



*quantum  
systems*

# TRINITY F90+ USER MANUAL V2.3.0.49

FOR TRINITY F90+ LOCKED <60 MIN. AND TRINITY F90+ UNLOCKED 90+ MIN.

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# 01

# GENERAL INFORMATION

# 01 GENERAL INFORMATION

Please read and follow these instructions carefully. All Quantum-Systems products are made for professional use only.

With the purchase of a Quantum-Systems product you agree with the terms and conditions. The applicable terms and conditions can be found at [www.quantum-systems.com](http://www.quantum-systems.com). These terms and conditions include regulations about liability and warranty.

Quantum-Systems GmbH reserves the right to make changes to specifications and product descriptions presented in this manual at any time without notice.

## **Applicable regulations**

When using Quantum-Systems products always follow civil aviation regulations. Regulations can vary depending on the country and the region where the product is operated. Inform yourself about the applicable laws before using a Quantum-Systems product.

“Beyond Visual Line of Sight” (BVLOS) operations might be prohibited depending on the country or area. In some areas, the use of UAVs is completely prohibited. Inform yourself about the privacy laws concerning the use of Quantum-Systems products equipped with cameras. The use of the products and the compliance of the regional laws is the user's sole responsibility.

## **Technical support**

For technical support please contact your reseller.

## **CE**

Quantum-Systems GmbH declares that the products: UAV Battery pack, UAV aircraft system, QS RC Transmitter, QS Battery Charger and QBase Modem are in conformity with the CE regulations.

## **Address**

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## **Version**

TF90+\_UM\_211103\_V2.3.0.49



The UAV is a UAV which combines hover capabilities with fixed wing flight. To ensure vertical take-off and landing (VTOL) the three motors are directed upwards, for cruise flight the motors are tilted forward. The thrust for forward flight is generated by the rear motor while the two front motors are turned off. Depending on the integrated sensor the UAV is suitable for a vast range of applications. The body of the UAV is made of Elapor® and molded around a rigid carbon fiber structure.

## 1.1 ABBREVIATIONS

<b>ACC</b>	Acceleration	<b>LED</b>	Light-Emitting Diode
<b>ADS-B</b>	Automatic Dependent Surveillance-Broadcast	<b>MAG</b>	Magnetometer
<b>AGL</b>	Altitude Above Ground Level	<b>MF</b>	Manual Focus
<b>ALT</b>	Altitude	<b>MSL</b>	Altitude Above Mean Sea Level
<b>ATO</b>	Altitude Above Take-Off	<b>QS</b>	Quantum-Systems
<b>BID</b>	Battery Identification Info	<b>PPK</b>	Post Processing Kinematik
<b>BVLOS</b>	Beyond Visual Line Of Sight	<b>RC</b>	Remote Control
<b>ELV</b>	Elevation (Ground)	<b>REEST</b>	Reestablishing
<b>EVTOL</b>	Electric Vertical Take-Off and Landing	<b>RTR</b>	Retransition Waypoint
<b>FLT</b>	Flight Time	<b>STBY</b>	Standby
<b>GCS</b>	Ground Control Station	<b>SRTM</b>	Shuttle Radar Topography Mission
<b>GPS</b>	Global Positioning System	<b>UAV</b>	Unmanned Aerial Vehicle
<b>GSD</b>	Ground sample distance	<b>UDP</b>	User Datagram Protocol
<b>ID</b>	Identification	<b>VTOL</b>	Vertical Take-Off and Landing
<b>IMU</b>	Inertial Measurement Units	<b>WGS</b>	World Geodetic System
<b>Incl</b>	Including		
<b>IR</b>	Infra-Red		
<b>JML</b>	JobMXL		
<b>KML</b>	Keyhole Markup Language		
<b>LAT</b>	Latitude		

# 02

# SAFETY INSTRUCTIONS

# 02 SAFETY INSTRUCTIONS

## 2.1 OPERATION

1. Always obey the manual when using the system.
2. It is the operator's responsibility to follow the laws that regulate the use of UAVs for the desired flying area. Flying out of pilot's sight might be prohibited depending on the local laws, please inform yourself.  
The distance between the pilot and the UAV should never exceed 2 km (1.24 mi).
3. Always keep a safe distance to spinning rotors of at least 10 m (33 ft) to avoid risk of injury and damage of property.
4. Always keep a safe distance between the UAV and humans at any time to avoid any personal injury in the event of a crash.
5. In case of an emergency the pilot must be able to manually fly the UAV in assisted flight.
6. Do not fly or take off close to objects generating magnetic/electromagnetic fields (power lines, generators, antennas, transformers, etc.) as it may cause malfunction of the GPS and/or the magnetic field sensors.
7. Do not fly or take off close to objects containing large amounts of metal or carbon fiber (parking decks, buildings of reinforced concrete, ships, cars or other machines) as it may cause malfunction of the GPS and/or the magnetic field sensors.
8. Always ensure proper GPS coverage of the UAV. Do not fly in narrow canyons as it may cause malfunction of the GPS and/or the magnetic field sensors.
9. Make sure no large obstacles (buildings, trees, mountains, etc.) or objects generating or blocking electro-magnetic radiation (antennas, fences, power lines, etc.) are between the transmitter/GCS and the UAV during the whole time of operation.
10. The Trinity must not be operated
  - at temperatures below -12 °C (10.4 °F) and above 50 °C (122 °F).
  - in rain or snowfall.
  - at windspeeds above 9 m/s (17.5 kn) (See chapter 3.1.). Please note

that the wind speed on the ground is always less than the wind speed at flight altitude.

11. Transportation of the system is only recommended in the original Quantum-Systems transportation box.
12. The use of third party products, such as batteries, chargers, ground modems, Payloads, RC transmitters and ground control stations, which were not provided by Quantum-Systems, is prohibited. Any modification to the system is prohibited unless expressly authorized by Quantum-Systems or an authorized reseller.
13. Due to the risk of an electric shock, do not open any Quantum-Systems products. For repair and maintenance work always contact your reseller (exceptions see chapter 13).
14. Each operator is responsible for ensuring the airworthiness of the UAV.
15. The UAV does not detect and avoid obstacles. Every operator is self responsible to plan a flight path that is free of obstacles.
16. Do not fly without a properly attached payload compartment.

## 2.2 BATTERY SAFETY

To avoid fire, serious injury and property damage observe the following safety guidelines when using, charging or storing the UAV battery pack. The UAV battery pack is based on Murata / Sony Konion US18650VTC6 - 3120mAh, 3,6V - 3,7V.

### 2.2.1 Battery handling

1. Do not use any battery other than the original UAV battery pack by Quantum-Systems.
2. Do not use or charge swollen, leaky, or damaged batteries. Do not use a battery that was involved in a crash or any kind of heavy impact.
3. For flying the temperature of the battery must be at least 25 °C (77 °F).

For outside temperature < 10 °C (<50°F):

- Heat up the battery to 25 °C (77 °F) for at least 5 hours

For outside temperature < 0° (<32 °F):

- Heat up the battery to 25 °C (77 °F) for at least 5 hours
- The flight time will be reduced to max. 70 minutes.

4. Do not expose the battery pack to direct sunlight. Temperatures over 60 °C (140 °F) may damage the battery pack.
5. To prevent malfunction of the battery, never fly the UAV in strong electrostatic or electromagnetic environments.
6. Do not drop the battery or expose it to water. Never open the battery pack or manually short circuit the battery. Replace the battery pack if exposed to water.
7. If your eyes or skin make contact with any battery liquid, immediately wash the affected area with clean running water for at least 15 minutes. See a doctor immediately.
8. Do not place the UAV battery pack in a microwave, dryer, oven or in a pressurized container. Do not solder on or close to a UAV battery pack. Do not place the battery pack near a cooking surface, iron or radiator.
9. Do not drop the battery pack. Do not step on it.
10. Never open or modify the battery pack.
11. The battery life may be reduced if it is not used regularly.
12. The Battery will age over time. Therefore, the warranty of the complete UAV system expires when batteries with more than 150 charging cycles are used.

## 2.2.2 Battery charging

1. To charge the battery follow the guideline as described in chapter 6.
2. Always use the Quantum-Systems battery charger to charge the battery pack. Quantum-Systems is not responsible or liable for damages caused by charging the battery with a third party charger.
3. Always charge the battery pack indoors at room temperature to prevent damage to the battery.
4. Do not charge the cells individually.
5. Never connect the battery pack to a wall socket or to the car charger outlets directly.

6. The battery must be charged under supervision. Never charge the battery pack close to flammable materials or on flammable surfaces.
7. Disconnect the battery when it is fully charged.
8. Do not clean the charger with flammable liquids like denatured alcohol.
9. Never use a damaged charger.

## 2.2.3 Battery storage

1. Keep the battery out of reach for children and animals . Do not leave the battery near heat sources such as furnaces or heaters.
2. Always store the battery at an ambient temperature of 25 °C (77 °F).
3. Always keep the battery dry. Do not expose the battery to water.
4. Never attempt to travel with or transport a damaged battery or a battery with a power level higher than 30 % or lower than 20 %.
5. For long-time storage (>1 week), it is recommended to charge/ discharge the battery pack to 75 % capacity.
6. Do not store the battery completely discharged.
7. Always remove the battery from the UAV when it is not in use.
8. Always apply the contacts protection cap if the battery pack is not in use.

## 2.2.4 Battery Warranty

1. Batteries are not covered as part of the standard warranty as rechargeable batteries are consumable components that become less effective as they chemically age.
2. Batteries are active elements and their life depends on the right handling and storage.

## 2.3 DISPOSAL



For the disposal of the UAV battery pack, follow the local regulations for the recycling of Li-Ion batteries. Do not dispose the battery pack with the normal trash. Make sure the battery is completely discharged before the disposal.

Before disposal apply the protection caps to the contacts. Never put the battery pack into fire due to the risk of an explosion. The battery can also be sent back to an official reseller or to Quantum-Systems. Dispose all Quantum-Systems products according to the local regulations for the recycling of electronic or electrical devices. The wings and the elevator of the UAV can be disposed along with plastic waste.



# 03

## TECHNICAL SPECIFICATIONS

# 03 TECHNICAL SPECIFICATIONS

TECHNICAL DATA	LOCKED <60 MINUTES	UNLOCKED 90+ MINUTES <sup>1</sup>
Max. Take-off Weight	5.0 kg (11.0 lbs)	5.0 kg (11.0 lbs)
Max. Flight Time	<60 min	90+ min <sup>1</sup>
Max. Range = Area	70 km = 500 ha	100 km = 700 ha
Maximum flight altitude (MSL)	4500 m (13123.4 ft) <sup>2</sup>	4500 m (13123.4 ft) <sup>2</sup>
Command and Control Range	5–7.5 km <sup>3</sup> (3.1–4.7 mi)	5–7.5 km <sup>3</sup> (3.1–4.7 mi)
Payload	max. 700 g (1.54 lbs)	max. 700 g (1.54 lbs)
Optimal Cruise Speed	17 m/s (33 kn)	17 m/s (33 kn)
Wind Tolerance (ground)	up to 9 m/s (17.5 kn) <sup>4</sup>	up to 9 m/s (17.5 kn) <sup>4</sup>
Wind Tolerance (cruise)	12 m/s (23.3 kn)	12 m/s (23.3 kn)
Battery Capacity	12Ah	12Ah
Battery Weight	1.5 kg (3.3 lbs)	1.5 kg (3.3 lbs)
RC transmitter frequency	2.4 GHz	2.4 GHz
Telemetry link (QBase Modem) frequency	2.4 GHz	2.4 GHz
Telemetry link (QBase Modem) power	max. 100 mW <sup>5</sup>	max. 100 mW <sup>5</sup>
Operating temperature range	-12°C to 50°C (10.4°F to 122°F) <sup>6</sup>	-12°C to 50°C (10.4°F to 122°F) <sup>6</sup>
Wingspan	2.394 m (7.85 ft)	2.394 m (7.85 ft)
Transport Case Dimension	1002×830×270 mm (39.4×32.7×10.6 inch)	1002×830×270 mm (39.4×32.7×10.6 inch)
Transport Case Weight (3 batteries)	22.3 kg (49.1 lbs)	22.3 kg (49.1 lbs)

1 Subject to export regulation, may require export permission.

2 Please be aware that the flight time and max. wind tolerance are reduced with increasing flight altitude. Depending on the weather conditions; tested at 15° C (59° F). For further details read the user manual chapter 3.1.

3 Under optimal conditions.

4 Please be aware that the max. wind tolerance is reduced with increasing flight altitude.

5 Please follow the local regulations for the maximum allowed transmission power.

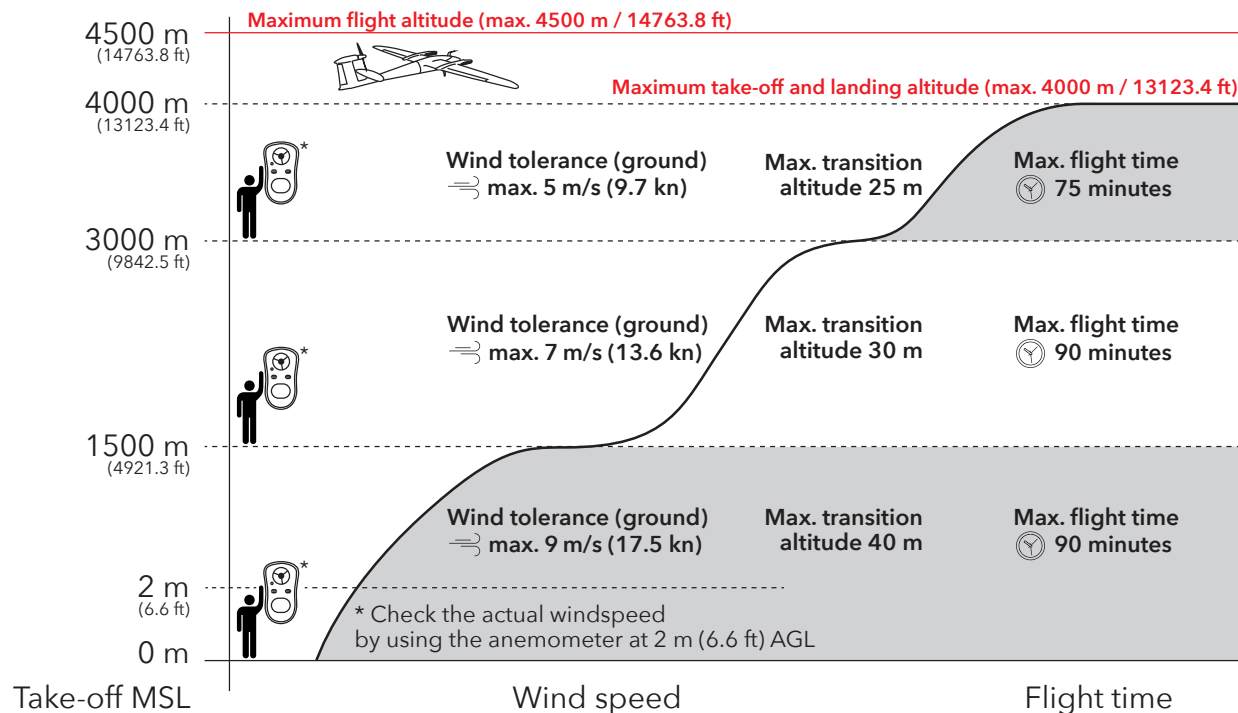
6 For outside temperature < 10° (<50°F):  
 • Heat up the battery to 25°C (77°F) for at least 5 hours  
 For outside temperature < 0° (<32°F):  
 • Heat up the battery to 25°C (77°F) for at least 5 hours  
 • The flight time will be reduced to max. 70 minutes.

### 3.1 MAXIMUM FLIGHT ALTITUDE & WIND TOLERANCE

Be aware that the wind tolerance (ground) is by default set to max. 9 m/s.

There is no automatic adjustment for take-offs between 1500 m – 4000 m regarding the wind tolerance (ground) and maximum flight time.

3

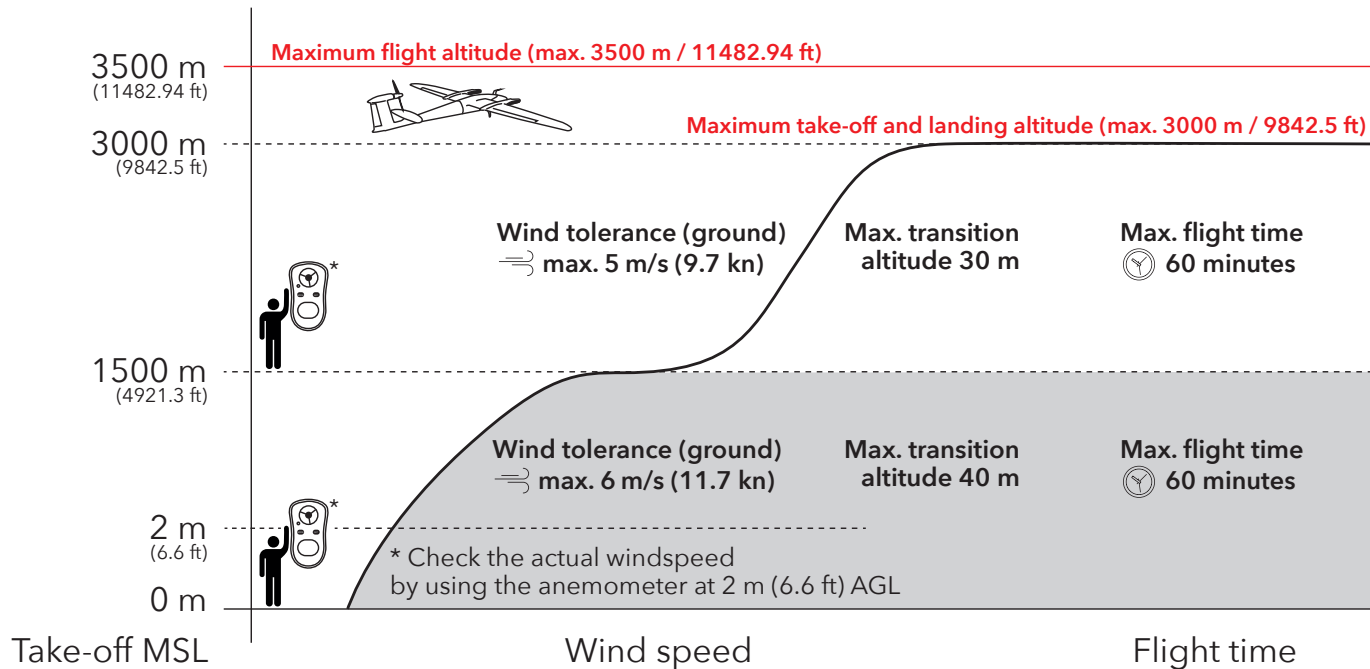


## 3.2 MAXIMUM FLIGHT ALTITUDE & WIND TOLERANCE WITH LIDAR QUBE 240

Be aware that the wind tolerance (ground) is by default set to max. 6 m/s.

