Inspace Rocketry Competition Preliminary Report

Introduction

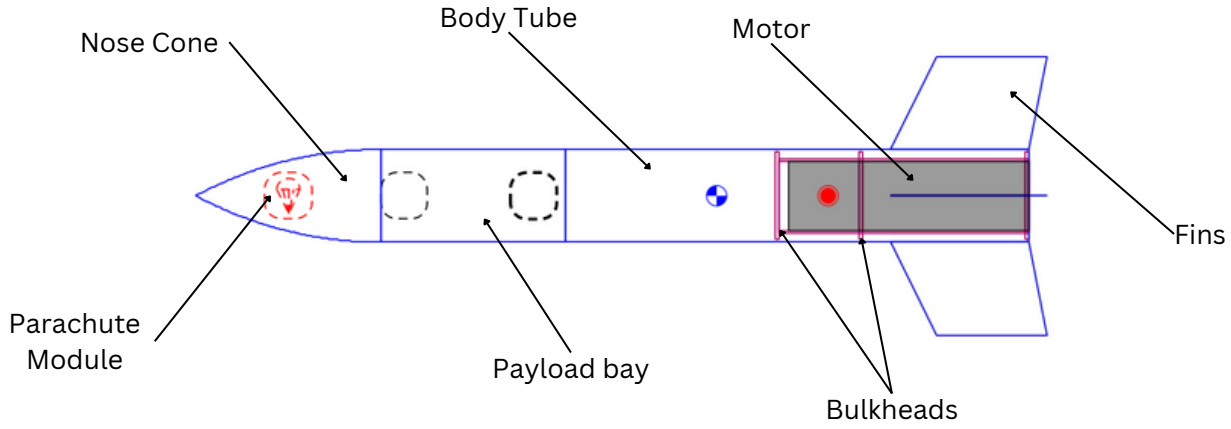
This report outlines our preliminary design and development plan for the IN-SPACe Model Rocketry India Student Competition 2024-25, organized by the Astronautical Society of India with ISRO. We aim to launch a 1kg rocket to 1.2km altitude, ejecting and landing the payload safely. This competition offers hands-on rocketry experience and develops essential soft skills.

Mission Requirements

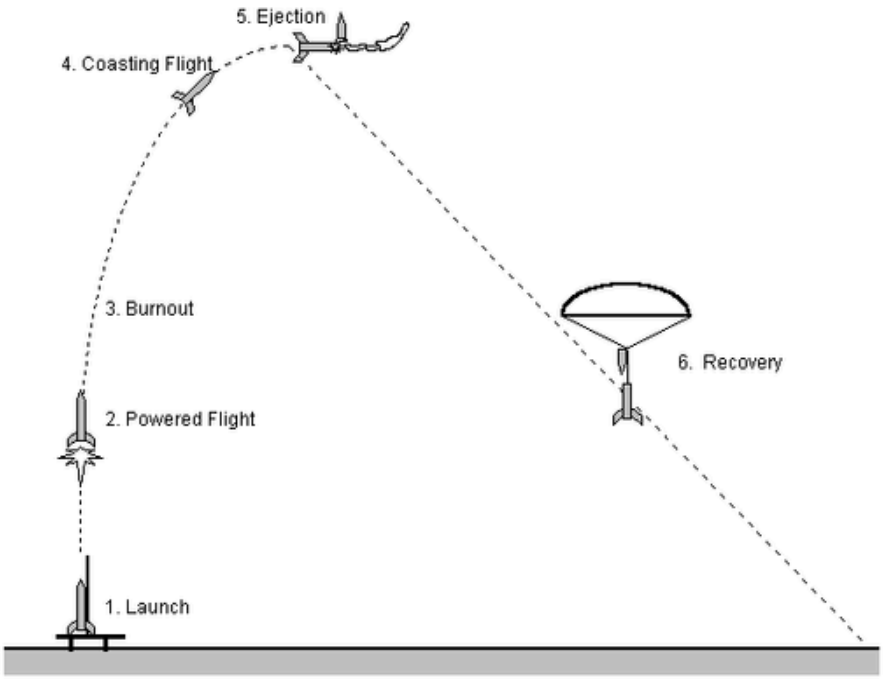
The IN-SPACe Model Rocketry India Student Competition 2024-25, organized by the Astronautical Society of India in association with ISRO, aims to provide a realistic experience for students and start-ups in designing and launching an amateur rocket. The key mission requirements are as follows:

- Payload: Design, develop, and launch a model rocket carrying a payload of 1kg mass.
- Altitude: Achieve an altitude of 1000m above the launch site.
- Recovery: Ensure the safe ejection of the payload and the safe landing of the rocket.

