

# Communication Based CubeSat

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ROVSat is a CubeSat-based communication and control system designed to explore remote areas of the Earth that are difficult to access by controlling Remotely Operated Vehicles (ROVs). It aims to provide a cost-effective and reliable solution for remote exploration and data collection where there is no connectivity such as GSM, enabling researchers to gather more accurate data from the surface of the Earth.



# RovSat

## Problem Statement

Limited connectivity in remote areas poses a challenge for exploration and data collection. The ROVSat project aims to address this issue by providing a reliable and cost-effective communication and control system for remotely operated vehicles (ROVs) operating in geographically inaccessible areas.

## Deliverables

- Final design report
- 1U CubeSat structure
- Self-sustained power system
- Assembled and programmed ROVs capable of earth exploration
- Functional communication system
- Ground station
- Complete CubeSat prototype

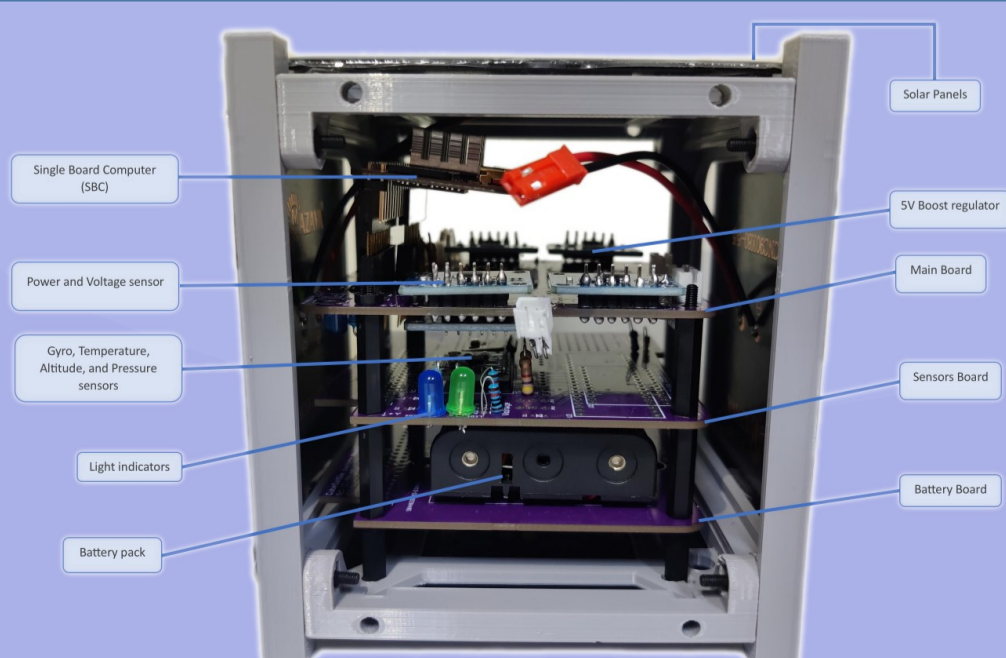
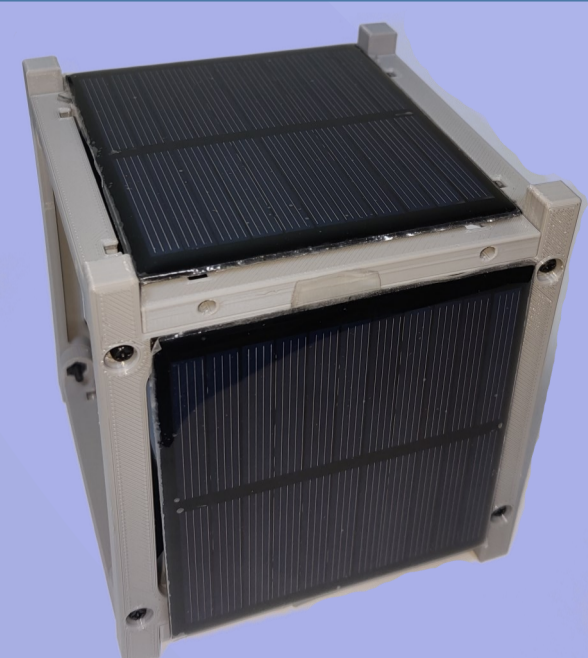
## Constraints

- 1U CubeSat size (10 cm x 10 cm x 10 cm).
- Project execution duration of one semester.
- CubeSat weight < 2 kg.
- Limited budget.
- Limited access to equipment and resources.