There is no automatic adjustment for take-offs between 1500 m – 3000 m regarding the wind tolerance (ground).

The maximum flight time is restricted to 60 minutes.

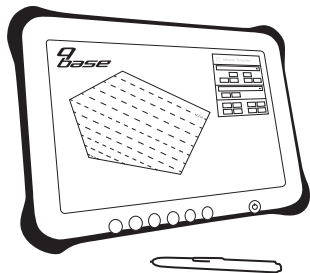


# 04

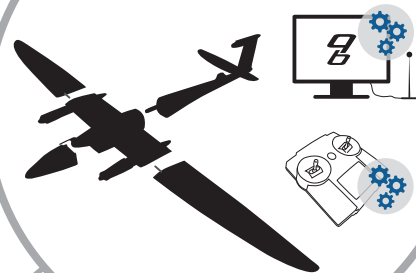
## PROCESS OVERVIEW

# 04 PROCESS OVERVIEW

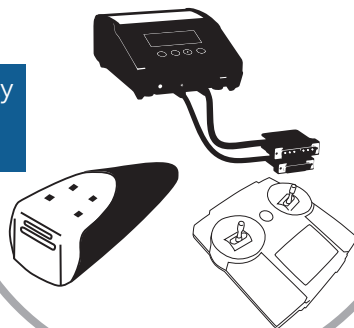
Planning a mission



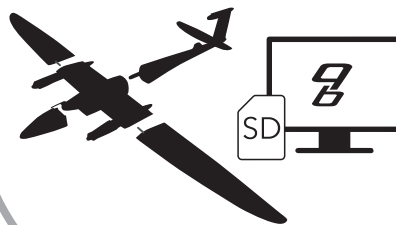
Flight setup



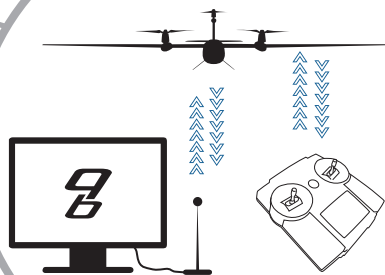
Charging your Trinity  
battery pack &  
transmitter



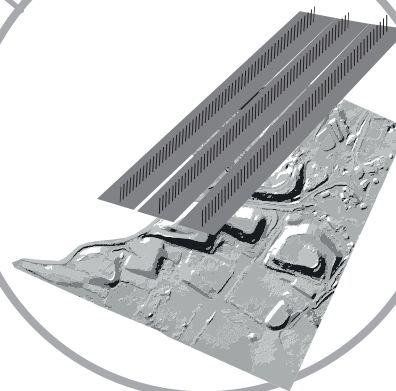
After the flight



Flight operation



Data Analysis







# 05

## COMMUNICATION LINKS

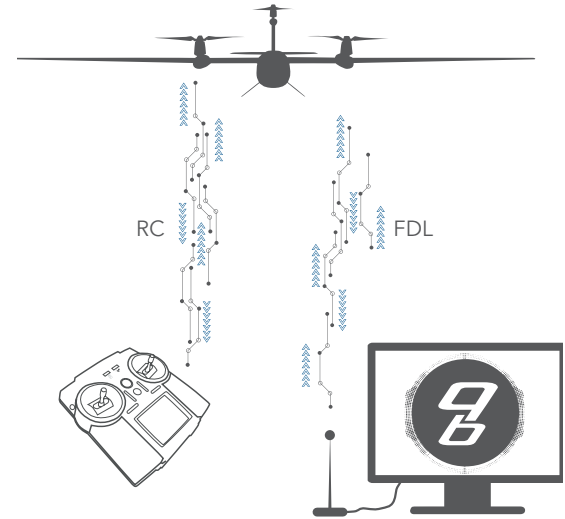
# 05 COMMUNICATION LINKS

The communication with the UAV is ensured by two links. The UAV is connected to QBase via a 2.4 GHz flight data link, a downlink sending telemetry data from the Trinity to QBase and an uplink sending commands from QBase to the UAV. The connection is ensured by the QBase modem.

The other link is a 2.4 GHz RC link between the transmitter and the UAV, that is used as an uplink for control commands and as a downlink sending telemetry data from the UAV to the transmitter.

It is possible to continue the mission even though one link is lost. In case of a loss of both links, the UAV flies to the link reestablishing waypoint and tries to reestablish the connection. If the connection is successful, either CONTINUE the mission or select COME HOME on the transmitter.

If both connections cannot be reestablished, a COME HOME will be initiated after the loiter time that was set in QBase expired. The UAV will land automatically.



# 06

## BATTERY & RC TRANSMITTER

# 06 BATTERY & RC TRANSMITTER

The Trinity is powered by 6S 4P Li-Ion batteries with an overall nominal voltage of 21.6V delivering 12Ah. The four batteries are completely physically separated and located in the nose of the Trinity. Each battery provides an energy of 65 Wh. The battery is enclosed by fire resistant ARPRO material. Do not open the Trinity battery pack at any time.

## 6.1 QS BATTERY CHARGER


The QS Battery Charger is suitable for charging the Trinity battery pack from the wall socket at 100V - 240V AC and for charging the battery with the help of a 12V car battery. Make sure your car is running while charging the Trinity battery to prevent depleting your 12V car battery. The USB port on the front panel of the charger can be used to charge the QS RC Transmitter. The following settings are pre-set for charging the battery pack and cannot be edited:



Charging current	12A
Discharging current	2A
Discharging voltage	3.1V
TVC voltage	4.17 V
Charging time	Around 1h (depending on state of charge)
Charging current USB port	2.1 A



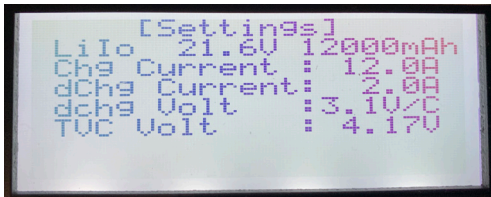
### 6.1.1 Menu overview

Change the menu of QS Charger by pressing  on the user panel.

Scroll through the menu or the submenu by selecting  and  on the user panel.

Select a menu item by pressing  on the user panel. To go back select .

6



#### [Settings]

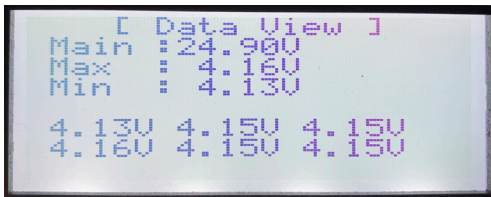
Battery type, nominal voltage, nominal capacity

Chg = Charging

dChg = Discharging

TVC (Terminal Voltage Control) = Final charge voltage per cell

All settings are default settings and can not be edited.

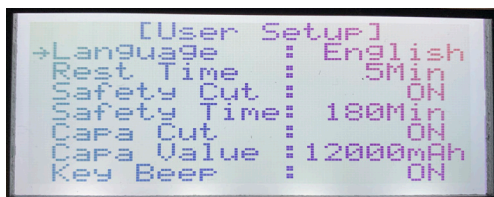


#### [Data View]

Main = Current total voltage of the six serial connected cells

Max/Min = Current minimum/maximum voltage of the cells

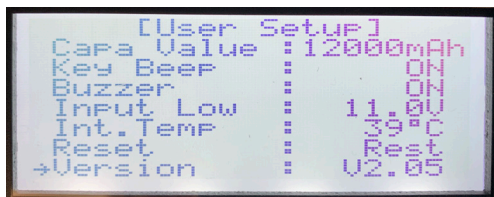
Current voltage of each cell



### [User Setup]

Language = Set the language (English, German, Italian, French)

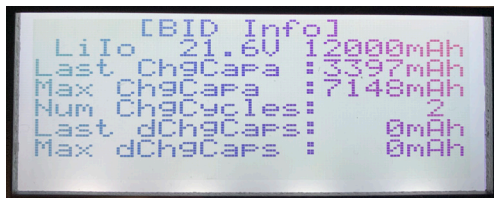
Key Beep = Mute/unmute the key beep.



Buzzer = Mute/unmute the audio signal. The signal notifies you when the charging process is finished or in case of an error.

Input Low = Set minimal input voltage (range 10.3V - 11V). Is used for safety reasons to not drain your car battery.

Note: Other settings than the one described above cannot be changed.



### [BID (battery identification) Info]

It is possible to read out data saved on the battery.

ChgCapa = Charged capacity

ChgCycles = Charging cycles

dChgCaps = Discharged capacity

## 6.1.2 Error messages

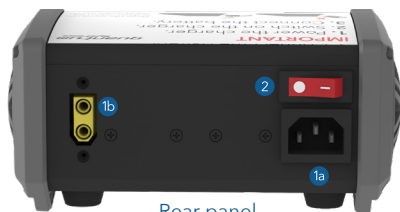
ERROR MESSAGES	EXPLANATION
[BID Insert / Break]	If the battery is disconnected during the charging process, reconnect the battery and press START/ENT on the user panel. Restart the charging process.
[BID is not Connected]	Please do a cross check with another battery to find out if it is the battery or the charger that is causing the issue. 1. If the battery is causing the issue, please contact your reseller for repair. 2. If the charger is causing the issue, the charger has to be replaced.
[BID Error Data Invalid]	Please do a cross check with another battery to find out if it is the battery or the charger that is causing the issue. 1. If the battery is causing the issue, please contact your reseller for repair. 2. If the charger is causing the issue, the charger has to be replaced.
[Internal temperature]	An internal temperature is excessive. Allow the charger to cool down.
[Balance connector Error]	Make sure the plug is connected correctly.
[Charging Timeout]	Please continue charging/discharging the battery by starting a new charging/discharging cycle. Depending on the state of charge the warning will be triggered during discharging.

6

## 6.2 CHARGING / DISCHARGING THE BATTERY PACK

For charging the Trinity battery pack use the QS Battery Charger only. Before charging please see 2.2.2 for the charging safety instructions.

### 6.2.1 Connecting the charger to the battery



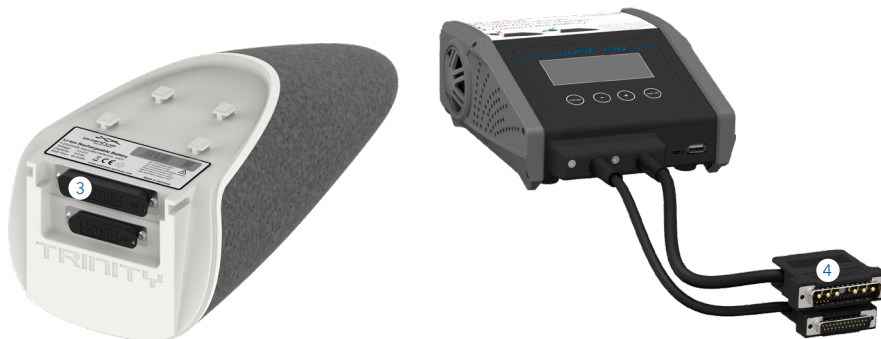
Rear panel

**1a. Connect the power cord** to the AC 100 – 240V port and connect it to a wall socket.

**1b. Alternative:** charging the battery with the help of a car battery. Connect the XT 60 power cord to the DC 11 – 18V port and connect the black clamp to the minus pole and the red clamp to the plus pole of the car battery.

Note: To prevent draining the car battery the minimal input voltage of the QS charger can be set (see chapter 6.1.1).  
Please follow your car manual for connecting the charger to the battery.

## 2. Turn on the charger.




**3. Remove the covers** from the contacts of the battery. Always apply the battery covers when the battery pack is not in use.

## **4. Connect the battery to the charger.**

If the connection is successful an audio signal notifies you.



## 6.2.2 Charging process

1. **Connect** the battery pack to the battery charger according to chapter 6.2.1.
2. **Press and hold the**  **button** for five seconds. Make sure the [Settings] menu is selected while pressing the button.
3. **Select** if you would like to fully charge the battery, charge or discharge it to 75 % or to 30 % capacity.

Scroll through the menu by pressing  and  on the user panel. Make a selection by pressing .

To go back select .



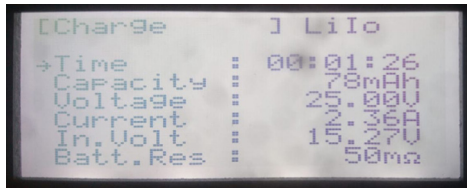
### Charging settings

- 100 %: Battery should be fully charged before each flight
- 75 %: For long time storage (> 1 week)
- 30 %: For shipping or transportation on an airplane



Find the UAV battery charging video tutorial on our YouTube channel. Just search for [www.youtube.com/c/QuantumSystems](https://www.youtube.com/c/QuantumSystems)

4. The following display gives you an overview of the **charging process**.



5. When the charging process is finished, it is shown on the display ([End: Charge]). If the buzzer is active (see chapter 6.1.2) an audio signal notifies you as well.
6. Disconnect the battery from the charger and turn it off.

## 6.3 BATTERY STORAGE

Please see chapter 2.2.3 for all battery storage safety warnings. Due to safety reasons, it is recommended not to leave the battery connected to the UAV when stored in the transportation box:

- Charge/discharge the battery to 75% capacity for long time storage (> 1 week) (see chapter 6.2).
- Always apply the battery protection caps to the contacts of the battery when the battery is not connected to the UAV.

### Storage temperature

The battery pack should be stored at an ambient temperature of 20°C to 25°C (68°F to 77°F).

### Storage location

Store the battery in a dry, non-humid location. Preferably inside a building.

## 6.4 BATTERY USE

- We advise you to use fully charged batteries for each flight. If the charging Status is below 62,5%, the UAV will disable the take-off automatically.
- After **150 charging cycles**, it is recommended to exchange the UAV battery pack (see chapter 13.4 ).
- The Battery will age over time. Therefore, the warranty of the complete UAV system expires when batteries with more than 150 charging cycles are used.
- For an ideal flight performance, the temperature of the battery should be 20°C to 25°C (68°F to 77°F).



If the temperature of the battery is below 15°C (59°F), the flight time will be drastically reduced.

- If you fly at an ambient temperature of below 15 °C (59 °F), ensure that you leave the battery pack at a heated place, 20 °C to 25 °C (68 °F to 77 °F), for as long as possible (e.g. inside a heat box or inside a car). If you wish to fly at an ambient temperature below 0 °C (32 °F), make sure the battery is heated to 25 °C (68 °F) before the flight.

## 6.5 TRAVEL NOTICE

For shipping the UAV battery pack its state of charge is not allowed to exceed 30 % (based on IATA Lithium Battery Guidance Document: <https://www.iata.org/whatwedo/cargo/dgr/Documents/lithium-battery-guidance-document-2017-en.pdf>). When carrying the UAV battery pack on board of an airplane, please charge the battery pack to 30 % state of charge. It must be carried in carry-on baggage. See chapter 6.2. to charge the battery pack to 30 %.

# 6

## 6.6 QS RC TRANSMITTER

Please do not use any other transmitter than the QS RC Transmitter to control the UAV. The transmitter works in the 2.4 GHz ISM band.

### 6.6.1 Transmitter specifications

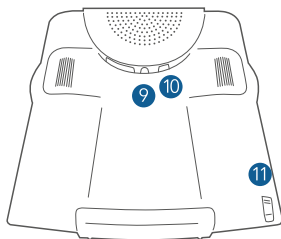
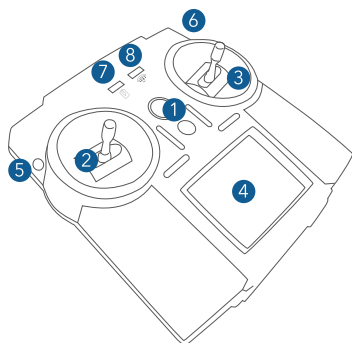
---

Frequency - 2.4 GHz

Transmission power - 100 mW (EIRP)

Power supply - LiFe battery 3.3 V / 4 Ah

Total weight approx. - 820 g (1.8 lbs)



#### 1: Power button

Turn on / off the transmitter.

#### 2 & 3: Left stick and right stick

The sticks are used to control the UAV. Some stick control inputs are not relevant depending on the flight mode.

#### 4: Touch display

For the use of the touch display use the supplied stylus pen or your fingers.

#### 5 & 6: Transition buttons

Push both buttons simultaneously to start the transition or retransition.

#### 7: Transmitter battery warning

The battery warning becomes active 30 minutes before the battery of the transmitter is empty.

#### 8: RC link light

The light is off when the RC link is established.

#### 9: 3.5 mm headphone jack

#### 10: Mini USB port

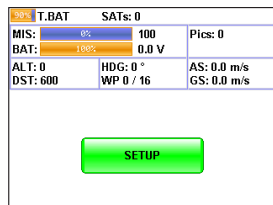
The Mini USB port is used to charge the transmitter.

#### 11: Stylus for the touch display

### 6.6.3 Binding the RC transmitter to the UAV

1. Please open QBase.
2. Select **Updates** in the main menu.
3. Select **Reset RC**.
4. Make sure the RC is turned off.
5. Connect the Trinity to your computer via the magnetic USB cable and make sure the connection is established, indicated by the green connection symbol in the top right corner of QBase.
6. Please follow the steps in QBase.

## 6.6.4 RC transmitter settings



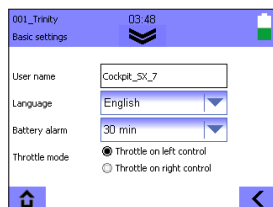
### Open the Setup menu

The transmitter is switched off. Then press and hold the right transition button of the RC transmitter and the power button simultaneously for about 5 seconds until the display turns on automatically.



### Setup

Choose between the following settings.



### Basic settings

Change the user name.

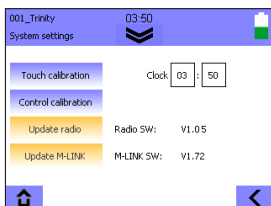
Set the language.

Set the battery alarm.

Set the throttle mode (stick configuration). If you change the stick configuration, the sticks are swapped.

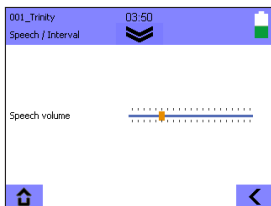
### M-Link settings

Please see chapter Binding the RC Transmitter if you have questions concerning a range check or concerning the binding.



