

Major Project Questions

Project Title: The redesign of the UWTSD formula student chassis to meet current regulations, optimising strength, and rigidity.

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Question 1

How did you determine the loads for the front and side impact simulation test and what are the actual loads?

Question 1 Response (maximum 200 words)

On page 25 in section 6 of my dissertation it states that the loads used during the test are the average weight of a formula student racecar (200kg) and the average weight of a driver 20 years of age (89kg).

This was calculated with the average weight of a vehicle due to the workshop being closed (due to covid-19) and not being able to access the racecar and weigh it.

This was then converted from kilograms to newtons so it could be used in the solidworks system to perform the tests.

This being $200 \text{ kg} + 89 \text{ kg} = 289 \text{ kg}$
kg to newtons conversion is $\text{kg} \times 9.80665 = \text{N}$
 $289 \times 9.80665 = 2834.12\text{N}$

Due to a slight rounding error the numbers used during the test were 0.1 decimals out, but the same number was used across all tests, so the testing was not corrupted.

For test 1 the loads were 2834.22 divided by 4 = 708.555N on all 4 points

For test 2 the loads were 2835.22 divided by 6 = 472.37N on all six points

Question 2

Could you elaborate on what extensive research into negative stress that you reviewed as defined on page 26 of your dissertation.

Question 2 Response (maximum 200 words)

After doing some reading on forums and some websites refer to the 'negative stress' as I have referred to it in my dissertation was always referred to as stress in opposite direction to the load or directional stress. with some people in forums saying that the negative stress is compressive, but without an accredited reference for this I decided not to include it in my dissertation and go with the negative stress being in the opposite direction to the loads applied direction, which from looking at the results was more clear to see and understand. (digital engineering 24/7, 2019), (Quora, 2017)

Question 3

Could you explain your validation results showing the calculations (including units), such as how the $6.204 \times 10^{-8} \text{ N/m}^2$, which converts to 6.2 kN in load (Page 22)

Question 3 Response (maximum 200 words)

On page 22 I explain that I apply a load of 7.55 kN, half in an upward direction and the other half downward. I then point out the yield strength being $6.204 \times 10^8 \text{ N/m}^2$, which in my dissertation is written as $6.204 \times 10^{-8} \text{ N/m}^2$ which is wrong, which was an oversight on my part and I have only now noticed.

I believe I may have explained it incorrectly during my dissertation, and what I was trying to explain was that due to the amount of stress experienced to break the part in SolidWorks, using the max load from the real-world test was the same as the yield point found in the graph from the real-world results and in SolidWorks were the same and I would assume that the load to break the part would be the same.

Question 4

How did you arrive at the loads of 1417.11 N that you applied to the two points for the twist test? (Page 30)

Question 4 Response (maximum 200 words)

This again is the same as the other two tests, taking the average weight of a formula student racecar and an average weight of a driver 20 years of age, and then converting into newtons and dividing it across the number of points required for the test, for example test 3 as mentioned has two points meaning the 2834.22 newtons divided by 2 and equals 1417.11 newtons.

This was done so that the tests are comparable and that not too many variables were then changed.

Question 5

Can you provide some details, i.e. a work flow, of how the Motion Sim would have been setup including any parameters needed (Tyres/suspension etc).

Question 5 Response (maximum 200 words)

After taking measurements from the workshop for the suspension wheels and tyre's and steering components, then recreating them into solidworks, the plan would have been to assemble the components together and make a set-up similar to the motion study assignment from the CAD module in the 1st term of 3rd year.

This would include the full suspension set-up on all four corners of the car, the steering assembly, and a flat component with a bump on one side acting/resembling a road. Or a flat piece with a corner and a small bump on the inside to act as a curb on the apex of a corner. As seen in the two examples/ mock-ups below these would have the type of racetrack representatives that could have been used during the motion study testing.

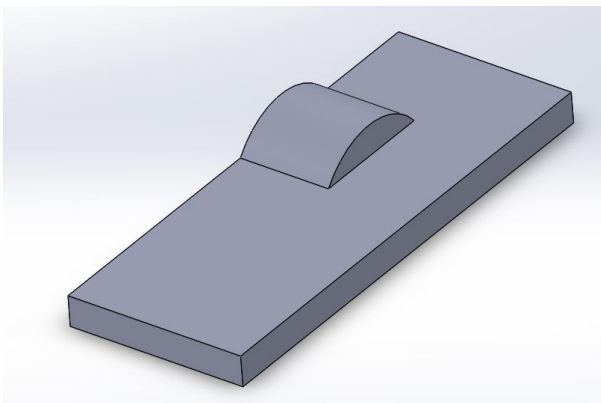


Figure 1 - One sided speed bump for mock-up motion study test - Oliver Gordon

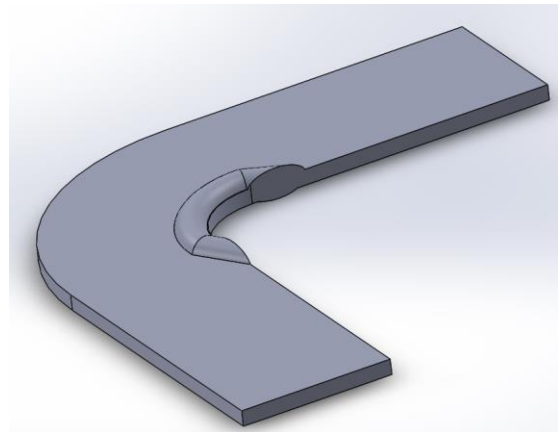


Figure 2 - Race track corner mock-up motion study - Oliver Gordon