Inspired by Maths: A day in the life of a Supportability Engineer

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Studying maths for A Levels does not limit one's career options to just accountancy or banking. Without A Level maths, I would not have been able to study engineering at university. But just how applicable is the maths we learn in the classroom to the engineering world?

My work requires me to have a sound understanding of probability theory and statistics, particularly exponential distribution and the addition and multiplication laws of probability to calculate the availability of various systems aboard a submarine. I learned the basics of probability theory while taking A Level maths. This knowledge was expanded upon by taking maths modules at university. Without this knowledge I would not be able to generate accurate system models and hence the results would be invalid.

Why is my project important?

Babcock International is a global engineering support services company. Currently, I'm working on a project to ensure that the UK's submarines will be operational until they are ready for decommissioning.

Submarines are vital for protecting the UK. They are full of complex systems with various functions. The ballast system enables a submarine to submerge and rise by allowing a specific volume of water to enter and exit the ballast tanks. The air purification system makes a submarine habitable by supplying the required amount of breathable air. The propulsion system produces thrust to push the submarine forward. When these systems were being first being designed, mathematical equations and formulae were used to predict how they would behave. Equations involving the volume of the submarine and the speed requirement were used to calculate the total power needed to keep all the systems aboard the submarine running.

When one or more of these systems fail, the results could be disastrous. It is important that we ask, 'Is it possible to predict which systems are more likely to fail before they actually do?'

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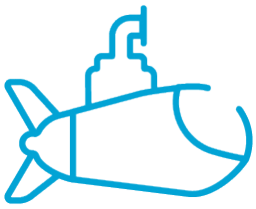

What does my current role involve?

I work for Babcock International as a supportability engineer. My current role is to demonstrate to the Royal Navy that the systems aboard a submarine will be available during a patrol. Most of my work is completed on a computer but sometimes I go aboard a submarine and talk to the sailors to familiarise myself with how the system operates.

I break down each system I am analysing into its constituent components. For each component, I will collect the failure rates from legacy failures, the manufacturer and databases. I then perform calculations on the failure rates to obtain the availability metrics. These metrics are used to generate a system Reliability Block Diagram (RBD). An RBD shows the functional relationship between the components, and indicates which ones must operate successfully for the system to accomplish its intended function.

After this, I will run a simulation. The results will demonstrate whether the system will be available for patrol, which components are most likely to fail and which components are availability drivers. The availability drivers will require the most maintenance so that the system will meet its availability target. If the availability target cannot be met, a redesign or a change in the maintenance schedule will be required.

Without understanding the maths, especially probability theory and statistics, I would be unable to generate an accurate system RBD as the wrong inputs would be used and therefore the results would be invalid- a submarine might not be available during a patrol or a system could be more likely to break down than predicted.

How did I get here?

While at school, I participated in a Headstart course where I discovered how engineers apply their knowledge of maths, science and business to develop innovative solutions to complex problems.

This interested and appealed to me. As a result, I chose to take maths, physics and chemistry for my A 'levels because without these subjects I would not be able to study engineering at university.

In 2012 I enrolled at the University of Warwick and by 2016 I obtained a Master of Engineering with Honours in Mechanical Engineering. Soon afterwards, I joined Babcock International as a graduate mechanical engineer, where I worked in a variety of graduate placements. I prepared safety assessments for design changes, scheduled technology demonstrations and produced a conceptual design of a submarine propulsion system.

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What do I think my job will look like in the future?

Currently I am working remotely from home but eventually I will return to the office. This will improve teamwork because the team will all be in the same location which makes communication easier.

As Babcock is interested in the personal development of their staff, they are helping me work towards becoming a chartered engineer. By the time I reach chartership, I will most likely be managing my own team as a senior supportability engineer. This is more of a people focused role rather a technical role. I would be setting personal objectives for my team and scheduling their tasks. Instead of generating my own RBDs, I would be reviewing other people's RBDs and providing feedback.

How useful is maths for a supportability engineer?

As I already mentioned before, I would not have my job without an engineering degree. I would not have been able to study engineering without taking maths at A 'level. The maths I learned at school was a starting point. As I participated in higher levels of education my mathematical knowledge became more specialised and focused. As a supportability engineer I regularly work with complex equations and probability theory.

Glossary

Reliability Block Diagram (RBD) – A visual representation of a system as blocks to illustrate how its components affect the success or failure of the system's functions.

Find out more

Brain, M. & Freudenrich, C., 2000. How Submarines Work. Retrieved January 31, 2022

About the author

From a young age I was always good at maths but I did not want to be an accountant like my father. I wanted a career that could be exciting, creative and allow me to apply my favourite subjects. Fortunately, in sixth form I learned how versatile engineering courses are and the many options available to those with engineering degrees.