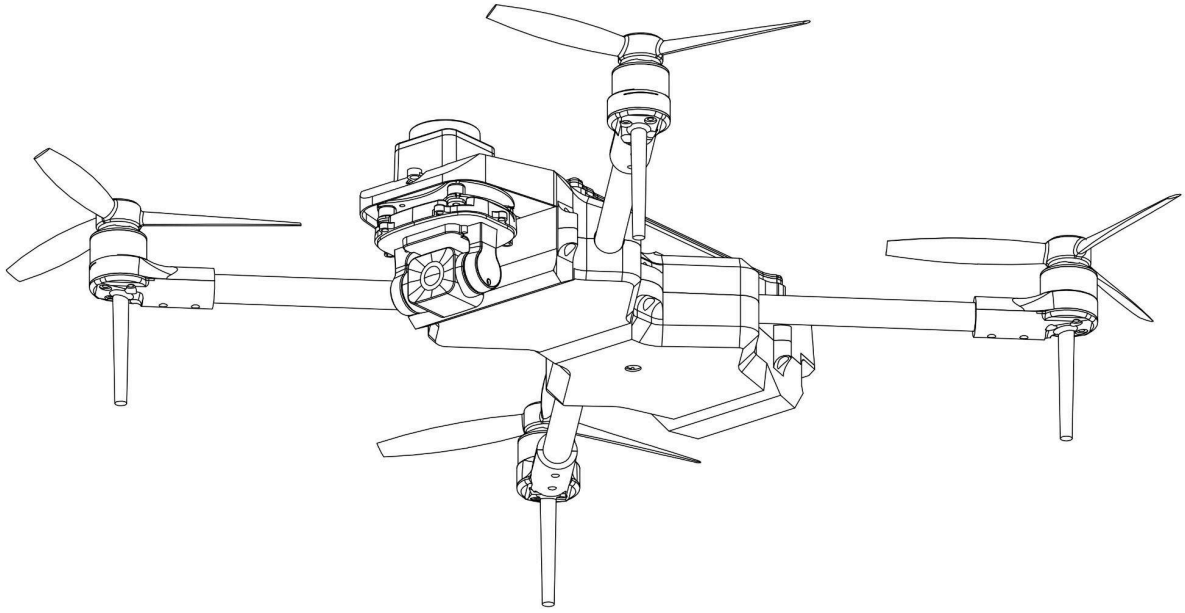
iDronam Suparna

User Manual v1.2 *Jan 24, 2024*



MENTHOSA

SOLUTIONS

💡 Searching for Keywords

Search for keywords such as “battery” and “install” to find a topic. Press Ctrl+F on Windows or Command+F on Mac to begin a search.

💡 Printing this Document

This document supports high resolution printing.

Revision Notes		
v1	01-Jan-2024	Initial Version
v1.1	14-Jan-2024	Added Joystick Control
v1.2	24-Jan-2024	Added Operation Alt. Data

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Using this Manual

Legend

🛑Warning ❗ Important 💡Hints and Tips 📘Reference

Read Before the First Flight

Read the following documents before using the **Suparna**:

1. Disclaimer and Safety Guidelines
2. Quick Start Guide
3. User Manual

❗ It is recommended to watch all tutorial videos on the official Menthosa website and read the disclaimer and safety guidelines before using for the first time. Prepare for your first flight by reviewing the quick start guide and refer to this user manual for more information

🛑 The operating temperature of this product is 0° to 40° C. It does not meet the standard operating temperature for military grade application (-55° to 125° C), which is required to endure greater environmental variability. Operate the product appropriately and only for applications that meet the operating temperature range requirements of that grade.

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Content

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Product Profile

This section introduces **Suparna** and lists the components of the aircraft.

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Product Profile

Introduction

Suparna features both an 360 degree Laser Sensing System and Downward Vision Systems, allowing for hovering and flying indoors as well as outdoors and for automatic Return to Home. The aircraft has a maximum flight speed of 54 kmph in outdoor stable wind conditions and 15 kmph indoor environment (***This has been tested under controlled environment.*** 🛑 ***Do not attempt to imitate***) and maximum flight time of 18 minutes.

Aircraft Highlight

The **Suparna** represents a significant leap in unmanned aerial technology, offering a blend of high-speed connectivity, advanced navigation, and versatile functionality. This compact drone is designed for a variety of applications, from commercial and industrial use to recreational and research purposes.

- **5G Connectivity and Control**: Equipped with support for a 5G nano SIM, this drone ensures seamless operation through high-speed cellular networks. The 5G connectivity provides a robust link between the drone and its controller, ensuring real-time data transfer and remote control, even over long distances.

- **Dual Connectivity Options**: Apart from 5G, the drone also features Wi-Fi connectivity, allowing it to operate efficiently in both urban and remote areas. This dual connectivity ensures ubiquitous access and control, providing flexibility in various environments.

- **Advanced Processing Engine**: Powered by an onboard processor, the drone is adept at AI/ML analytics, making it suitable for applications that require real-time data

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processing, such as image analysis and environmental monitoring.

