

# GARUDA AEROSPACE PVT LTD

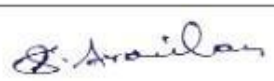
## USER EDUCATIVE MATERIAL

## VERSION3.0

## VOLUME-01

## DATE OF DOCUMENT-17.04.2024

## VERSION CONTROL

| | | |
|---|---|---|
|  |  |  |
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| DESIGNATION: UAV ENGINEER | DESIGNATION:PRODUCTION MANAGER | DESIGNATION: EXECUTIVE DIRECTOR |

## AMENDMENT TABLE

| DATE | AMENDMENT | PAGE NO | DONE BY |
|---|---|---|---|
| 08-12-2023 | Battery Maintenance | 36 | Divya shree R |
| 29-12-2023 | Tank Filling | 45 | Divya shree R |
| 17-04-2024 | Labelling part of UAS, Antenna angle of Sky section | 16, 25 | Divya shree R |

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# 1 ABOUT GARUDA

Garuda Aerospace is a human-centric brand that is focused on developing low-cost drone solutions to optimize industries through accurate data. At our core, we're a Drone-As-A-Software aggregator that designs impeccable drones for a myriad of human and industrial needs. We pride ourselves on the impactful intelligence our drone solutions have to offer. Having only started in 2015, we've already made a significant mark on the drone industry.

Garuda Aerospace received national and international recognition for its success in the drone sector. We are one of India's top 3 enterprises. We've received an NRDF Award for Bravery for the support we provided to the Indian forces in the Uttarakhand Glacier disaster. We were featured on the United Nation's top ten socio-economic innovations of 2016. Tesla founder, Elon Musk liked a tweet showcasing the abilities of our Solar Panel cleaning drone. Garuda Aerospace has helped position India on the global technological map.

Garuda Aerospace Pvt Ltd, a promising Drone start-up company in India values quality at the top-priority in all verticals like manufacturing, assembly, sales and marketing, service and maintenance, operations, training and Research and Development.

Garuda Aerospace focuses on the design, building and customization of unmanned aerial vehicles (UASs) or drones for various applications. Catering to diverse needs such as Agricultural Survey, Mapping, Reconnaissance and Surveillance Garuda Aerospace meets the customer's requirements with precision.

The Garuda team consists of enthusiastic and dynamic engineers, who have a comprehensive approach towards design and development, thereby, making them well, knit. The engineers in the team experiment with new designing methodologies that can be incorporated in future projects.

Garuda Aerospace is an International Standard certified company in ISO9001:2015 and AS9100 for Aerospace Quality Management Systems. Garuda Aerospace envisions itself to be the finest commercial UAS design, Development, Service and Support Organization in India.

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# 2 SAFETY REQUIREMENTS

## 2.1 General

The Operator must read this manual and understand the systems and operations of the RPA. The operator is responsible for any direct or indirect consequences that can result from its use. The operator must operate the RPA for the approved purposes that are given by government regulatory bodies and must follow the local and airspace rules and regulations. This manual includes the information about safety requirements, handling, transportation, RPAS specifications, component functions, mobile application usage and field operations. Follow all the notes, warnings, and cautions given in this manualto prevent accidents or incidents.

1. GA-AD-V2 RPA is an Agri drone, multi-rotor aircraft, and the configuration is Hexa copter UAS. RPA must be operated with standard procedures, as incorrect handling can cause damage to property, serious personal injury, or death.
2. Person fly RPA must have RPTO certificate. Only trained and certified personnel must handle, operate, or maintain the RPA.
3. Without proper training and approval, no personnel must not operate or handle the RPA.
4. Always obey the Drone rules and regulations to operate the RPA.
5. Always follow the SOP and guidelines given by the OEM, MoA and government bodies for RPA operations and pesticide usage.
6. Marking of the area shall be the responsibility of the operators.
7. RPA must be operated in the Visual Line of Sight (VLOS).
8. Follow maintenance schedules, contact the service provider/OEM for any maintenance, repair, overhaul, and troubleshooting activities.

## 2.2 Personnel Safety:

1. During spray activities, operation team personnel must wear personal protective gears (e.g., PPE, Full sleeve, goggles, mask, hand gloves, Gumboots and helmet).
2. Personal protective gears prevent the personnel from direct contact of pesticide. If any personnel exposed to chemical or pesticide, use water and soap to wash the hands, face, and the exposed partsof the body.
3. Contact the doctor immediately if any of the following symptoms you observe:

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1 Running nose.

2 Skin discomfort or burning sensation.

3 Drowsiness.

## 2.3 Environmental Considerations:

1. Spray missions shall be conducted in moderate weather conditions, temperatures ≤ (less than or equal to) 50° C (95° F), humidity > (greater than) 50%, wind speed < (lessthan) 21 kmph.
2. Make sure that sky is clear. Do not power ON RPA in rain.
3. Make sure that your operations do not violate any applicable laws or regulations, andthat you have obtained all appropriate before authorizations.
4. Do not operate RPA indoor.

## 2.4 Operational Safety Measures:




Figure 1: Drone Zones

1. Check and confirm for Green, Yellow and Red zones, obtain for permissions ifflight operations do not come in Green zones.
2. Do not go near to the RPA when it is prepared for take-off (in armed state) or when themotors are rotating.
3. It's Pilot's responsibility to maintain a safe distance of minimum 10 m from RPA for both pilot and other persons from take-off point, spray mission area. Intimate the safety guiltinessat each flight.
4. Confirm a place for take-off, landing and payload mixing operations.

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1. Calibrate the RPA spray system to ensure nozzle output and accurate application oflabelled rates. Make sure there is no leak in the spay system.
2. Set up the least buffer zone between drone treatment and the non-target crop. Set upwarning sings in the spray area.
3. The Maximum Take-Off Weight (MTOW) of the RPA must not exceed, refer specificationsection of this manual for MTOW value.
4. Make sure that the payload filled is as per the OEM permitted limit.
5. Do not use personal mobile and attend or receive phone calls during flight.
6. If there is a low battery warning, land the RPA at a safe location.
7. Do log your flights and intimate concerned authorities (local police etc.) of Anyincidents/accidents, contact service provider/OEM.
8. Do not fly the RPA over group of people, public events, government facility/militarybases or over/near any no-Drone zones, private property unless permission is given.
9. Do not drop or carry any hazardous materials using drone.

## 2.5 Pesticide Usage:

1. Residue on the equipment caused by splashes or spills when pouring and mixing the pesticide can irritate your skin. Wear protective clothing (PPE) to prevent direct body contact with the pesticide.
2. Flush your hands and skin after handling pesticides.
3. Use clean water to mix the pesticide and filter the mixed liquid before pouring into the spraytank to avoid blocking the nozzle. Clear any blockage before using the equipment.
4. Operation team shall always stay at the downwind end of the field and backlight direction.
5. Timely evacuate and transfer to fresh air. Take shower put on clear clothes.
6. Triple rinse of empty container is mandatory.
7. Make sure waste generated is kept to a minimum; the disposal must conform to the locallaws. Never burn or bury hazardous waste. Never leave empty containers in the field.

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# 3 INTRODUCTION

The Garuda Agri Drone is a multi-rotor drone specially designed for agricultural applications ina variety of environments and terrains, including fields, forests and a variety of other landscapes. It is dustproof and made of carbon fiber, which features a lightweight and high strength.

The drone is built with a flight controller which offers top-class stability, the easiest modes andmaneuvers with its dual CPU configuration and triple redundant backup. The combination of terrain following sensor obstacle-avoidance greatly enhances the drone path by avoiding obstacles and
following the terrain. The drone consists of 4 flat jet nozzles and FPV camera.

The drone is provided with ample space to install a lot of equipment such as battery, GPS, flightcontrol system, power distribution, obstacle avoidance and data transmission system and all other electrical connections. Also, the new water-saving nozzles could save the pesticide and improve the efficiency of spraying at the same time and prevent the liquid sloshing during flight.

## 3.1 Maintenance Safety Measures:

1. Follow the OEM maintenance manual to do RPA repair and maintenance activity.
2. In case of fire, it is recommended to use only powder-based fire extinguishers.
3. Disconnect the battery from the charger when smoke or fire detected during charging.
4. Maintain the logs for all maintenance repairs and overhaul activities done on the RPA.

