Cerana ONE Pro

Uncrewed Aircraft System

User Manual

Version 1.4 | May 2024

Garuda Robotics
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Versions

v1.0	January 2023	Initial release
v1.1	August 2023	Added reference to Onboarding Guide
v1.2	December 2023	Updated Compliance section Updated Support section
v1.3	March 2024	Added Plex Pilot app instructions Removed QGroundControl app instructions
v1.4	May 2024	Updated Battery specifications Updated GNSS module photo

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About This Manual

This user manual provides the basic information you need to set up, operate and maintain your Uncrewed Aircraft System (UAS). On its own, this manual is not intended to be sufficient to ensure safe and compliant drone operations.

The UAS consists of an Uncrewed Aerial Vehicle (UAV) and accompanying equipment. Your UAV is a sophisticated device and is solely intended for use by trained and licenced professionals. Before conducting any UAS operations, ensure that you have fully read and understood this manual, particularly the following sections:

- Before You Fly;
- Compliance;
- Acceptable Use Policy; and
- Warranty.

The information contained in this manual has been verified to be accurate at the time of publishing. You may download the latest version of this manual from the product website at any time.

Updates to operations software may have been implemented since the time of writing of this user manual. As a result, there may be differences across images and/or terms used in this document and in the actual operations software. Unless the changes are critical, new updates will be included in the next version of this manual. Critical updates will be communicated to users in the form of amendment bulletins to highlight the changes.

Some sections of this manual may be annotated with one or more of the following icons:

	NOTE	Indicates important information that helps you make better use of your UAS.
	CAUTION	Indicates potential hardware damage or data loss if instructions are not followed.
	WARNING	Indicates potential for property damage, personal injury, or death if instructions are not followed.

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Contents

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About Your Uncrewed Aircraft System

The Cerana ONE Pro UAS by Garuda Robotics is an industrial grade multirotor uncrewed aircraft designed for flight operations in manual, semi-autonomous or fully-autonomous modes. The onboard mission computer (Garuda CoPilot Computer, or GCC) and redundant 5G cellular connectivity system enables Beyond Visual Line of Sight (BVLOS) remote operation from a Drone Operations Center (DOC) at unlimited range.

Multiple high-resolution onboard cameras provide the operator with real-time video streams, while camera and radar-based sensors enable safe flight through Detect and Avoid (DAA) capabilities.

Compatible with a wide variety of interchangeable payloads, Cerana ONE Pro is a multi-role aircraft capable of being deployed in service of multiple use-cases.

All Cerana ONE Pro aircraft are designed and manufactured by Garuda Robotics in Singapore.

Features

- Dual batteries for power system redundancy
- Dual RTK-ready GNSS with high sensitivity, simultaneous multi-constellation receivers
- Forward obstacle avoidance sensors
- Automatic Return-to-Launch (traditional), or Backtrack-to-Launch (pilot directed, or automatic)
- Failsafe detection and recovery from low battery, RC signal loss, and geofence breach
- BVLOS ready (when piloted using Plex Horizon GCS in drone operations centre, and connected via cellular signals)

WARNING

Full BVLOS operations require careful testing. Please consult your local civil aviation authority before performing BVLOS operations!

Support

For all technical support and warranty matters, please contact your local authorised reseller or support@garuda.io.

WARNING

All after-sales servicing and support (if any) must be carried out by Garuda Robotics or its appointed agents. Any unauthorised disassembly, modification, or attempted updates to the UAS may result in personal injury and/or void your warranty.

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Before You Fly

Ensure that:

1. You are familiar with your local aviation regulations and only conduct flight operations within the permissible scope of operation granted to you by the appropriate authorities;
2. You and your team have read and understood this user manual and are familiar with the UAS;
3. You have obtained all necessary training, permits, insurance, and authority clearance;
4. You have completed all necessary pre-flight checks; and
5. All safety precautions are taken to ensure the safety of the public and all involved personnel.

 WARNING	It is the UAS operator's responsibility to be familiar with and only operate the UAS in accordance with the local unmanned aviation rules and regulations. Failure to comply may result in voiding of warranty and/or legal penalties. Please refer to the Appendices for further details.
 NOTE	It is highly recommended, and may also be a regulatory requirement, that a comprehensive pre-flight checklist be developed and customised for your specific context. Such a checklist will typically include regulatory, environmental, risk, and platform assessments.

