

Motors / drivetrain error

WingtraRay runs motor checks before every take-off. It spins each motor very quickly for two instances. WingtraRay will only take-off if the tests detect that both motors are correctly spinning.

Check that the propellers are correctly attached and that nothing is blocking their rotation. Repower the drone.

GNSS error

WingtraRay uses GNSS to establish its home position and to navigate through the mission. It needs to find a minimum number of satellites to estimate its current position correctly. When powering WingtraRay for the first time it might take some minutes to establish its position.

Check that the take-off position is far enough away from any tall obstacles.

Warning : “WingtraRay SD Card: Not discovered”

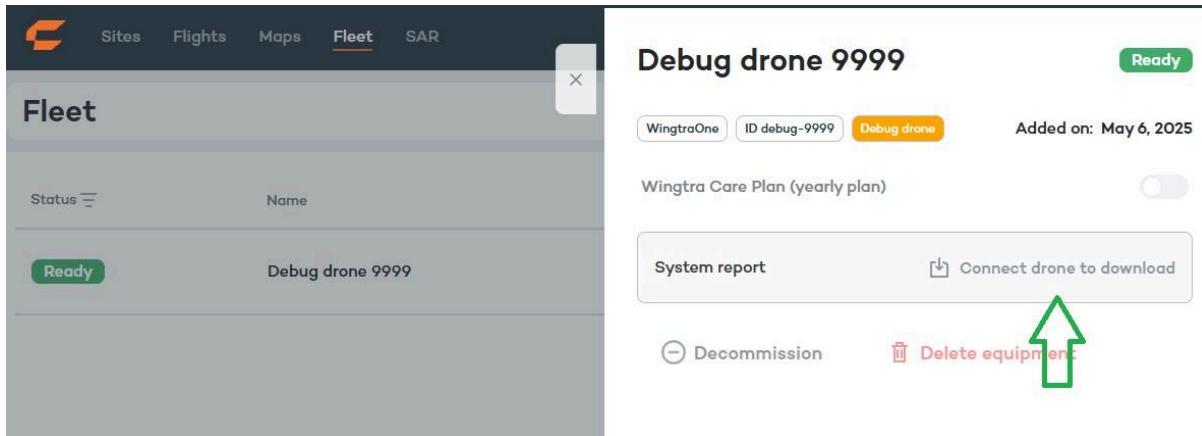
The WingtraRay SD card needs to be plugged into the SD card slot located under the nose cone. Make sure that the SD card is inserted into the WingtraRay.



Transferring flight logs

To access the flight logs from a WingtraRay using the tablet controller while the drone is still powered on and connected to the telemetry. Go to the Fleet tab under which you should select the Drone you are connected to. From here you can press the “System report” download button, which will transfer all the logs onto the WingtraRay SD card. After this transfer is finished you can shut down the drone and remove the SD card and use it to transfer the logs to your computer.

The flight log files are found in each session folder corresponding to each time the drone was powered on.



The screenshot shows the Wingtra tablet app interface. At the top, there are tabs for 'Sites', 'Flights', 'Maps', 'Fleet' (which is highlighted in orange), and 'SAR'. Below the tabs, the word 'Fleet' is displayed. The main area shows a list of drones. One drone is selected, showing its details: 'Name' is 'Debug drone 9999' and 'Status' is 'Ready'. In the detailed view on the right, the drone is identified as 'Debug drone 9999'. It has a 'Ready' status and is part of a 'Wingtra Care Plan (yearly plan)'. There are buttons for 'System report' (highlighted with a red box and a green arrow pointing to it), 'Connect drone to download', 'Decommission', and 'Delete equipment' (highlighted with a red box).

Send flight logs to Wingtra support

On the tablet or computer submit a support request at address:

<https://wingtra.com/support/open-a-ticket/>

Describe your issue in as much detail as possible.

8.2. Telemetry Connection loss

The environment in which the drone is operating affects the strength of the telemetry.

In urban areas, the connection between the drone and the telemetry is expected to be lost faster due to obstructions, like buildings and other structures, or due to interferences with the mobile network signals.