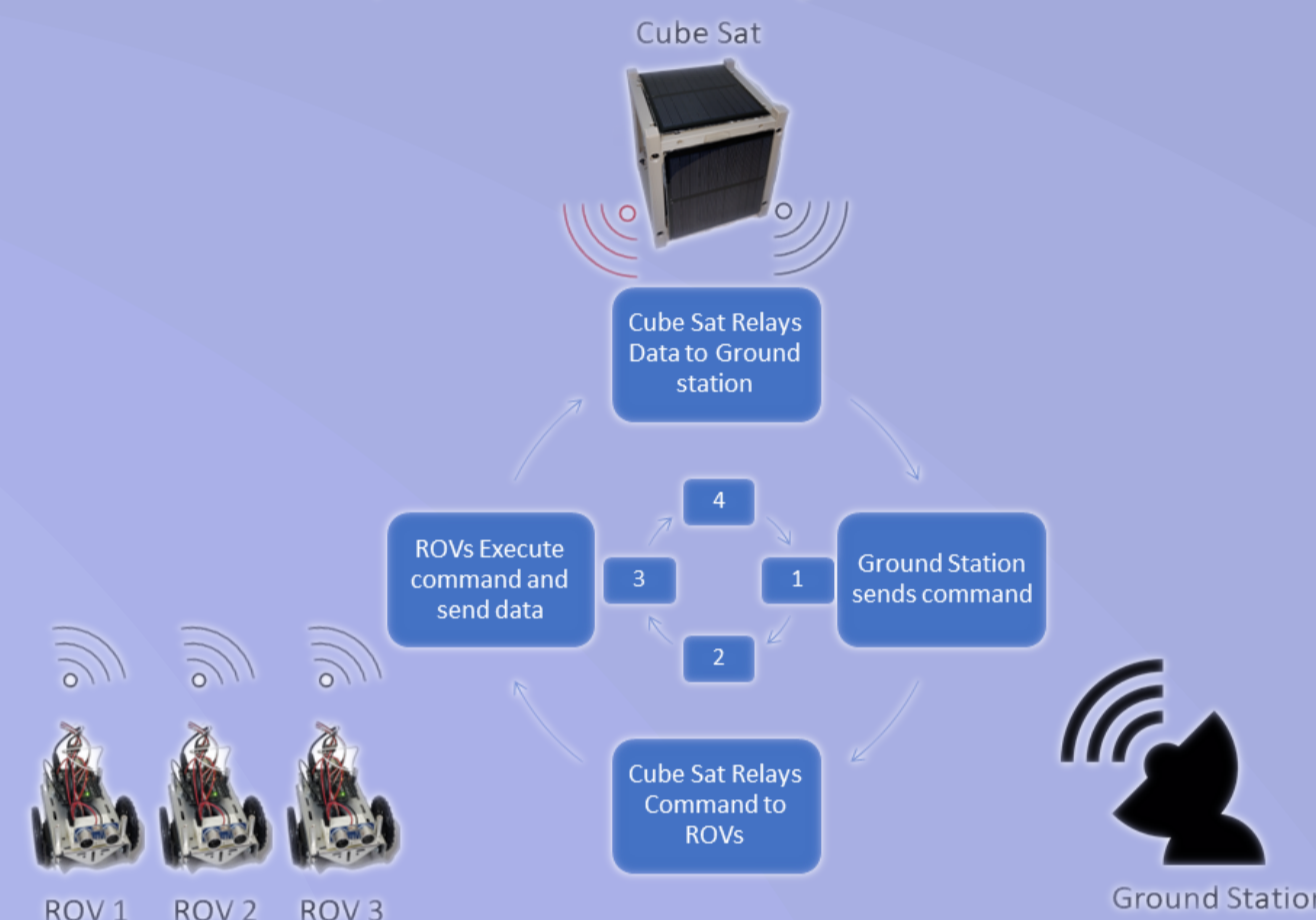
## Technical Specifications

- Maximum power consumption of 3 W.
- Frequencies of operation between 435 MHz – 438 MHz.
- Maximum temperature resistance of 100 °C.
- Battery capacity around 2700 mAh.
- RTT times of 1 second.