## 3.2 Drone Images



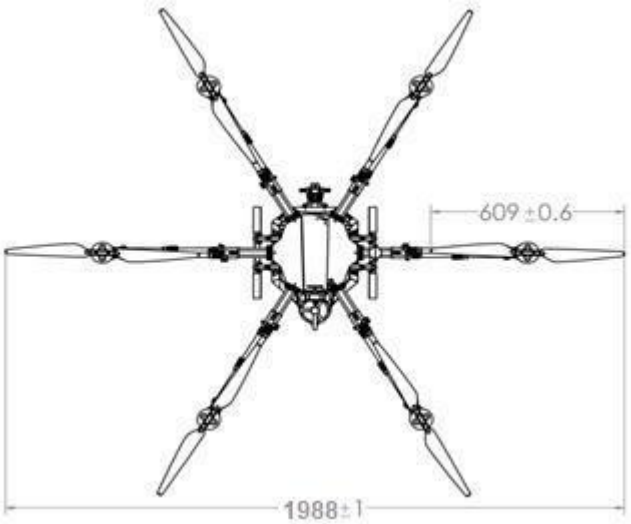
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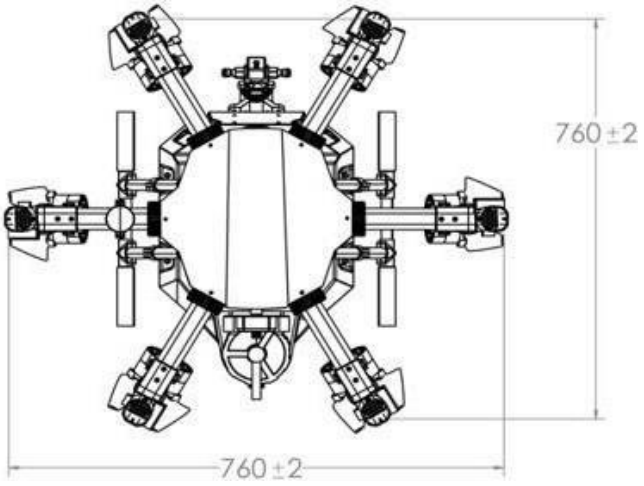
(a)



(b)




(c)




(d)

Figure 2: (a) Top view of the drone, (b) Top view of the drone with folded arms, (c) Top view drawing (All dimensions in mm), (d) Top view drawing of the drone with folded arm (All dimensions in mm)

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Figure 3: Front view of the drone

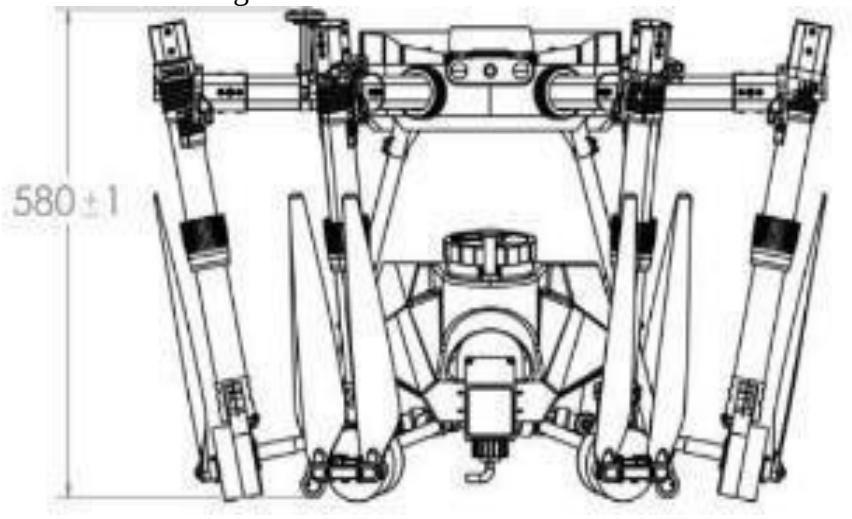



Figure 4: Front view drawing (All dimensions in mm)

### 3.3 Specifications of GA-AD-V2

| Parameter | Details |
|---|---|
| **Manufacturer's Name** | GARUDA AEROSPACE PVT LTD |
| **RPAS Model No.** | GA-AD-V2 |
| **Description** | The GA-AD-V2 is a Small Category Agri drone, multi-rotor aircraft, and the configuration is hexacopter, specially designed for agricultural applications in variety of environments and terrain, including fields and a variety of other landscapes. |

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| | |
|---|---|
| | The drone has a variable payload capacity of 8 litres for spraying of Pesticides & Insecticides. |
| **RPA Details** | |
| RPA Category | Small |
| RPA Type | HEXACOPTER |
| Maximum all-up-weight (including payload) in kg | 24.90 KG |
| Overall dimensions (l × b × h) in mm | 1988 × 1804 × 580 |
| **PAYLOAD DETAILS** | |
| Details of each Compatible Payload (including Manufacturer Name, Payload Specifications with Model No., Intended Applications) | Maximum payload up to 8 L |
| Variable Load/Consumables (Like fluid etc., if any) | Variable payload, Water, Pesticides, Fertilizers |
| **OBSTACLE AVOIDANCE SENSOR** | |
| Product Size | 67.5 × 66 × 16.5 mm |
| Weight | 80 g |
| Center Frequency | 24.125 GHz |
| Range | 3.1–15 m |
| Accuracy | 0.1 m |
| Frequency | 40 Hz |
| Power Consumption | 3 W |
| Working Voltage | 9–28 V |
| Output Interface | CAN |
| **TERRAIN SENSOR** | |
| Product Size | 82.4 × 74.2 × 20 mm |
| Weight | <50 g |
| Center Frequency | 24.125 GHz |
| Altimetry Range | 0.3–15 m (Relative to the ground) |
| Altimetry Accuracy | 0.05 m |
| Output Frequency | 50 Hz |

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| | |
|---|---|
| Power Consumption | 1.5 W |
| Working Voltage | 6–28 V |
| Working Temperature | -20°C to 85°C |
| Output Interface | CAN |
| **REMOTE PILOT STATION** | |
| Ground Control Station Model No. | H-12 |
| GCS App. Version | Garuda 1.0 |
| **C2 LINK** | |
| Equipment Details | H-12 |
| Frequency Band | 2402–2480 MHz |
| ETA issued by WPC Wing, DoT | Yes |
| **PERFORMANCE DETAILS** | |
| Maximum Endurance (min) | 15 mins |
| Maximum Range (in m) | 1500 m |
| Maximum Speed (in m/s) | 5 m/s |
| Maximum Height Attainable / Maximum Ceiling Height (in m) | 3000 m |
| Operating Altitude (in m) | 25 m |
| Operational Envelope | Altitude: 25 m AGL; Range: 1500 m; Wind Speed: 7 m/sec; Drone Speed: 5 m/sec |
| Engine Limits (Maximum RPM) / Max. Battery Temperature (in °C) | 6280 RPM / Up to 50°C |
| Propeller Limits | 6280 RPM, 2388 (23 inches, 8.8 pitch) |
| **DOCUMENTS / MANUALS IN BOX** | |
| Remotely Piloted Aircraft Flight Manual / Manufacturer's Operating Manual (as applicable) | Yes |
| Manufacturer's Maintenance Guidelines (as applicable) | Yes |
| Maintenance Inspection Schedule / Overhaul Interval | Yes |
| Maintenance Log Book | Yes |
| Flight Log Book | Yes |

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| | |
|---|---|
| User Guide / Self-Explanatory Information Booklet for End Users | Yes |
| **INTENDED APPLICATIONS** | |
| Intended Applications | Spraying water, fertilizers, insecticides |