In rural areas, the connection can be interrupted due to natural obstructions such as trees, hills, etc. For example, when you are standing in a valley and your mapping area is at a higher altitude, the telemetry signal is weakening earlier due to the obstruction of the line of sight between the WingtraRay and the operator.

Another parameter that affects the range of the telemetry is the placement of the antenna and the position of the antenna in relation to the WingtraRay. For example, when the WingtraRay is flying towards the antenna, the signal is stronger. In the following article, you can find best practices for maintaining the connection for longer while flying.

Choose your position so that there are as few obstructions between you and the drone as possible before taking-off.

During the flight a telemetry loss may occur occasionally. If the connection between ground control station and UAS is lost, a warning will be raised to the pilot through a voice message. The signal icon will also show a cross marking and say interrupted.

The security and integrity of the software and C2 link communication is ensured through common methods, such as cyclic redundancy checks and frequency hopping spread spectrum.

9 Remote ID

The WingtraRay is fitted with the Remote Identification feature, which is mandatory for flying in US, Europe and Japan. The purpose of this feature is to provide information about the UAS and the operator to the authorities and the interested observers that are nearby.

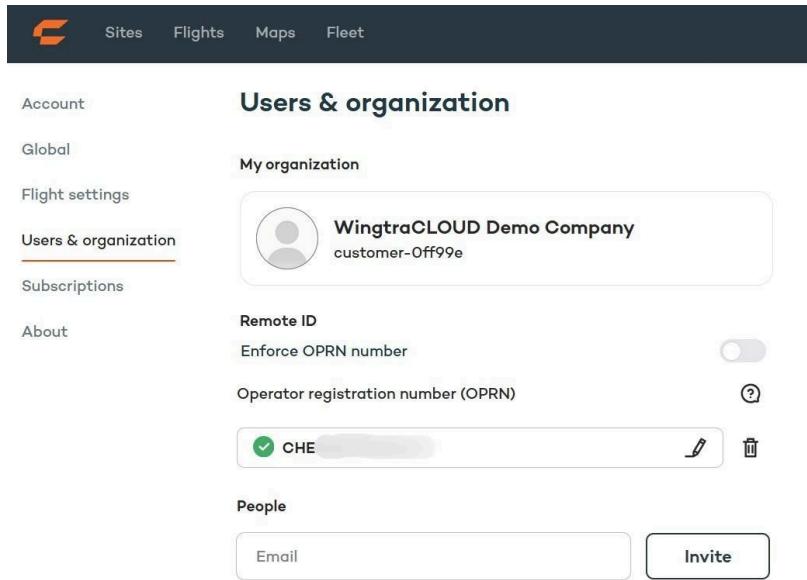
This feature broadcasts the following information using WiFi Beacon as a transmission protocol according to the IEEE 802.11 b standard standard:

Messages	<ul style="list-style-type: none"> • Unique serial number • UAS operator registration number (OPRN) • The position of the remote pilot • UA class and category • The following specific WingtraRay flight information: <ul style="list-style-type: none"> ◦ Location ◦ Altitude ◦ Speed ◦ Flight direction ◦ Timestamp ◦ Drone status
Transmission protocol	WiFi Beacon - 2.4 GHz band - 802.11b standard
WiFi Channel	Number 6

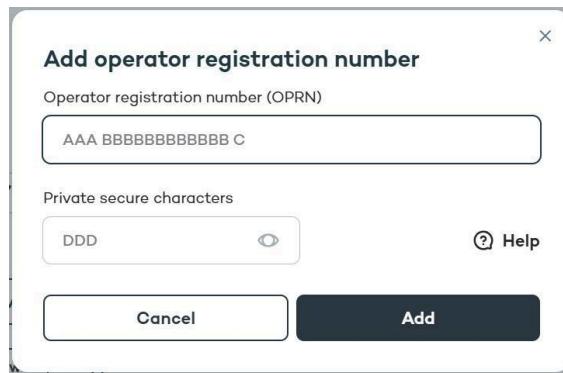
9.1 Operator Registration Number

To fly in the US, Europe and Japan you have to enter your unique operator registration number (OPRN) provided by your National Aviation Authority.