### System settings

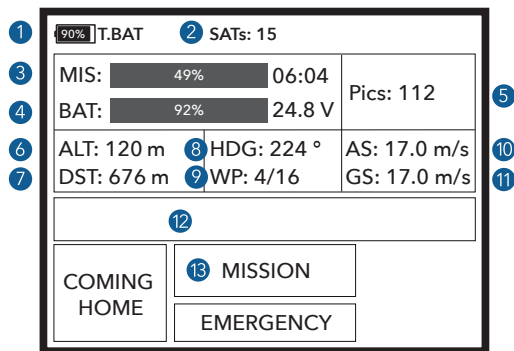
Calibrate the touch display.  
Set the time.



### Speech volume

Set the speech volume.

## 6.6.5 RC transmitter display during the flight



1. Battery state of your RC Transmitter
2. Number of satellites
3. Remaining mission time
4. Battery state of the UAV
5. Number of the taken pictures
6. Current altitude above take-off
7. Distance to the Home Waypoint
8. Heading (direction of the nose of the UAV)
9. Waypoints (current/overall). If switched to manual flight: (current/ heading e.g. 250° of the home waypoint) (see chapter 9.2 step 13.1)
10. Current airspeed
11. Current ground speed
12. Messages
13. Current state of the UAV

### 6.6.6 Charging the RC transmitter

The QS RC Transmitter is charged via the Mini USB on the back of the transmitter.

### 6.6.7 RC transmitter firmware update

If an update for the QS RC transmitter becomes available, you will be informed by your reseller.

1. Connect the USB cable to the Mini USB port on the back of the transmitter and connect the transmitter to your computer, laptop or tablet.
2. The transmitter is switched on.
3. Select USB data connection.
4. The transmitter COCKPIT\_C3 is now displayed in the file explorer of your PC.
5. Delete all folders in the COCKPIT\_C3 directory.
6. Unpack the new firmware .zip file.
7. Insert all subfolders of the firmware folder into COCKPIT\_C3.
8. Disconnect the USB connection between the transmitter and your computer, laptop or tablet.
9. Push the left transition button and the power button simultaneously until the red LED starts rotating.
10. The LED on the transmitter starts rotating. The transmitter starts to update.
11. The update is finished when the display switches on and the lights are yellow.

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## 6.7 COOLING STATION

In case of Motor Temperature too high please use the cooling station to cool down the ECS temperature. The cooling station turns on automatically when connected to the Trinity F90+ battery. Insert the cooling station outlet into the air inlet of the Trinity F90+. The cooling station needs about 3 minutes to cool down the ECS temperature. The cooling station needs to be ordered separately.





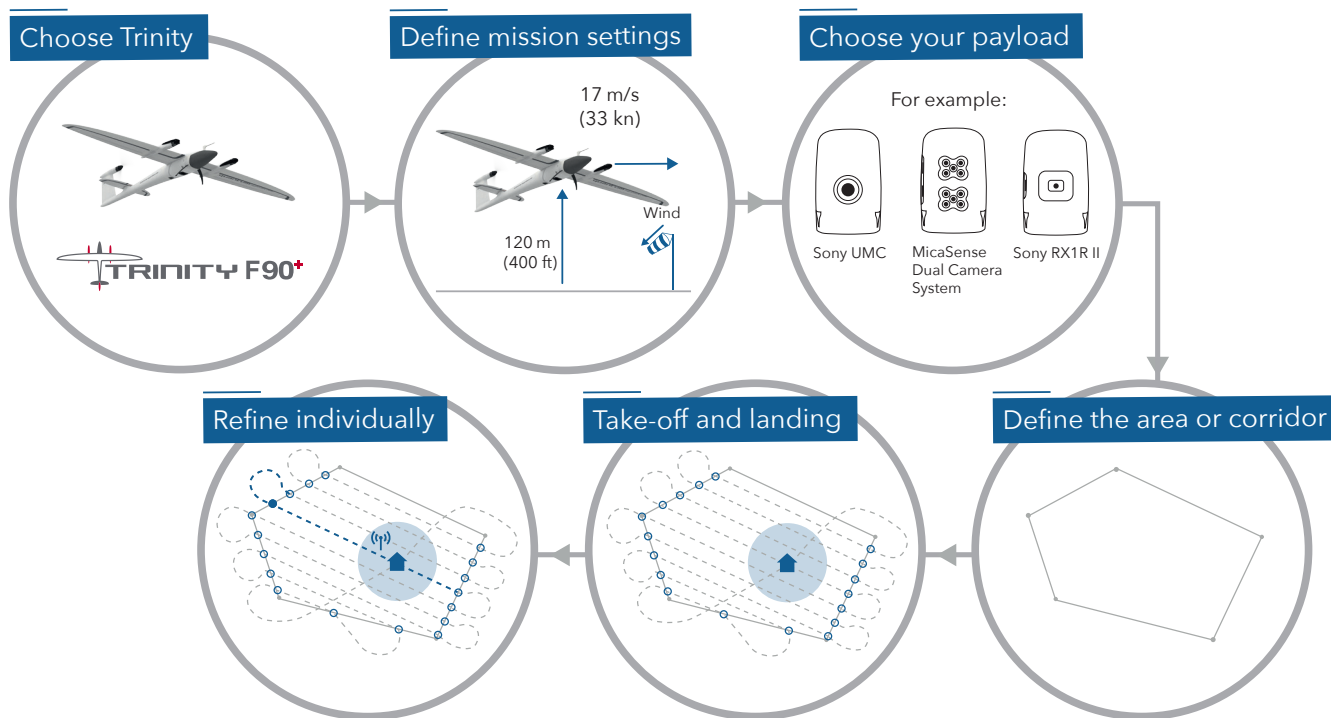


# 07

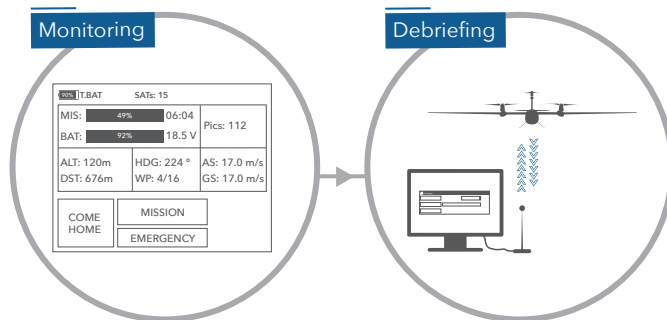
## QBASE - GROUND CONTROL STATION

# 07 QBASE – GROUND CONTROL STATION

QBase is a Microsoft Windows based desktop software. QBase assists the user in planning a mission. The planning process is always accomplished in the following order:



After planning a mission, QBase assists the user in monitoring and controlling the UAV during the flight but also in debriefing the mission.



7



Find the QBase area and corridor planning video tutorial on our YouTube channel.  
Just search for [www.youtube.com/c/QuantumSystems](https://www.youtube.com/c/QuantumSystems)

# 7.1 INSTALL/UNINSTALL QBASE

The following chapter will deal with the installing and the uninstalling of QBase.

## 7.1.1 Install QBase

1. QBase is provided by your reseller.
2. Open the QBase installer file and follow the instructions of the installation guide.
3. Open **Start QBase** to open the program.

MINIMUM SYSTEM REQUIREMENTS	
OS	Windows 10 64bit
CPU-Speed	2.5 GHz or higher (Hyper-threading or Multicore recommended)
RAM	2 GB or higher
Free Disk Space	500 MB
Display	24-bit color depth
Screen Resolution	1600 x 900 or higher at normal size (96 dpi)
Video /Graphic Adapter	64 MB RAM minimum, 256 MB RAM recommended; NVIDIA, AMD, and Intel chipsets supported; Accelerated graphics card driver; Be sure to use the latest available driver

If you have problems starting QBase, make sure your installation of Microsoft Windows is up to date.

## 7.1.2 Uninstall QBase

1. Open **Settings**.
2. Open **Apps & features**.
3. **Search** for QBase.
4. Select **Uninstall**.

Alternative: Uninstall QBase by using the uninstaller shortcut found under  
C:\Programs\Quantum Systems\QBase 3D\Uninstall QBase 3D

### 7.1.3 Drivers

#### QBase Modem driver

For the connection between QBase and the UAV via the QBase modem a driver is required. If you have problems connecting the UAV to your computer via the QBase modem, make sure the driver is installed.

The required driver can be found in the Windows directory: Programs → Quantum Systems → QBase 3D → Drivers → QBase Modem

Open CDM21228\_Setup.exe and follow the instructions of the installation guide.

#### Autopilot

When using Windows 8 for the connection between QBase and the UAV via USB a driver is required. If you have problems connecting the UAV to your computer via USB make sure the driver is installed.

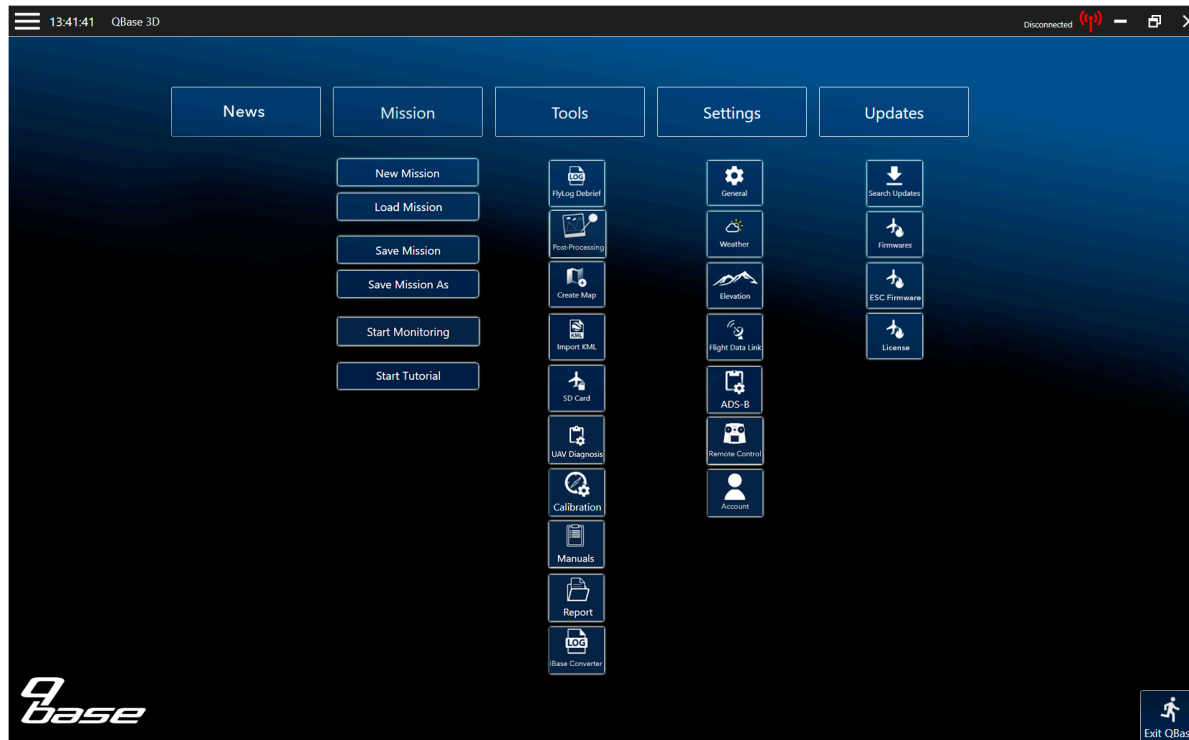
The required driver can be found in the Programs → Quantum Systems → QBase 3D → Drivers → Autopilot

Open Setup\_W8\_x64.exe (also for windows 10) and follow the instructions of the installation guide.

## 7.2 USER INTERFACE

The graphical user interface of QBase is divided into several sections.

### 7.2.1 Main menu





## Create Map

Offline maps are generated based on the information of the online maps. During the creation process QBase needs to be connected to the internet.

1. Select Pan To in the left section and search for the area that you wish to create the offline map of or zoom to the desired location.
2. Boundaries are marked with a green rectangle. Please add some margin between the boundaries of the offline map and the desired flight area. It is possible to switch between horizontal and vertical orientation.
3. The Max. Zoom (maximum level of detail) is displayed in the top left corner. In order to change it please use the scroll bar in the right panel.  
**Recommended zoom level: 17 - 18.**
4. Set a name for the offline map.
5. Select *Download* in order to save the offline map. If the Download button is disabled either decrease the Max. Zoom (maximum level of detail) or decrease the area of the offline map.

The map is saved in Documents > QBase > Maps.

## Map Layer

It is possible to import a custom map layer. The format needs to be a .tif file.

Please insert the corresponding file into Documents > QBase > Maps > Layers.



## Post-Processing

Geotagging the pictures with the accurate PPK coordinates. Please see chapter 7.4.3



## Import KML

Import your KML file to improve your mission planning.



## SD Card

See chapter 7.4.3



## Calibration

Calibrate the magnetometer and accelerometer.



## iBase Converter

Convert the iBase Log file to Rinex 2.11



### Weather

This menu gives you an overview of the weather forecast for the specific location.



### Elevation

Download the SRTM elevation data for offline use of QBase 3D.

Please note that the SRTM data in general is only available between 56° S and 60° N.

SRTM was recorded with an accuracy of around 30 meters and might not correlate with the actual elevation profile.

You can also import your own elevation data.

Make sure the imported file is a .tif file with WGS 84 coordinates with EPSG 4326 and EGM 96 geoid altitude.



### Flight Data Link

The network ID and password for the connection between the QBase modem and the Trinity can be changed.



### ADS-B

To change the ADS-B settings a connection via the QBase modem must be established.

Call-Sign:

Individual name or number. Call-Sign should be suitable for identification.

ICAO-Code:

A unique code that is provided by the ICAO. Only use those codes provided by the authorities. Do not use the transponder without allocated ICAO-Code.

Squawk:

Standard VFR (visual flight) Squawk in Europe is 7000. Use this as default. If in contact with Air Traffic Control please change your squawk upon request.

Modes:

Mode A: Only Squawk is sent to the radar station  
Mode C: Squawk and Flightlevel are sent to the radar station

Standby: No data transmission





### Remote Control

In this menu you can bind the RC to the Trinity.



### Account

QBase offers the possibility to create a user account. This allows to share missions between different computers.

The missions are automatically saved online to the corresponding account when being connected to the internet.

Furthermore, QBase3D can be used in the standard version or the Pro version. With every purchase of a Trinity F90+ one Pro license is delivered. The Pro License can be activated by connecting the Trinity F90+ to your computer while being logged into your account.

The license file is then saved in the corresponding account. When logging into the same account on a different computer the Pro license will also be available.

One license key from a Trinity F90+ can be used with multiple accounts.

The Pro license enables the user to use the KML Editor functions (see chapter 7.2.3).



### Search updates

If new updates are available you can download them.



### Firmwares

In this menu you can install new PMB and UAV firmwares.



### ESC Firmware

Flash new ESC firmware.



### License

If a 90 minutes license is available the 90 minutes license can be activated. Please follow the steps described in this manual.

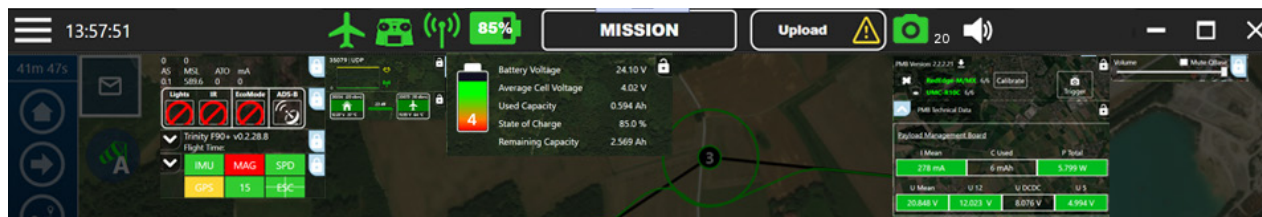
### Mission Synchronization

When logged into the account missions can be uploaded to your account. This offers the possibility to open the same mission on a different computer when logged into your account.

The green check mark shows that the upload was successful.



## 7.2.2 Header



### Header Icon colorcodes:

Unknown Status

Operational

Warning

Error (Either flight or mission critical)



### UAV Status

1. UAV type
2. Autopilot version
3. Flight time
4. Serialnumber
5. Sensor status information



### GCS Controller Status



Display widgets permanently by activating the **lock symbol**



### Mode Display

Current autopilot mode



### Camera status + Amount of pictures

Widget open:

1. Name of camera
2. Amount of pictures/Amount of trigger attempts



### Upload Status

1. Write flight plan: Upload your mission to the UAV
2. If a different mission is stored on the UAV, the upload mission box appears with a **Warning** or an **Error**.

## 7.2.3 Planning screen

The screenshot displays the Trinity F90+ planning interface. The main map shows a green flight path with numbered waypoints (1-54) over a satellite view of a rural area. The left sidebar contains the following sections:

- Mission Settings**: Includes buttons for 'Add New Element', 'Clear All', and 'Reset All'.
- Mission Elements**: A list of mission stages:
  - 1 Take-Off / Landing**: Alt: 25 m ATO
  - 2 Transit**: 1m 48s, Dist: 1.7 km
  - 3 Area**: 48m 14s, Area: 106.2 ha, 2.13 cm/px
  - 4 Transit**: 1m 46s, Dist: 1.9 km
  - 5 Retransition**: Alt: 30 m ATO
  - 6 Landing Path**: 32s, Dist: 54 m
- Zone Elements**: A section for defining mission zones.
- Status**: Total Flight Time (52m 20s), Total Area (106.2 ha), Total Battery (75% (1 Bat)).
- Controls**: 'Restart Simulation' and 'Show Monitoring' buttons.

A 'Choose Map' dialog is open, showing options: 'World Imagery', 'World Imagery with Labels', 'World Streets', 'Terrain with Labels', 'Topographic', 'Open Street Map', and 'Default'. The 'World Imagery' option is selected. The map also features a 'Plots' button at the bottom right and a '500 m' scale bar.



**MAP NAVIGATION** The map can be moved by using left mouse button. Zooming is possible with the mouse wheel. Touch screen devices: Move the map with one finger. Use two fingers to zoom in and to zoom out.



**Message Dialog**  
Info, Warning, Error



**Lock Map To UAV**  
The map stays focused on the UAV.



Zoom in



Zoom out



**Wind**



**GDAL**  
The user provided custom elevation files are used as the single data source.



**MIXED**  
Both the SRTM data set and the user provided custom elevation files are used as data sources. This is the case if not all flight path elements are covered by the user provided file.



**SRTM Downloading**  
The required SRTM elevation files are currently being downloaded.



**Calculate Bearing**  
Get a bearing and range of the aircraft to your selected reference position. This helps communicating with ATC or other airspace users.



**Choose Map**  
The list includes online and offline maps. To use online maps, make sure your device is connected to the internet.