# 4 GENERAL EXPLANATION OF THE RPA

## 4.1 Labelling Parts of the UAS

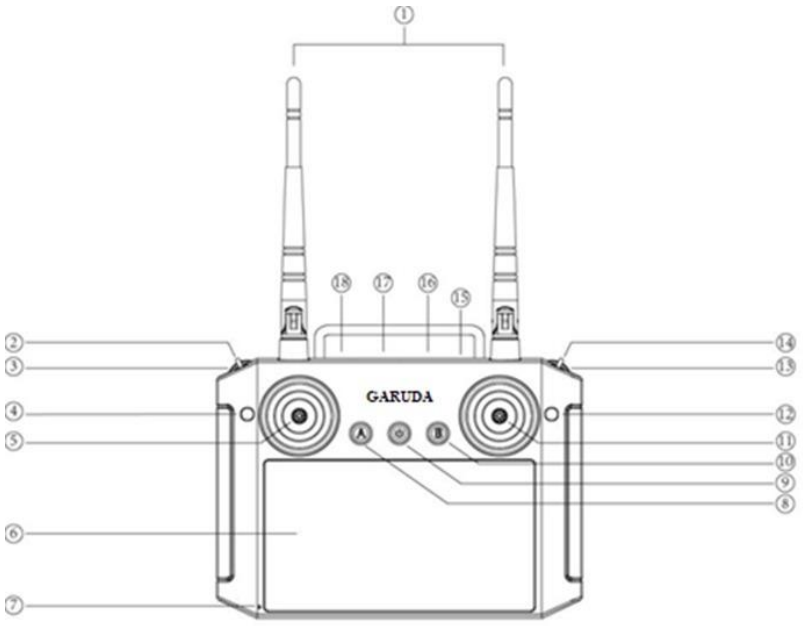



Figure 5: Labelling Parts of the UAS

## 4.2 Remote Control Station

1. H-12 transmitting system is applied with upgraded bidirectional 2.4GHz spread-spectrumtechnology.
2. The maximum control range can be 4km (unobstructed, free of interference).
3. H-12 transmitter and its receiver are linked by a unique matching code, and the enhanced anti-interference ability supports multiple transmitters working in stability synchronously.

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| Number | Annotation | Number | Annotation |
|---|---|---|---|
| 1 | 2.4G 3dB antenna | 10 | Button B |
| 2 | Toggle 3 positions switcher E | 11 | Stick X2、Y2 |
| 3 | Thumbwheel switch G | 12 | Button D |
| 4 | Button C | 13 | Thumbwheel switch H |
| 5 | Stick X1、Y1 | 14 | Toggle 3 positions switcher F |
| 6 | 5.5inch screen | 15 | Speaker |
| 7 | MIC port | 16 | SIM card slot |
| 8 | Button A | 17 | Charging port |
| 9 | Power switcher | 18 | PPM output |

Figure 6: Remote Control Station

### 4.3 GSM details

## 4.3.1 Introduction

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 megahertz (MHz) or 1,800 MHz frequency band.

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### 4.3.2 GSM Security

GSM offers several security using confidential information stored in the AUC and in the individual SIM.

The SIM stores personal secret data and is protected with a pin against unauthorized use.

### 4.3.3 Advantages of GSM

- Compatibility: GSM is widely used around the world, so it is compatible with many different networks and devices.
- Security: GSM offers enhanced security features such as authentication, encryption and confidentiality, which helps to protect the user's privacy and data.
- Efficient use of bandwidth: GSM uses a time-division multiplexing (TDM) technique whichenables many users to share the same frequency channel at different times, making it an efficient use of the available bandwidth.
- Roaming: GSM allows users to roam internationally and use their mobile phones in other countries that use the same GSM standard.
- Wide range of features: GSM supports a wide range of features, including call forwarding,call waiting, voicemail, conference calling, and more.

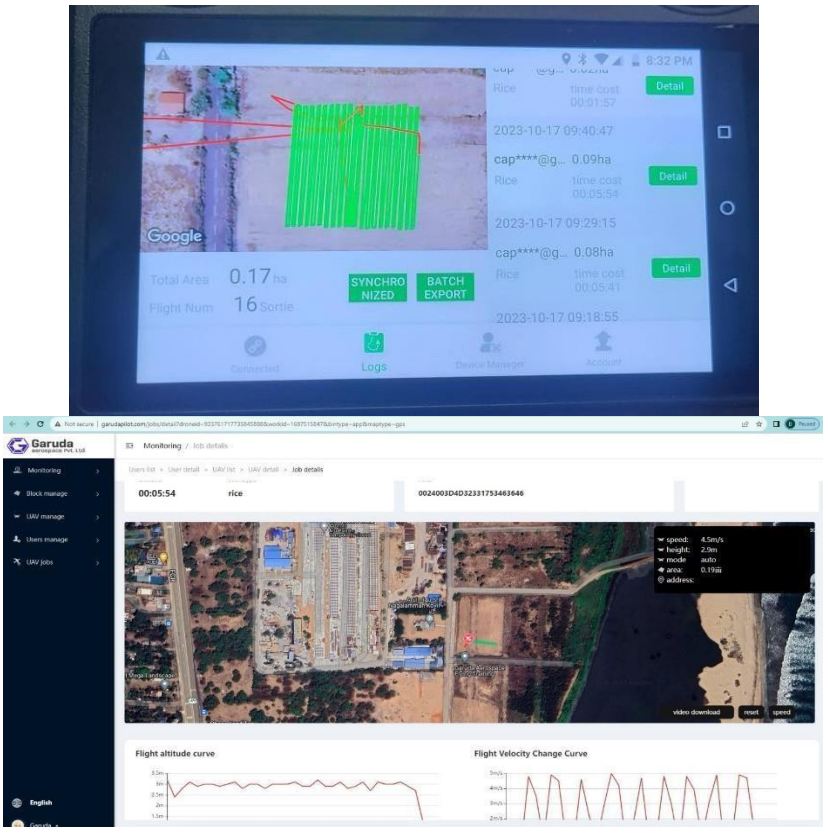
### 4.3.4 Purpose of GSM in UAS

The GSM is used to communicate and control the UAS. In this technique, the user will give command to the UAS from an Android application. The GCS receives the data from the flight controller. This data should be stored in the server for usage. The GSM technology facilitates this transfer of data to the server. This data is now accessible to the user for flight data.

### 4.3.5 GSM details:

In essence, the integration of GSM connectivity and the use of micro SIM cards in agricultural drones represent a powerful technological advancement in modern farming. These capabilities enhance the efficiency, productivity, and sustainability of agricultural practices by providing real-time insights and remote control over drone operations,ultimately leading to more informed and data-driven decision-making in the field

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Screen shot images of GCS and Garuda Captain app

### 4.3.6 Garuda Captain app;

Through the GSM Sim card the drone is also tracked in terms of the GPS location and mapped to its FC ID. The web portal (http:garudapilot.com) will host the log of the drone along with its image and video captured by the RGB camera through the transmitter and Garuda Captain app.

### 4.3.7 Use of SIM card

The micro SIM card is used as the connectivity tool to establish, 4G connection between the transmitter and the web application. Through this connection, images and videos are transferred from the transmitter to the web application.

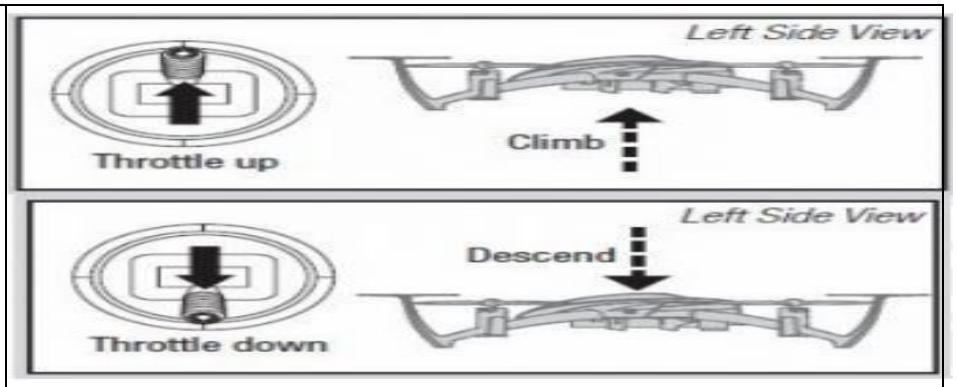
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GSM sim card slot in transmitter