You can enter an Operator Registration Number (OPRN) in “Settings > Users & organization”.

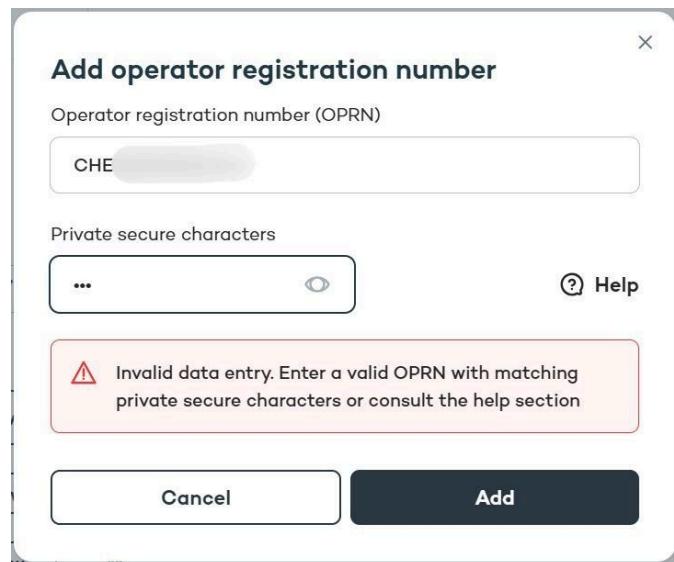


The screenshot shows the 'Users & organization' settings page. The sidebar on the left has tabs for Account, Global, Flight settings, **Users & organization** (which is selected and highlighted in orange), and Subscriptions. The main area is titled 'Users & organization' and shows a card for 'WingtraCLOUD Demo Company' with the subtext 'customer-Off99e'. Below this, the 'Remote ID' section has a toggle switch for 'Enforce OPRN number' that is currently off. The 'Operator registration number (OPRN)' field contains 'CHE' with a checkmark. The 'People' section has an 'Email' input field and an 'Invite' button.



WingtraCloud or App will validate the consistency of the OPRN. The result of the validity check will be displayed to the operator.

- Invalid result:



10 Geo-Awareness

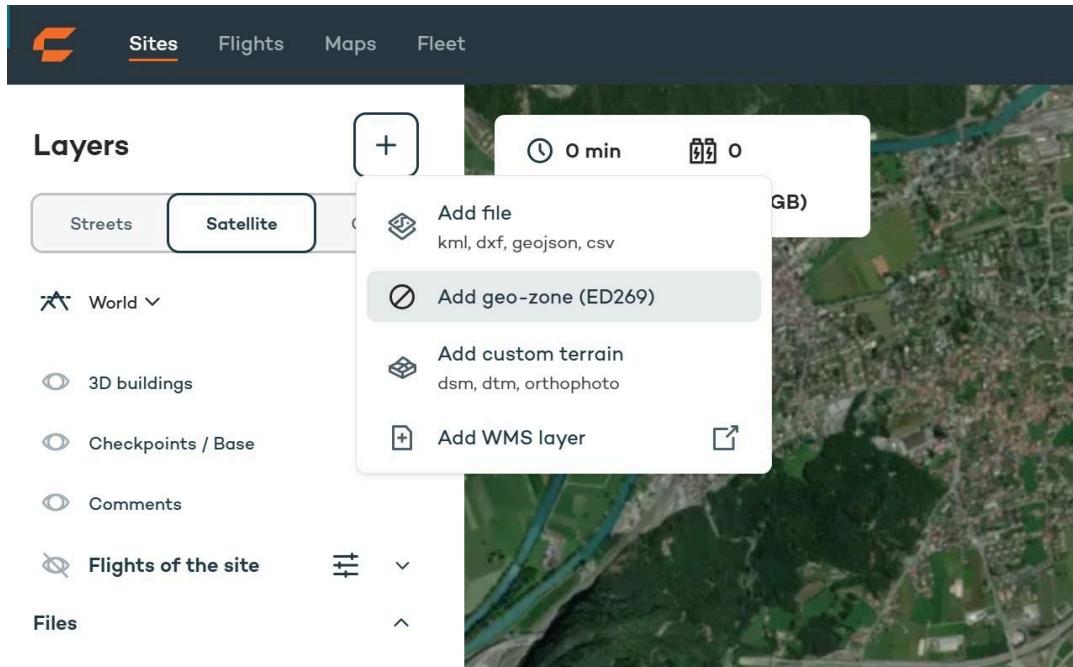
To keep aircraft and people on the ground safe, drone geographical zones, or geo-zones, have been set up across Europe by the different member states. Geo-zones are portions of airspace where drone operations are facilitated, restricted or excluded. Geo-Zones are set up to:

- minimise safety risks
- protect the privacy of others
- address security issues
- deal with environmental concerns.

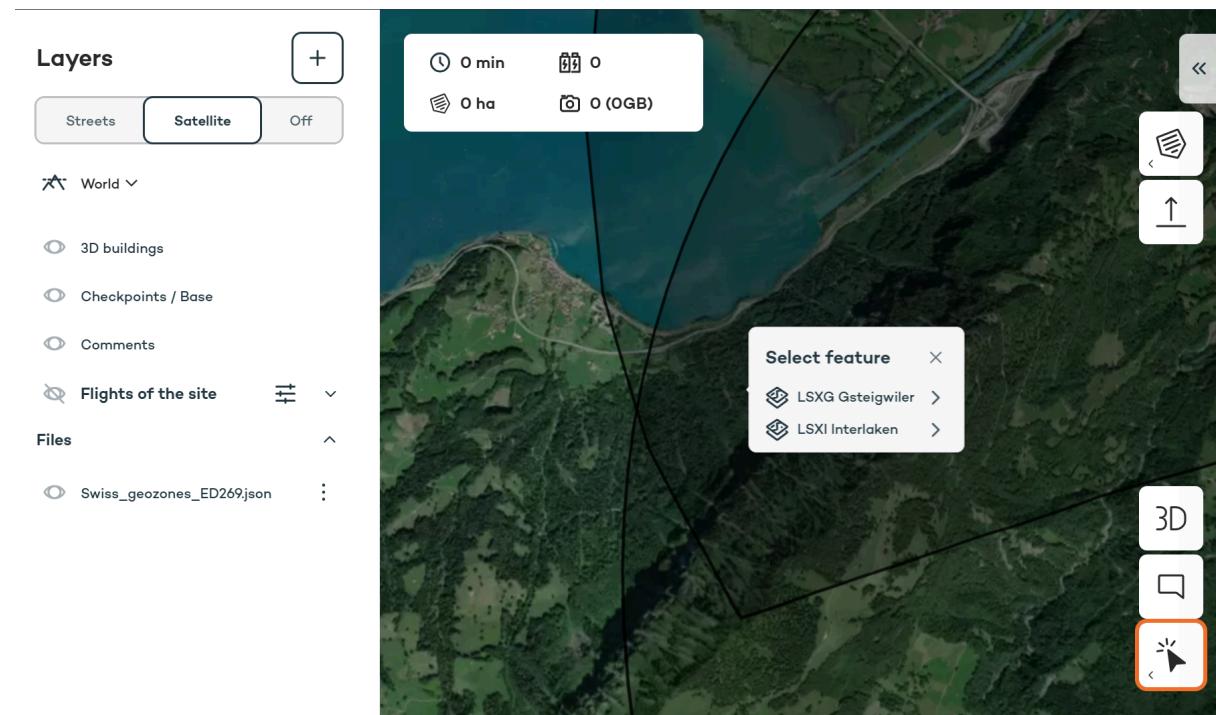
10.1 Uploading geo-zones to the flight plan

WingtraCloud and App provide the functionality to upload geo-zones to the flight plan, which is accessible from the Layers tab under Add geo-zone (ED269). You should be able to download the geo-zone files in the required ED269 file format from the European national aviation authority in which you are flying. Other file formats are not accepted as geo-zones, but can be added under files or as WMS layers for information purposes.

