Weight reduction of the Railing system

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Aim of the Project

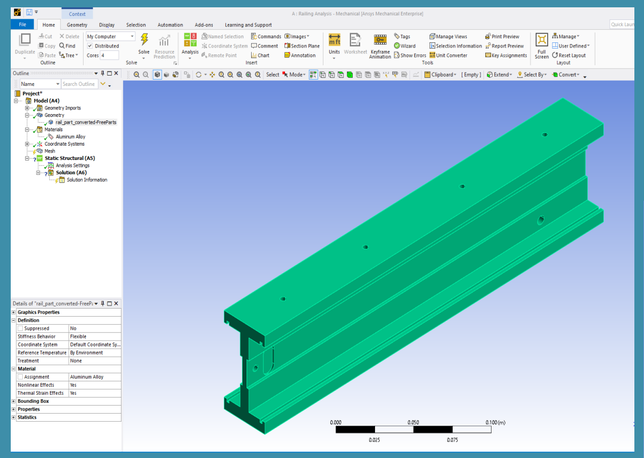
To reduce the weight of the rail by 50 percent as well as to maintain structural stability

Background

- Small satellites, sometimes known as nano or micro satellites
- Often weigh less than 1kg
- They are employed to capture and store a variety of photographs
- launched by companies like Space X, NASA, and Firefly Aerospace.
- . James Drew, a researcher and software engineer at TUS's Hartnett Building, assigned the group the responsibility of developing his earlier prototype
- Regulations from SpaceX and firefly impose limitations on the design of the system
- Not allowed to use magnets or pressure systems that could damage other cargo

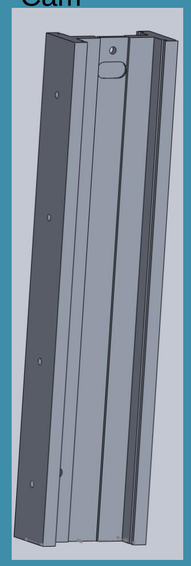
Photo of the micro satellite design proposed by James Drew

Methodology

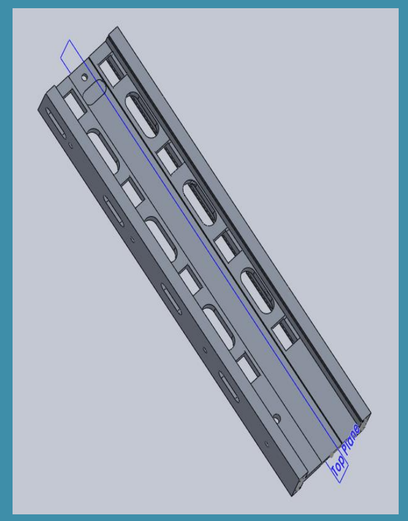


Snapshot from Ansys work bench

- Ansys workbench was used to obtain the structural figures for stress strain and deformation
- a topology study was done ,due to the unrealistic design SolidWorks was used to manually try remove sections of material from the rail.
- After which the final iteration was put threw Cam



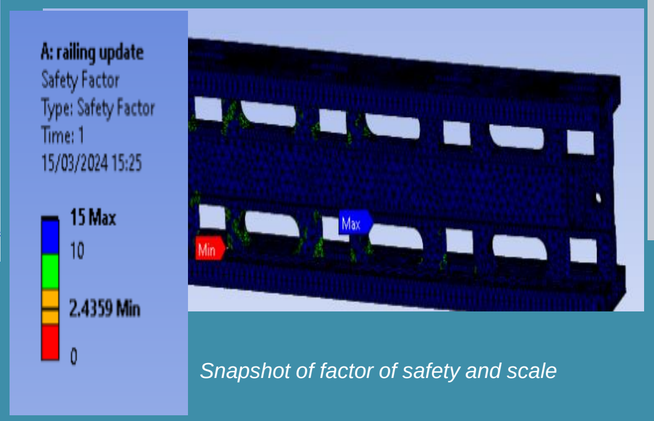
Snapshot of the original design



Snapshot of the final Design from SolidWorks

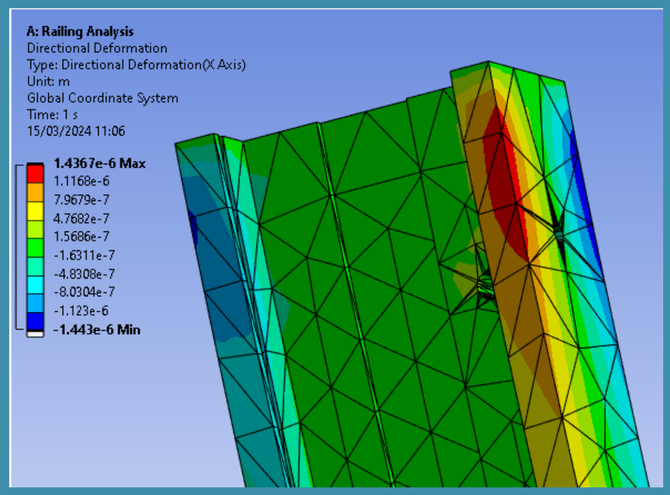
Results

- The structural stresses for the railing remained with in limit.
- The biggest where the over all factor of safety from 15 to 2.43



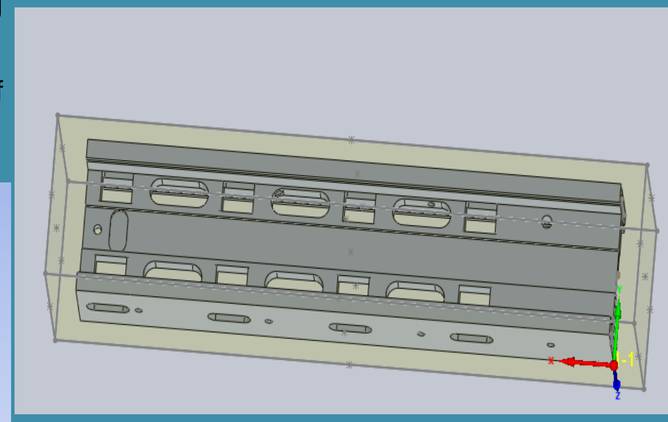
Snapshot of factor of safety and scale

- majority of the forces were concentrated in higher load along the outer edge
- a solution was to add more material to these point or to create a chamfer to the edges which would distribute the load



Snap sot of the deformation on the X axis of the original model

Conclusion



Snapshot of the cam design of the final model

Due to the limited amount of time as well as the external constraints of the project i.e. mounting holes the target of a 50% weight reduction was unobtainable

Solutions

- Lighter material such as aluminum 6061 metal foam
- Forming the rest of the satellite launching system around the railing

Acknowledgments

Daniela Butan for her training in Ansys work bench as well as the advice on how to work around the topology study

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Ciaran O Loughlin for always being available to have time for one of my infamous quick questions