- **Autonomy and Navigation**: The drone boasts sophisticated autonomous capabilities like Visual Inertial Odometry (VIO) for accurate positioning, advanced path planning algorithms, and PX4 software for autonomous flight control. It also features GPS-denied navigation and Beyond Visual Line of Sight (BVLOS) capabilities, enhancing its utility in complex environments.

- **360-Degree Obstacle Avoidance** : With depth estimation and obstacle detection technology, the drone can navigate safely through challenging terrains. It employs mapping and Visual Obstacle Avoidance (VOA) systems to detect and avoid obstacles in all directions.

- **Payload Capacity**: Designed to carry payloads of 500g, this drone is suitable for a variety of tasks, including delivery, surveying, and equipment transport.

- **Outdoor Navigation System**: The inclusion of both GPS makes it reliable for critical missions.

- **Geo-Fencing**: This feature allows users to set virtual boundaries for the drone, ensuring it operates within predefined areas, enhancing safety and compliance.

- **High-Performance Sensors**: Equipped with sophisticated tracking and image sensors, the drone can capture high-quality images and videos, and efficiently track subjects or terrain features.

- **Connectivity and Ports**: The drone includes a 5G modem supporting the available 5G bands, an Ethernet/management port, and dual-band Wi-Fi-6, providing various options for data transmission and device management.

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This **Suparna**(5G-Enabled Mini Drone), with its advanced features and capabilities, is set to revolutionize the way we think about remote operations, surveillance, mapping, and a host of other applications in various sectors.

Purpose and Target Users

The **Suparna**, with its advanced technological capabilities, is an invaluable tool tailored for a diverse group of users, including students, trainee professionals, researchers, and faculty members across various disciplines. This drone's unique features make it an ideal fit for educational, professional training, and research environments.

1. **Students**: For students pursuing studies in fields such as engineering, robotics, environmental sciences, and cinematography, this drone serves as a practical learning tool. It offers hands-on experience in cutting-edge technology, including 5G connectivity, AI/ML analytics, and advanced navigation systems. Its user-friendly interface makes it accessible for beginners, while its advanced features provide a deeper learning opportunity for more advanced students.

2. **Trainee Professionals**: Aspiring professionals in sectors like surveying, urban planning, and emergency response can greatly benefit from training with this drone. The practical skills gained in operating and managing advanced drone technology are directly transferable to their respective industries. The drone's capabilities in obstacle avoidance, payload management, and high-speed data processing provide a real-world understanding of how unmanned aerial vehicles (UAVs) can be utilized in professional scenarios.

3. **Researchers**: For researchers, particularly in fields such as environmental monitoring, agricultural technology, and geographical mapping, the drone's advanced navigational

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technologies like VIO, GPS-denied navigation, and BVLOS offer new avenues for gathering data in inaccessible or challenging terrains. Its ability to carry payloads and advanced sensors enables detailed environmental data collection and analysis, crucial for scientific advancements.

4. **Faculty Members**: In an academic setting, faculty members can integrate this drone into their curriculum to provide students with insights into the latest technological advancements. It can be used for demonstrations, practical experiments, and even as a research tool to aid in academic studies and publications. The drone's versatility makes it an excellent resource for a wide range of academic disciplines.

Overall, the **Suparna** (5G-Enabled Mini Drone) is not just a piece of technology; it's a gateway to experiential learning, professional skill development, and groundbreaking research for its diverse range of users. It offers a unique combination of practicality, innovation, and educational value, making it a significant asset in the hands of students, trainee professionals, researchers, and faculty alike.

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Aircraft

This section introduces **Suparna** technical checklist.

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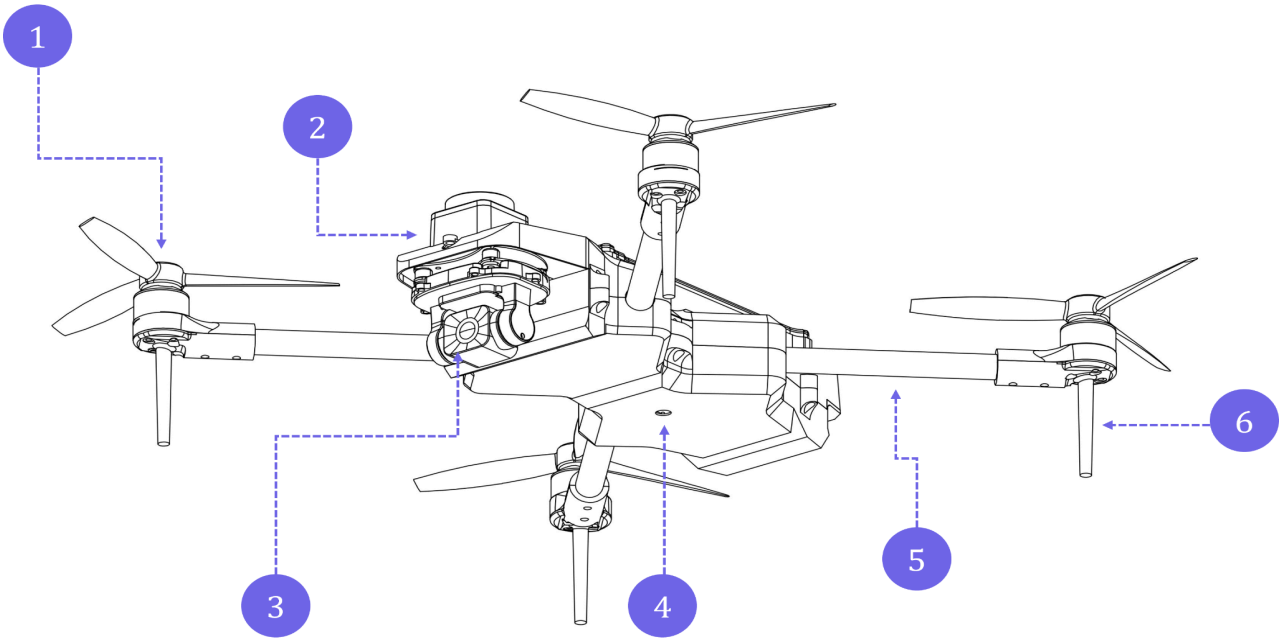
Aircraft