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Package Contents

Your Cerana ONE Pro typically ships with the components shown below.

Standard Package

Cerana ONE Pro Uncrewed Aircraft

The landing gear assembly is removed for storage. Consult the on-boarding guide included in your package for assembly instructions.

Cerana Flight Battery Set
(Two LP6100 22.2V 10,000mAh batteries)

4-way Battery Charger

Handheld Controller

USB charging cable

NOTE Some items may be optional and may not ship with your UAS. Some components may not be available in certain countries. Contact your local distributor for details.

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If you have purchased a compatible payload with your aircraft, you may see the following components as well.

Payload Package

ClearCam Ultra	
ClearCam Ultra Z10	
ClearCam Ultra Z18	

Accessories

Your package comes supplied with all equipment required to get started.

You may purchase additional batteries, rotors, and other accessories from Garuda Robotics or your preferred authorised reseller.

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Specifications

Aircraft

Dimensions	Storage configuration, folded	500 mm (W) × 380 mm (D) × 230 mm (H) 630 mm (diagonal)
	Flight configuration, rotors open	950 mm (W) × 950 mm (D) × 450 mm (H) 1,344 mm (diagonal)
Weights	Dry weight (no battery)	3,700 g
	With standard batteries	6,300 g
	Maximum payload	1,200 g
	Maximum Takeoff Weight (MTOW)	7,500 g
Performance	Flight time with no payload	42 min
	Maximum height (service ceiling)	3,000 m AMSL
	Maximum speed	12 m/s
	Wind resistance	12 m/s
Propulsion	Configuration	Quadrotor
	Rotor diameter	20″ (508 mm)
	Rotor material	Carbon fiber reinforced polymer
Avionics	Garuda CoPilot	Generation 2 Embedded
	Flight Control Computer	mRo Control Zero H7
	IMU	Triple, redundant
	GNSS	Dual F9P RTK (GPS, GLONASS, BeiDou, Galileo)
	RTK performance (with base)	±0.025 m + 1 ppm CEP (horizontal) in FIX
Awareness	Forward sensing	1080p camera, 60° (H) x 40° (V) FOV Stereo depth camera Radar, max 40m range
	Downward sensing	1080p camera, 60° (H) x 40° (V) FOV
Connectivity	Frequencies	2.4 GHz ISM, 5G / 4G
	Cellular bands (4G)	B1/B3/B5/B7/B8/B20/B28/B34/B38/B39/B40/B41
	Cellular bands (5G)	N41/N77/N78/N79, NSA and SA modes
	SIM	2x Nano SIM (user accessible)
Control	VLOS operations	Handheld controller with 5.5″ screen
	BVLOS operations	Plex Horizon from Drone Operations Center
Power	Battery	LP6100
	Battery configuration	Dual, redundant
	Battery chemistry	Lithium Polymer
	Battery voltage	22.2V
	Cell configuration	6S1P
	Capacity (per battery)	10,000 mAh
	Weight (per battery)	1,300 g
Environmental	Operating temperature	0°C to 50°C (32°F to 122° F)

CAUTION

You are responsible for ensuring that the aircraft is operated within its stated weight limits.

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Handheld Controller

Screen	Size	5.5-inch
	Controls	Capacitive touch
Controls	Control sticks	2x Hall Effect gimbals with removable sticks
	Scroll wheels	1x top left
	Buttons	5x bottom, 1x top right
Radios	Operating frequencies	2.4 Ghz (ISM / SRD)
	Channels	Single channel multiplexed video / data / control
	Receiver sensitivity	-99dBm @ 20MHz BW
	Interference recovery	< 1 second
	Transmission range	Singapore (IMDA): 14km < 20 dBm EIRP US (FCC): 20km < 26 dBm EIRP Europe (CE): 12km < 18 dBm EIRP China (SRRC): 12km < 18 dBm EIRP
	Latency	Minimum 110 ms
Connectivity	Wireless	Wi-Fi, Bluetooth
	Wired	USB
Power	Battery	Built-in 4,950 mAh Lithium Polymer
	Charging	USB Micro-B (5V, 2A)

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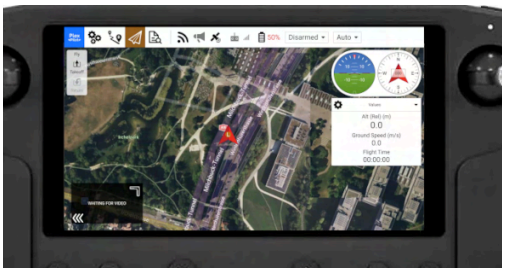
Ground Control Station (GCS)