### Pan to Dialog

Select the button *Pan* to if you wish to pan to the UAV, to the mission or if you wish to search for an address.

### Map Settings

Adjust the display settings of the map.

### KML Editor

This feature is only available if the QBase3D Pro license is activated, it features advanced KML import and managing possibilities.

The tool offers the possibility to import and display multiple KML files and its elements. The kml elements can be used for planning a mission by drawing the mission elements accordingly.

Furthermore, it also allows you to automatically plan a mission element based on the imported kml file. Therefore please select the kml element (highlighted blue), choose the corresponding shape from the drop-down and select Create. The kml shapes area and path are supported to either create a flight area or a flight corridor.



### Switch to 3D view



### MISSING ELEVATION

One or more SRTM elevation files could not be downloaded.

This can be caused by the following reasons:

- A connection error occurred.
- The requested elevation data is not available.

This applies to regions which are not covered by the SRTM data set.



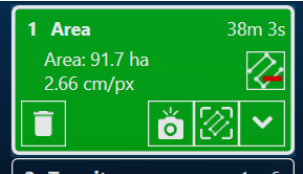
Location where the Trinity F90+ will return due to 60 minutes flight time restriction (if applicable).



Predicted location where the Trinity F90+ will return due to battery low.



# Mission elements



Deactivate element



Show/Hide Payload Triggers

(This will not deactivate the trigger-points)



Pan to Element



Delete element



Move element up/Move element down  
(in order to change the order of the elements)

Element Summary		UMC-R10C	
Flight Length:	7.9 km	GSD	2.95
Flight Time:	7m 45s	cm/px	
Battery Usage:	7% (1 Bat.)	Trigger	1.2
Trigger Count:	288	s	

**Element Summary:** All Settings are displayed in the right corner.

If the selected **camera cannot manage the required trigger speed**, the trigger speed is **displayed in red color**. In this case, try to switch the side and forward overlap settings in the Mission Settings. Other options are selecting a higher flight altitude or changing the direction of the legs (cross wind).

# Plots



**MSL:** Altitude above sea level of UAV  
**ATO:** Altitude above take-off  
**AGL:** Altitude above ground of UAV  
**GSD:** Ground sample distance

**Plot colorcodes:**

During Mission:

Warning <50 m

Error <20 m

During Take-off and Landing:

Warning <19 m

Error <10 m



## 7.2.4 Monitoring screen



7

### Plot

#### Live Elevation Plot (Plots)

- Current altitude above ground (AGL)
- Current altitude above mean sea level (MSL)
- Altitude of the last 10 seconds
- Predicted altitude for the next 50 seconds.



#### UAV Type

- Displays wind speed, direction, groundspeed & airspeed
- Transparent UAV icon: estimated shadow (based on time & coordinates)



#### Mission & Emergency Commands

## 7.3 PLANNING A PHOTOGRAMMETRY OR LIDAR MISSION

In order to display the planning view, choose **New Mission** or **Load Mission** in the **Mission Menu**.

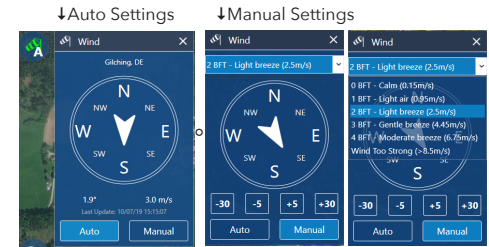
### Wind Settings



- Auto: Get the wind data online.

The wind is automatically updated as soon as the first waypoint is defined

- Manual: Set the wind manually by selecting:
  - the corresponding BFT intensity in the dropdown menu
  - the current wind direction with -30/-5 or +5/+30



### Mission Settings

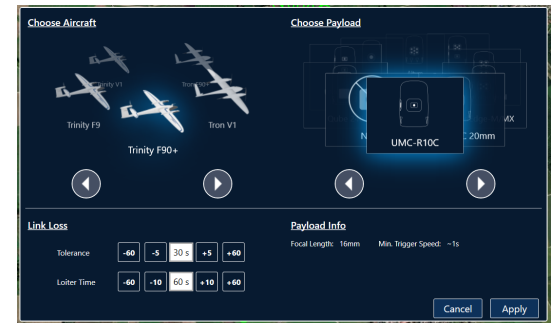
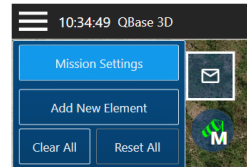
- To be found in the top left corner
- Choose UAV and sensor

#### Link Loss Tolerance

If the RC link as well as the flight data link is lost during the flight, the UAV returns to the link reestablishing waypoint after the selected time expired.

#### Link Loss Loiter Time

At the link reestablishing waypoint, the UAV loiters for the selected time and tries to reestablish the telemetry connection to QBase and the transmitter.



## Add new element

Add a new element by clicking one of the following buttons:

**Set Take-Off/Landing:** Location and settings of Take-Off/Landing and retransition can be individually adjusted afterwards.

**Draw New Area:** The flight area is created by defining the corners of an area. Each click on the map defines a corner of the area. The orange highlighted circle represents the highlighted corner. To move a corner it must be selected.

**Load Area From File:** A .kml or .shp file can be imported into QBase. The flight area is automatically created based on the file.

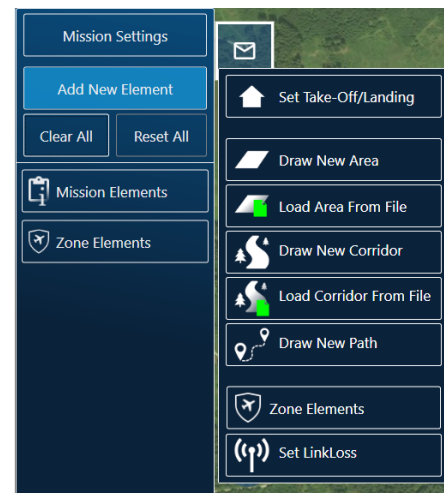
**Draw New Corridor:** The corridor is created by defining the points of a polyline. The orange highlighted circle represents the selected point. To move a point it must be selected.

**Load Corridor From File:** A .kml or .shp file can be imported into QBase. The corridor is automatically created based on the file.

**Draw New Path:** The path is created by defining waypoints through a click on the map.





**Zone Elements:** The zone element is created by defining the corners of an area. Each click on the map defines a corner of the area. The orange highlighted circle represents the selected corner. To move a corner it must be selected.

**Link Loss:** (chapter 7.3): By default, the Link Loss Loiter Circle is equal to the retransition circle. You can set it separately using this element.



## Planning a new area

Draw a new area according to chapter 7.3.

 **Undo the last change** editing the geometry  **Redo the last change**  **Delete selected point**  **Finish**

 **Start/Stop adding points** By selecting  a new point between two existing points can be added.

After planning the area the settings dialog appears. You can always edit the settings by selecting the element on the left side or in the map.

**GSD:** The ground sample distance (distance on the ground between the mid of two pixels) is calculated based on the flight altitude and the camera properties for each camera. This value is linked to the altitude.

**Altitude:** The flight altitude is defined as the altitude above ground.

Please do not exceed the maximum altitude that is allowed for your region. This value is linked to the GSD.

**Side and Forward Overlap:** Overlap settings are dependent on the payload. Overlap default settings are based on the payload settings.

**Legs can be extended** at the entry and the exit of the flight area. By default the legs at the entry are extended by 30 m to ensure alignment of UAV and leg before starting to take pictures.

**Skip Waypoints:** Skip the selected amount of waypoints at the beginning of an area.

**Flip Legs:** Change the waypoint order of the area. While planning a PPK mission in QBase it is recommended to choose the



option **Flip Legs** for optimal PPK quality. This option is necessary so that the **first waypoint is as far away as possible** from the Home Waypoint.

**Invert Legs:** Change the entry and exit direction on a leg.

**Optimize Leg Sequence:** Optimize the leg order based on turn radius of the UAV and the current leg distance.

**Deactivate Triggers:** By default the payload is taking pictures within the area. If required for special cases it can be deactivated.

**Cross Legs:** Create additional legs perpendicular to the main legs.

**Above Max. Area Altitude:** The flight is performed on a constant flight altitude (MSL). The altitude is based on the max. area terrain elevation.

**Terrain Following (Above Max. Leg Altitude):** The flight altitude per flight leg is based on the corresponding max. terrain elevation.

**Terrain Following (Above Avg. Leg Altitude):** The flight altitude per flight leg is based on the corresponding average terrain elevation.

**Advanced Terrain Following:** Additional waypoints inserted for more accurate terrain following. Possibility to adjust distance between the inserted waypoints.

**Finish Elements:** Stop editing the element.

**QBase:** will prevent planning flight legs lower than in 50 m altitude. This also affects the "Above Avg. Leg Altitude" terrain following model. If the chosen altitude depending on the average leg elevation is less than 50 m above the maximum elevation of the terrain within a flight leg, QBase will automatically increase the altitude of this flight leg to 50 m above the maximum elevation of this leg.

Please note that the turns between the flight legs are not affected by this.

## Corridor planning features

In addition to the area settings the corridor provides the following settings.

**Corridor Width:** This defines the width of the corridor.

**Initial Offset:** This value shifts the legs relative to the center of the corridor.

**Max. Turn Angle:** This value determines if the UAV makes a turn before the new corridor segment or continues with the next one. The aim is to always enter the next segment straight and level for the best photogrammetry results.

**Even Leg #:** Allows an even number of flight legs.

To improve the terrain following please locate the waypoints of the corridor in close distance to each other.



The screenshot shows the 'Corridor Settings' panel with various adjustable parameters:

- Corridor Width:** -50, -10, 30 m, +10, +50
- GSD:** -2, -0.5, 2.66 cm/px, +0.5, +2
- Link GSD to Altitude:** ☒
- Altitude:** -50, -10, 100 m, +10, +50
- Distance:** Auto (selected), Manual
- Side Overlap:** -10, -1, 75 %, +1, +10
- Forward Overlap:** -10, -1, 75 %, +1, +10
- Initial Offset:** -10, -1, 0 m, +1, +10
- Entry Extension:** -20, -5, 30 m, +5, +20
- Exit Extension:** -20, -5, 0 m, +5, +20
- Skip Waypoints:** -5, -1, 0, +1, +5
- Max. Turn Angle:** -5, -1, 10 °, +1, +5
- Flip Legs:** ☐
- Invert Path:** ☒
- Deactivate Triggers:** ☐
- Even Leg #:** ☐

At the bottom, there is a 'Finish Element' button and a status bar showing '2.7' and '+3.8'.

## Path

Simple path: Specifying waypoints in order to fly around obstacles or delay the flight by loitering.

📍 Delete selected waypoint 🗑️ Delete all waypoints ✅ Finish editing the geometry

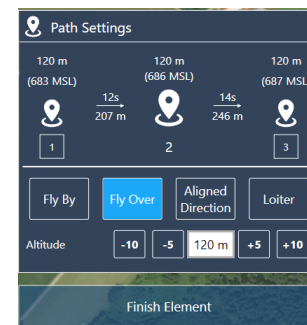
1. Select **+** on the map: add new waypoint between two existing waypoints
2. Setting dialog appears
3. Change settings in the element on the left side or in the map

### Altitude

- Flight altitude: Altitude above ground.
- Do not exceed the maximum altitude that is allowed for your region.

### Waypoint types

The selected waypoint is displayed in green.



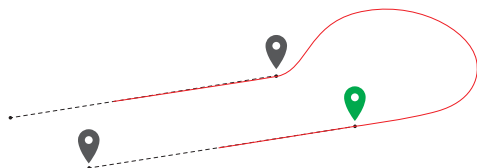
7

### Fly By

- The waypoint is not directly overflown.
- The UAV turns before reaching the waypoint to smoothly align with the next leg.

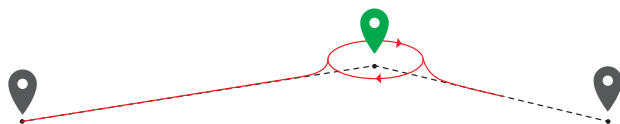
### Fly Over

- The waypoint is directly overflown.
- The UAV realigns with the next leg after the waypoint.



### Aligned Direction

- The flight track is automatically determined in order to match the waypoint and the direction of the next leg.
- Subtypes can manually be selected in the waypoint property menu. For photogrammetry missions it is recommended to set the subtype to Auto. Not all subtypes are applicable for every scenario. Non applicable subtypes are indicated by a red dotted line between the waypoints.



### Loiter

- The UAV enters a circular trajectory around the waypoint. The radius of the trajectory, the circling duration and the circling direction can be set in the waypoint property menu.
- The UAV approaches and leaves the trajectory from the outside.



### Take-Off/Landing

- The UAV will take off and land at the exact same position
- Take-Off/Landing is performed in hover mode
- Define the planned take-off and landing position by clicking on the map
- Move the position by dragging. The real take-off position is automatically adjusted right before the start of the flight.

### Important:

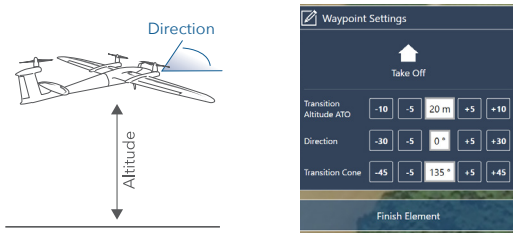
- No obstacles around the Home Waypoint within a radius of 20 meters
- Take-off against wind direction
- No take-off in a wind sheltered area (lee) as turbulences may occur



**If there is an obstacle in the flight track of the descent circle, make sure the re-transition altitude is 20 meters (65.6 ft) higher than the obstacle.**



- Transition cone:
  - Green = Transition cone (allowed transition direction)
  - If there is an obstacle: transition altitude must be 20 meters (65.6 ft) higher than the obstacle.
- Select the take-off or the retransition location on the map or select Take-Off/Landing in the left section in order to set the way-point settings.



### Transition Altitude ATO (above take-off)

- **Set the transition altitude as low as possible (if the surrounding allows for it)**
  - Save energy by reducing the hover duration to a minimum

At this altitude the UAV will switch from hover mode to the fixed wing flight.

### Direction of the Transition/Retransition

**Note:** Choose the transition direction based on the surrounding. If possible, set it against the wind direction.

### Transition Cone

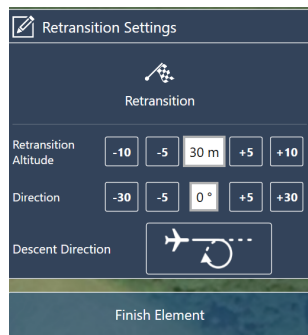
- The transition is performed within the defined cone
- The direction of the UAV does not match the cone → UAV will not enter the transition phase → mission will be aborted
- Select the angle of the transition cone as wide as possible (if the surroundings allows for it)

## Take-Off/Landing - Retransition

### Retransition Waypoint

During the retransition the UAV will switch from aero fixed wing mode to hover mode. The retransition waypoint is the location at which the UAV finishes the retransition. At this location the UAV is in hover mode. The retransition track is indicated by the dotted path and is by default 150 m (492 ft).

- The retransition waypoint should be located close to the home waypoint (take-off and landing location) (ideal <50 meters; max. 100 meters). The distance between the two waypoints is covered in high energy demanding hover mode.
- Depending on the wind condition, the real retransition location might not comply with the retransition waypoint in QBase.
- If there are obstacles in an area with a radius of 50 meters (164 ft) around the retransition waypoint, make sure that the retransition altitude is 20 meters (65.6 ft) higher than the obstacles are.
- Select the *Take-Off* or the *Retransition location* on the map or select *Take-Off/Landing* in the left section in order to set the waypoint settings.



### Retransition Altitude ATO (above take-off)

Defines the hover altitude at the end of the retransition. If the flight area allows for it, set the retransition altitude as low as possible in order to save energy by reducing the hover duration to a minimum.

### Direction

- It is recommended to set the direction against the wind direction.
- In case it is not possible to carry out the retransition against the wind direction, be aware that the real retransition location does not match the retransition waypoint that was set in QBase (per 1 m/s tailwind ~ 20 meter deviation).
- If there is an obstacle in the retransition track, make sure the retransition altitude is 20 meters (65.6 ft) higher than the obstacle.



### Descent Direction

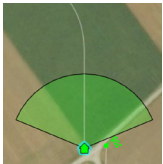
- Before the retransition, the UAV enters the descent circle automatically in order to descend to the required retransition altitude.
- The radius of the circle is by default set to 60 m (197 ft) and cannot be changed.
- In case no link reestablishing waypoint is set, the UAV will use the descent circle as the link reestablishing waypoint.
- Set the orientation of the circle depending on the surrounding and obstacles.

**If there is an obstacle in the flight track of the descent circle, make sure the retransition altitude is 20 meters (65.6 ft) higher than the obstacle.**

### Set Link Loss

#### Link Loss Waypoint

- Select *Set Link Loss* in the category Add New Element.
- After link loss time out the UAV returns and circles around the defined waypoint.



If possible the link between QBase and the UAV or between the RC transmitter and the UAV is reestablished. If the connection is successful, either *Continue* the mission or select *Come Home* on the transmitter. Locate the Link Loss Waypoint close to the home waypoint.

#### Altitude AGL (Above Ground Level)

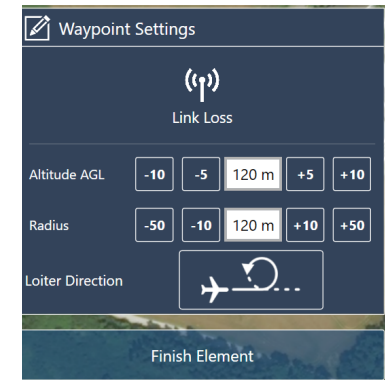
Set the altitude of the link reestablishing circle.

#### Radius

Define the radius of the link reestablishing circle.

#### Direction

Define the direction of the link reestablishing circle.



## Checks

Open the **Plots** in the footer section.

1. Please check in the MSL plot that the flight altitude is sufficient during the complete mission.

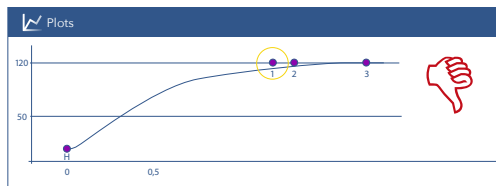
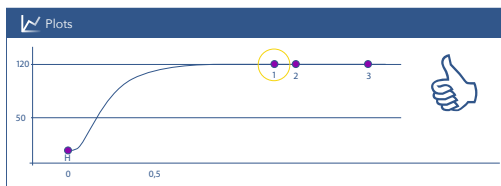
**Yellow:** Flight altitude 20 meters to 50 meters above ground. **Red:** Flight altitude below 20 meters above ground.

