PORTFOLIO

Vishesh Kumar

MECHANICAL ENGINEERING
2023 - PRESENT

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Skills Demonstrated

- Engineering Innovation
- 3D CAD Design
- 3D Printing
- Sheet Metal
- Coding (Python & IDE)
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About This Portfolio

This portfolio is aimed at showcasing the technical skills I have acquired through my university coursework, hackathons, personal projects, and various training sessions and projects with student teams at RMIT University. It has been designed to supplement my resume. For each project, I have provided a detailed overview, the technical processes involved, and key outcomes supported by visuals. If you require further details regarding any of the projects, feel free to contact me.

Freight Pods **(Ongoing)**

Overview

- The project **(RTSA hackathon)** is aimed at increasing the share of rail in the transit market for distances under 1500 km, which is currently a major issue due to high handling costs.
- The objective was to penetrate this market by designing a conductive guidance rail within a dedicated Category B lane, using existing infrastructure.

Skills : Engineering innovation, Solidworks modelling, Motion study

What I Did

- I carried out a literature review on the railway sector and its industry challenges. This led me to an excellent course on edX, which further enhanced my knowledge in the field.
- The idea emerged as a natural solution, as freight logistics have needed a Category B solution for quite some time.
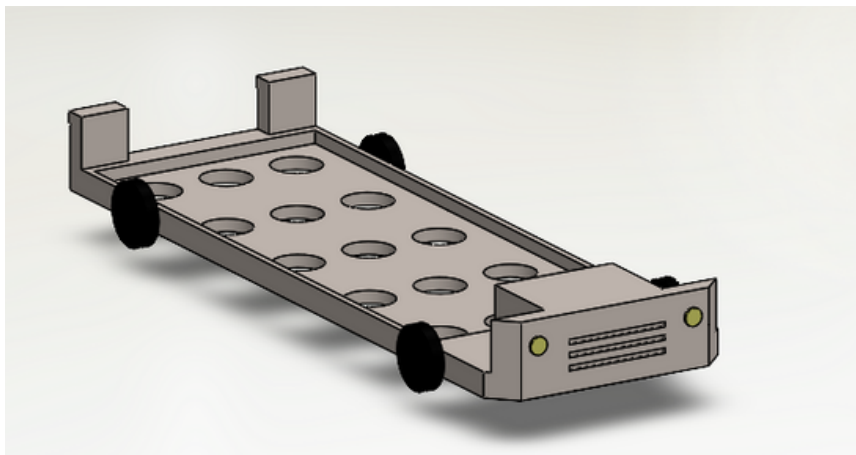
Key Outcomes

- Produced a SolidWorks preliminary design and motion study.
- Received positive feedback from senior members of the RTSA community for the novel concept, and was encouraged to work out the deeper problems before the finals.

Deployable Nosecone

Overview

- The project was carried out as a trainee under **HIVE (Rocketry Club at RMIT)** to design a deployable nosecone for an L2-class rocket.
- The design was based on a servo-actuated two-fairing mechanism, supported by trade studies.

Skills : OpenRocket simulation, Systems engineering

What I Did

- I was responsible for all aspects of systems engineering within the project and also took on project management, showcasing the skills I learned in project management courses from Google.
- I performed trade studies for material selection, servo selection and determined the optimal parachute size.
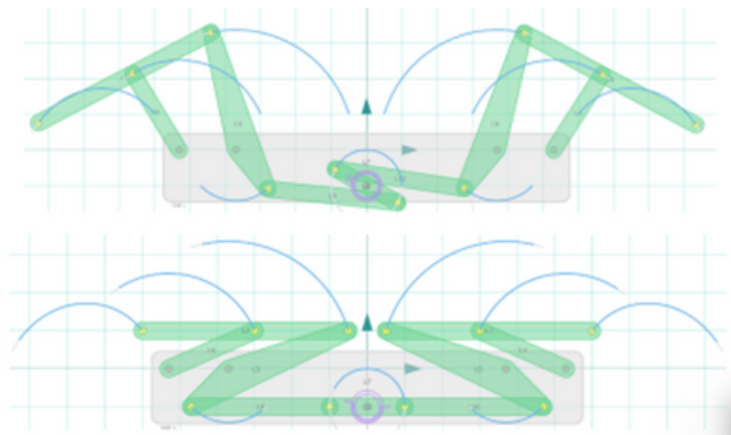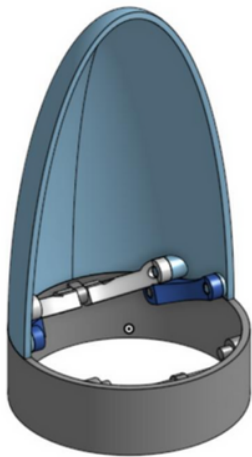
Key Outcomes

- As a result, a validated preliminary design was achieved with a prototype for demonstration.
- I produced simulation and trade study-backed CAD files, the prototype, and OpenRocket simulations.