Aircraft Diagram



1: Propellers

2: 360 Lidar

3: Gimbal Camera

4: Downward Facing Vision System

5: Arms

6: Landing Gear

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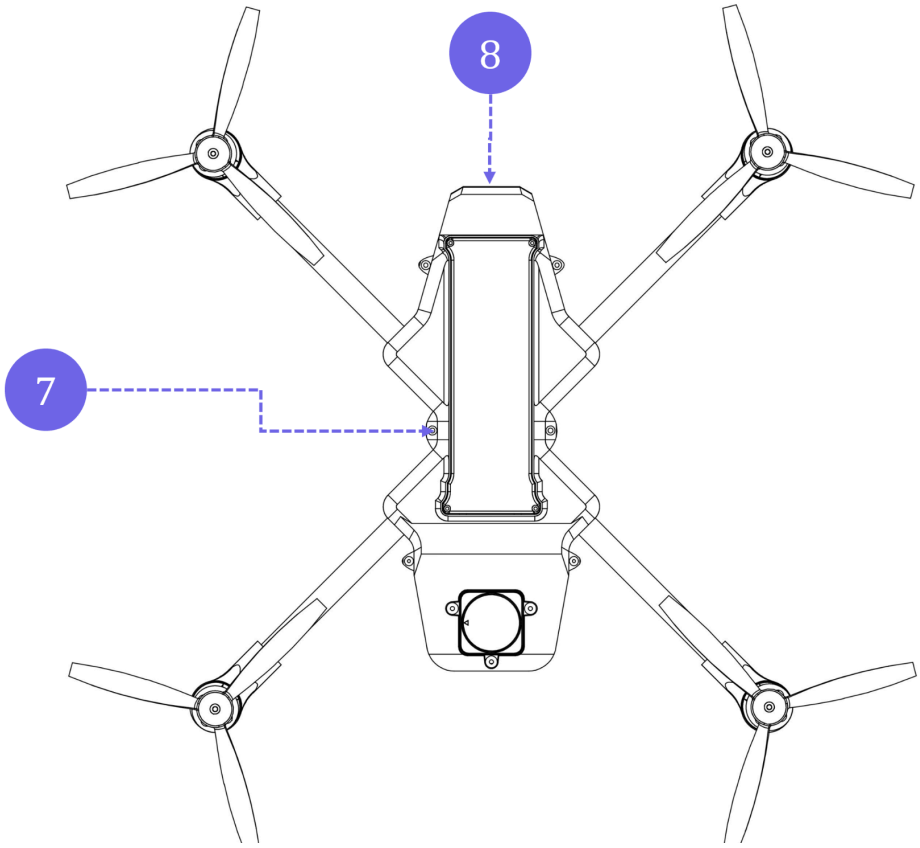

7: Removable Battery

8: GPS & External Compass

Aircraft Technical Specification

Drone Type	Quadcopter
Frame Material	Carbon Fiber
Size (Propeller to Propeller)	470mm
Weight	1300gm

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Extra Payload	500gm
Max Altitude-Outdoor	50 m AGL (🛑Check Local Rules and Regulation)
Max Operating Altitude	750 m AMSL
Failsafe Features	1. Low Battery 2. Critical Battery 3. Ground Station Connection Loss
Indoor Features	• 360 Degree Obstacle Avoidance System. • Vision Based Odometry • 10cm Precision for Indoor Altitude Hold. • Real Time Video Streaming. • Position Visualizations in 2D/3D Space. • ROS Support.
5G Features	• N78 Bands for Captive Networks. • 5G Compatible Specialized GCS.
Battery Type	Li-ion 4 Cell
Battery Capacity	4500mAh
Battery Charging/Discharging Cycle	300
Flight Time	18 Minutes
Cruise Speed	54 kmph (Outdoor) 15kmph(Indoor) (🛑 **Warning!** These Data have been recorded in a professional environment. ***Do not attempt to imitate.*** Always use and fly drones with utmost caution.*)*
Communication Channel	Internet - 5G with LTE Fallback Or WiFi:6
GCS	iDronam for Enterprise
GNSS	GPS