Visual Line of Sight (VLOS) flight operations	Plex Pilot This is the default GCS application installed on your Handheld Controller and is recommended for beginner users.	
	Mission Planner This application requires a Windows laptop and is recommended for advanced users who are familiar with the Ardupilot ecosystem.	
	Contact us if you require additional GCS options for VLOS operations.	
Beyond Visual Line of Sight (BVLOS) flight operations	Plex Horizon version 1.3.0 and above See https://garuda.io/plex-horizon/tech-specs for the recommended hardware setup.	
	Overwatch version 1.0.0 and above	

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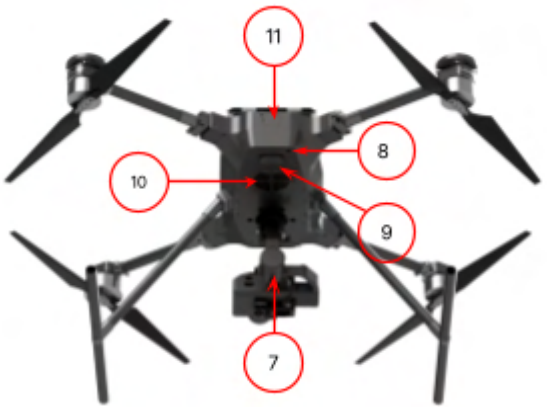
Identifying Parts and Controls

Aircraft

Front View

Bottom View



1	Folding rotors: Fold for storage, open for flight
2	Dual LP6100 batteries
3	Dual helical antennas for RTK GNSS
4	Folding arms: Fold for storage, open for flight
5	Forward camera / Stereo camera / Radar
6	Removable landing gear assembly
7	Payload (ClearCam or other compatible system)
8	Downward camera
9	Laser altimeter
10	Cooling fan exhaust port
11	SIM card slot for cellular radio communications

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Handheld Controller

Front View

1	Throttle Stick
2	Yaw Stick
3	Pitch Stick
4	Roll Stick
5	Power Button - Long press: Turn controller on/off - Short press: Turn display on/off
6	Scrolls Wheel: Camera Pitch Control
7	Shoulder Button: User configurable
8	Button A: Select Non-GPS Flight Mode (Altitude Hold)
9	Button B: Select GPS Flight Mode (Loiter)
10	Button C: Select Autonomous Flight Mode (Auto Mission)
11	Button D: User configurable
12	Status LED
13	USB Micro-B charging port
14	MicroSD card slot
15	5.5″ 1080P capacitive touch screen
16	Antennas
17	Home Button: Selects Return-To-Launch

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Setting Up the Aircraft

Initial Hardware Setup

Charging the Batteries

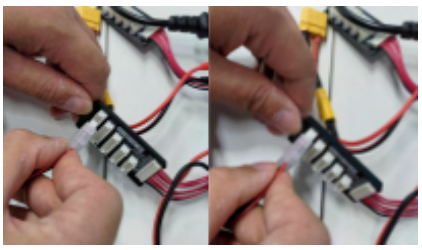
Connect the XT90 charging cables and balance boards for all four segments of the battery charger.

Connect the charger to the mains outlet.

Turn on the charger.

Using the XT90 and balance port connectors, connect the batteries to be charged to the charger.

Each battery's XT90 and balance port connectors must be connected to the same charging segment.



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Press “BATT TYPE”.

Under PROGRAM SELECT, choose “LiPo Battery”.

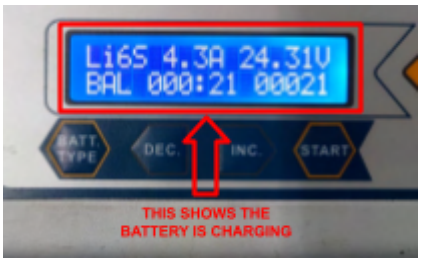
Press “START” once.

Press “START” once and select “6S”. Use “DEC.” and INC.” to change your selection.

Press “START” once and select “BAL-CHG” and do the same for “C=10000mAH”.

Press and hold “START” for at least 3 seconds until you hear the beeper sound.

Press “START” once to begin charging.



When battery charging is complete, the charger will make a beep sound with a tune.