2. Please also check the GSD plot for a consistend GSD of the recorded data.

3. Please check the estimated trigger points and the corresponding GSD for consistency by selecting **Show/Hide Payload Triggers** (see chapter 7.2.3).

4. Please check the minimum trigger speed in the Element Summary (see chapter 7.2.3).

5. Ensure that the distance between the home waypoint and the first waypoint of the flight area is sufficient to reach the required flight altitude.

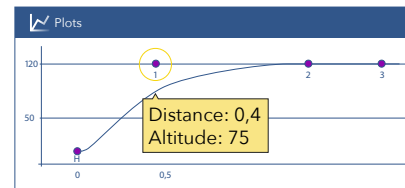
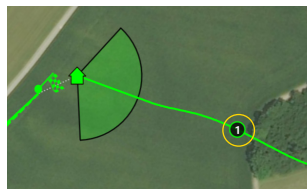


Flight altitude is reached at the first waypoint of the flight area    Flight altitude is NOT reached at the first waypoint of the flight area

### If the altitude cannot be reached

- try to flip or invert the legs or
- extend the Transit by inserting extra waypoints in between.

**6. If obstacles are in the flight track** during climbing phase (between the transition and the first waypoint), ensure that the flight altitude is 20 meters (65.6 ft) higher than the obstacles are. Add a waypoint at the obstacle. Please always check the flight altitude for this position in the Plots.



---

**7. Make sure that there are no obstacles** between the flight area and the take-off and landing position. If a coming home is initiated the Trinity F90+ will return on the direct path.



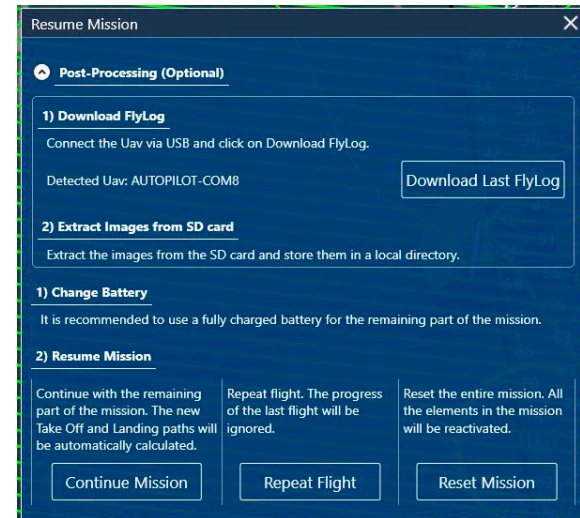
## 7.4 AFTER THE FLIGHT

### 7.4.1 Resume/Repeat

You can plan missions longer than the maximum flight time of the Trinity. **To use the resume mission feature, make sure there are no obstacles in the return way throughout the whole mission!** The mission will then be split into multiple parts depending on the following conditions:

- If you have a flight time restriction due to export permission rules, QBase will only upload the mission unto the waypoint that reaches less than one hour flying time. QBase indicates the last uploaded waypoint with a yellow circle and a dotted line to the retransition point.
- The amount of waypoints per flight is limited to 200. QBase indicates the last uploaded waypoint with a yellow circle and a dotted line to the retransition point.
- If the Battery Critical come home is triggered during the flight the UAV will return to the home waypoint in a direct line from the current position. QBase estimates the last reachable waypoint and indicates it with a yellow circle and a dotted line to the retransition point. This waypoint is only estimated and can change due to wind conditions or battery age! **Therefore make sure there are no obstacles in the return way throughout the whole mission!**

After flying the first part of the mission and landing at the home position, the following dialog will appear:



**Post Processing:** You can download the latest FlyLog by connecting the aircraft via magnetic USB. It is recommended to download the flylog and to extract the images from the SD-card after each flight to facilitate the grouping of FlyLog and images.

**Change Battery:** Change the battery of the Trinity.

### Resume Mission:

**1. Continue Mission:** Continue with the remaining part of the mission. You will be redirected to the planning view and the flight plan is automatically adjusted to the remaining part.

**Please check the adjusted flight plan and solve the conflicts, if any, before uploading it to the aircraft.**

**2. Repeat Flight:** Repeat the last flown part of a multipart mission. Use this option to repeat the last flight. You will be redirected to the planning view and the flight plan is automatically adjusted.

**Please check the adjusted flight plan and solve the conflicts, if any, before uploading it to the aircraft.**

**3. Reset Mission:** Attention! This will reset the entire mission to the original state. You will be redirected to the planning view and the flight plan is automatically adjusted. **Please check the adjusted flight plan and solve the conflicts, if any, before uploading it to the aircraft.**

**Note:** The UAV will return to (home/take off) at the current altitude, after 1 hour flight time (if applicable) or after the estimated last reachable waypoint marked in yellow (see conditions at beginning of section).

The window Resume Mission also appears if a mission is aborted by Come Home.

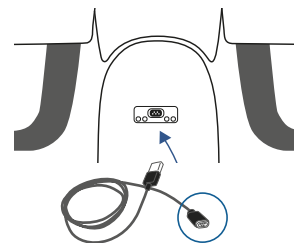
**Important:** The adjusted flight plan needs to be uploaded to the UAV before the next flight!

## 7.4.2 Download the FlyLog and the LogFile from the Trinity F90+

### FlyLog:

Contains all the coordinates of the pictures that are recorded during the flight. During the geotagging process (see chapter 7.4.3) these coordinate tags are correlated with the corresponding pictures.

For every flight there is a new FlyLog written.





**LogFile:**

Includes all the sensor data of the flight and might be needed by your reseller for troubleshooting. For troubleshooting the FlyLog and the corresponding LogFile is required.

In order to download the FlyLog and LogFile please follow the these steps:

1. Disconnect **the battery**.
2. **Connect the main body** of the UAV to your computer, laptop or tablet via magnetic USB.  
Do not connect the battery. The power supply is guaranteed by the USB connection.
3. Open QBase.
4. Select **Tools**.
5. Select **SD Card**.
6. The UAV will be mounted as a **local drive**.
7. **Open** the local drive and select the corresponding **LOG.bin and/or Fly.bin files**.
8. **Save** the files on your computer.

Please note that only the last twenty FlyLogs and LogFiles are saved on the autopilot board. In order to prevent loss of data, please download the FlyLogs and LogFiles regularly.

### 7.4.3 Geotag (PPK)

The aim of PPK post processing is to geotag the pictures with very precise geodata.

Required files and data:

- FlyLog that is recorded during the flight and saved on the UAV
- iBase Log
- Pictures that are saved on the camera SD card

iBase:

1. **Insert the Micro SD card ①** of the iBase into your computer.
2. **Copy** the iBase Log file corresponding to your flight on your computer (the latest file on the SD card e.g. QS341B00.21R)

UAV FlyLog:

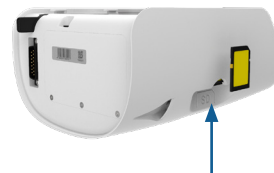
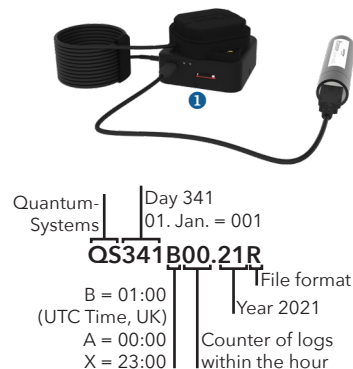
3. For downloading the **FlyLog** from the UAV follow the instructions described in chapter 7.4.2.

Pictures:

4. **Remove the SD card** from the payload compartment.
5. **Insert the SD card** into your computer, laptop or tablet.
6. **Save** the pictures on your computer, laptop or tablet.

Post processing in QBase:

7. Remove the pictures that were manually taken on the ground during the camera check as well as during the automatic camera start-up (2 pictures).
8. Open Tools and select Post-Processing.



The view is split into four sections:

### Data input (A):

1. Please select the FlyLog from the Windows directory.
2. Please select the corresponding pictures from the Windows directory.

Depending on the type and amount cameras that were used different options are displayed.

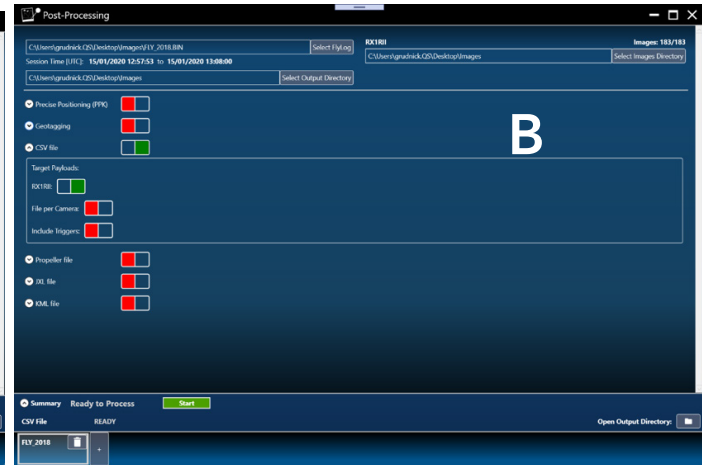
### Exporters (B):

3. Please select the type of exporters depending on the required files for the post processing in a 3rd party software (e.g. Pix4D or AgiSoft).

Depending on the flight type, different export options are available (e.g. PPK, GeoTagging).

Please find detailed explanations of the exporters in section Exporters in detail (B).

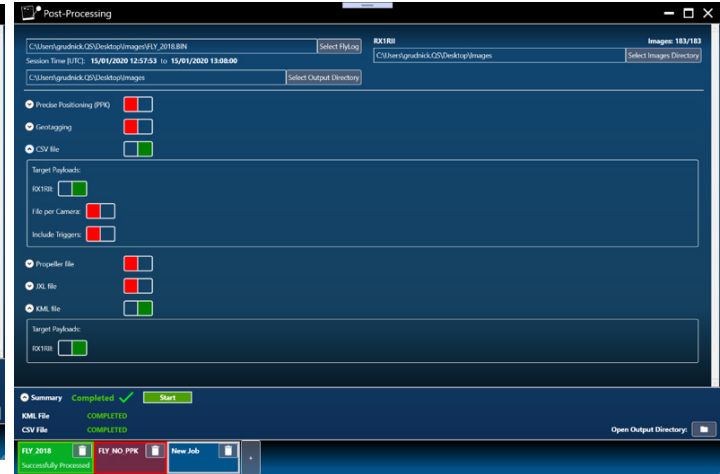
7



## Job Summary (C):

4. The Job Summary contains an overview of the selected exporters, the job status and warnings or hints in case of conflicts.
5. Please select Start to start geotagging of the pictures with the corresponding coordinate tags from the FlyLog.
6. Once the geotagging is completed "Open Output Directory" opens the output folder.

Below is an example of a successfully completed job:

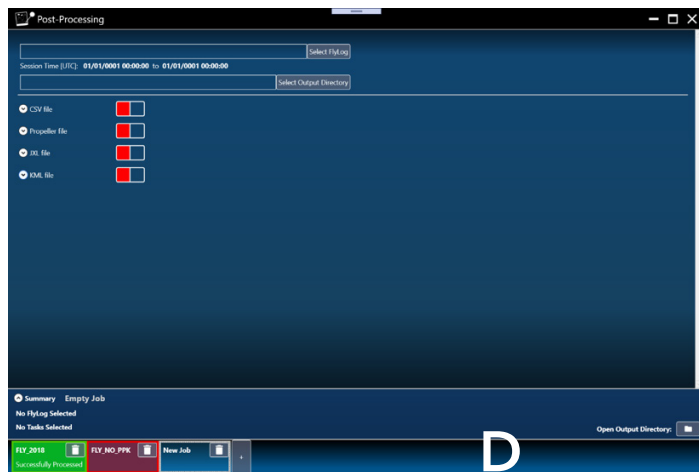


## Job Management (D):

7. Please check the PPK Fix/Float value after successful processing.  
The fix value should at least be 90 % for PPK accuracy.

Multiple jobs can be run in parallel\*. This section allows you to add or remove jobs and get an overview of their status.

\*Jobs without PPK task can be processed simultaneously. Jobs with PPK tasks are queued and automatically processed after the previous PPK task is completed.



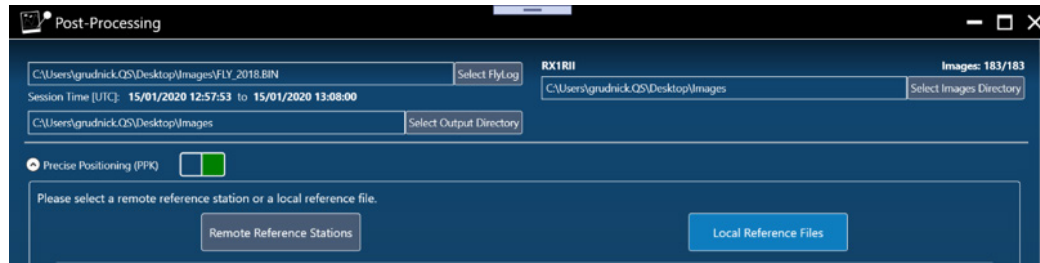
7

## Exporters in detail (B):

### Precise Positioning (PPK)

For PPK, a reference file for a defined position is required. This can either be obtained via the Quantum-Systems iBase or by external providers.

Select **Remote Reference Station** or **Local Reference Files**.



### Remote Reference Station

Choose a reference station in the list to download reference data or click Get Closest to automatically download data from closest available reference station. Note that remote reference data is usually not available until a few hours after the flight.

### Local Reference Station

- a. Select + on the right side of the Post-Processing window
- b. Choose a reference file from the Windows directory (iBaseLog or 3rd party Rinex file)

#### iBaseLog

iBaseLog file format: \*.yyR

(yy in file extensions above are the 2 last digits of the year number. E.g. 21 is for the year 2021: \*.21R, etc.)

### 3rd party Rinex file

Reference file from another receiver or from geodetic corrections service (e.g. SAPOS in Germany, Trimble VBS Now in USA, KOREC in United Kingdom).

3rd party reference receiver or a geodetic corrections service file format:

- a Rinex2 or Rinex3 observations file (possible extensions \*.obs, \*.o, \*.yyo, \*.yyO)
- a compressed Rinex file (possible extensions \*.yyd and \*.yyD)

(yy in file extensions above are the 2 last digits of the year number. E.g. 21 is for the year 2021: \*.21o etc.)

### c. Select the Reference Position from the dropdown menu

#### Autodetect the Reference Position

The position is automatically calculated based on the header of reference file or

#### Set Reference Position

Either choose a previously saved reference position from the dropdown list or define a new reference position.

New reference position:

- Latitude and Longitude must be inserted in decimal format and contain at least eight decimal digits.
- Antenna Vertical Offset for iBase.
  - uBlox Antenna placed on top of iBase: 0.033 meters
  - uBlox Antenna placed on the ground: 0.008 meters
- Input Elevation Mode (Geoid or Ellipsoid) based on the information from your reference file.

### d. Choose the **Output Elevation Mode** (Geoid or Ellipsoid). Ellipsoid is the mode that should be used by default.

If Input **Elevation Mode „Geoid“** is selected only the **Output Mode „Geoid“** is available.

If the Input Elevation mode Ellipsoid and the Output mode Geoid is selected the transformation is made based on a 1 deg x 1 deg grid geoid model derived from EGM96.

---

**Geotagging:** The geotags are written into a copy of the images using the exif tags.

**CSV file:** This exporter creates a .csv file with the relevant metadata for each image. It is possible to choose between yaw, pitch roll for AgiSoft or omega, phi, kappa for Pix4D as additional information.

**Propeller Aero file:** This exporter creates a .ubx and a .prop file required by the Propeller online service.

**KML file:** A KML file of the flight for visualization in Google Earth is created. The KML file includes all trigger and exposure events.



## Mismatches Solving Tool:

In case there are mismatches between exposures and pictures please access **“Solve Mismatches”** in the **“Job Summary (C)”**.



7

### Flight Path (A)

The complete flight path and the corresponding geotags and images are directly displayed in the map.

### Flight Summary (B)

A summary of total active\*\* exposures detected in FlyLog and the total amount of images found in the directory are displayed here. The data is updated based on the current selected payload, and the color indicates if there are mismatches detected for the current payload (Red\Green).

### Flight Leg Summary (C)

The images and exposures are split and grouped flight legs and only these with mismatches are displayed. In this section, the

current selected flight leg is displayed with information about the number, the time scope and the count of active\*\* triggers and exposures.

\*\*Active: Non-skipped entries

### Map Interactions (D)

Pan to mission, selection of base map and export of debugging file can be done here.

### Time scope (E)

This section provides a direct filter to define the current time scope. Only images and exposures below the selected time scope are visible.

### Usage:

1. Please select the Flight Legs that contain mismatches between pictures and exposures in the top right corner (C)
2. Please individually check the flight legs and make sure that every picture correlates with a corresponding exposure

#### Autodetection of Conflicts

The images and exposures are automatically analyzed and possible conflicts are identified and marked in red. The marked entries are only a hint of the possible cause of mismatches.

It is important to check the path and verify the detected conflictive entries before skipping them.

3. Please select the corresponding image or exposure to skip the entry.



#### Skip Entries

Skipped entries are displayed with a grey border. Skipped entries are ignored for any post-processing task.



#### Display of Image (Only for Images)

Use this action to display the current selected picture on the map.

4. After the mismatches are solved \*\* indicated by the green selected payload, the changes can be applied by clicking the “Apply Changes” button. You will be redirected to the post-processing window to start processing the job. All skipped images and exposures are ignored for all tasks defined in the job.

\*\*solved: same count of exposures and images.

### Command Line Tool:

Post-Processing can be executed via the Command Line tool “PostProcessingCL.exe”, which is automatically installed along the QBase.exe.

Use “.\PostProcessingCL.exe --headless” in a Windows PowerShell window to get more information about the usage.

## 7.5 UPDATES & SETTINGS

### 7.5.1 DataLink settings

The frequency band and the transmission power of the ground and air modems can not be changed. In order to guarantee a connection between the UAV and the QBase modem the settable network ID and password need to match. User defined IDs and passwords are only necessary if you wish to fly with two UAV (see chapter 15).

DataLink Settings

LongRange Modem

**Current Settings**

	Ground	Air
Port:	COM18	
ID:	8183	-
Power:	100.0 mW	0.0 mW

**Ground** Air

Only ground modem will be configured

ID: 8183

Set a different ID for every pair of ground and air modem to fly multiple aircrafts simultaneously.

Configure

Password:

Set a password to prevent other users from interfering. The same password must be used on ground and air modem.