Electric Control Panel

Overview

- As a **personal project**, I designed and modelled an electric control panel in SolidWorks using the Sheet Metal workbench.
- The objective of the project was to showcase my proficiency in sheet metal design.

Skills :	Sheet metal design, Solidworks modelling, Product design

What I Did

- I designed the control panel using SolidWorks Sheet Metal modules, including bends, flanges, and cutouts.
- I applied material thickness and bend allowances and created a flattened sheet metal pattern for laser cutting or CNC punching.

Key Outcomes

- Enhanced sheet metal proficiency in SolidWorks, focusing on practical design for manufacturability.

Quadcopter

Overview

- As a **personal project**, I modelled a quadcopter in SolidWorks to enhance my proficiency in the software and strengthen my part modelling and assembly skills.
- This was inspired by the quadcopter project I undertook at RUASRT (UAV Research Team at RMIT).

Skills : Engineering innovation, Solidworks, Motion study, UAV design

What I Did

- I modelled key components ranging from nuts to the complex geometries of propellers.
- I used advanced mates to later perform a motion study animation.
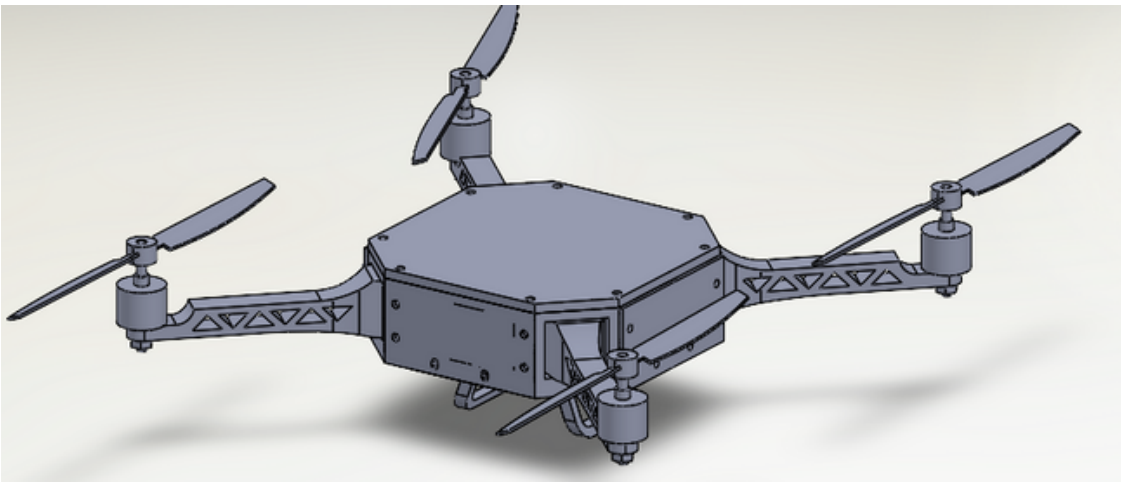
Key Outcomes

- As a result, I developed strong skills in SolidWorks, enhancing my proficiency in CAD modelling.
- I also produced an exploded view for technical communication.

Landing Gear

Overview

- As a **personal project**, I modelled a landing gear to enhance my skills in SolidWorks, focusing on strengthening my understanding of mechanical linkages and realistic motion studies.
- The project was aimed at deepening my proficiency in SolidWorks while modeling a complex mechanical component.

Skills : Engineering innovation, Solidworks modelling, FEA analysis

What I Did

- I modelled all the components from scratch and applied advanced mates to simulate the gear retraction and extension.
- I performed FEA analysis within SolidWorks using its add-ins to analyse the real-world performance of the design by testing different materials.
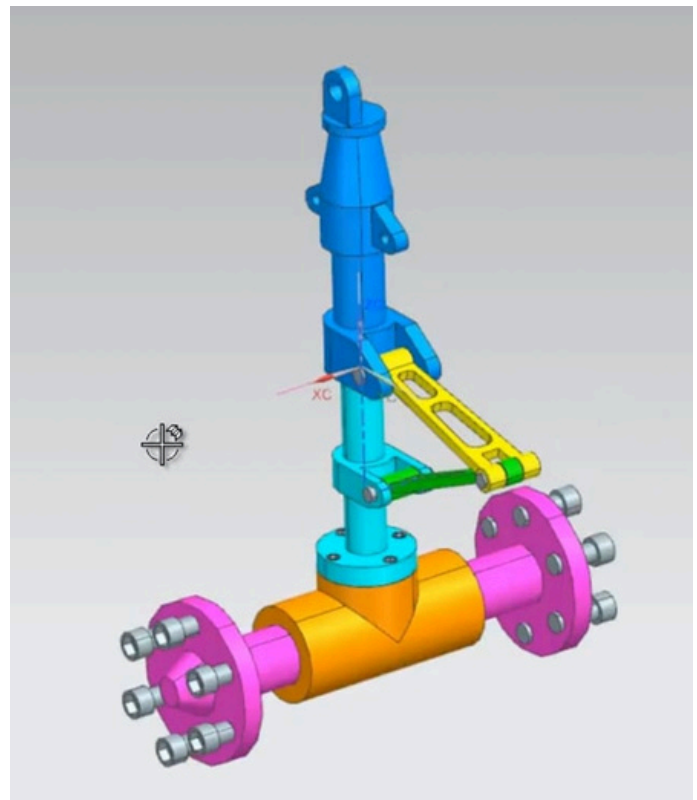
Key Outcomes