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## 4.4 GCS CONTROLS

| | |
|---|---|
| THROTTLE |  |

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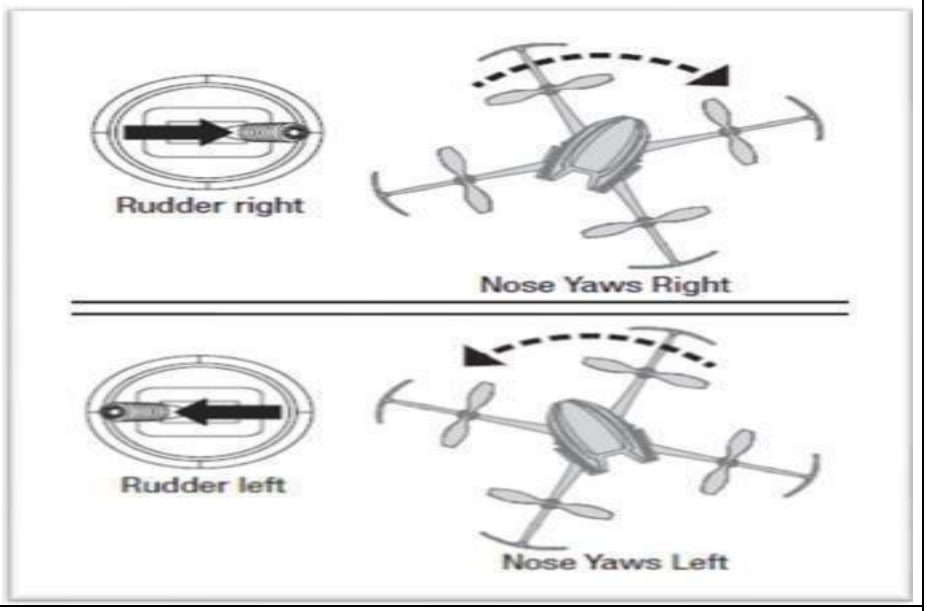
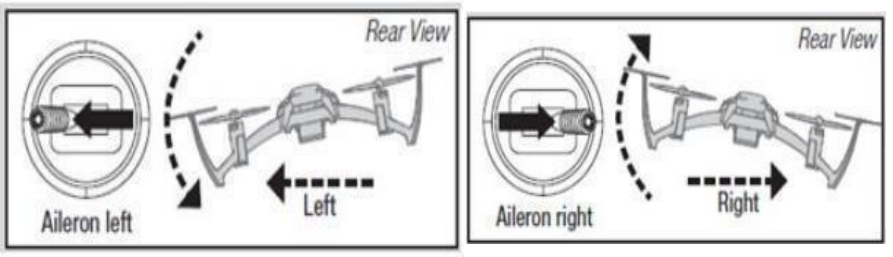
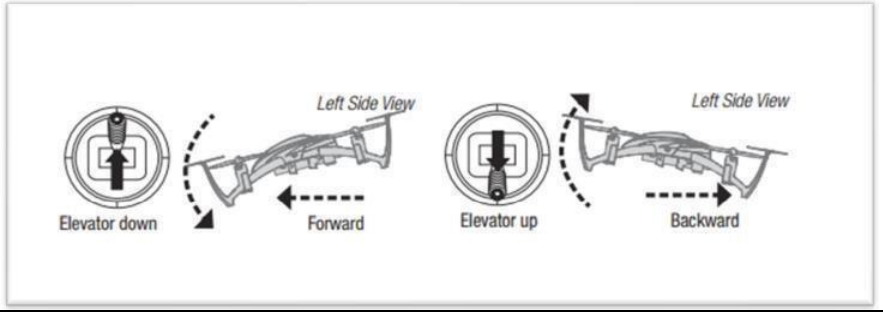
| | |
|---|---|
| YAW |  |
| ROLL |  |
| PITCH |  |

Figure 7: GCS Control Abbreviations

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## 4.5 How to Place Transmitter Antenna Right

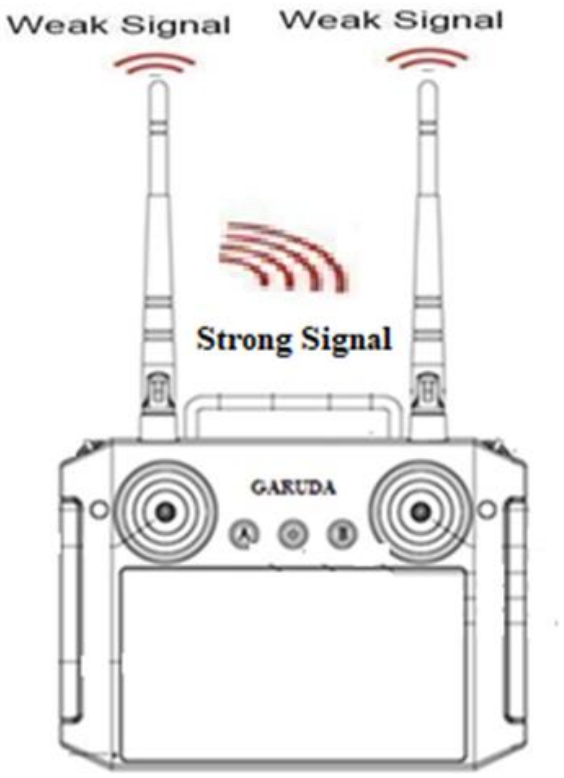



Figure 8: Avoid pointing antennas' upper end directly to your aircraft

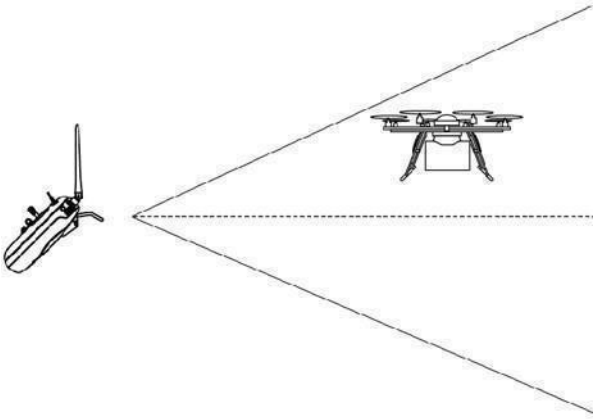
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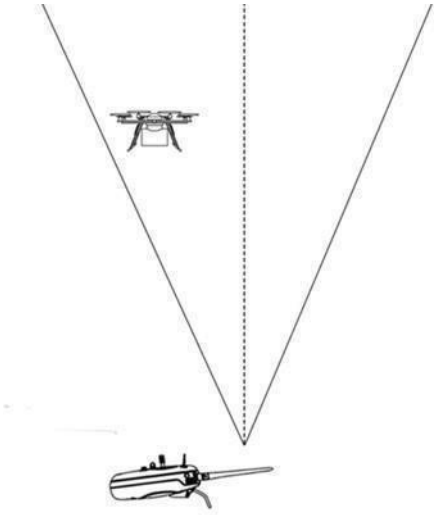
Figure 9: Do not fold the antennas Transmission of signal

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## 4.6 Good Antenna Angle of Transmitter



Aircraft in front of the transmitter



Aircraft above the transmitter

Figure 10: Good Antenna Angle of Transmitter

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## 4.7 Good Antenna Angle of Sky Station

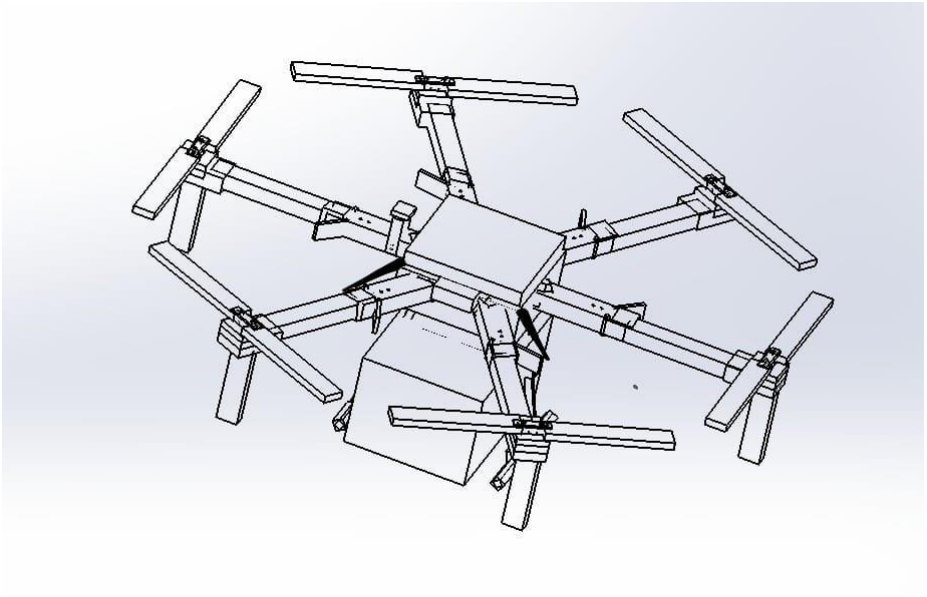


Figure 11: Flying at a high altitude

(Altitude higher than 10 meters, antennas should be placed downwards)