Set Password

Reset Modem to Factory Settings

The modem settings for the ground and air modem can be changed using the following dialog:

1. Select the modem to change via the ground and air switch. The air modem can only be accessed if the aircraft is connected via USB and the battery is plugged in afterwards.
2. Multiple aircrafts can fly at the same time, if each ground and air modem pair has a different ID.  
Enter the **target ID** and click **Configure** to set it.
3. By using a password no other user with the same ID can access your aircraft. Enter a **password** and click **Set Password** to set it.
4. Restore the factory settings for the selected modem by clicking **Reset Modem to Factory Settings**

Air and ground modem need to have the same settings, in order for the communication to work!

### 7.5.2 Updating QBase

QBase will notify about new available QBase updates upon startup.

To manually check for new updates, go to Updates menu and select Search Updates.

1. Select **Updates**.
2. Select **Download** to start downloading the update. The update consists of an installer file.
3. Select **Update** to start the installation.
4. QBase is closed and the installer opens automatically.
5. Follow the instructions of the Setup Wizard. The old version of QBase is automatically overwritten.

### 7.5.3 Updating the UAV

When a new UAV firmware becomes available the user is informed via QBase.

1. Open QBase.
2. Select **Updates** and select **Search Updates**.
3. Select **Download** to start downloading the update.
4. Select **Update** and confirm with **Yes**.
5. **Please follow the four steps in QBase.**
6. Afterwards the writing process starts automatically. After the update please select OK.
7. After a successful writing process, the new firmware version is displayed in the header section of QBase.

Please be aware that displaying the new version might take several seconds.

➡ **It is important to always update QBase as well as the UAV firmware as soon as updates become available.** ⬅

**DO NOT**  
 - attach modem to PC  
 - attach battery to main body

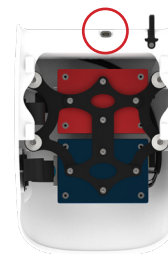
7

The highest level of flight safety can only be achieved with the latest software release. Therefore, Quantum-Systems can only offer warranty if the UAV and QBase are up to date as soon as an update becomes available.

## 7.5.4 Updating the Payload Management Board (PMB)

When a new Payload firmware becomes available the user is informed via QBase.

1. Start QBase.
  2. Select **Updates** and select **Search Updates**.
  3. Select **Download** to start downloading the Firmware.
  4. Select **Update** and confirm with **Yes**.
  5. **Please pay special attention that the payload compartment is connected to the computer AFTER selecting Detect Device.**
  6. Afterwards the writing process starts automatically. After the update please select **OK**.
  7. Disconnect the USB connection between the payload management board and your computer.
- ➔ In order **to validate the update** please follow the following four steps.
8. Connect the QBase modem to your computer.
  9. Attach the payload compartment to the UAV (see chapter 11.1).
  10. Connect the battery to power up the UAV. The UAV connects to QBase automatically.
  11. Select **the Payload Icon**. The current software version is displayed.



## 7.5.5 Updating the ESC

When a new ESC firmware becomes available the user is informed via QBase.

1. Start QBase.
2. Select **Updates** and select **Search Updates**.
3. Select **Download** to start downloading the Firmware.
4. Select **Update** and confirm with **Yes**.
5. The ESC Firmware Update opens.
6. Please follow the instructions of the ESC update. When requested please select the downloaded ESC firmware (QSESC\_ESC\_S32K\_...\_.hex.bin) in the User > Documents > QBase > Firmware > ESC folder.
7. After the update please disconnect the battery from the UAV.

➔ In order **to validate the update** please follow the following four steps.

8. Connect the QBase modem to your computer.
9. Connect the battery to power up the UAV. The UAV connects to QBase automatically.
10. Select Updates and select Search Updates.
11. Please confirm that the detected version corresponds with the newest version





# 08

## FLIGHT SETUP – STEP BY STEP

# 08 FLIGHT SETUP – STEP BY STEP

After planning the mission in QBase follow the steps below for the flight setup.



The steps 8.1 – 8.12 must be completed in the following order.

## 8.1 Step 1 – Ensure that the weather conditions are suitable for flying

It is possible to fly the UAV under the following conditions:

1. Wind up to 9 m/s (17.5 kn) (See chapter 3.1.)

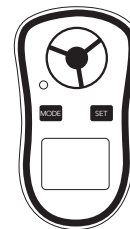
In addition to wind data provided by QBase or meteorological service check the actual windspeed using the **anemometer**.



### First time start-up of the anemometer

- Switch on the anemometer by pressing and holding **MODE** for 2 seconds.
- Set measuring method to **MAX** by pressing **MODE** for 3 seconds till m/s is blinking.  
Press **SET** until **MAX** is shown blinking. Press **MODE** to confirm.
- To reset the **MAX-value** press **MODE** for 3 seconds till m/s is blinking.  
Then press **MODE** to confirm.

For more details see the brief manual delivered with the anemometer.



2. Temperature -12 °C to 50 °C (10.4 °F to 122 °F)

Below 0 °C (32 °F): non icing conditions, battery must be heated to 25 °C (77 °F) for at least five hours before the flight and the flight time is limited to 60 minutes. **Do not fly in rain or snow.**

## 8.2 Step 2 – Ensure that the battery is sufficiently charged

Before the flight, the battery of the UAV must be sufficiently charged. The required state of charge depends on the duration of your mission. It is not possible to take off if the battery is less than 62.5 % charged.



We recommend to use fully charged batteries for each flight.

## 8.3 Step 3 – Power bank for iBase

Make sure the power bank for the power supply of the iBase is sufficiently charged. The iBase can be powered for up to 10 hours with one power bank.

## 8.4 Step 4 – Ensure that QBase and the UAV firmware are up to date

If necessary, update QBase (see chapter 7.5) and the UAV firmware (see chapter 7.5).

8

## 8.5 Step 5 – Set up QBase modem

Do not use any other ground modem than the QBase modem for the connection between the UAV and QBase.

### Modem setup

1. **Connect the QBase modem** to your laptop/tablet via USB.
2. **Open QBase and open the mission.**
3. **Place the modem.**

The modem should be placed as high above the ground as possible. In order to guarantee the best connection, **please ensure the modem is not shaded by any obstacles and has a direct line of sight to the UAV.**



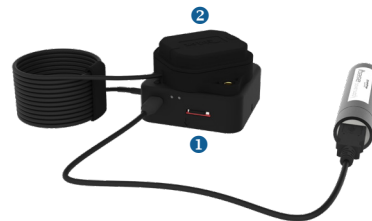
## 8.6 Step 6 - Set up ADS-B receiver

1. Insert a suction cup into the gimbaled mount.
2. Insert a microUSB cable into the pingUSB.
3. Connect the other end of the USB cable to your laptop or computer.  
Please always hang up the pingUSB vertically.




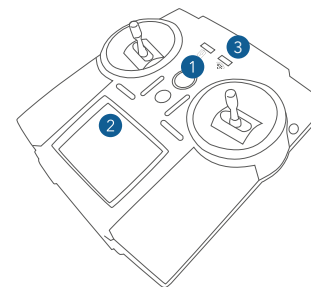
## 8.7 Step 7 - Set up iBase

- Make sure the Micro SD card is inserted into iBase ❶.
- Place the antenna ❷ of iBase on your desired reference point (make sure the antenna center is exactly above the reference mark) or directly on top of the iBase.  
*It is recommended that the iBase is not shaded by objects (trees, buildings,...). While logging, you should stay away (min. 5 meters) and not stand or run beside it!*
- Connect the power bank to the iBase via the USB cable.  
*(Please not: There is a gap between the iBase housing and the micro USB plug. Do not connect the plug with force.)*
- Switch on the power bank by pressing the power button.  
The iBase will power up automatically (green LED).  
The iBase Log file is created as soon as the iBase determines its position within approx. 25 seconds after powered up (blue LED is blinking).



## 8.8 Step 8 – Turn on the QS RC transmitter

1. Turn on the **main switch** of the QS RC Transmitter.
2. Check the **battery status** of the transmitter. Do not fly if the battery capacity of the transmitter is below 50 %.
3. If the LED  on the transmitter is off, the RC connection is successful.



A safety pilot who is able to control the UAV with the help of the transmitter is always required. Be prepared to take over and control the UAV manually in assisted flight in case of an emergency. The transmitter must be held by the pilot during the whole flight time.

8

## 8.9 Step 9 – Check the UAV for damages

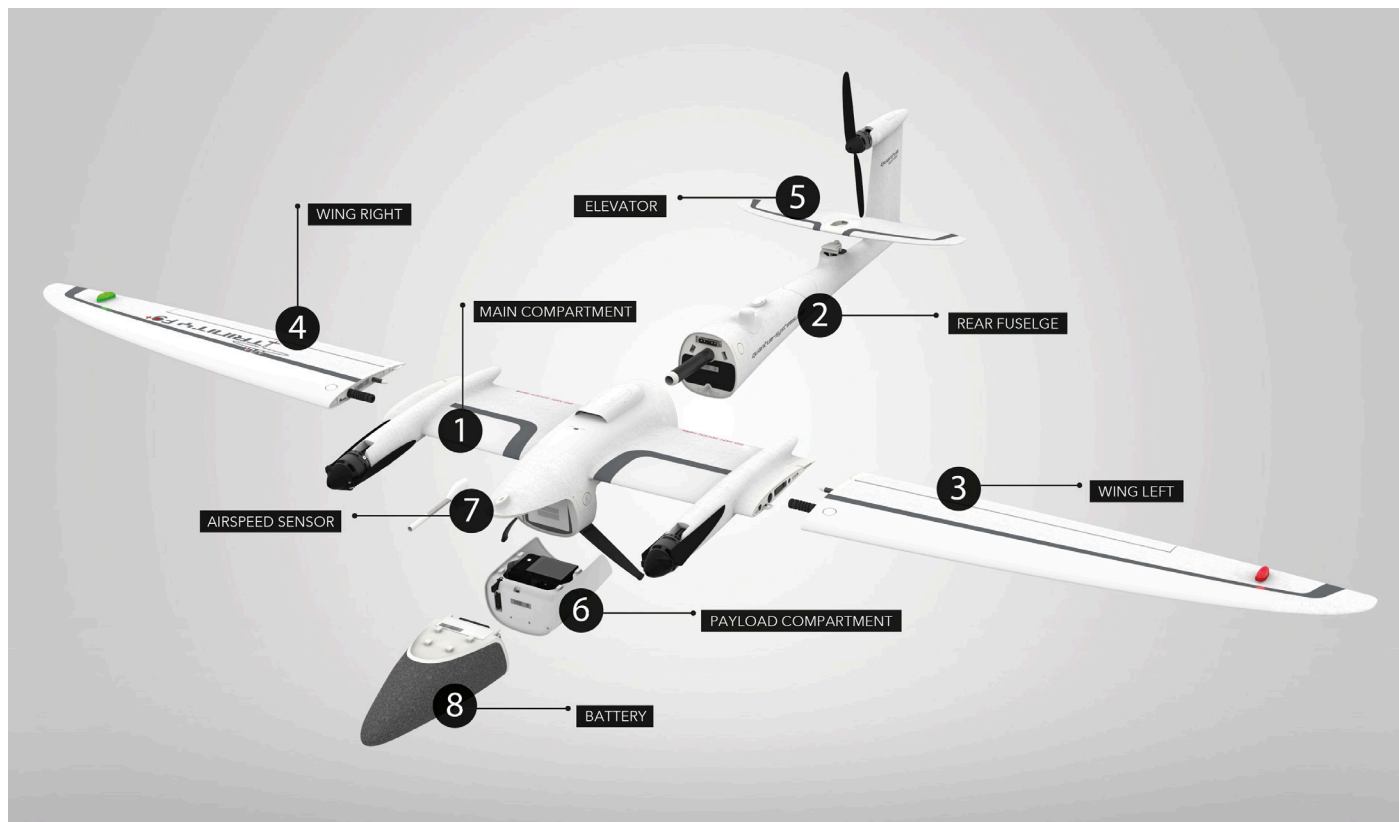
Please make sure every part is free of damages.

## 8.10 Step 10 – Magnetometer calibration (if required)

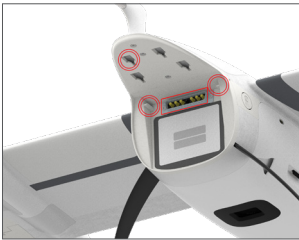
Obligatory: flight location > 50 km away from the last flight location

**Calibration and take-off area is free of metal (parking decks, cars, metal structures) or any devices causing electric or magnetic fields (power lines, generators, mobile phones).**

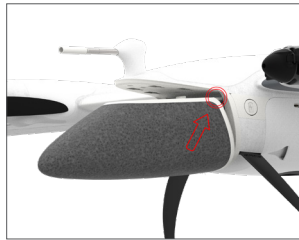
## 8.11 Step 11 - Assemble the UAV



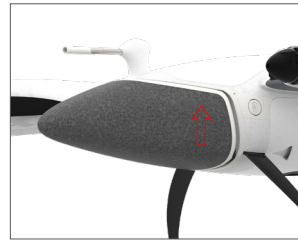
1. Remove the payload transport lock.
2. If not already attached, attach the payload compartment. Ensure that the SD card for the camera is inserted in the payload compartment. The payload compartment must be attached for the flight operation.
3. Attach the rear fuselage to the main body.
4. & 5. Attach the wings.
6. Attach the elevator.
7. Take off the battery caps.
8. Connect the battery. **The UAV will power up automatically.**



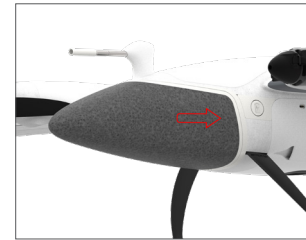
Nose lock mechanism



Align the battery according to the picture.



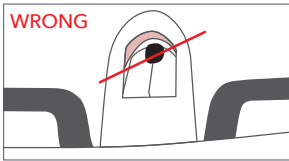
Connect the four mounting hooks on the top of the battery to the main body.



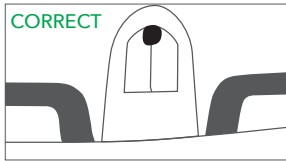
Slide the battery backwards. Make sure the locking mechanism is in place.

8

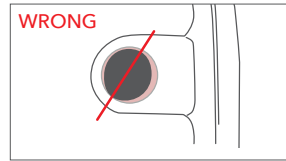
All parts are connected by a lock mechanism. No tools are required for the setup. Check all connections and ensure that the lock mechanism is in place.



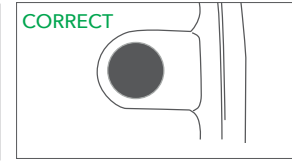
Elevator



Elevator

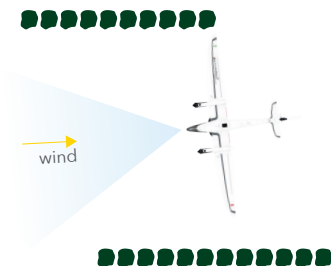


Wing/Rear Fuselage/Nose



Wing/Rear Fuselage/Nose

## 8.12 Step 12 - Choose the take-off position



- It is always recommended to take-off from the UAV transportation box as it provides a flat surface.
- If your take-off / landing use position is in a dusty area, please cover the ground with a canvas cover. Please use weights to fix the canvas cover to the ground.
- Please do not land the UAV on the transportation box as it may fall off.
- To ensure the highest level of safety it is recommended to take off from the highest point of the flight area.

**Please always consider the wind direction and wind speed when choosing the take-off position.**

**Do not take off in a wind sheltered area (lee) as turbulences may occur.**

**Please always check the wind not only at the take-off position but also in the immediate surrounding.**

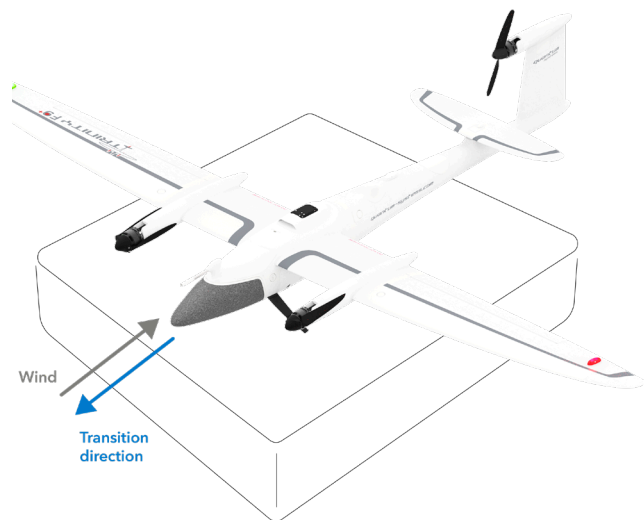
Because the correct take-off position will be transferred to QBase right before the start of the mission, the chosen take-off position does not have to match the home waypoint that was defined in QBase before.



If there is an obstacle in transition direction (defined as the transition cone in QBase) make sure the transition altitude is at least 20 meters (65.6 ft) higher than the obstacle.  
If possible choose the transition direction against the wind direction.



### 8.13 Step 13 - Place the UAV



Place the UAV on the transportation box on the take-off position facing the desired transition direction.

**It is always recommended to do the transition facing the wind direction.**



# 09

## FLIGHT OPERATION

# 09 FLIGHT OPERATION

## 9.1 FLIGHT OPERATION - STEP BY STEP

Normally the flight is carried out in automatic mode. The UAV is not controlled by the pilot but flies automatically based on the flight plan that was generated in QBase and transferred to the UAV. Waypoints must be set and transferred to the UAV in order to fly in automatic mode. Only in emergency situations, it is recommended to switch to assisted flight to control the UAV manually with the help of the transmitter. If switched to assisted flight, the waypoint mission is paused. It is possible to switch between the modes at any time.

For the flight operation, the UAV must be connected to the transmitter and to QBase.


### Step 1 - Flight setup

---

Ensure that the flight was set up correctly (see chapter 8.1 - 8.13).

### Step 2 - Check the connection between QBase and the UAV

---

The connection status is displayed in the header section of QBase (green and yellow graph). Furthermore, the UAV is displayed on the map . If the UAV does not connect with QBase see chapter 14.1.

### Step 3 - Check the camera

---

The camera can be triggered manually to check if it is working correctly.

1. Pull the right stick (standard configuration) of the RC transmitter towards yourself.

Alternative: Open **Payload Info** in QBase and use the **Trigger Payload** button.

2. If the camera works correctly, it emits a shutter sound and the picture count in the header section of the RC transmitter and in the header section of QBase counts up.

Please see chapter 14.3 if the camera does not work correctly.