Press “BATT TYPE” to return to main settings before disconnecting the battery.

To stop charging, press “BATT TYPE” once.

To check the voltage value on each individual cell, press “INC” while the battery is charging.

The voltage for each cell must not exceed 4.2V.

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WARNING	Take care when handling and charging Lithium Polymer batteries. Do not overcharge the batteries or leave them charging unattended. Store batteries in a cool, dry place away from heat.

Handheld Controller and GCS Setup

Charging the Controller

Connect the USB cable to the Handheld Controller.	
The current battery percentage will be displayed momentarily. Press the Home button again to check the battery percentage.	
The charging LED will appear green while charging.	

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Turning On the Controller

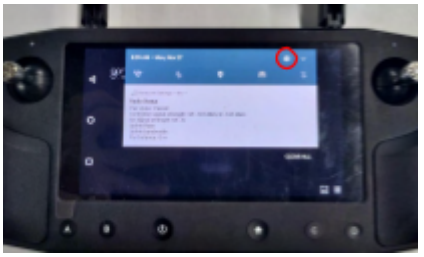
Press and hold the Power button for 3 seconds to turn the controller on.

Connecting a GCS via Wi-Fi Hotspot

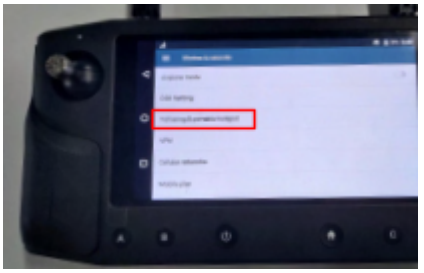
Swipe down from the top of the screen.

Press and hold the hotspot icon.

If you do not need to change the hotspot settings, press this icon to toggle the hotspot on and off.



Select 'Tethering & portable hotspot'.



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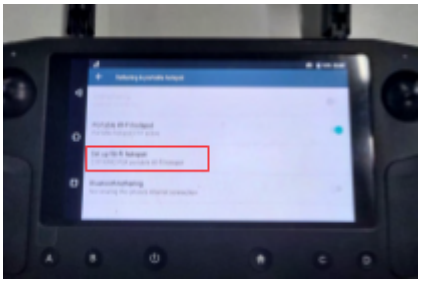
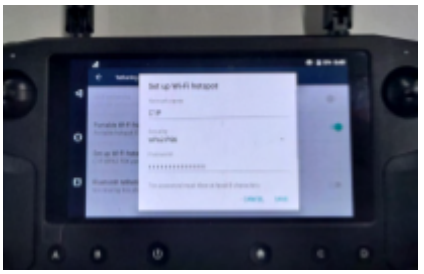
Select ‘Set up Wi-Fi hotspot’.



Use the WiFi hotspot details displayed to connect your GCS device to the controller.

You may also modify the hotspot SSID and password via this screen.



With the aircraft powered up, establish a MAVlink connection from your GCS via the controller Wireless hotspot.

You may refer to the Quick Start Guide of your GCS for further application setup procedures.

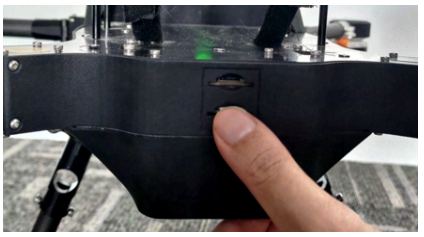
Aircraft Internet Connection Setup

Ensure the aircraft is powered off with the batteries disconnected.

The Cerana ONE Pro requires Nano-sized SIM cards.

A 5G SIM card is required to access 5G cellular networks.

Insert the SIM card(s) into the aircraft’s SIM card slots.



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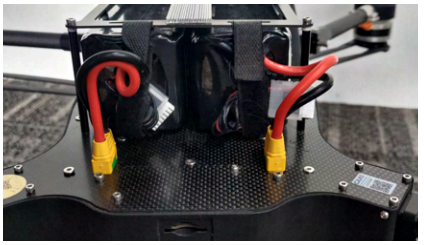
Power on the aircraft by connecting the batteries.



Press and hold the power button on the controller to turn if on.

Launch the Plex Pilot app if it does not automatically start.

Select the Setup icon.

Scroll down and select “Modem” on the left.

Under the “APN Configuration section”, key in the APN for your cellular plan and click “Save”.

