Thrust project
What mathematics is needed for ThurstWSH?

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ANDREW BRADLEY: I'm Andrew Bradley. I've been working on the project for about four years now and I'm very much sort of considered to be the the technical lead. There's people with other specialisms, but I try and pull them all together.

You vary from the computational fluid dynamics, which is all based around maths.

You also have to look at basic inertia equations, what you'll have picked up in school, the distances, acceleration times, times squared, all those sorts of things. The ones that you learn back in physics in your early days. We use them all the time and they're the ground stay of actually moving forward with these.

JAMES MORTON: I'm James Morton and on this particular project I'm project engineer on the C3 2B a quarter scale boat.

I'm not doing clever stuff, but I'm just doing the everyday stuff that you one has to do. I mean, it's, you know, plus and minus and multiply and divide mostly because you're just making parts fit into other parts.

So you've got to make sure that works on the drawing board. Otherwise it ain't going to work in reality. I suppose the most interesting part of mathematics I did on this was Lorne gave me the task of looking after weights and keeping the CG [centre of gravity] in the right place.

And again, very simple, you just got to weigh everything or, or calculate its weight by looking at its shape and then the density, etc.

And then putting it into a massive great spreadsheet and looking at where it is on the boat and what effect it has on the moment arm of the boat, try to keep that CG in the right place. And you've got some bits you can, heavy bits, you can move around quite a bit like batteries in particular. You can shove them, we shove them right up the front here, and that compensated quite a lot of because we've got some heavy stuff at the back.

And, and to be honest, it's been really successful. We kept it under the weight limit or under the weights bet that lawn required and the CGS give or take in the right place. So that's been something I'm quite pleased with.

BUTCH DALRYMPLE-SMITH: You can't calculate your way into a better solution for a problem, but what you need is you need to be able to verify that the solution that you have in mind is going to work.

And in fact, it's surprising that although when you read technical papers, and I read a lot of technical papers, they all look a bit baffling with their long formulae, but the basic mathematics that we're working with are fairly straightforward.

It's, you know, it's not particularly advanced but you do have to do it because you need to make sure that you have the size of the wings, right, that the boat's going to take off at the appropriate speed and all that sort of thing.

So it is, it's vital, but just it shouldn't be scary, doesn't have to be scary.

MATTHEW KEAR: I use lots and lots of maths in my job. Some of the key mathematics that I mean I use all of the time, so to list some, so you've got your your standard algebra and rearranging of equations, I do that regularly. But then you've got more sort of in depth methods.

So there's things like matrix mathematics that's incredibly important in terms of understanding sort of control and different reference frames within how a controller works. But then a lot of what we do is we look at when we analyse things not just only in the time domain, we also analyse things in the frequency domain and we get a lot of information by doing that. And so we've got the Fourier transform, for going back and forth between those, those, those, those different domains.

So that's some examples of the kinds of mathematics I'm using almost a daily basis.

DICK BARTON: Anything to do with engineering it has a basis in mathematics. It underpins anything you do engineering wise. On this project one of the biggest things because we're running an engine, it's quite a thirsty engine, was to work out how much fuel flow, how much quantity of fuel for, for what our needs is.

In the first case on the testing of the engine to prove that it was a good engine, but also for the size of the fuel tanks for the boat. You have to work all this out so you know a practical, solid basis for building the boat in the end.

The most important thing is not a single thing, is mathematics is very, very good at giving you an answer to a problem. If you are looking for an answer to an engineering problem, the mathematics will help. You just have to find the right formula or way of graphing.

I mean graphs, I love graphs. They're a visual representation of a relationship and they can tell you so much. It's, it's when you understand, it's not a matter of seeing all lines on a piece of paper it's understanding what that relationship is telling you. I love that.