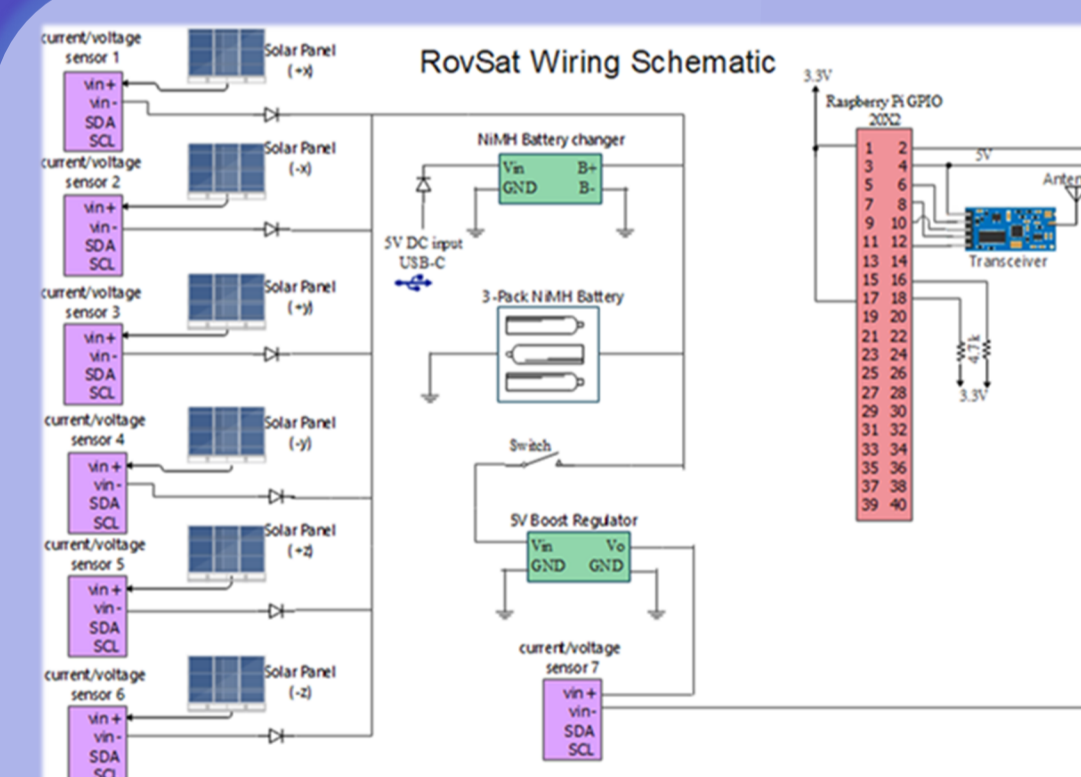
## Prototype Design



## Concept: Active Two-way Communication

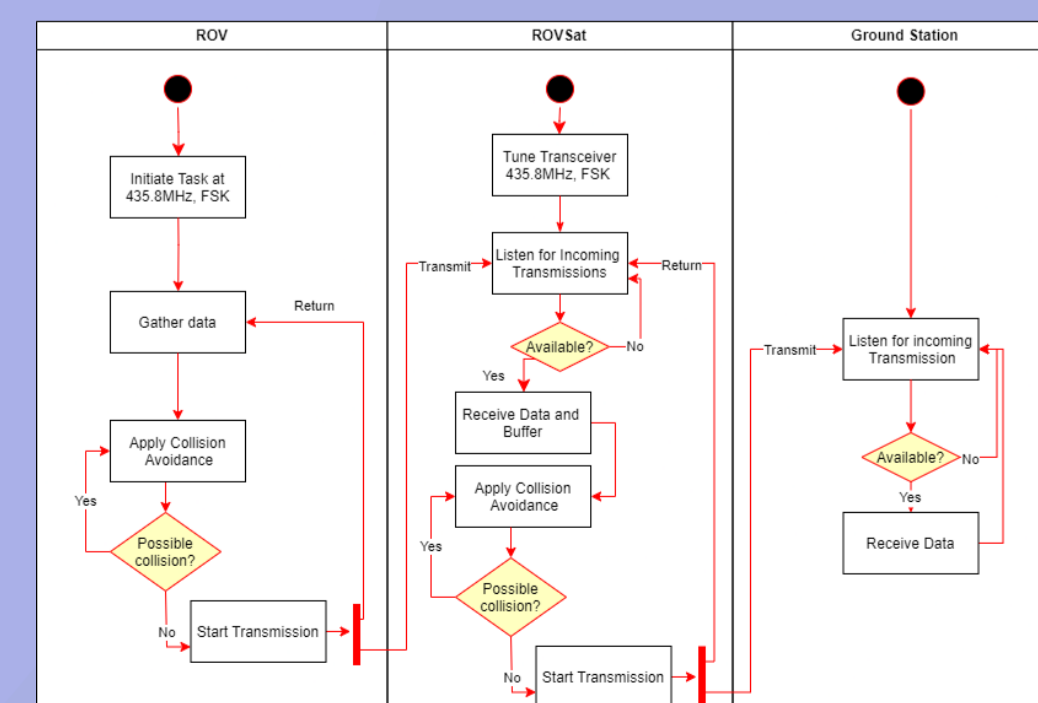


This concept allows the users to actively modify targeted geographical locations of the ROVs and data required to be collected even after deploying the ROVs. The users can modify and upload instructions at any time and will obtain feedback from the ROVs instantaneously.