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Hovering Accuracy	Vertical: ±0.2 m (with Vision Positioning), ±1 m (with GNSS Positioning + Barometer) Horizontal: ±0.3 m (with Vision Positioning), ±1.5 m (with GNSS Positioning)
Operating Temperature	5° to 40° C
Vision Operating Environment	• Non-reflective, discernible surfaces with diffuse reflectivity of >20% • Adequate lighting of lux >15
Image Sensor (Default)	1/2.7 Inch, 2 MP effective resolution
FOV	Horizontal 160°
Controllable Pitch Angle	-90° ~ 25°

❗ Maximum flight time was tested in an environment with no wind while Hovering at a consistent point and the maximum flight speed was tested at sea level altitude with no wind. These values are for reference only.

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Safety First

This section introduces **Suparna** safety Procedure

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Safety Precautions

Safety Procedures

Operating a **Suparna** (5G-enabled mini drone) indoors requires careful attention to safety and precautionary measures to ensure both the operator's safety and the integrity of the drone. Here are some guidelines for the safe operation of the drone in indoor environments:

- **Pre-Flight Check**:
    - Inspect the drone for any damage or loose parts.
    - Ensure all software and firmware are up-to-date.
    - Check the battery level and ensure it's adequately charged.
    - Test the drone's sensors and navigation systems to ensure they are functioning correctly.

- **Environmental Awareness**:
    - Clear the area of people, pets, and fragile objects to minimize risk.
    - Be aware of the indoor space layout, including ceilings, walls, and any obstacles like furniture.
    - Avoid flying near air vents, as the airflow can affect the drone’s stability.

- **Control and Supervision:**
    - Always maintain a line of sight with the drone.
    - Do not rely solely on the drone's cameras or sensors; use visual supervision.
    - Keep the drone within a safe distance from the operator and bystanders.

- **Use of Safety Features:**
    - Utilize the drone’s obstacle avoidance systems to prevent collisions.

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- Engage geo-fencing features to limit the drone's operational area.
- Use the drone's autonomy features wisely, especially in confined spaces.

- **Speed and Height Management:**
  - Operate the drone at lower speeds to maintain control.
  - Avoid flying too close to the ceiling or too low to the ground to prevent crashes.

- **Interference Considerations**:
  - Be aware of potential Wi-Fi or electronic interference in indoor environments that might affect drone control.
  - Test the 5G and Wi-Fi connectivity in the indoor area before flying.

- **Emergency Procedures:**
  - Familiarize yourself with the drone's emergency stop function
  - Have a clear plan for what to do in case of a loss of control or other emergencies.

- **Training and Skill Level:**
  - Ensure that the operator is adequately trained to handle the drone indoors.
  - Practice in a safe, controlled environment to build skill and confidence.

- **Legal and Ethical Considerations:**
  - Abide by any institutional or organizational policies regarding drone usage indoors.
  - Respect privacy if the drone is equipped with cameras or recording devices.

- **Post-Flight Check:**
  - After flying, inspect the drone for any damage.

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- Download and analyze any collected data if necessary.
- Store the drone in a safe, dry place away from potential hazards.

By adhering to these guidelines, operators can safely and effectively utilize the 5G-enabled mini drone in indoor settings for various applications, while minimizing risks and ensuring the longevity of the device.

❗ Vision Systems have limited ability to sense and avoid obstacles, and the performance may be affected by the surrounding environment. Make sure to maintain visual line of sight with the aircraft and pay attention to prompts in iDronam App.

❗ (**Warning**)The Vision Systems cannot work properly over surfaces that do not have clear pattern variations.

The Vision Systems cannot work properly in any of the following situations. Operate the aircraft cautiously.

- Flying over monochrome surfaces (e.g., pure black, pure white, pure green).
- Flying over highly reflective surfaces.
- Flying over water or transparent surfaces.
- Flying over moving surfaces or objects.
- Flying in an area where the lighting changes frequently or drastically.
- Flying over extremely dark (< 10 lux) or bright (> 40,000 lux) surfaces.
- Flying over surfaces that strongly reflect or absorb infrared waves (e.g., mirrors).
- Flying over surfaces without clear patterns or texture.
- Flying over surfaces with repeating identical patterns or textures (e.g., tiles with the same design).
- Flying over obstacles with small surface areas (e.g., tree branches). Keep the

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sensors clean at all times.

- DO NOT tamper with the sensors. DO NOT use the aircraft in dusty or humid environments.

