. This is because engineers fundamentally have high standards on how certain aspects of their decisions can affect different day to day factors, which include: climate change, increased ozone, et cetera. Two different organisations that publish a code of conduct for engineers are, Federation Internationale de l'Automobile (FIA) and Federation Internationale de Motorcyclisme (FIM).

Taking into consideration the amount of Greenhouse Gases released by automobiles, the FIA has had at least nine biodiverse submissions competing in relation to the Climate Action Awards. This is because engineers in the various organisation focus to work on how

to better the rate of emissions to make sure there is minimum affects on the environment. They make sure to comply with their targets to make their vehicles as sustainable as possible. Some of these entrants are, Automobile Club d'Italia, German Motor Sports Federation, MotorSports New Zealand, Motorsports UK, Saudi Automobile and Motorcycle Federation (Federation Internationale de l'Automobile, 2023). Furthermore, when taking FIM into consideration, they have an environmental code where some race teams have decided to use solar powered hospitality units in order to make the work environment more sustainable with the motion to 'go green'. One such team that has taken this step to eliminate climate issues is, the Kawasaki Racing Team. The President of the Federation Internationale de Motorcyclisme, George Viegas, also mentions that this is the most economical way to better the environment and that it is done with the intention to 'decentralise the production of energy' (Kawasaki Racing Team, 2023).

3. Problem Solving

Engineering teams and individuals deal with issues on a daily basis. Some of these issues could arrive during development or even when the product is set to be on the market. However, engineers can also face issues when it comes to supplies during the production process. Being systematic is the best way for them in order to deal and eliminate such issues.

The following is a flow diagram that potentially demonstrates different problem solving methods engineers can use in order to tackle such issues. It outlines a simple and systematic approach that engineering teams can use addressing the issues during several steps, this helps in promoting regular improvements of the products as well as a more positive role in customer satisfaction.

Issues found during the production:

- Identify the issue - Using quality control and inspections assisting the process of production to detect any deviations from the product specifications.
- Analyse the main cause(s) - Investigate the root causes of issues using tools to have better understanding of how/why the problem has occurred.
- Rectification - Implementation of quick fixes to rectify and prevent further defective products.
- Optimisation of the process - Modification of the products to optimise and prevent similar issues in further batches of production.

Issues found once on the market:

- Analysis of customer feedback - gathering feedback from customers and identify issues noticed in the market.
- Recalling products that are on the market - If there are critical issues, consider recalling the products or provide retrofit solutions to the customers that are affected.
- Transparency with customers - clear communication with customers regarding the identified issue, including compensation or replacement.
- improvement - enhance future designs and manufacturing processes to improve quality in products.

Supplier issue during the production process:

- Communication with supplier - Establish open communication with suppliers, including nature and extent of the issue.

- Assure quality protocols - Enforce quality protocols from suppliers.
- Keep alternative suppliers - have backup sources as alternatives in order to mitigate risks.
- Collaboration with other suppliers - collaborate with suppliers to implement positive actions and prevent measures.

4. Team Structure

While dismantling and assembling an engine, our team experienced a dynamic evolution of team structures, each of which had its own set of advantages and disadvantages. Initially adopting a hierarchical structure, we benefitted from good leadership and quick decision making. However, since we were a group of three working on an engine, it hindered the input of creativity from all members. Some members were more educated from the other(s) making it a learning outcome, as different sets of skills were introduced. The abundance of ideas was a positive outcome but it slightly presented management difficulties. Significantly, decision making became more collaborative as it got the entire team involved in the task. Similarly various team structures could have been used in order to ease the process. Some of them could include:

- Functional structure
- Cross functional structure
- Matrix structure
- Self directed or autonomous teams.

3. Conclusion

In conclusion, To sum up, the field of Motorsports Engineering necessitates a careful approach to health and safety, particularly when it comes to engine construction, where risk assessments and compliance with personal protective equipment laws are critical. A organised framework for detecting and mitigating potential dangers is provided by the risk assessment matrix. Beyond motorsports, engineers have societal obligations that impact environmental activities aimed at reducing emissions, as demonstrated by the standards of conduct established by the FIA and FIM. The dedication to environmentally friendly methods, including solar-powered buildings, highlights how engineering choices have a wider influence.

Engineers solve problems on a regular basis, and this calls for a methodical approach in both the production and market stages. A rigorous flowchart leads engineering teams in discovering problems, streamlining procedures, and guaranteeing customer transparency, all of which promote continual progress.

In Motorsports Engineering, team structures change often. While hierarchical arrangements provide effective leadership, they can stifle innovation. It is imperative that decision-making be done collaboratively. Different organisational structures, such as matrix, autonomous, cross-functional, and functional teams, allow for flexibility in responding to a wide range of difficulties. Maintaining a healthy balance between inclusion and leadership is still essential to productive team relations in the dynamic area of Motorsports Engineering.

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Personal Development Plan

Name - Snasloy D'Silva

Degree – BEng Motorsports Engineering

Previous Qualifications – IB Diploma

Previous Experience - BEng Mechanical Engineering (Year 1)

Long Term Goals (5 to 10 years)				
Motorsports Engineer for the Formula 1 program. Entrepreneur.				
Short Term Goals (0 to 5 years)				
Degree in Motorsports Engineering including work experience. Start up Events & Marketing company.				
Goal	Objective	Resources Required	Measurement	Target Date
Year 1 Motorsports Engineering	Complete Year 1 with 70% of higher.	Productivity	Self management skills	June 2023
Entrepreneur	Public relation in Motorsports field	Socialisation F1	Cultural activities Degree (BEng Motorsports)	June 2026
Work for AMG	Finish degree with good grade %	Self motivation Hard work	Time management	December 2026
Events & Marketing company	Start own events company	Public Relations Degree	Help from elder/ experienced entrepreneurs	March 2027
BEng Motorsports Engineering	Complete Motorsports degree	Study material Hard work Productivity Dedication	Good grades	June 2026

NOTE - Add more rows if necessary