## Step 4 - QBase final check

### Obstacle clearance in reality

- No obstacle within a radius of 20 m around Home Waypoint
- Re-/transition, descent circle, flight paths: altitude 20 m higher than obstacles

### UAV heading

- Ensure the heading of the displayed UAV corresponds to the direction of the UAV on the ground
- Do not fly if the heading on the ground is not correct: **critical deviation  $\geq 10^\circ$**

### Wind direction

- Re-/transition is set against the wind direction!
- **Retransition with tailwind: per 1m/s tailwind ~ 20 meter deviation**
- Windcheck in the immediate surrounding
- Do not take-off in a wind sheltered area (lee) as turbulences may occur

## Step 5 - Upload the mission

Upload the Mission



**Make sure the home waypoint in QBase  is adjusted to the real take-off position .**

## Step 6 - Preflight check

The UAV will self-check and initialize the attitude and position algorithms.

After the **Preflight Check** it is recommended to wait at least **30 seconds** before you start your mission so that GPS data on the ground will be logged prior to flight. This enables a better PPK convergence in the post process.

Please stand behind the UAV and keep a safety distance to the UAV of at least 10 m (33 ft) during the complete flight operation. **Make sure the UAV is not moving during the Preflight check.**



## Preflight

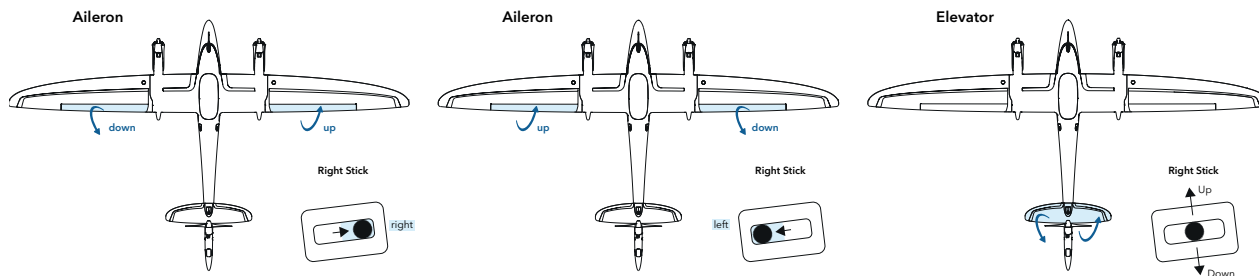
Select **PREFLIGHT (CHECK)** on the display of the transmitter or in QBase3D.

If the preflight check is not successful a message will be displayed on the transmitter. During the preflight check the actual take-off position is transferred to QBase.

### Step 7 - Check the control surfaces

Move the right stick to check the ailerons and elevator. If the stick configuration was changed, use the left stick to check the ailerons and the elevator.

Make sure left and right aileron always move in the opposite direction and ensure that the ailerons are moving according to the stick position as shown in the example below.



Make sure the control surfaces are moving while moving the stick. Do not fly if a control surface is not moving. See chapter 14.2 for troubleshooting.

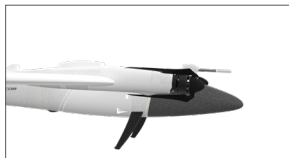
## Step 8 - Arm

**!!NEVER ARM AN AIRCRAFT WITH A DAMAGED PROPELLER!!**

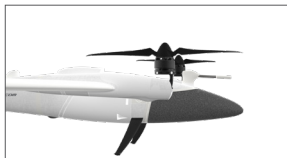
The arming process starts the motors.

1. Select **ARM** on the display of the transmitter.
2. Confirm the arming process by selecting **Yes!**. Abort the process by selecting **No!**
3. The motors start running at idle. If you wish to turn off the motors, select **OFF**.

- Due to safety reasons the UAV will **turn off the motors automatically** after **30 seconds** if no button has been pressed.
- Make sure the motors are **spinning freely**. If the spinning of the motors emits an untypical sound, turn off the motors.
- Make sure **all three motors are tilted 90° upwards**. If not, turn off the system. Contact your reseller for further assistance.



Front alignment: neutral position  
**CORRECT**



Front alignment:  
tilted upwards correct for  
take-off/landing  
**CORRECT**



Rear alignment:  
neutral position correct for  
forward flight  
**CORRECT**

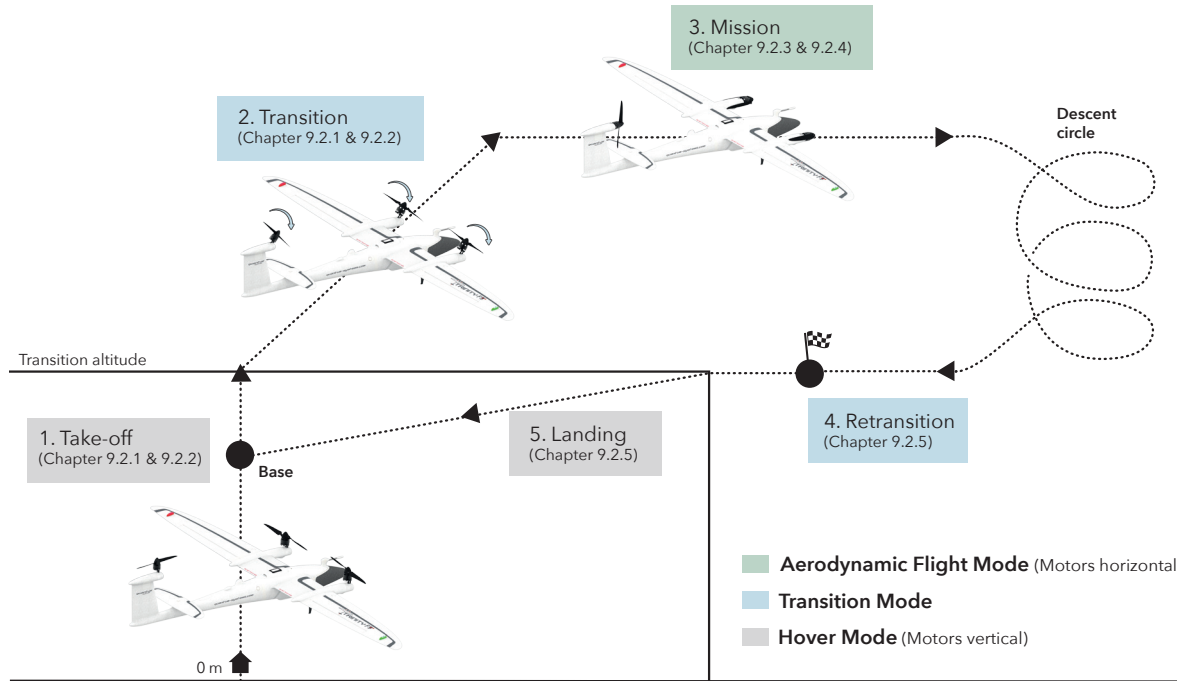


Rear alignment:  
tilted upwards correct for  
take-off/landing  
**CORRECT**

## 9.2 GENERAL FLIGHT OPERATION

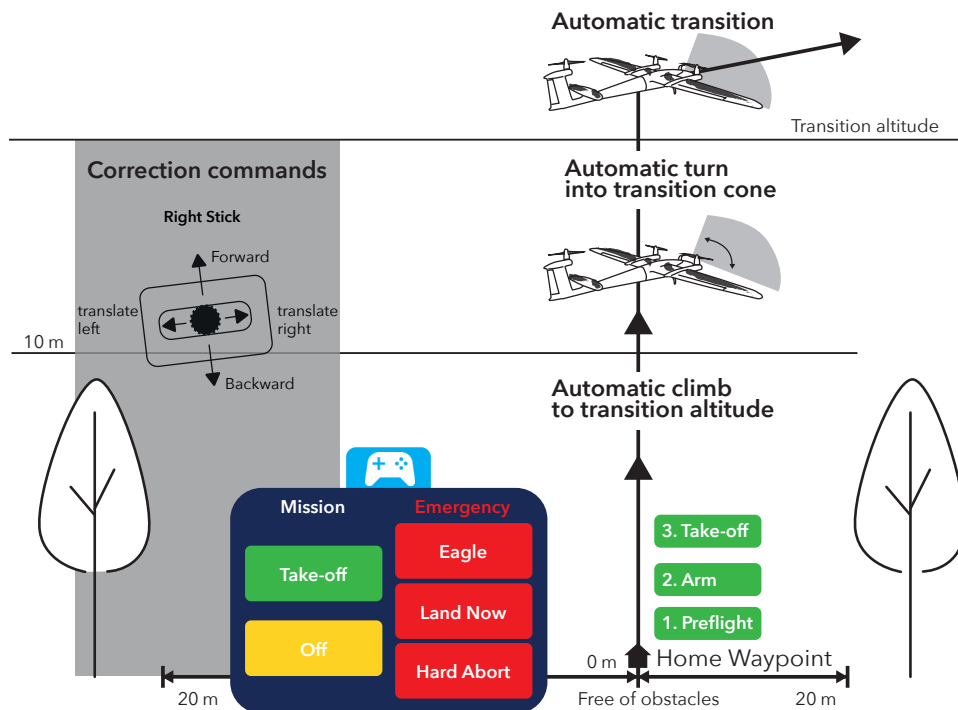
This chapter describes the general flight operation of the UAV incl. the take-off, transition, mission, retransition and landing. During every flight phase the operator has the possibility to intervene or to abort the flight.

Furthermore, the UAV is equipped with safety features that initiate an automatic coming home in case of an emergency.





## 9.2.1 Take-off & Transition



### Take-off Location

No obstacles around the Home Waypoint (20 m radius)

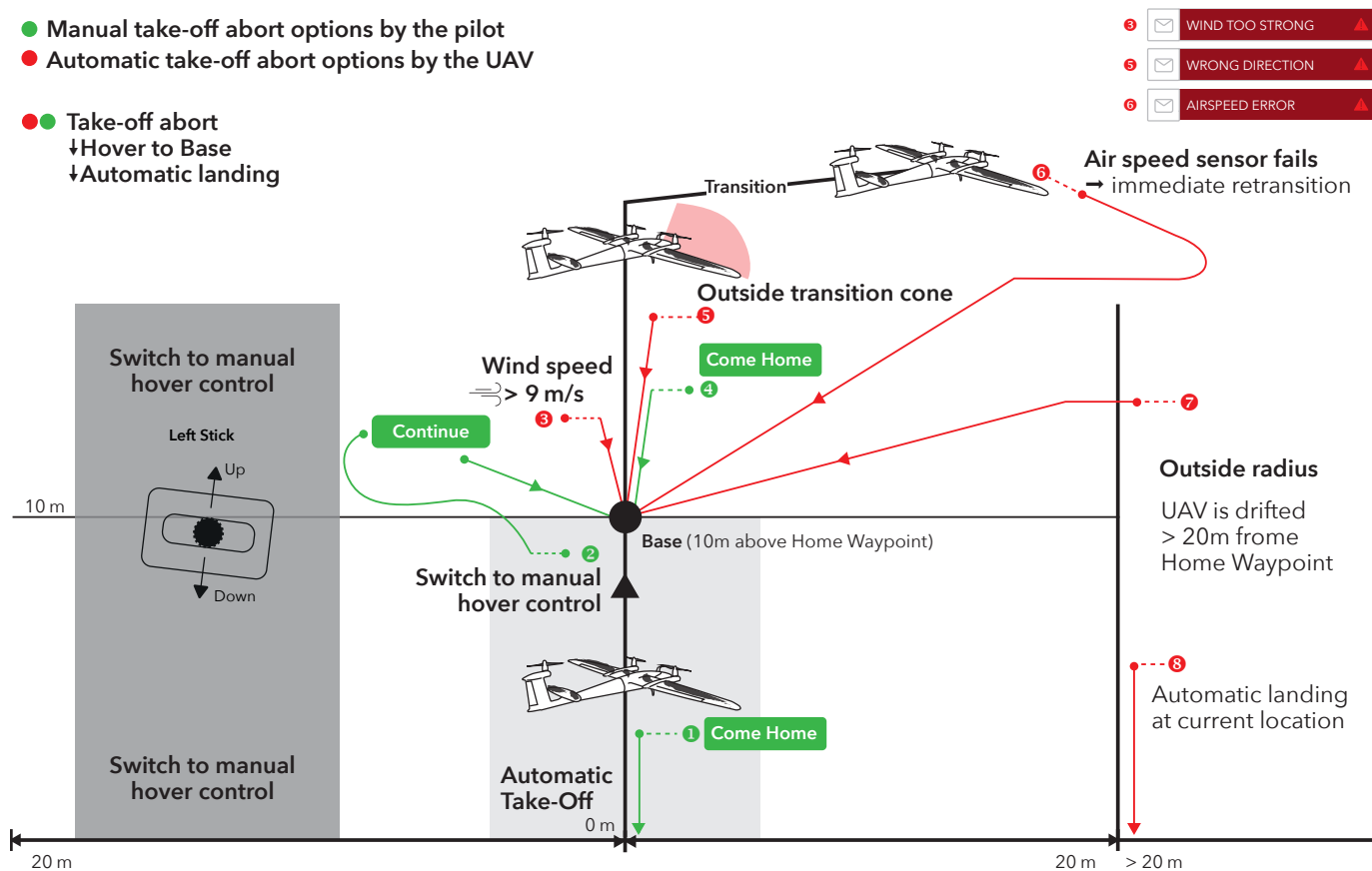
Transition altitude: 20 m (65 ft) higher than obstacles

Take-off direction: facing the wind

## 9.2.2 Manual & automatic take-off abort scenarios

- Manual take-off abort options by the pilot
- Automatic take-off abort options by the UAV

- Take-off abort
  - ↓ Hover to Base
  - ↓ Automatic landing

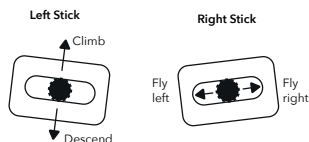


## 9.2.3 Manual & emergency & mission commands

**+++ ONLY USE IN CASE OF AN EMERGENCY +++ IN CASE OF OBSTACLES IN THE FLIGHT-PATH DUE TO MISSION MISPLANNING.**

### Manual Commands

Min. flight altitude is **40 meters**  
(ATO = above take-off)



**Continue**

→ return to planned mission.

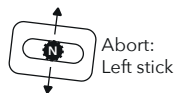
**No manual commands for >5 seconds**

→ return to planned mission.

### Emergency Commands

Auto climb  
15 sec.  
max. climb angle

**Eagle**



Abort:  
Left stick

### Mission Commands

Loiter at current  
altitude & location

**Hold**

**Continue**

**Mission**

or Manual commands

### The UAV will crash!

**Hard Abort**

Descent in assisted  
flight mode

**Land Now**

Immediate  
retransition

Switch off  
the motors &  
enter spiral dive

**Come Home**  
current  
altitude  
and on direct path.

or climb up to 40m  
above retransition  
altitude

**Descent circle**

**Retransition  
Waypoint**

Automatic  
hover

Transition altitude

Descent &  
land at  
current location

10 m

**Base**

0 m

20 m

Free of obstacles

The UAV  
will crash!

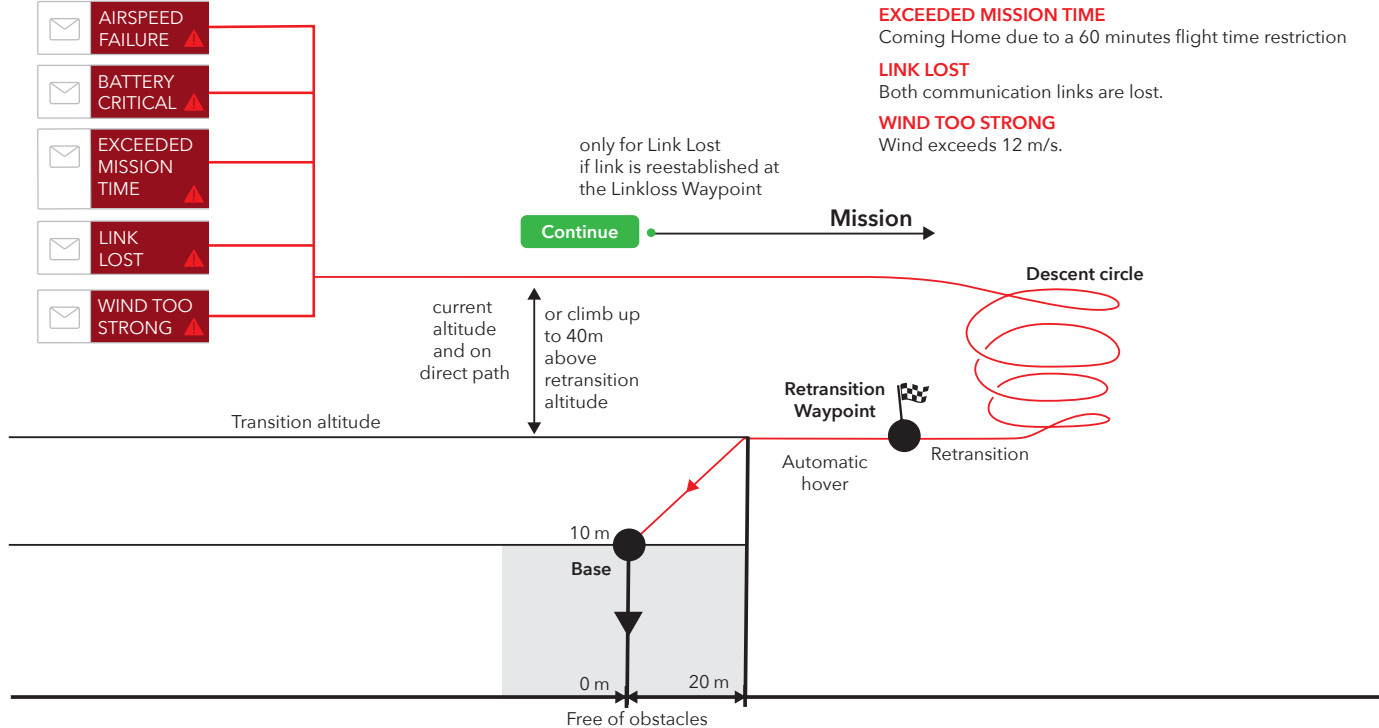
**!!It is always necessary to keep the hover time as short as possible to avoid extensive heating of internal electronic components!!**



# 9.2.4 Automatic mission coming home

See chapter 14.6 for detailed explanation of the Error Messages

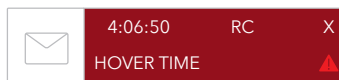
Coming home is performed on current altitude and on direct path.