If you add layers in other formats than ED269 they are not handled as geo-zones during saving of the flight plan or in the preflight check logic and you will get a warning that geo-zones are not added before a flight.



To inspect details of what a geo-zone requires, use the inspection tool  and click on the map the wanted feature. If there are multiple features on top of each other they are listed as shown here in the example image where two aerodromes protective areas are overlapping. You can then select the individual geo-zones and open the details in a scrollable window.



The ED269 file format includes all the details regarding what type of geo-zone the feature is and the altitude band where it is active. However, currently WingtraApp treats all geo-zones the same way and will assume they are from the surface to unlimited altitude and prohibitive for flights.

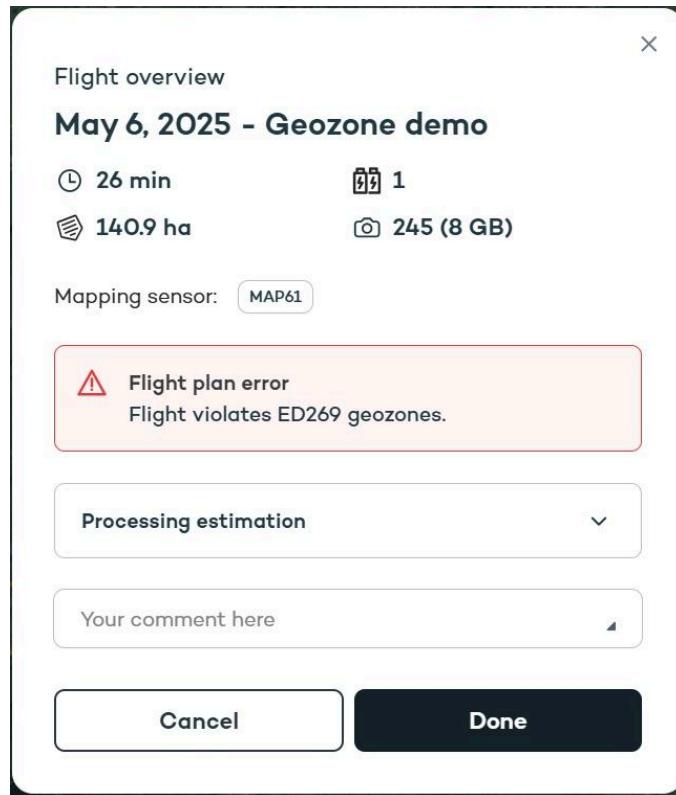


Purpose	AUTHORIZATION
Interval Before	PO1DTOOH
Lower Limit	0 M AGL
Upper Limit	99999 M AGL
Type	COMMON
Layer Id	9f02816e-b9cf-47a5-b54f-9b64fa496bfb
Id	e5cd9ef4-cd08-45eb-a0f5-6a71a8dafa24
Layer Name	Swiss_geozones_ED269.json
Feature Type	Polygon
Color	black

When saving a flight plan WingtraCloud or App will run a check if any geo-zones are overlapping with your flight plan.

 Check for ED269 geozones violation in progress.
This can take several minutes.

If geo-zones are overlapping with your flight plan then you will be given the following warning message.



Before starting a flight the preflight check will then run again a check if any geozones are overlapping with the flight plan and prevent take-off.

11 Software updates

Software releases often include both a new WingtraRay Firmware, as well as a new WingtraApp software version. You can only operate the system with compatible software versions and will receive a request from the app to update if this is not the case.

The WingtraApp software can be updated after a new software release. When connected to the internet, WingtraApp will inform you when a new update is available. You will profit from software updates Wingtra provides for both WingtraApp and the WingtraRay firmware.

The installation file is transferred from the tablet to the drone by means of the Tablet telemetry link. The FMU code is encrypted to protect against manipulation.

No training is required for new or upgraded UAS features. In case you require guidance in order to use the feature for the first time, this is displayed on the help slides that appear directly after the software update.