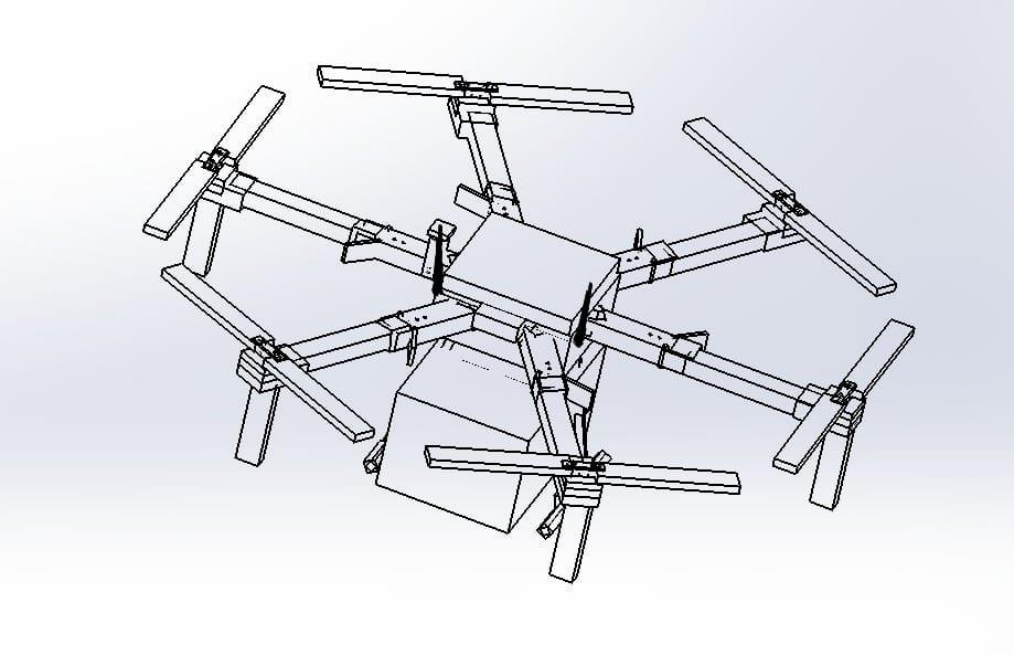


Figure 12: Flying at a low altitude

(Altitude lower than 10 meters, antennas should be placed upwards)

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### 4.8 Warning

Do not fold or cover antennas and avoid any obstruction between the transmitter and the aircraft in flight, otherwise there will be an obvious decrease to transmission signal quality.

- In charging, the charging indicator is solid red; when charging is finished, it turns to solidgreen.

## 5. ON FIELD UNBOXING




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Figure 13: Unfolding Arm

.

# 2 FLIGHT TEST

## 2.1 Pre-Flight Checklist

| S. No | COMPONENT | CHECKLIST | YES/NO |
|---|---|---|---|
| 1 | AIRFRAME | Inspect all arms are securely latched to the center frame with each spring-loaded mechanism locked in place. | |
| | | Verify no play movement between boom and folding mechanism. | |
| | | Inspect center airframe for structural anomalies | |
| | | Inspect the airframe for potential loose parts or missing fasteners. | |
| 2 | BOOMS | Inspect the length of each boom for any damage or wearto the carbon fiber tube, paying close attention to the junctions on either end. | |
| 3 | MOTOR MOUNT | Inspect for play between each motor mount and boom | |
| | | Inspect for play between motor bell and base. | |

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| | | | |
|---|---|---|---|
| 4 | MOTOR | Spin the motor by hand and inspect for rough or constricted rotation. | |
| | | Inspect motor bell for any dents or scratches indicating prior impact. | |
| 5 | PROPELLER | Inspect each propeller blade to ensure it is correctly fastened to propeller hub. | |
| | | Inspect for pitch play between propeller and hub. | |
| | | Inspect propeller for wear, damage or warping. | |
| | | Inspect propeller for wear, damage or warping. | |
| | | With propellers unfolded, verify the blades remain clear of adjacent structures and propellers as they rotate through a full motion. | |
| 6 | BATTERIES | Test the voltage of each battery pack; log readings. | |
| | | Inspect each battery for any signs of damage or swelling. | |
| | | Inspect battery connectors and leads for damage orwear. | |
| | | Ensure all batteries are securely fastened to the battery tray. | |
| | | Ensure battery plate is securely fastened to airframe with both locking pins fully seated. | |
| 7 | LANDIN GGEAR | Verify the gear is securely fastened to airframe (or payload, if operating with a configuration where the payload replaces the stock landing gear). Verify correct orientation of landing gear legs. | |
| | | | |
| | | | |

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| | | | |
|---|---|---|---|
| 8 | ANTENNA | Verify GPS antennas are locked in their extendedposition. | |
| | | Verify control link antennas are securely fastened and Correctly oriented. | |
| 9 | LIGHTING | Verify RPA indication lights on the end of each boom are functional. | |
| 10 | PAYLOAD ATTACHMENT | Inspect payload attachment points and ensure anti drop clip is in place (if used). | |
| | | Check payload data and power connections. | |
| 11 | REMOTE PILOT STATION | Verify antennas are in good condition and correctly oriented. | |
| | | Inspect free movement of control sticks. Check for dust or debris. | |
| | | Calibrate control sticks and inputs if necessary. | |
| | | Check the RPS battery levels are sufficient for the duration of operation. | |
| 12 | FAILSAFE SETTING | Check that the RPA Failsafe is appropriately set for type of operation and environment. | |

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## 2.2 Maintenance Checklist

| S. NO | DESCRIPTION | CHECK | DONE ON | DONE BY | REMARKSAFTER MAINTENANCE |
|---|---|---|---|---|---|
| 1 | FRAME | Check for deterioration, cracks, deformation and replace if required. | | | Replaced framedue to crack |
| 2 | MOTORS | Replace motor after 500 flight hour or replace if any friction occurred. | | | Replaced motor afterflight hour |
| 3 | PROPELLERS | Replace propeller after 250 flight hours or replace if anycrack and bend occurred. | | | Replaced propeller due tobend |
| 4 | CIRCUIT INSPECTION | Check and replace if there isa high resistance occurred every six months | | | Inspected the circuit and circuitis in good condition. |
| 5 | TANK | Replace tank for one year based on liquid usage. | | | Inspected thetank. |
| 6 | PUMP | Replace pump for every six month or replace when the flow pressure decreases. | | | The pressure is same so not required to change the Drone. |
| 7 | SENSOR MANAGEMENT | Replace sensor if the any error occurred | | | Inspected the sensor and the sensor are in |

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| | | | | | |
|---|---|---|---|---|---|
| | | | | | working condition. |
| 8 | CALIBRATION | Calibration needs to be done while inspecting the drone | | | Calibration is done |
| 9 | LANDING GEAR | Replace landing gear after 500 landing or replace if any crack and bend occurred | | | Replaced landing gear due to crack |
| 10 | BATTERY | Replace battery after 250 cycle | | | Inspected the battery for each cell |

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# 3 BATTERY




Figure 14: Battery

# 4 CHARGER




Figure 15: Charger port and Switch

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1. Buttons: Mainly there are 4 buttons present, they are:
    - Stop/setting button: To stop the charging, press the button once and for Settings, long-press the button
    - Status buttons: These buttons are used to switch between the statuses.
    - Start button: To select any configuration, press start button once, and to start the charging, long press the start button.
2. Charging port: Connect the battery charging cable to this port.
3. Balance port: Connect the balance port of battery to this port.

# 5 CHARGING OF THE BATTERY

Connect the power cord of the charger to power connector placed on the back of the charger.



Figure 16: Charger Connect to Power Board

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Figure 17: Connect balance port extender to the balance port present in front of the charger




Figure 18: Charging Path

➢ First, connect the balance port of the battery and charger, and then connect the power cable of the battery to the charging port of the charger.

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Figure 19: Charging Procedure

➢ Press the start button and select mode according to the need. Select current values according to the C ratings of the battery.



Figure 20: Switch on the Charge

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- Select offline, and long-press the start button and wait for the long beep for the charging to start.
- After completion of the charging, charger screen will show the “Battery is fully charged”, press the “stop” button and remove the power cable first and then the balancing order of the battery.