You may refer to your telco provider’s website for the APN information if you are unsure of the details.

Under the Latency Test section, select “Test”.

Your cellular connection setup is complete if you see a green indicator.

Green - Good connectivity
Orange - Poor connectivity
Red - No connectivity

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Operating the Aircraft

Setting Up the Aircraft

The following steps are to be carried out with the aircraft still in the storage case until otherwise directed.

Carefully remove the payload from the case.

Connect the payload to the aircraft gimbal mount as shown.

Ensure the registration line on the gimbal ring aligns with the corresponding registration dot on the connector when inserting the payload.

Twist until you hear the ring click in place.

Carefully lift the aircraft from the storage case.

Remove the two landing gear assemblies from the storage case and install them onto the aircraft.

Flip the aircraft over and stand it right side up.

Unfold and fully extend each of the motor arms, then lock each one in place.

Fully unfold the rotor blades.

Powering up the Aircraft

Remove one set of Cerana Flight Batteries (2x batteries) from the storage case.

Place them in the battery compartment of the aircraft.

Secure the batteries by looping the velcro strap through the designated hole.

The XT90 battery connectors are designed to allow insertion in one orientation only.

Ensure the battery plug is correctly aligned with the socket on the aircraft fuselage.

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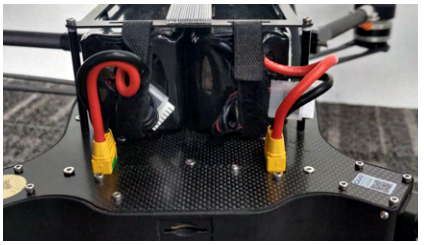
Connect both batteries (in any order).



Failsafe Settings

Failsafe settings are critical safety parameters that must be set correctly.

We provide the following recommended failsafe settings, which have been pre-configured in your aircraft.

You should configure the failsafe settings according to the requirements of your specific flight operations.

Radio failsafe: Enable Always RTL
Geofence failsafe: RTL or Land

Battery Low Voltage: 21.5
Battery Low reserved mAh: 6,000
Battery Low Action: Return to Launch

Battery Critical Voltage: 19.0
Battery Critical reserved mAh: 2,000
Battery Critical Action: Land

Arming the Aircraft

Ensure that there are no error messages from the GCS and that the correct flight mode is selected.

Ensure that the aircraft vicinity is clear of any personnel or obstacles.

This diagram is for illustrative purposes only. Local regulations may differ.

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Once Pre-Flight Checks have been completed, arm the aircraft by pushing and holding the left control stick fully down and to the right.

The aircraft should arm its motors and spin them.

Gently release the left control stick back to the neutral center position, or hold it at a low throttle position.

Check that all motors are spinning smoothly.

If no problems are detected, you are ready for takeoff.

Firmly and decisively command the aircraft to takeoff by pushing the left control stick up until the aircraft lifts off from the ground.

Maintain an above-neutral throttle position until the desired holding altitude is attained.

CAUTION

The deflection on the control sticks directly determines the inputs commanded to the aircraft. Exercise caution and familiarise yourself with the characteristics of the aircraft and its controls before commanding maximum deflection of the sticks.

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Care and Maintenance

You have purchased a sophisticated aircraft with sensitive components. Although it is designed to operate in a variety of environmental conditions, you should take proper care of your aircraft and the other parts of the system to ensure optimum performance.

WARNING

Your aircraft uses Lithium Polymer rechargeable batteries. Follow the recommended procedures for safely charging and operating your aircraft.

General Care

1	Do not disassemble the aircraft. Unauthorised disassembly of the aircraft will void its warranty.
2	Do not insert foreign objects into the aircraft.
3	To prevent electric shock, explosion, or other injury, do not operate the aircraft if it has been damaged in any way, whether by immersion in liquid, crushed by mechanical forces, etc.
4	Do not subject the aircraft to extreme forces such as crushing, bending, puncturing, or shredding. Avoid placing heavy objects on the aircraft.
5	Do not drop the aircraft.
6	Store the aircraft in a cool dry place when not in use.

Operating Environment

1	Do not submerge the aircraft in liquids of any form. The aircraft is designed to resist splashes but is not waterproof.
2	Avoid using the aircraft in extremely dusty conditions. The aircraft is designed with limited dust resistance, but using it in environments with plenty of fine particles may cause its performance to degrade over time.
3	Do not expose the aircraft to environments that contain fine metallic particles or any other substances that may lead to electric short circuits.
4	Do not expose the aircraft to corrosive environments.
5	Keep the aircraft away from heat sources, combustible gases, and liquids.