Changelog

In addition to the help slides you also have access to the change log on Canny (see example below). Canny is used for feedback, feature requests and publishing of the change log. You can log in to Canny following the linked instructions:

<https://knowledge.wingtra.com/en/introduction-to-wingtra-feature-requests-1>

You can always check your WingtraApp software version in "Settings" -> "About"

FW version is shown when the drone is powered on and the telemetry link is established between the tablet controller and the drone.

12 Basic maintenance instructions

WingtraRay does not require extensive maintenance in cases of normal operation. Here is what you need to know to maintain your drone.

Wingtra's approach to maintenance



Predictive maintenance / self diagnosis

At Wingtra we aim to make our drones as smart as possible when it comes to maintenance. WingtraRay can self-diagnose when you need to inspect or replace the batteries, the motors or propellers as well as its servos. Additionally, there are system checks in place to guarantee proper functionality of the onboard sensors (GNSS, baro, IMU), the camera, the PPK module and the telemetry.



Visual inspection

Customers should do a visual inspection of their equipment once per flying day. Visually check the WingtraRay hull, tail fin, winglets, propellers, motor mounts and batteries for damages. In case a part is damaged, it should be replaced.



Replacements and repairs

If a part breaks or reaches the end of its lifetime, it typically can be replaced by the customer.

We generally recommend that customers replace parts themselves since this minimizes downtime of the equipment.



Parachute maintenance

If the parachute is activated or it reaches its maintenance interval of 2 years it needs to be inspected and packed again by a Wingtra dealer.



Lifetime

If you treat a WingtraRay carefully, it will have a typical lifetime of two to four years. Once it reaches this age, we recommend replacing it with either a new drone bundle or replacing the drone with a new spare drone in order to have continued safe operations.

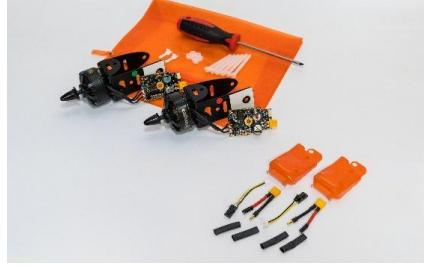
An inspection for damages is included in the pre-flight checklist, and should be performed before each flight. In addition to that, the predictive maintenance and self diagnosis functions of the WingtraRay might ask you to inspect or replace the batteries, the motors or propellers as well as its servos. All of these checks and inspections are logged in the flight logs to ensure traceability.

12.1 Spare parts & Replacements

Spare parts are items that can easily be replaced once an item gets damaged or reaches end-of-life.

While many components—such as motors, servos, and electronics—are automatically checked by WingtraRay predictive maintenance algorithms, we recommend visually inspecting the WingtraRay system before every flight. In case of damaged components, we recommend immediately replacing the damaged parts. Through this strategy, the WingtraRay lifetime can be maximized and incidents prevented. The following items are recommended to purchase as spare parts:

Product name	Description	Picture
Spare drone	WingtraRay wing, including electronics, telemetry antenna, nose cone, tail fin, winglets and propellers	
Set of flight batteries	Enabling a flight duration of up to 1 hour	
Battery charger	To charge one pair of flight batteries in the office within about 1 hour	

Winglets	Winglets with integrated landing legs	
Tail fin	Back rudder for stability during flight, and surface for landing as well as standing upright	
Propeller (pair)	Standard set for flights at up to 2500m AMSL.	
Drivetrain replacement kit	Left and right motor assembly, including all tools that are required for a replacement	
Nose cone	Covers the flight battery & SD card slot compartment	

128 GB high-speed SD card	Camera SD card with proven durability and reliability, based on tested read and write speed for flawless data acquisition	
Tablet SD card adapter (USB C)	To inspect flight data with the tablet directly in the field	
Bumper	Tail bumper cushions the landing	
Parachute cover	The hatch covering the parachute bay	
Replacement mounts and cameras for all payloads	All the items included in a payload package	
Control surfaces	The two control surfaces attached to the wings	

Basic replacement instructions can be found on the customer portal on Knowledge Base. Instructions to replace parts that require more advanced operations and skills, will be shared with you through our customer support team, for recommended replacement activities only.