Basic Rocket Design



Flight Profile



Rocket Components

- Airframe:
    - Material: Carbon Fiber
- Fins:
    - Material: Carbon Fiber
    - Shape: Airfoil
- Recovery System:
    - Parachute Material: Nylon
    - Ejection system: Ejection Charge Deployment
    - Parachute chords: Braided nylon
- Propulsion System
    - Casing: Aluminum
    - Motor Type: Solid Propellant
    - Nozzle: Converging-Diverging (CD) Nozzle
    - Fuel:
        - Alkaldehyde - Potassium nitrate mixture
- Black powder

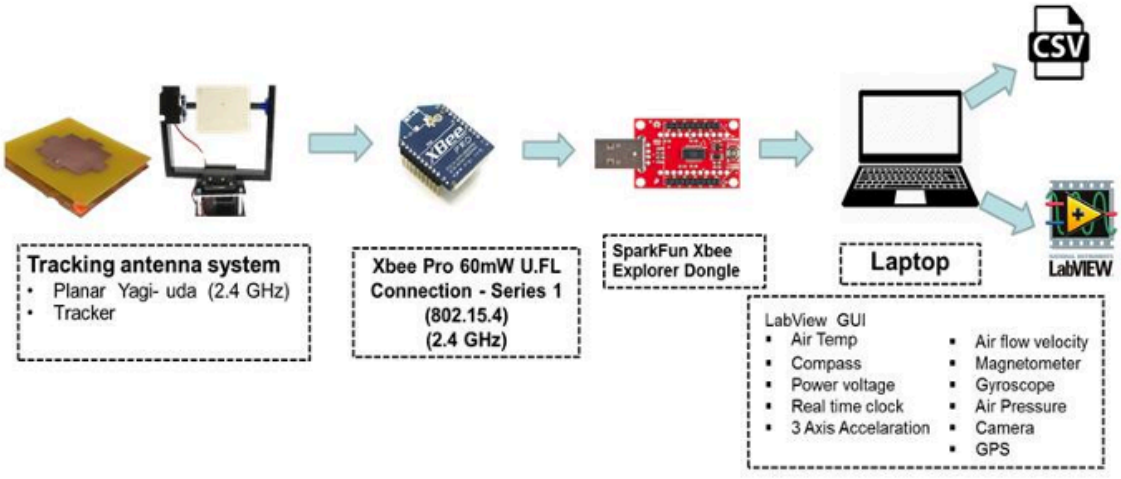
- Igniter:
  - Pyroigniter with black powder.

- Avionics

Sensor Type	Sensor Name	Working
Air Pressure and Temperature Sensor	BMP280	BMP280 has a wide range of barometric pressure, altitude and temperature.
Accelerator, gyrometer and Magnetometer	MPU 9250	MPU9250 displays 9 axis thus predicting the accurate position of rocket.
GPS	GY-NEO6MV2	It provides real-time coordinates of rocket.
Transciever	XBee	It provides real-time connectivity to the rocket.
Microcontroller	Teensy 4.0	It handles, stores and transmits all the data from sensors.
Voltage controller	5v converter	it checks and reduces voltage for microcontroller operations
Battery	9V Li-Ion	It powers the system

Ground Station

Ground station is a very important part of the whole satellite system that receives data from the sensors in the Rocket. We also develop a tracking system to increase the efficiency of the operation. below shows the components of the ground station for this competition.



Conclusion

Team Valkyrie is committed to designing and building a high-performance rocket for the IN-SPACe Model Rocketry India Student Competition. Our goal is to achieve an altitude of 1.2 km with a 1 kg rocket using advanced materials and efficient propulsion systems. We look forward to further developing our design and conducting tests to ensure success in the competition.