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Battery Handling

This section introduces **Suparna** Battery Handling Guidelines

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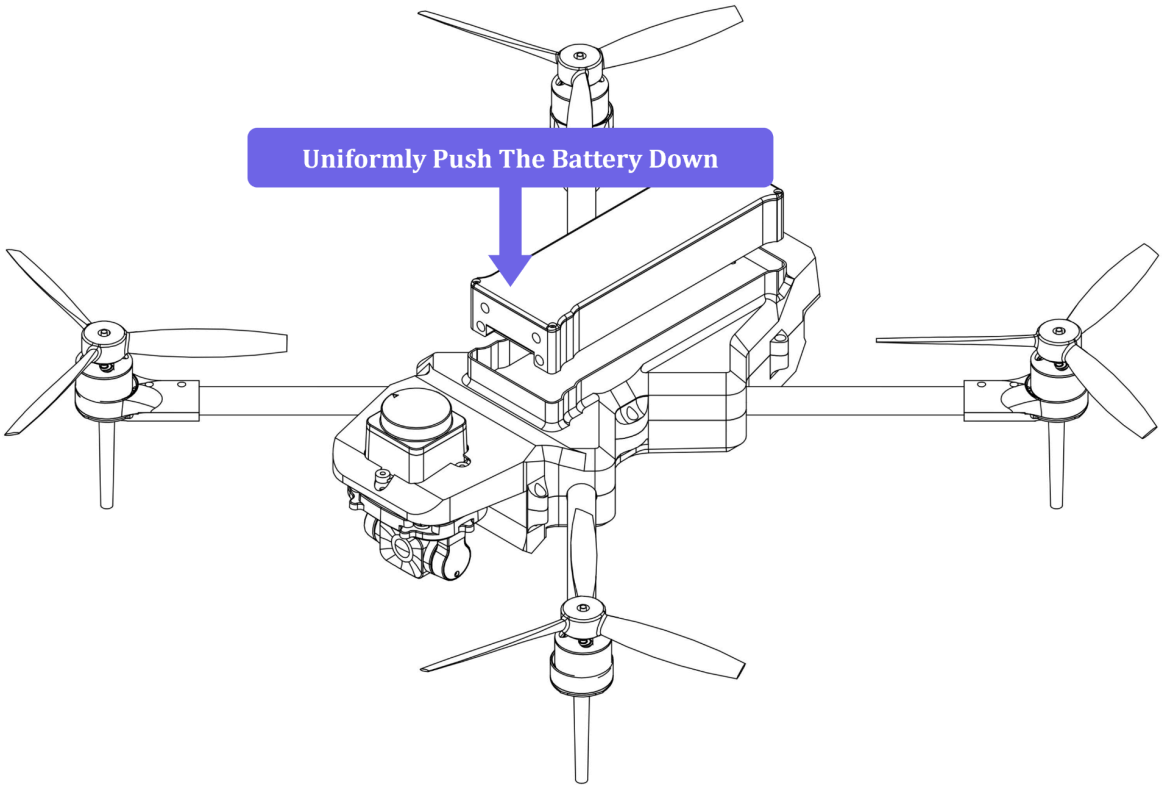
Battery Handling

Battery Installation



Handle with Care

Battery handling and storage are critical for maintaining the safety and longevity of the 5G-enabled mini drone. Proper care of the drone's batteries ensures optimal performance and reduces the risk of accidents. Here are detailed instructions for handling and storing the drone's batteries:

- **Charging the Battery:**
    - Use only the charger provided with the drone or one recommended by the

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manufacturer.

- Charge the battery in a well-ventilated area away from flammable materials.
- Do not leave the battery unattended while charging.
- Avoid charging the battery immediately after flight. Allow it to cool down first.

- **Handling the Battery**:
  - Handle batteries with care. Avoid dropping them or subjecting them to impact.
  - Do not dismantle, puncture, or alter the battery in any way.
  - Keep the battery dry and away from water or moisture.
  - Avoid exposing the battery to extreme temperatures, both hot and cold.
  - If the battery appears swollen, discolored, or damaged in any way, do not use it.

- **Storage of the Battery:**
  - Store batteries in a cool, dry place, away from direct sunlight and heat sources.
  - If storing for an extended period, keep the battery at a 40-60% charge level. Avoid storing it fully charged or fully depleted.
  - Check the charge level every few months and recharge to the recommended storage level if necessary.
  - Use a fireproof bag or container designed for LiPo battery storage.

- **Transporting the Battery:**
  - When transporting, ensure the battery terminals are protected and cannot come into contact with metal objects.
  - Carry batteries in a dedicated, fireproof battery case.
  - Follow any specific regulations for transporting batteries by air or other

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means.

- **Battery Disposal:**
    - Do not dispose of batteries in regular trash. Batteries should be recycled according to local regulations.
    - If the battery is damaged, follow local guidelines for hazardous waste disposal.

- **General Precautions:**
    - Never use a battery that is not specifically designed for your drone model.
    - Keep batteries out of reach of children.
    - Regularly inspect the battery for signs of wear or damage.

By following these guidelines, users can ensure the safe operation and extended life of their drone batteries. Proper battery care is not only a matter of performance but also a critical aspect of operational safety.

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Flight

This section introduces **Suparna** safe Flight guidelines.