- As a result, I enhanced my skills in modelling complex real-world parts in SolidWorks while accounting for mechanical linkages.
- I was also able to introduce myself to FEA and understand how useful it is in designing robust components.

VTOL Drone

Overview

- As part of a research project at **RUASRT (UAV Research Team at RMIT)**, I contributed to the development of a VTOL (Vertical Take-Off and Landing) prototype by modifying an existing UAV frame to enable vertical lift.

Skills : 3D printing, Prototyping, CAD modelling

What I Did

- My key responsibilities involved rapid prototyping and 3D printing of custom brackets for carbon fibre rods.
- I worked with inherited CAD files, making minor adjustments to suit the design needs and iteratively testing and refining printed components.
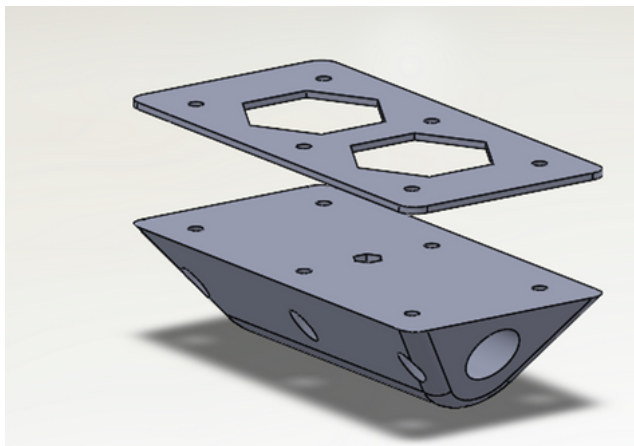
Key Outcomes

- This project allowed me to gain hands-on experience in prototyping, 3D printing, and practical problem-solving for UAV structural design.

Autonomous Drone (Ongoing)

Overview

- As a part of **RUASRT (UAV Research Team at RMIT)**, I am currently working on an autonomous UAV project, providing valuable insights into autonomous flight and enhancing my Python skills.
- The objective of the project is to design an autonomous UAV capable of detecting colours and performing a landing upon detecting a specific colour.

Skills :	Python, Autonomous Navigation

What I Did

- As part of this project, I have learned Python, a critical skill across all engineering disciplines.
- I have gained hands-on experience with a UAV equipped with sensors (gyroscope, range, colour, and temperature) to enable autonomous decision-making.

Key Outcomes

- As a result of this project, I expect to achieve an associate-level proficiency in Python while gaining a deeper understanding of autonomous flight algorithms.
- Video

Coursework Highlights

Overview

- In this section, I have presented projects that I am particularly proud of, which have provided me with a deep understanding of concepts and skills that are highly relevant to the industry.

Skills : Arduino, 3D printing, Electronics & Hardware Integration

Mechatronics Project

- In this project, I came up with the idea and designed the pseudocode based on a path map for the obstacle track in an inter-university competition.
- Our design was well-received, and we were applauded by the faculty for our innovative approach, finishing in the top percentile.
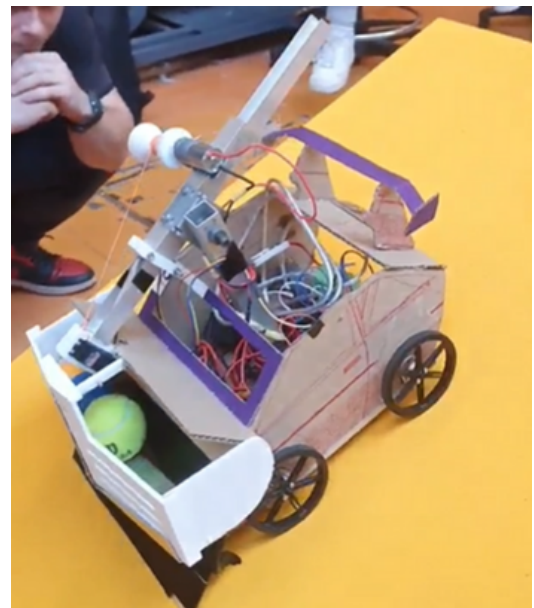
Systems Engineering Project

- In this project, I was responsible for prototyping and came up with an innovative solution of using a plastic film on the leading edge to avoid flow separation.
- This project introduced me to flight controls, electronics, ESCs, and other components used in prototype-scale UAVs for testing.