## 6 BATTERY MAINTENANCE

- Battery maintenance is one of the most important things to increase battery life. These are the following step to maintain battery health:
- Deep charge the battery after the operation (Deep charge: Charge the battery at half C). The battery can be charged according to its “C” ratings.
- Maintain room temperature

*C ratings: “C-rate” is a measure of the rate at which a battery is discharged relative to its maximum capacity. “1C rate” means that the discharge current will discharge the entire battery in 1 hour. For example, if the battery capacity is 10Ah then it will provide10Acurrent at 1 C rating.

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# 7 POWER UP THE SYSTEM

- Turn on the transmitter.

Figure 8-1: Turn on Transmitter

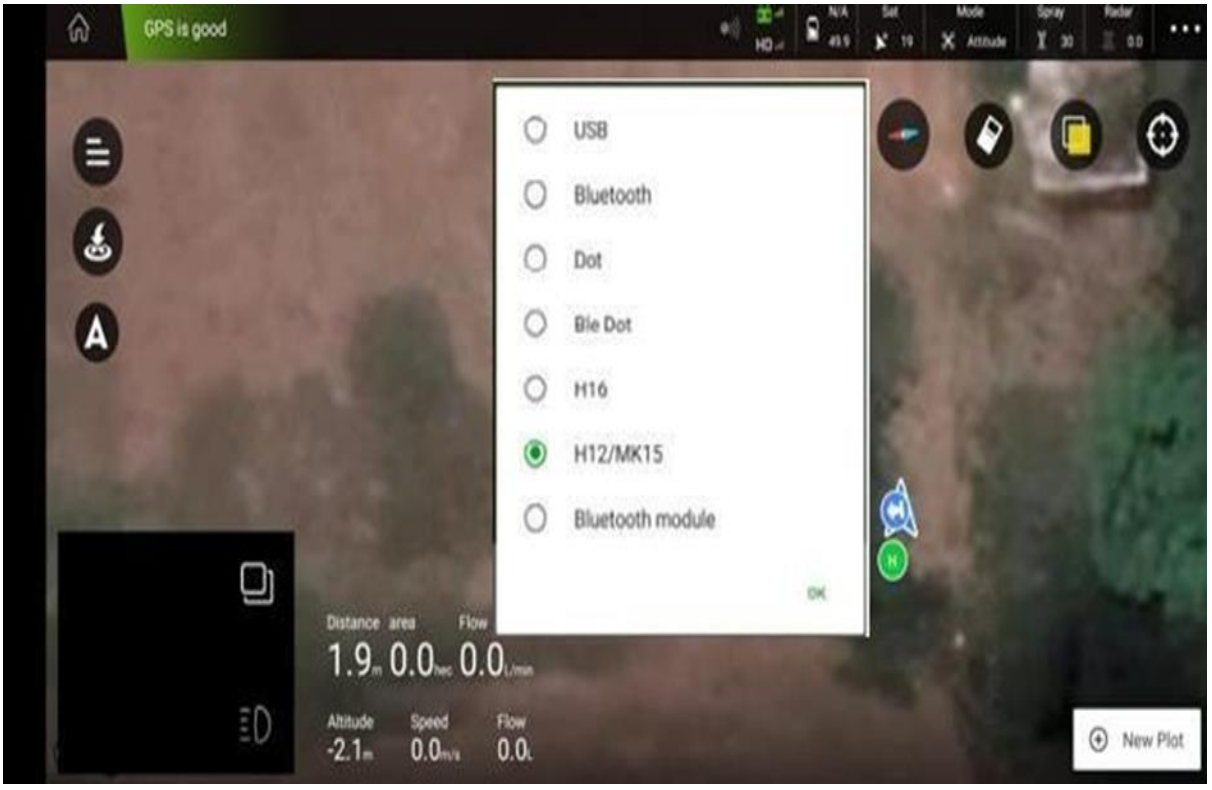
- Then connect the batteries of the drone – always connect the right side first and then the left one.



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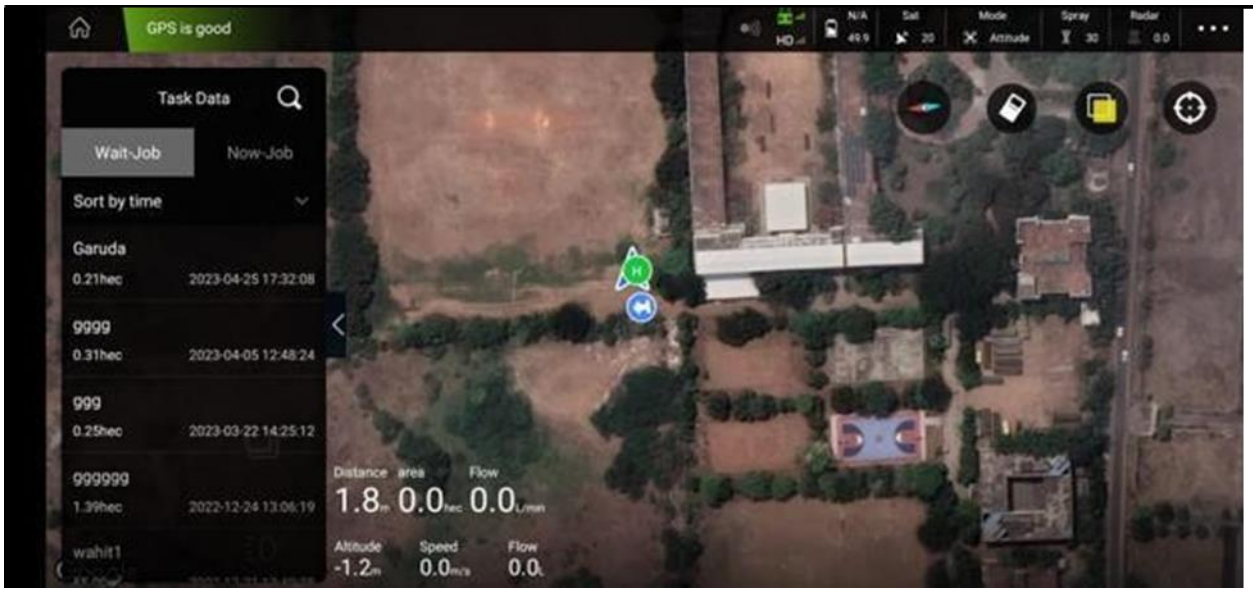
- Open Garuda application.
- The Garuda application provides the following options for connecting a drone.
- You can connect a drone in the following ways:
- From the dashboard: Click on the icon. In the top-bar options of the dashboard connect the drone.

**From the Home menu:**




- Connect a drone while creating a new Project:
- We have to connect a device before creating a new project. The Garuda- Agri Assistant will prompt you to connect a device before creating a project as shown in the image:

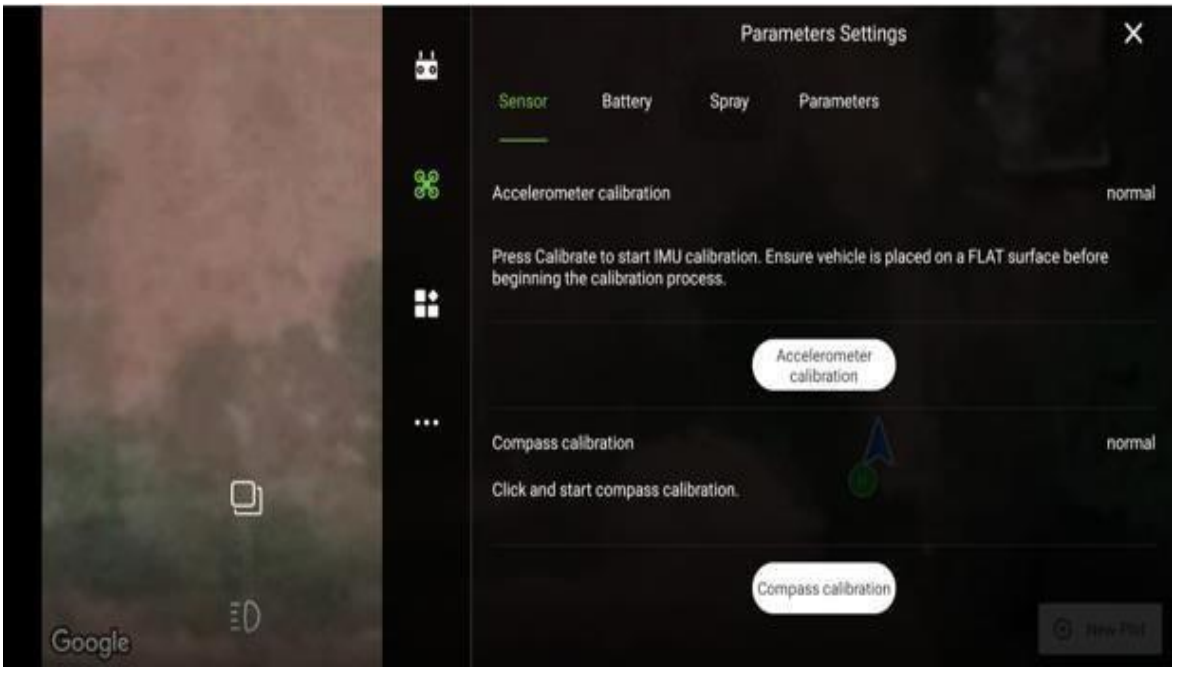
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➢ Click on the "Yes" button to connect a drone so that you can upload the plan with desired settings into a drone.