Charging and Power

1	Do not leave the batteries unattended while charging. Do not charge the batteries overnight.
2	Stop charging the batteries once they are fully charged. Do not overcharge the batteries.
3	Always charge the batteries in a well ventilated area. Do not place the batteries under pillows, blankets, fabrics, or other flammable materials while charging.
4	If you will not be using the aircraft for an extended period, the battery should be discharged to approximately 50% charge before storage.

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Acceptable Use Policy

A user of the product shall not, either directly or indirectly:

1. Modify, reverse-engineer, adapt, or redistribute the product;
2. Manufacture, assemble, disassemble, sell, export, or supply the product;
3. Allow the product to be operated or maintained by unauthorised personnel;
4. Use the product for any purpose other than in accordance with your regulatory permit, including renting, selling, leasing or directly or indirectly charging others for the use of the product;
5. Remove, circumvent, impair, bypass, disable or otherwise interfere with any feature of the product;
6. Misrepresent or make false or misleading claims regarding the product;
7. Use the product for any illegal activity, unlawful purpose, or purposes prohibited by these Terms or in breach of these Terms;
8. Use any device, software, exploits, or routine, including any virus (e.g. Trojan horse, worm, time bomb, or any other methods not specifically mentioned herein) intended to damage or interfere with the proper operation of the product or to intercept or expropriate any data from the product;
9. Use the product in any manner that could damage, disrupt, disable, overburden, or impair the operation of the product or interfere with any person's use of the product;
10. use the product to acquire, access, or process data not intended for you.

In applicable jurisdictions, you are to ensure that any tracking devices required by regulatory authorities for UAS Traffic Management (UTM) are adequately secured to the aircraft before the conduct of each flight.

In the unfortunate event that your UAS is involved in any accident, loss, or theft, promptly report the details of the incident to support@garuda.io.

Compliance

Please refer to https://garuda.io/regulatory-compliance/ for legal compliance requirements depending on where you fly the aircraft.

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Appendices

Preflight Checklist Samples

You may use these pre-flight checklists as a starting point for creating your own pre-flight operational procedures. You should ensure that all crew members receive the necessary training before using any checklists.

WARNING

These checklists are presented primarily for illustrative purposes and are not intended to be comprehensive or customised to your specific context. Please see the ‘Before You Fly’ section for further information.

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Date: _____
Deployment Identifier: _____
Battery Identifier: _____
Capacity used: _____ mAh

Flight Engineer Checklist				
Group	Description		Checked By	Verified By
Setup	Telemetry Connectivity	Check		
	GCS Battery Level	Check		
Failsafe settings	RC Failsafe (1.RTL / 2.Land / 3.Carry on Mission)	Verify 1 / 2 / 3		
	Low Battery Failsafe (1.RTL / 2. Land)	Verify 1 / 2		
	Low Battery Voltage and Capacity	Verify _____ V _____ mAh		
GeoFence settings	Pre-arming checks set to “1”	Check		
	Geofence enabled	Check		
	GeoFence Type (Any combination) (1.Altitude & Circle 2. Polygon)	Verify 1 / 2		
	Max Altitude	Verify _____ m		
	RTL Altitude	Verify _____ m		
	Max Radius; or GeoFence Polygon written	Verify _____ m		
	Action (1. RTL or Land / 2. Report Only)	Verify 1 / 2		
Telemetry Data	Battery Voltage	Verify _____ V		
	Horizon/Axis	Check		
	No Error Message	Check		

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RC Pilot Checklist					
Group	Description			Checked By	Verified By
Platform Checks	Physical Inspection of UA		Check		
	Cracks	Loose Parts			
	Payload		Check		
	Secured	Operational	SD-card		
	Motor Mount		Check		
	Level	Secured			
	Propellers		Check		
	Direction	Secured	No Cracks		
	Battery		Check		
	Secured	Connect	No Smoke/Smell		
	CG Check		Perform		
Handheld Controller Checks	Physical Inspection		Check		
	Cracks	Loose Parts			
	Handheld Controller Battery Level		Verify _____ V		
	Connectivity with UA		Verify		
	Flight Mode Switch Toggle		Verify		
	Trims - Neutral		Verify		

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END OF DOCUMENT

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