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Flight

Flight Environment Requirements

- Do not use the aircraft in severe weather conditions including wind speeds exceeding 8.0 m/s, snow, rain, and fog.
- Tall structures and large metal structures may affect the accuracy of the onboard compass and GNSS system.
- Flying indoors flying do not force aircrafts to go through sharp turns. Have at least 4m*4m clearance from all sides.
- It is recommended to keep the aircraft at least 8 m away from structures.
- Avoid obstacles, crowds, high voltage power lines, trees, and bodies of water.
- It is recommended to keep the aircraft at least 10 m above water.
- Minimize interference by avoiding areas with high levels of electromagnetism such as locations near power lines, base stations, electrical substations, and broadcasting towers.
- Aircraft and battery performance is subject to environmental factors such as air density and temperature. Be careful when flying (5,000 m) or more above sea level, since battery and aircraft performance may be reduced.
- Aircraft cannot use GNSS within the polar regions. Use the Downward Vision System when flying in such locations.
- If taking off from a moving surface, such as a moving boat or vehicle, fly with caution.

Flight Limits

When GNSS is Available

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Max Altitude	100m (Subject to Flying Permission)
When GNSS is not available and Downward Facing Vision System is used	
Max Altitude	20m

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JOYSTICK

This section introduces **Suparna**'s Controlling System

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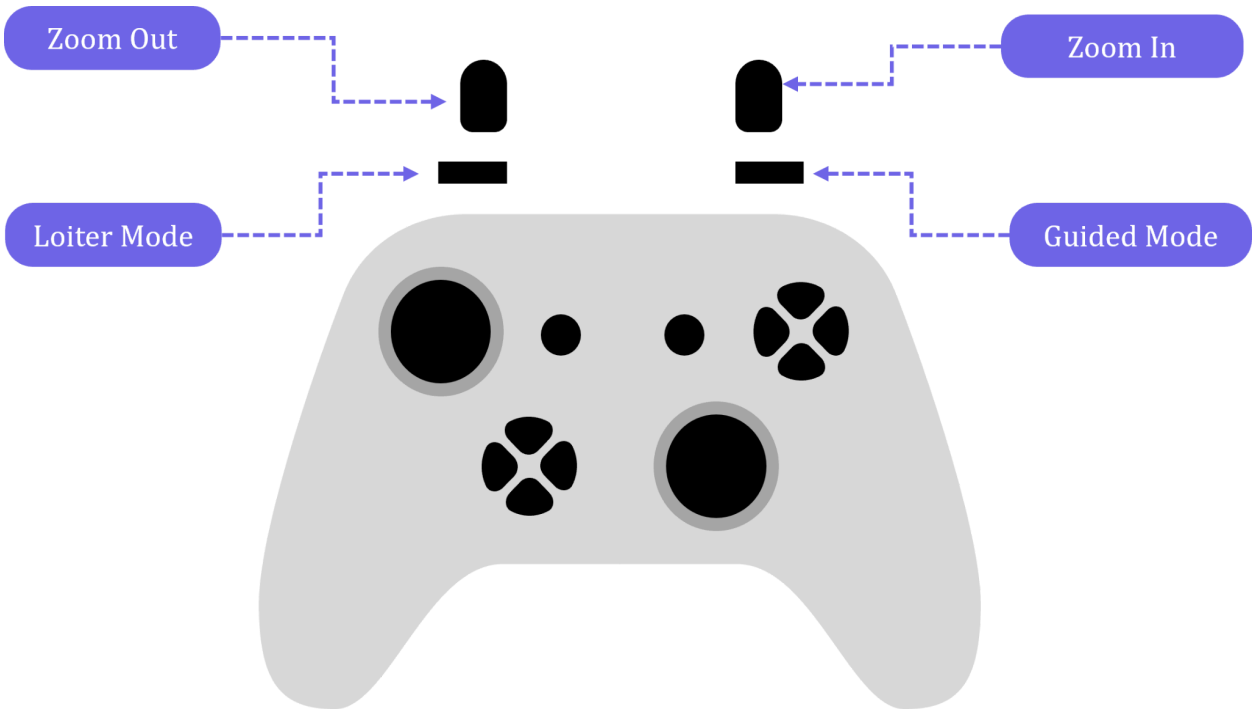
Joystick