12.2 Long-term storage

For long-term storage we recommend the following conditions:

Drone and payloads:

- Temperature: 25°C +/- 5°C (77°F +/- 5°F) .
- Relative humidity: 35 - 50% RH.
- Equipment should be stored in a dry, dark and low humidity environment.
- Be sure not to expose the drone to condensation, water drop or not to store it under frozen conditions.
- Altitude: 0m to 2500m ISA conditions.
- Protect the drone from mechanical shock and avoid drops, store the drone in the hard case.
- The storage location should be clean, without direct dust particles.

Battery

- Temperature: 25°C +/- 5°C (77°F +/- 5 degrees)
- Relative humidity: 0 - 80% RH.
- Equipment should be stored in a dry, dark and low humidity
- Environment.
- Be sure not to expose the battery to condensation, water drop or not to store it under frozen conditions.
- Altitude: 0m to 2500m ISA conditions.
- Avoid short circuiting the cell. Avoid mechanical damage to the cell. Do not open or disassemble.
- Keep away from open flames, hot surfaces and sources of ignition.
- Storage capacity at preferably 20 to 60% of the nominal capacity.
- Do not store the battery in places under direct sunlight or other sources of heat.
- Avoid storing the battery in the places where it is exposed to static electricity so that no damage will be caused to the protection circuit of the battery pack.
- Incompatible materials: Do not store them together with metallic objects.
- In case of leaked electrolyte, the housing can be damaged.

Make sure to perform a visual inspection and conduct a pre-flight check to return to service after storage.

12.3 End of life disposal

When it comes to the end of your drone's operational life, responsible disposal is essential to minimise environmental impact. Please dispose of the product in compliance with local laws and regulations. For more information on collection systems that are available for consumers, please contact your local municipal authority.

13 Compliance in US - FAA & FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance voids the user's authority to operate this equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with a minimum distance of 25 cm between the radiator and your body.

FCC ID:

2AVC8-WINGTRA-RAY

Contains FCC IDs:

NS9P2400, RYK-WPET236ACNBT, 2A3LJ-MAMWLE, XPYUBX21BE01

13.1 Compliant settings and operational limitations

- Operations Over People Category 3

To perform Category 3 operations over people in the US remote pilots must comply with the following requirements and operational limitations:

1. Remote pilots must maintain visual line of sight.
2. Maximum altitude flown must be below 400ft.
3. The UAS must not fly over open-air assemblies of human beings
4. The minimum flight altitude used for flight must be over 100 feet AGL
5. Flight operations over people are not allowed during take-off and landing and the flight phases below 100 feet altitude.
6. Remote pilots must have completed Wingtra's online OOP training module.
7. Maximum wind speed, temperatures, visibility and allowed configurations according to the following table.

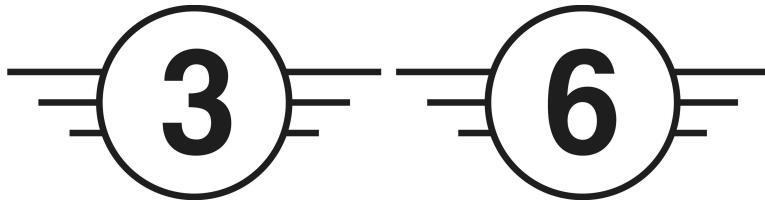
Wind speed limits per maximum altitude	Max sustained wind on the ground	Maximum altitude limit AMSL
	5 m/s (11 mph)	700 m (2300 ft)
	4 m/s (19 mph)	2500 m (8200 ft)
	3 m/s (7 mph)	5000 m (16,400ft)
Temperature limits	-10 to +40 °C (14 to 104 °F)	
Weather	Do not fly in fog, rain or snow	
Visibility	WingtraRay is allowed to be flown only during daylight in good visibility conditions.	
Allowed UAS configurations for OOP	UAS must be equipped with the parachute module and manual trigger device. The parachute module can be combined with any of the payloads listed in chapter 3.	

