



Robotics Club — Project Proposal Format

1. Project Title

Aerial VTOL Drone Multi-Purpose

2. Team Details

- Team Name: Onyx
- Team Members:-
 - Hemant Yadav
 - Mehebub Alom
 - Suvendu Kumar Sahu
 - Further more are required
- Team Leader / Point of Contact: Hemant
- Faculty / Mentor (if assigned)

4. Problem Statement

Emergency teams, environmental agencies, and military units lack a single, adaptable drone solution that can perform rescue, forest fire monitoring, aerial mapping, and reconnaissance with efficient deployment and modular payloads. This leads to slower response, higher costs, and operational complexity.

5. Objective(s)

- Demonstrate modular payload capability for rescue, fire monitoring, mapping, and military use.
- Achieve vertical take-off and landing for rapid deployment in tight or remote areas.
- Validate autonomous flight and real-time sensor operation for diverse missions.
- Ensure reliability and adaptability across different operational scenarios.

6. Proposed Solution / Concept

- Modular Payloads:
Fast-swappable bays enable switching between thermal cameras, mapping sensors, and tactical modules for different scenarios.
- VTOL Configuration:
Vertical take-off and landing design allows operation in tight or rugged environments while fixed-wing mode provides efficient cruise for long-range coverage.
- Solar Panel Integration:
Lightweight, high-efficiency solar cells mounted on wings/fuselage supplement battery power, prolonging flight duration and enabling longer remote missions.
- Autonomous Operation:
GPS and onboard AI allow for autonomous routing, data collection, and real-time communication with ground stations.

7. Expected Outcome

- Demonstration of seamless payload swaps for rescue, fire monitoring, mapping, and military tasks.
- Successful vertical take-off/landing from diverse environments.
- Achieving increased flight duration with solar panel integration.

Core Demonstrations

- Quick payload swap between rescue, mapping, or surveillance modules on the same drone airframe.
- Vertical take-off, transition to fixed-wing flight, and smooth landing in a compact area.
- Autonomous navigation of a pre-set route while collecting and transmitting real-time sensor data.
- Increased flight endurance observed with onboard solar panel power assist.

8. Hardware & Software Requirements

Hardware Requirements

- **VTOL Airframe:**
Lightweight fixed-wing/multirotor hybrid frame with modular payload bay.

- **Motors & ESCs:**
Brushless DC motors suitable for vertical lift and forward thrust; compatible electronic speed controllers.
- **Flight Controller:**
Open-source (e.g. ArduPilot-compatible) for custom programming and multi-mode operation.
- **Battery System:**
High-capacity LiPo batteries (4S–6S), plus solar panel array (flexible, high-efficiency cells) with charge controller.
- **GPS/Telemetry:**
GNSS module, telemetry links (2.4 GHz, LTE/5G optional) for autonomous flight and data relay.
- **Modular Payloads:**
Thermal camera, HD/multispectral mapping camera, rescue drop module, or surveillance sensors.
- **Ground Station:**
Laptop/tablet running ground control software, telemetry receiver, and mission monitoring interface.

Software Requirements

- **Flight Control Firmware:**
ArduPilot or PX4 ecosystem for VTOL support, autonomous routing, failsafe, and payload integration.
- **Ground Control Software:**
Mission Planner, QGroundControl, or similar for route planning, real-time monitoring, and data download.
- **Custom Scripts:**
Autonomous task switching, payload management, sensor data collection, and solar panel charge tracking.
- **Communication Stack:**
MAVLink protocol for drone-to-ground telemetry, camera control, and sensor streaming.

9. Project Timeline / Milestones(Physical Prototype Should be ready by March for the competition)

Break the work into weekly or phase-based milestones:

Phase	Description	Expected Completion
Phase 1	Research & Design	Week 1–2
Phase 2	Hardware Setup	Week 2–7
Phase 3	Coding & Testing	Week 7–8
Phase 4	Final Demo & Report	Week 7-8

10. Roles and Responsibilities

Hemant(Designing + Hardware + AI&MI + Open CV)

Mehebub(Hardware + Electronics + Mechanics)

Suvendoo(Research+Coding+Communication)

11. Estimated Budget

50 - 90K

12. References (if any)

[WanderB-VTOL](#)

13. Approval Section (for you/faculty)

A simple section for mentor or club lead signature:

Approved / Not Approved

Comments: _____

Signature: _____