Joystick - Modes and Zoom



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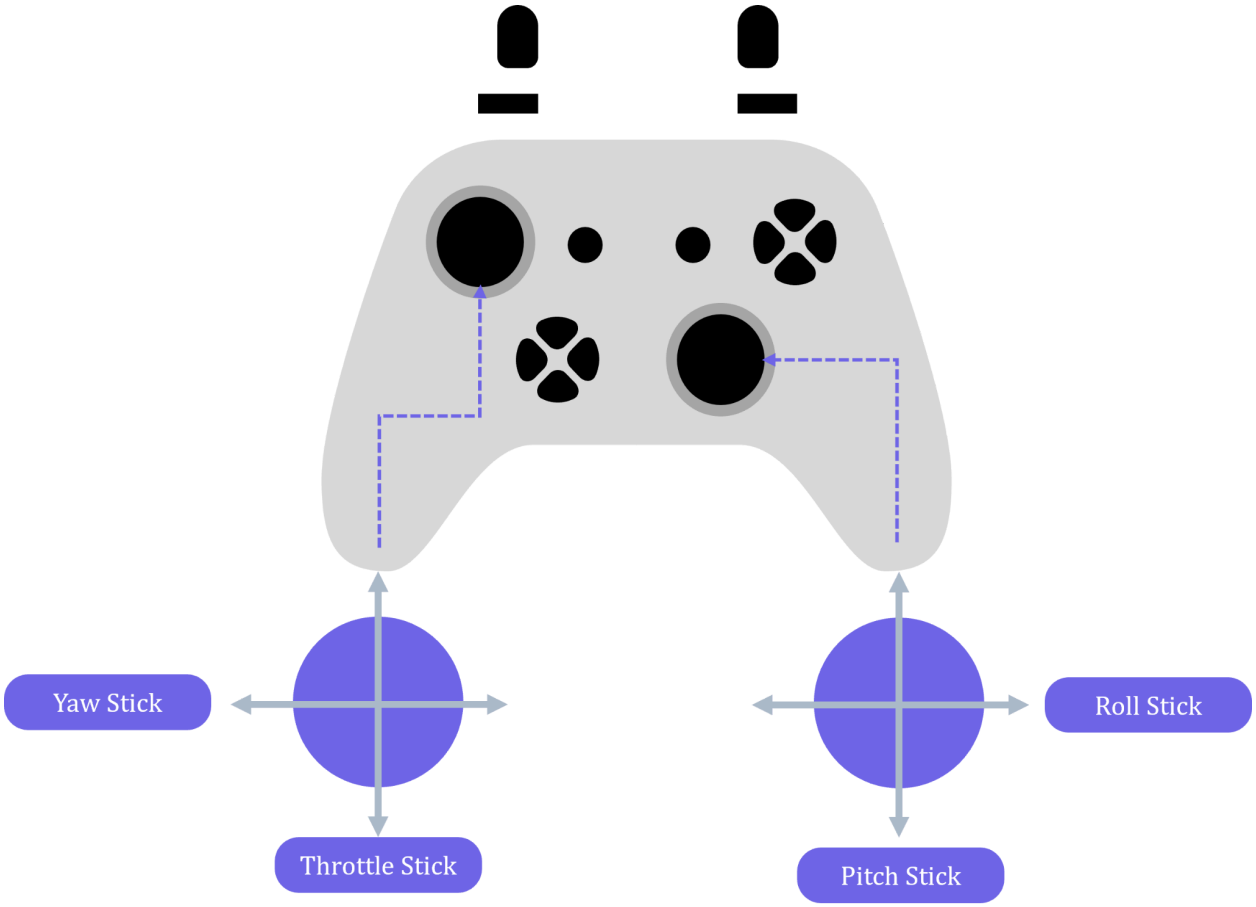
Joystick - Sticks and Control