13.2 Compliant settings and operational limitations - Part107 operations without a parachute

To perform normal Part 107 sUAS operations remote pilots must comply with the following requirements and operational limitations:

1. Remote pilots must maintain visual line of sight.
2. Maximum altitude flown must be below 400ft.
3. The UAS must not fly over human beings

14 Compliance in Europe EASA & CE



WingtraRay is designed to comply with the Open category A3 rules and the EASA STS-02 permits requirements. It has been certified as a C3 and C6 class UAS for compliance to the previously mentioned operational rules.

Additionally, for the Specific category SORA authorisations WingtraRay is designed to be compliant with the EASA Means Of Compliance 2511-01 and 2512-01.

14.1 Compliant settings and operational limitations - Open Category A3



Operators in the Open category must always maintain Visual Line Of Sight VLOS. This requires lighting conditions to be sufficient and visibility otherwise good to ensure the ability to see the drone and other airspace users around the drone.

To operate a C3 drone in the open category, you have to consider the following requirements:

Subcategory	A3
Operational instructions	<ul style="list-style-type: none"> • Must not overfly uninvolved people; • Maintain a horizontal distance of 150 m from urban areas; • Maintain flight altitude below 120m above ground level. • Keep the UA in the line of sight
Drone operator registration	Yes
Remote identification	Yes

Geoawareness system	Yes
Remote pilot competence	<ul style="list-style-type: none"> • Read carefully the user manual; • Obtain a 'Proof of completion for online training' for A1/A3 'open' subcategory by: <ul style="list-style-type: none"> ◦ Completing the online training ◦ Passing the online theoretical exam
Remote pilot minimum age	16*

* A State may lower the remote pilot minimum age to 12. In that case, the lowered age limit will apply only in that State.

Required settings and operational limitations for Open A3 flights:

WingtraApp settings

Geobarrier ceiling	120 m
Connection loss timeout	10 seconds or less
Geo-zones	must be used in flight planning
Internet connection on tablet	must be used during flights

Allowed maximum wind speed, temperatures, visibility and allowed configurations according to the following table.

Maximum wind speed limit	Max sustained wind on the ground 8 m/s
Temperature limits	-10 to +40 °C (14 to 104 °F)
Weather	Do not fly in fog, rain or snow
Visibility	WingtraRay is allowed to be flown only during daylight in good visibility conditions.
Allowed UAS configurations for A3/C3	UAS can be equipped with or without the parachute module and with any of the payloads listed in chapter 3.

14.2 Compliant settings and operational limitations - EASA STS-02 permit



Operators flying with a STS-02 Declaration must fly during sufficient lighting conditions and good visibility (5km) to ensure the ability for the remote pilot and visual observers to see the drone and other airspace users around the drone.

To operate a C6 drone with a STS-02 Declaration, you have to consider the following requirements:

Operational instructions	<ul style="list-style-type: none"> Must only fly over controlled ground area Maintain flight altitude below 120m above ground level. Fly within a maximum distance of 1km away from the remote pilot or visual observer.
Drone operator registration	Yes
Remote identification	Yes
Geoawareness system	Yes
Remote pilot competence	<ul style="list-style-type: none"> Read carefully the user manual; Obtain a certificate for additional STS-02 theoretical knowledge obtained from a designated entity.

Required settings and operational limitations for Open A3 flights:

WingtraApp settings

GeobARRIER ceiling	120 m
Ground risk barrier	Must use the equation (1) in chapter 5.1.7
Connection loss timeout	10 seconds or less
Geo-zones	must be used in flight planning

Internet connection on tablet	must be used during flights
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Allowed maximum wind speed, temperatures, visibility and allowed configurations according to the following table.

Maximum wind speed limit	Max sustained wind on the ground 8 m/s
Temperature limits	-10 to +40 °C (14 to 104 °F)
Weather	Do not fly in fog, rain or snow
Visibility	WingtraRay is allowed to be flown only during daylight in good visibility conditions.
Allowed UAS configurations for STS-02/C6	UAS must be equipped with the parachute module and manual trigger device. The parachute module can be combined with any of the payloads listed in chapter 3.