## 8 COMPASS CALIBRATION

➢ Click on to sensors tab and click compass to start compass calibration.




➢ The drone is required to turn around various axis to complete the calibration process.

➢ First, rotate the drone in clockwise direction in X-axis.

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- Then, rotate in Z-axis keeping nose down.



- Next, rotate in Y-axis, keeping nose left.

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- Rotate in Y-axis, keeping nose right.



- Rotate the drone in Y-axis, keeping nose up.

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## 8.1 PUMP FLOW RATE SETTINGS

Pump rate is one of the important features, if you want to do the desired spraying. In Agri drone you can vary the pump rate according to your need, for doing this, you have to follow the followings steps:

- Click on the settings option.
- Go to the spray settings option.
- Enter the values or you can use slider to change the value.
- After setting the value click on save and after that refresh.

Note: Minimum Liquid Flow rate is 180ml per minute per nozzle and maximum liquid flow rate at 100% pump rate is 875 ml per minute per nozzle.

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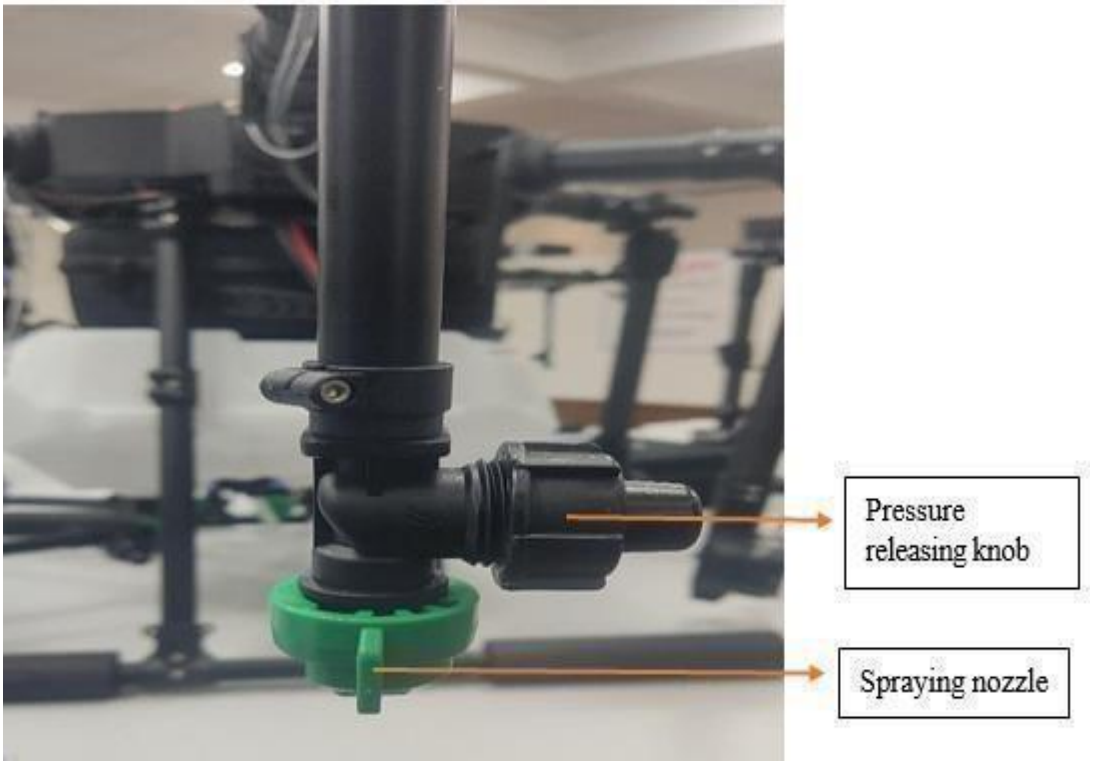



Figure 21: Nozzle parts

Attention:

If there is an occurrence of air lock while spraying the liquid, it can be resolved by slightly removing the pressure release knob above the spraying nozzle.

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# 9 TANK FILLING PROCEDURE



Figure 22: Level of tank filling procedure

1. Ensure that the drone is disarmed.
2. All batteries are disconnected.
3. Ensure that there is no damage to the tank or leakages seen through physical examination.
4. The tank has to be filled with the diluted pesticides/insecticides only from calibrated 10L Jar
5. Pour the diluted pesticides/insecticides up to the 8L line marked throughout the tank.
6. Do not fill the tank more than the red line i.e.,8L mark.

## 9.1 LEAK PROOF PROCEDURE

- In order to leak proof the tank, the outlet of the tank is winded using Teflon tape. Thread seal tape (Teflon tape) is a polytetrafluoroethylene film tape commonly used in plumbing for sealing pipe threads. The tape is sold cut to specific widths and wound on a spool, making it easy to wind around pipe threads.
- Teflon tape is then winded on the thread of L pneumatic connector and then inserted into the outlet cap and closed.

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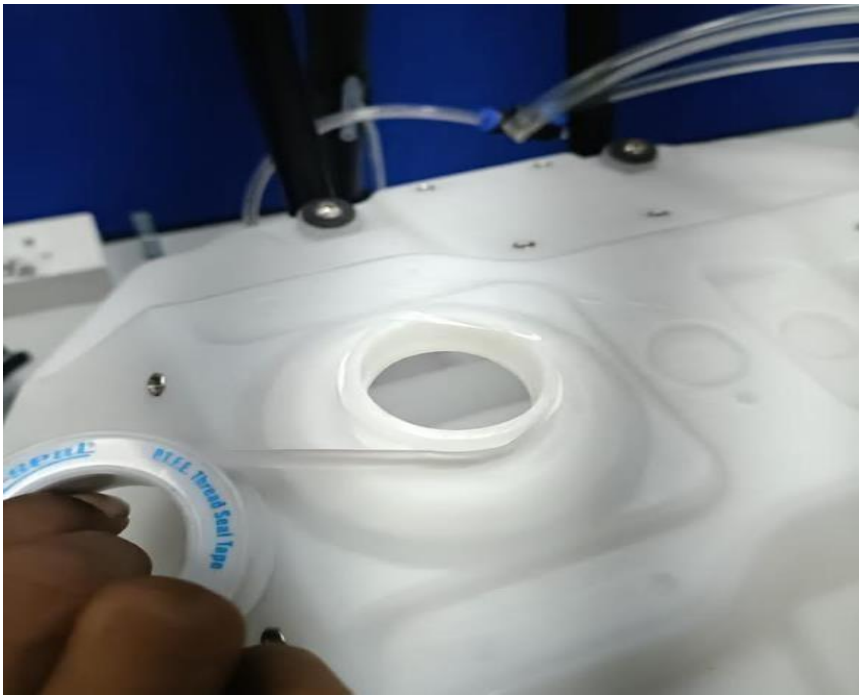