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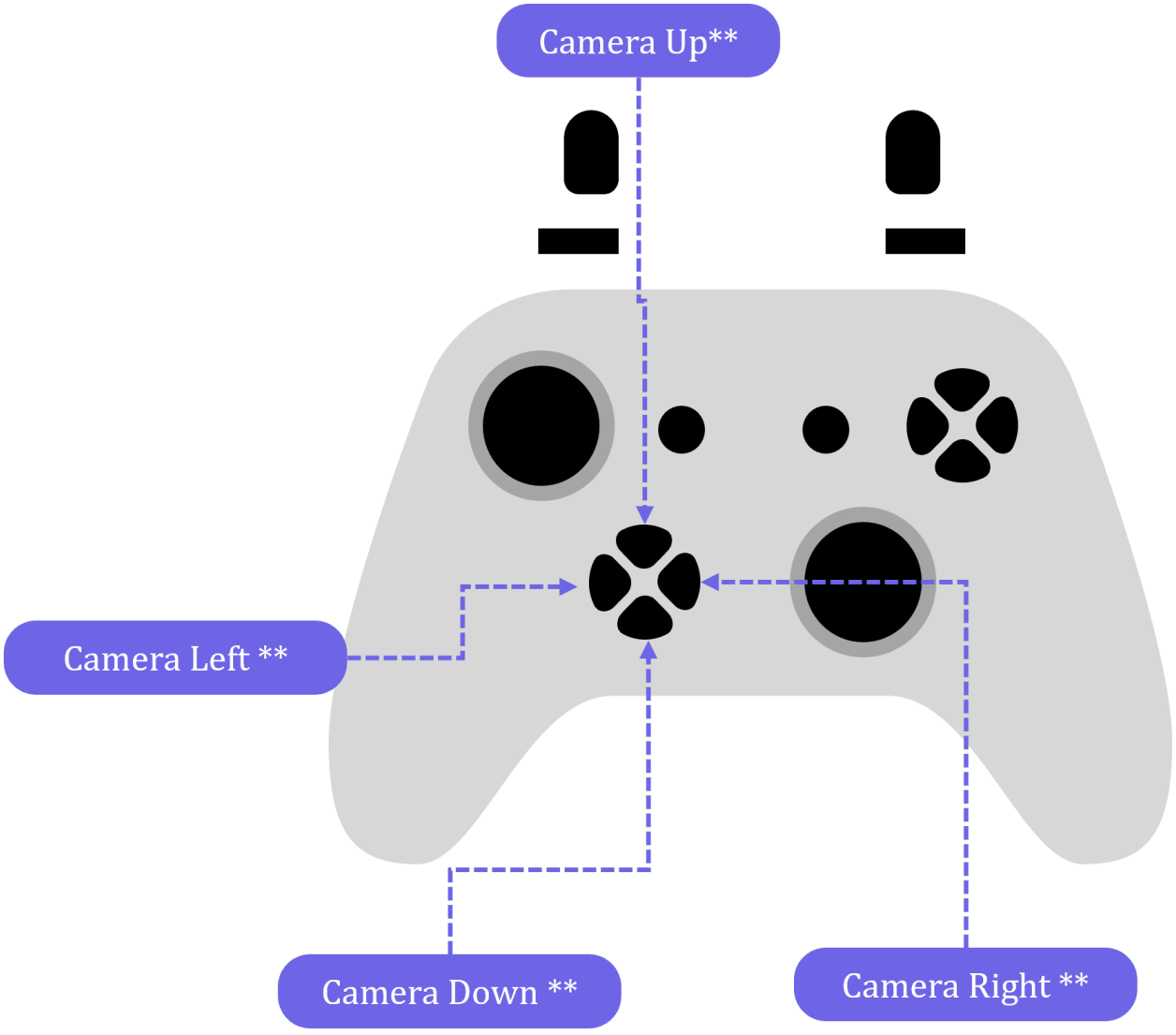
Joystick - Camera Control



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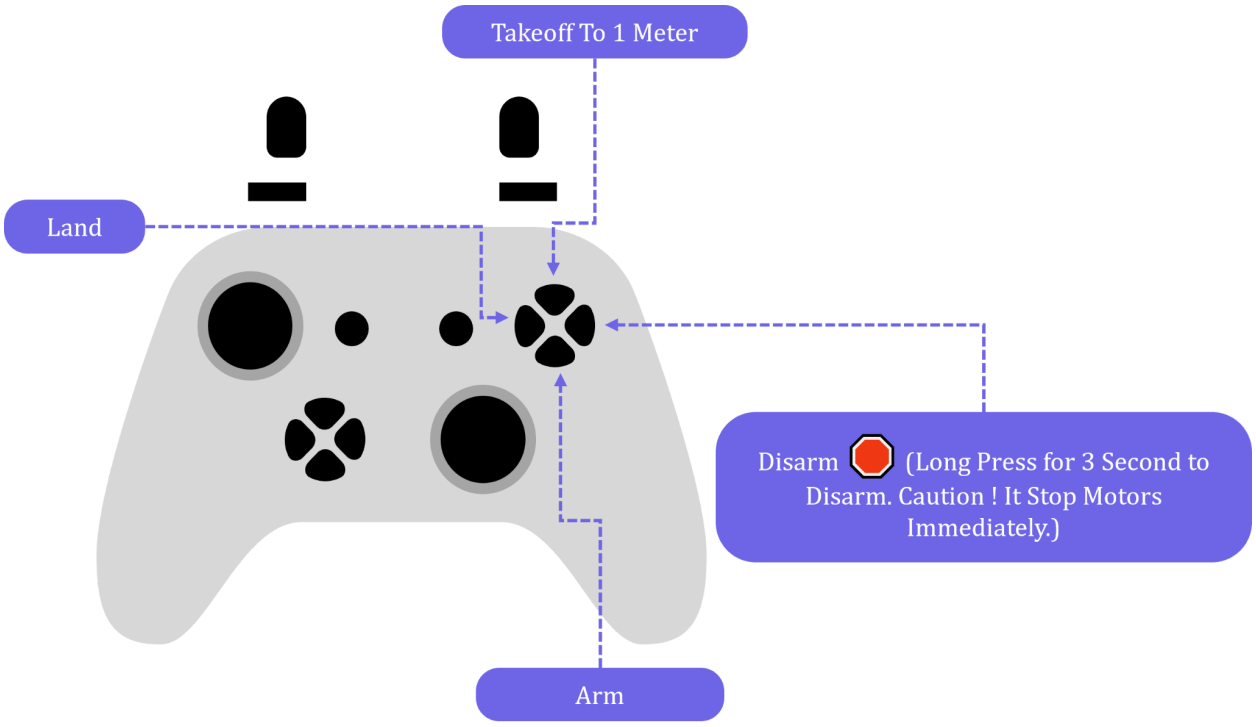
Joystick - Command and Special Modes



** Available with only selected Model.

: Use with caution

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