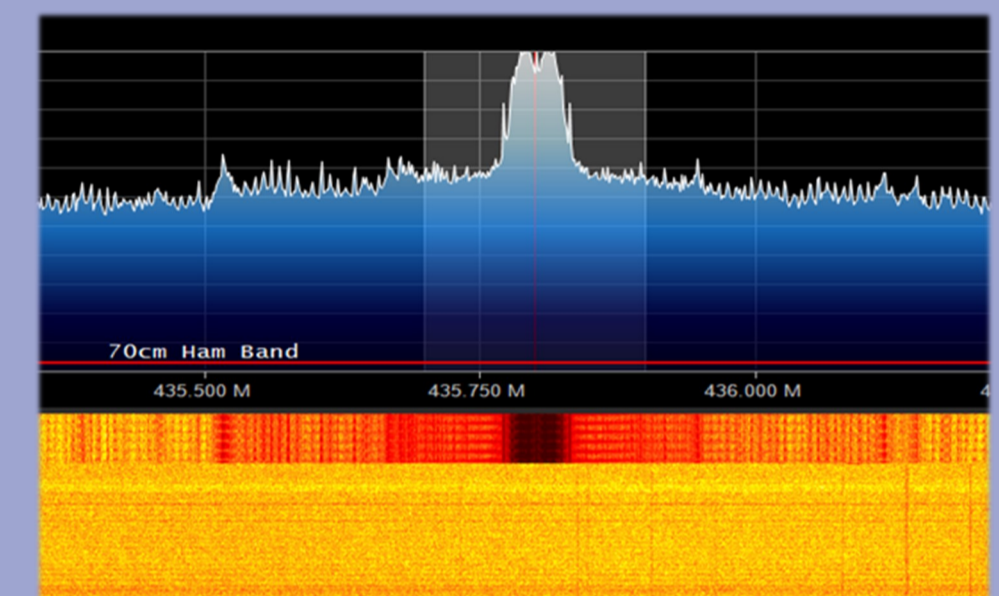
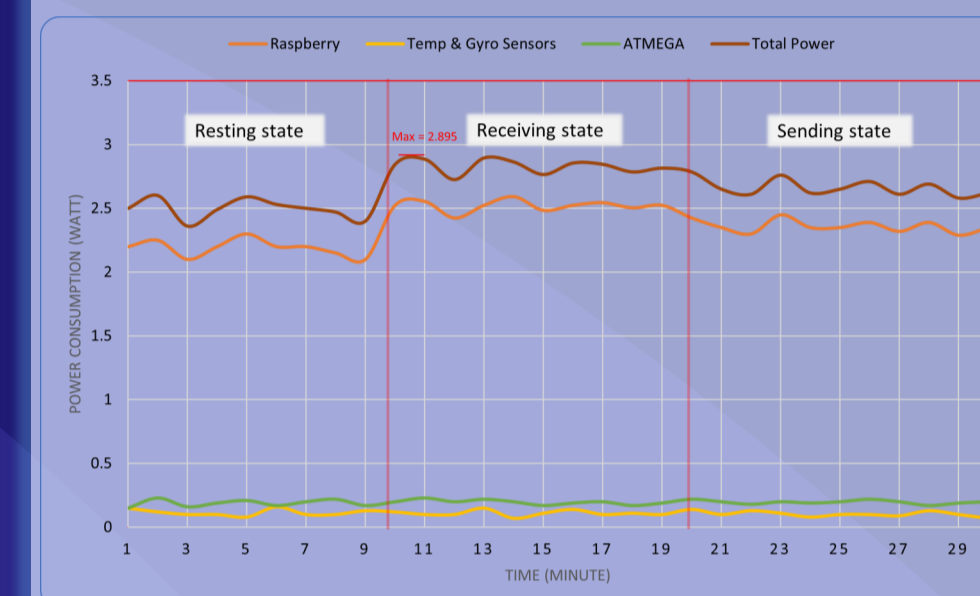


Wiring schematic of the system

## Full communication transmission cycle of the system



## Design Verification



- Maximum power consumption during the ROVSat operation is 2.895 W
- The maximum temperature resistance of 100°C was achieved by utilizing the nylon carbon fiber material properties, which has been proven to be around 240 °C
- The battery capacity specification of around 2700 mAh was verified as we utilized a 2700 mAh Ni-MH battery as specified by the manufacturer.
- Transmission frequency of 435.8MHz

Mode	FU1	FU2	FU3
Idle current	3.6mA	80µA	16mA
Transmission time delay	15-25mS	500mS	4-80mS

- Assuming worst case scenario, RTT = 160.003ms

## Results

All specifications were successfully verified through testing, and all subsystems (Power, Communication, and Structure) were designed. Multiple ROVs were combined and programmed to work together seamlessly. The ground station was built to communicate with the ROVs through the CubeSat, and a successful communication cycle was established and maintained from ROVs to the ground station throughout the CubeSat's operation.