Figure 23: Winding of Teflon tape on tank outlet

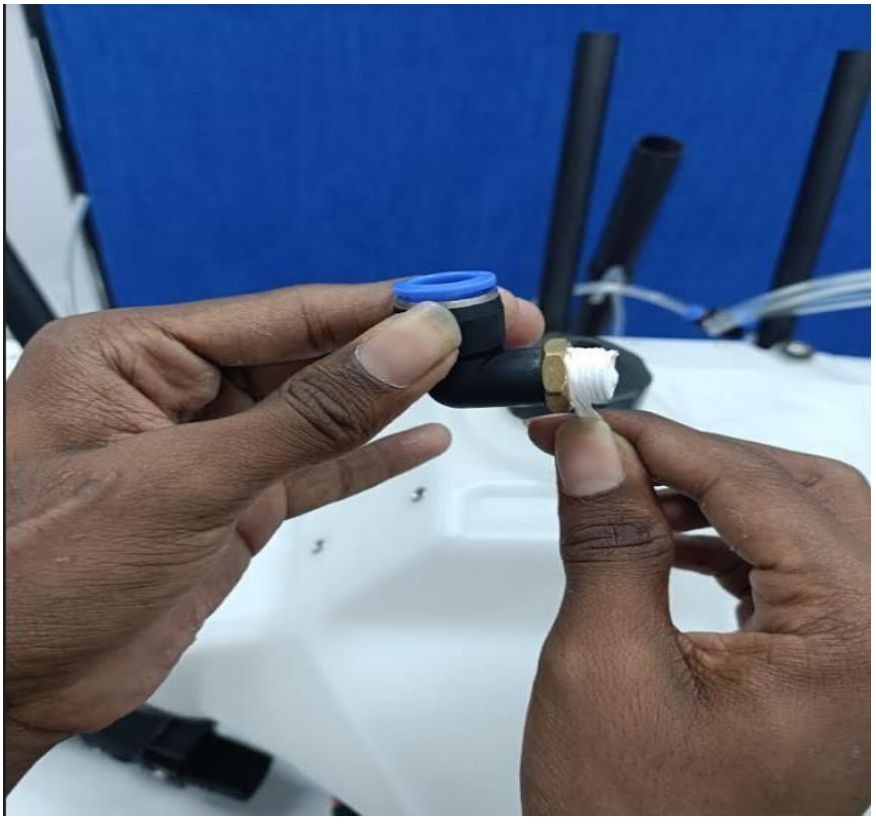
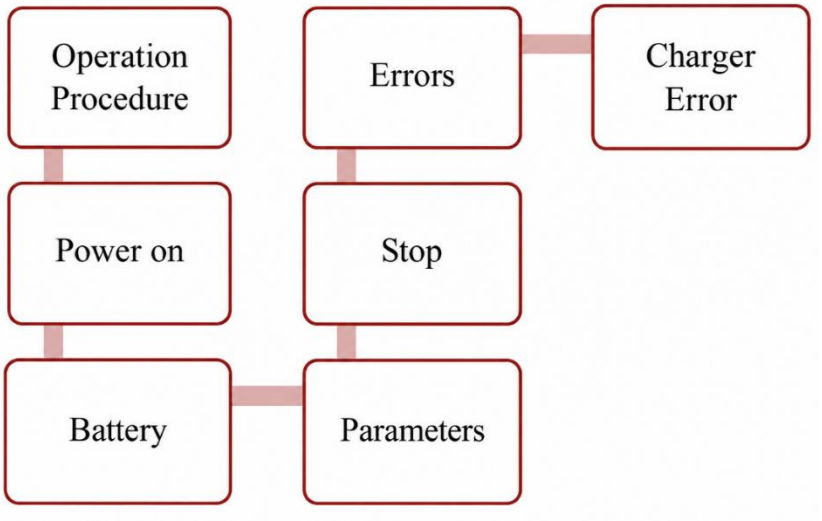


Figure 24:Winding of Teflon tape on pneumatic connector

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## 10 BATTERY CHARGING:

User shall charge battery when the voltage is low. Connect the power cable of the battery to the charging machine and press and hold “start” button for 2 seconds to start charging. Once charging is finished, it will show “charging finished” on screen with some musical tones. If the batteries are not used for more than 10 days, user shall use “charge for storage” mode to keep the battery in storage mode.




### 10.1 BEFORE CHARGING / DISCHARGING:

- Inspect the battery for any damages. Do not charge a damage battery.
- Inspect the battery for any swelling. Do not a swollen battery.
- Inspect the battery for possible battery fluid leaks. Do not chargea leaking battery.
- Inspect the voltage for each battery cell. If the cell voltage is significantly lower than the normal voltage (3.3 v per cell) or voltage of each cell have significant difference; the battery may be in defective condition. Do not charge the battery.
- Make sure the wire connection polarly is correct; do not short circuit the battery.
- Verify the lithium polymer charger is in good condition.

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15.2. CHARGING AND DISCHARGING THE BATTERY:

- Cover the charging container with a fire proof material cover.
- Never leave while battery is in charging process. Do not charge the battery unattended.
- In case of fire. Disconnect the electrical wire from the electrical outlet immediately. Do not put any combustible material near the charging area.

**15.3.** LITHIUM POLYMER BATTERY WARNINGS**:**

- Never charge a lithium ion battery with charger designed for NiCd, NiMH, or any other type of battery chemistry.
- Use ONLY charger designed for Li-Po battery. Failure to do so may result in personal injury and property damaged.
- Battery charging/discharging and observation should occur in an isolated safe location outside of any building or vehicle and away from any combustible material.
- Purchase and use devices that are listed by a qualified testing laboratory.
- Always follow the manufacturer's instructions.
- Only use the battery that is designed for the device.
- Put batteries in the device the right way.
- Only use the charging cord that came with the device.
- Do not charge a device under your pillow, on your bed or on a couch.
- Keep batteries at room temperature.
- Do not place batteries in direct sunlight or keep them in hot vehicles.
- Store batteries away from anything that can catch fire.

15.4. SAFETY INSTRUCTIONS FOR CHARGER:

- Do not the power supply near water (for example a bathtub, washbowl, kitchen sink, laundry tub, wet basement, or swimming pool).
- Do not place the power supply on an unstable cart, stand or table, if the power supply falls, it could injure a person or cause serious damage to the power supply.
- Do not overload power outlets or extension cords. An overload can result in fire or electric shock.

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- Take it to a qualified service technician when service or repair is required.

| | |
|---|---|
| Voltage | 100-240V AC |
| Power Efficiency | 89% |
| Power Factor | > 0.98 |
| Weight | 3.08Kg |
| Power Efficiency | 89% |

## 15 SERVICEABLE CAUTIONS:

The electronic component should not be modified by the buyer if any issue arises the component and damaged parts can't be claimed.

If the physical damage is caused by the pilot the product can't be claimed. The buyer shouldn't modify the Flight controller in case if it has been modified the company are not responsible for any issue.

If the tank gets damaged due to erosion occurring without cleaning the tank, after end of the day. The company is not responsible at the end.

### 15.1 WARNINGS

- Do not make any modification/changes in the drone/No external fittings.
- Do Not fly- in area with dense trees, poles, and other obstructions.
- Don't fly in a populated area. Human should not be there.
- Do not fly near the restricted area.
- Use only allowed chemicals for drone prescribed by chemical manufacturer.

*Note: Incase, if the user does not follow warnings, Garuda Aerospace will not be responsible for any loss or damage.*

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## 15.2 DO'S AND DON'TS

- Make sure to ensure that you have GPS fix before flying on them is on planner software.
- Make sure that the drone components like GPS and sensors like Radar are clean before flying. Keep the Radar clean with a soft cotton cloth before flying.
- Do not fly the AGRI DRONE without pesticide in the pump, do fill min 500 ml liquid for pump safety. Do the air lock process after the filling of tank every time before taking the flight.
- Always carry mask, face shield, gloves and other protective gear to avoid direct contact with chemical / pesticide.
- Don't try to fly the drone in stabilize mode.
- Don't switch on any other mode shown in the GCS that can lead to risk of the pilot and it voids the warranty.
- If the battery voltage is below 45.5v volts then fill 6-8 liter of pesticide or chemical in the tank.
- Any changes or modifications not expressly approved by Garuda Aerospace will void the user's authority to operate the equipment as well as equipment warranty.
- Wait for the 10 minutes before doing Accel, Pressure, level horizon or compass calibration.
- It will help in stabilizing the internal heaters of the drone wait until temperature will rise up to 45 degrees Celsius than reboot and then do the calibrations.
- Make sure there is no obstacle within 5m radius of any waypoint.
- Don't open the parts like (**Tank, motors, Top canopy**, etc.) of the Drone until unless it is authorized personnel.

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| CERTIFICATES | |
|---|---|
| AEROSPACE QUALITY MANAGEMENT SYSTEM CERTIFICATION | AS 9100:2016 |
| INTERNATIONAL ORGANIZATION FOR STANDARDIZATION | ISO 9001:2015 |

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Secondary number: 9943844233

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