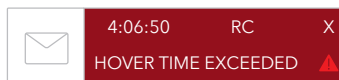
## 9.2.5 Retransition & landing

**Transit:** Altitude (MSL) of last waypoint or automatic climb to 40 m above retransition altitude if last waypoint is below the altitude of the retransition waypoint

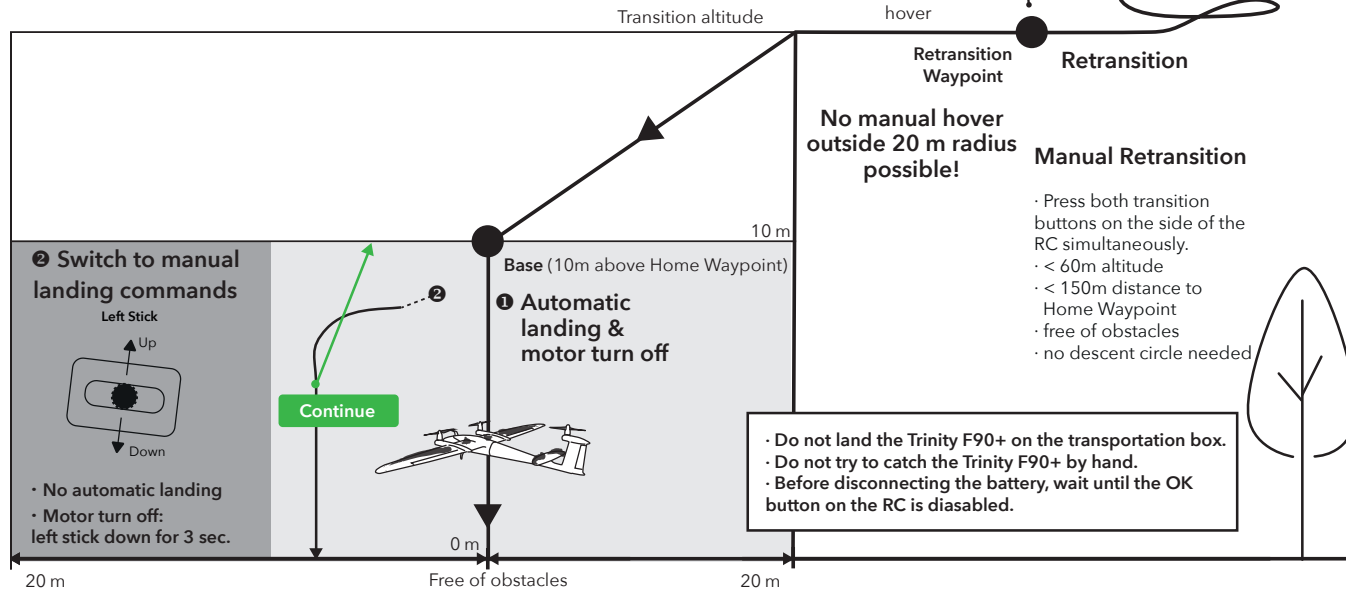
**Transit**



**55 seconds: HOVER TIME**  
Notification after 55 seconds.

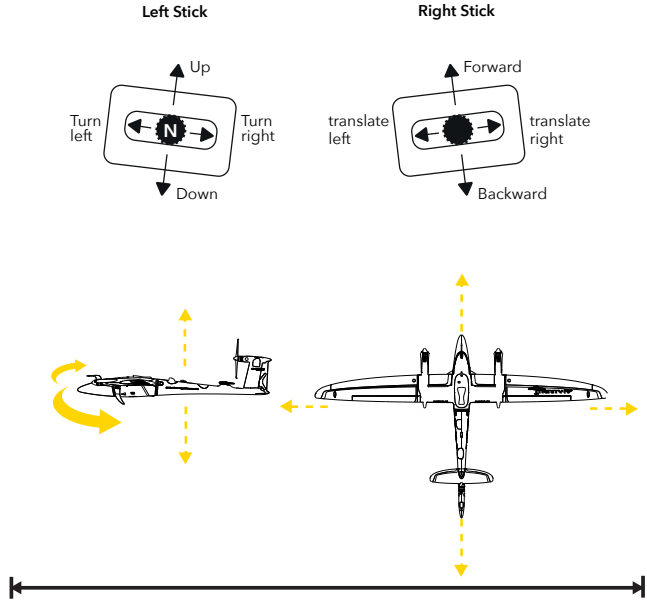


**70 seconds: HOVER TIME EXCEEDED**  
Automatic and immediate descent at current location  
**Full throttle:** will reduce the sink rate for smooth touch-down

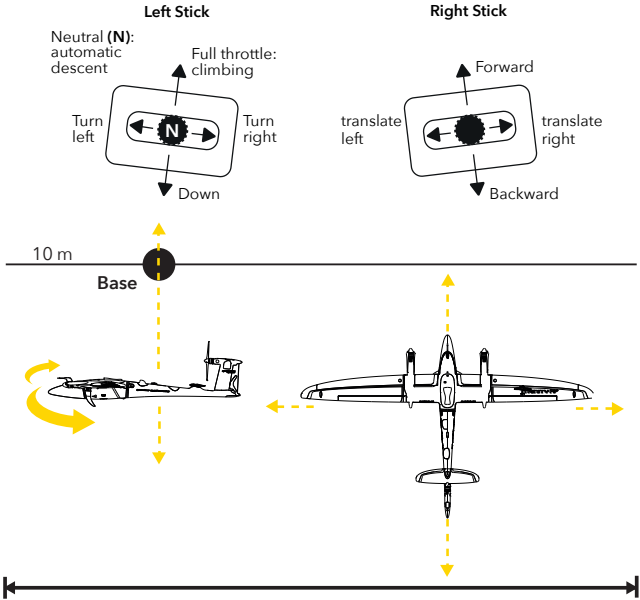


9.2.6 Hover commands

Manual hover commands  
after manual take-off abort



Manual landing commands



# 10


## AFTER THE FLIGHT

# 10 AFTER THE FLIGHT

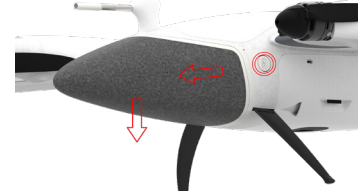
## 10.1 DISASSEMBLE THE UAV

**IMPORTANT:** Before disconnecting the battery, please wait until the OK button on the transmitter is disabled. This ensures the best PPK accuracy.

1. **Disconnect the battery** from the UAV and cover the connections of the battery with the protection caps.

Press  (A) on the left side and slide the battery forwards (B) and pull it down (C).  
Note: The UAV can only be switched off by disconnecting the battery.

2. **Turn off the RC transmitter** by pressing the power button.
3. **Shut down QBase.**
4. **Disassemble the UAV.** Disconnect the parts by pushing the lock mechanism button and simultaneously pulling the parts apart.
5. **Check all parts** of the UAV **for damages.**
6. **Clean the airframe** by wiping off the dirt with a moist cloth. If needed, use window cleaner to clean the airframe.  
Do not expose the UAV to water as it may damage the electronics.
7. **Store the parts inside the transportation box.**  
For storage and transport, leave the battery disassembled from the UAV and **attach the payload transport lock.**





## 10.2 DOWNLOAD THE FLYLOG

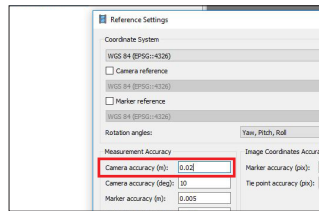
FlyLogs are generated during the flight and saved on board of the UAV. KML and tagging files can be generated from the FlyLog. See chapter 7.4.2 to download the FlyLog from the UAV with the help of QBase.

Please note that only the last twenty fly logs are saved on the autopilot. In order to prevent loss of data, please download the fly logs regularly.

## 10.3 DOWNLOAD AND GEOTAG THE PICTURES

See chapter 7.4.4 to [geotag the pictures](#) with the geodata with the help of QBase.

In order to post process the geotagged pictures please use a third party software like Agisoft, Pix4D, Propeller Aero or Trimble business Center.  
For optimal accuracy results the recommendation is to adjust the accuracy settings in the software.  
Therefore, please see the following screenshots:



## Pix4D Accuracy

[illegible][illegible]

Edit all horizontal accuracy  
Adjust to 0.020 m

Latitude (deg)	Longitude (deg)	Altitude (m)	Accuracy (m)	Accuracy Var (m)	Omega (deg)	Phi (deg)
48.047676	12.947702	720.00	0.00	0.00	-4.7500	-44.3000
48.048003	12.950003	720.00	0.00	0.00	-4.7500	-44.3000
48.047604	12.948501	719.26	0.00	10.00	-4.7500	-44.3000
48.047608	12.947801	721.23	0.00	10.00	-4.7500	-44.3000
48.047610	12.947500	720.00	0.00	10.00	-4.7500	-44.3000
48.047610	12.947400	720.00	0.00	10.00	-4.7500	-44.3000
48.047610	12.947300	720.00	0.00	10.00	-4.7500	-44.3000
48.047610	12.947200	720.00	0.00	10.00	-4.7500	-44.3000

Edit all vertical accuracy  
Adjust to 0.100 m

[illegible]

# 11

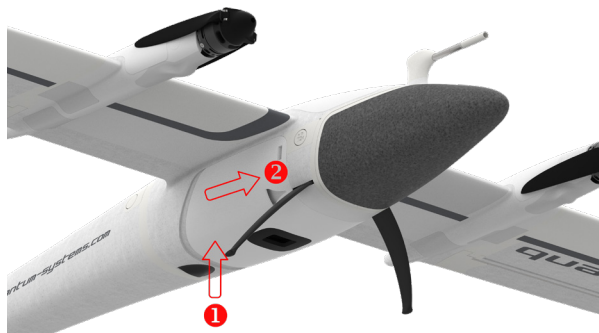
## PAYLOAD COMPARTMENT

# 11 PAYLOAD COMPARTMENT

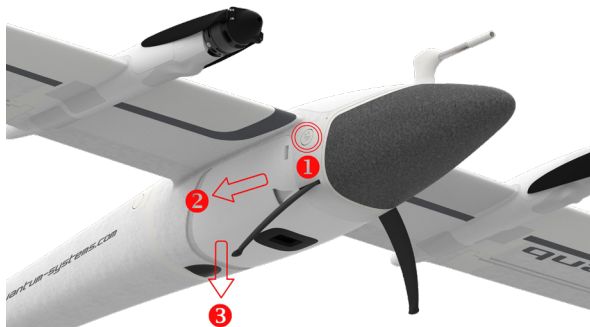
The UAV payload compartment is available in five different standard payload configurations.



## 11.1 PAYLOAD COMPARTMENT ATTACHMENT



Attach the payload compartment.



Disconnect the payload compartment.

**A:** In order to attach the payload compartment to the main body, connect the four mounting hooks on the upper side of the payload compartment to the main compartment of the UAV.

**B:** Slide the payload compartment forward.

**C:** Make sure the lock mechanism is in place.

**A:** To remove the payload compartment from the UAV press



on the right side.

**B:** Slide the compartment backwards.

**C:** Disconnect the compartment.

Make sure the D-Sub connector between the main body and the payload compartment is attached correctly. Ensure that the SD card is connected and that it provides enough space for the pictures. After a mission, it is recommended to delete the pictures on the SD card after saving them on your computer, laptop or tablet.



## 11.2 SONY UMC-R10C CAMERA

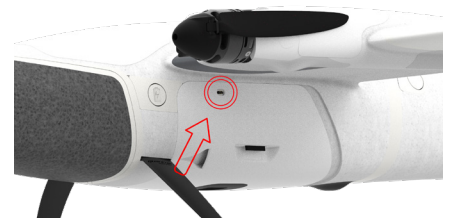
In order to change the camera settings, the software Camera Control Manager is required.

The software can be downloaded at: [www.sony.net/Products/CameraSystem/CA/UMC\\_S3C/index.html](http://www.sony.net/Products/CameraSystem/CA/UMC_S3C/index.html). For installing the software, please follow the instructions.

Due to licensing restrictions, no support is provided by Sony.

### 11.2.1 Change the camera settings

1. Connect the payload compartment to the UAV.
2. Attach the battery to the UAV. The UAV will power up automatically.
3. Connect the magnetic USB cable to the payload compartment and to your computer, laptop or tablet.
4. Open the Camera Control Manager software
5. Select Connect in the opening window of the Camera Control Manager. If the connection is not successful, please ensure that the battery is charged.



6. Change settings:

It is not recommended to change the settings of the Sony UMC-R10C camera. By default the shutter speed is set to 1/1000s, the aperture is set to F8 and the ISO is set to Auto. Due to a better trigger speed, the focus is set to Manual Focus (infinity). Nevertheless it is possible to change the settings.

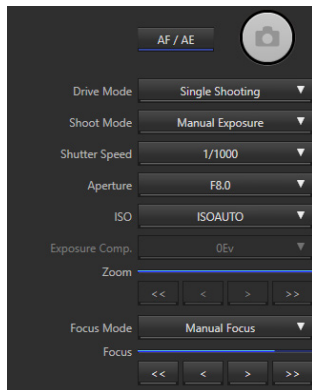
7. In order to save the settings select Power Off in the bottom left corner. The camera is switched off and the software is closed.

**Reset the focus mode to manual (infinity)**

1. Run through steps 1 - 6 and select Manual Focus.

2. In order to save the settings select Power Off in the bottom left corner. The camera is switched off and the software is closed.

## 11.2.2 Sony UMC-R10C standard settings



### 11.2.3 Sony UMC-R10C troubleshooting

#### Camera is not recognized on Trinity start up

##### 1. Loose connection between the main and payload compartment

- Connect the payload compartment to the UAV main body.
- Connect the battery to the main and establish the modem connection to QBase.
- Please check if the payload compartment is detected in QBase:  
Select the camera symbol in the header section and open the dropdown window.  
Is all sensor data green?  
→ **YES:** connection between the main and the payload Compartment is okay. Continue with step 2.  
→ **NO:** please again update the latest PMB firmware (see chapter 7.5.4).

##### 2. SD card format

- Formatting the SD card via the windows directory (first quick format, if this is not successful: hard format).  
→ Camera recognized after formatting?  
→ **YES:** it was a SD card issue and the problem is solved.

##### 3. Loose connection between the payload management board and the camera

- Unplug the micro USB from the camera
- Connect a micro USB cable to the Sony UMC and connect the cable to your computer.
- Connect the payload compartment to the main body.
- Connect the UAV battery to the main body.
- Open camera control manager: [https://www.sony.net/Products/CameraSystem/CA/UMC\\_S3C/](https://www.sony.net/Products/CameraSystem/CA/UMC_S3C/)
- Please trigger the camera via the camera control manager.
- Please change the folder from SD card to any directory on your computer to write the picture to the computer instead of the SD card.
- Please trigger the camera.

- Is the picture saved on the computer?
- **YES:** No connection issue between the payload management board and the camera.
- Must be an issue between the camera and the SD card (see step 4.).

#### 4. Loose Connection between camera and SD card

- See step 3, but please select SD card instead of computer as the folder when taking a picture via the camera control manager (the picture needs to be written to the SD card).
  - Is the picture saved on the SD card?
  - **YES:** No connection issue between the camera and the SD card. Please try to setup the UAV incl. payload again.
  - **NO:** Are all connections on the SD card PCB in place?
  - **YES:** Please contact the Quantum-Systems Support



## 11.3 MICASENSE REDEGE-M/MX/ALTUM CAMERA

General note: When the SD card of the MicaSense Red-Edge-M/MX/Altum is removed and attached again, it is important to always turn off and power on the UAV afterwards.

**Important: If you don't do this, it is possible the camera might not save the pictures on the SD card.**

### 11.3.1 Taking a calibration picture

For a correct post processing of the pictures, it is important to calibrate the Red-Edge-M/MX/Altum camera. Please take a calibration picture before and after every flight.

**Before the flight, it is recommended to add this step during the flight setup before 8.11 Step 11 - Assemble the UAV.**

Make sure the SD card is empty before every flight as the Red-Edge-M/MX/Altum takes five pictures simultaneously (size of each image: approx. 2.4 MB)

Please follow these steps in order to calibrate the camera.

1. If not already attached, attach the payload compartment.
2. Connect the battery to the main compartment. Do not attach the wings and the rear fuselage in order to prevent shadow on the calibration panel.
3. Turn on the UAV.
4. Make sure the connection between the UAV and QBase is established.
5. Establish a WiFi connection between your computer/laptop or tablet and the camera.  
Camera WiFi name: rededge[serial number], password: micasense
6. Ensure that the RedEdge-M/Altum is chosen as the payload in the mission template of QBase
7. Open the Payload Info in the footer of QBase
8. Select RedEdge-M/Altum Calibration to open the calibration window
9. When taking the picture of the calibration panel:
  - a) Stand beside the lower right side of the panel and make sure the sun is behind you (see picture) in order to avoid miscalibration because of reflections on you. Hold the UAV (without rear fuselage and wings) above the calibration panel as perpendicular as possible.
  - b) Furthermore pay attention to the following points:

- The panel is placed on the ground, far from any obstructions
- The panel fills about half the picture
- Camera is pointed as perpendicular to the panel as possible
- No shadows on the panel
- Direct sunlight illumination on the panel (no reflected lighting)

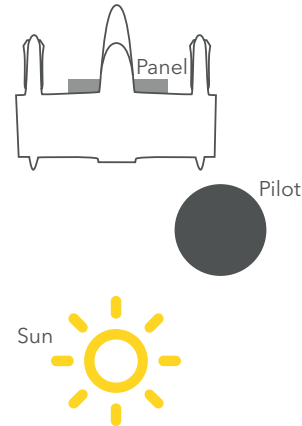
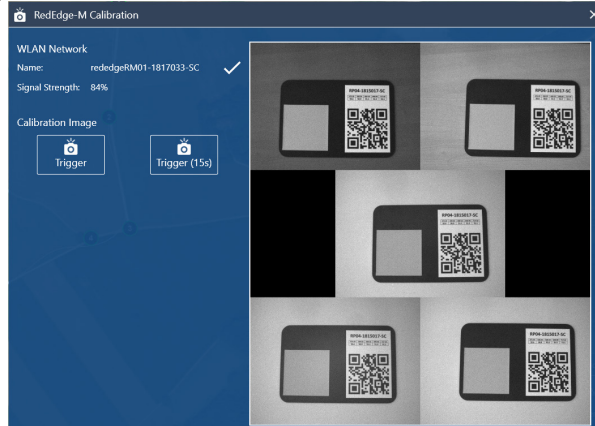
10. In order to take the picture, please select one of the following options

a) Instant Trigger

b) Delay Trigger (15s) - Recommended if the calibration is made by only one person

11. The picture is shown in QBase. Please make sure the panel itself as well as the QR code are in the picture.

Example:



Note: Please take at least two calibration pictures. **Please do not take the calibration picture by selecting the Trigger Payload button.**

12. Turn off the UAV again by removing the battery from the UAV.

13. Please continue with chapter 8.9 step - Assemble the UAV.

**After the flight**

**After the flight, it is necessary to take the calibration picture immediately after landing.**

**11.3.2 Geotagging**

The pictures of the RedEdge-MX/Altum are automatically geotagged. It is not necessary to geotag them in QBase. In case PPK accuracy is required please follow the normal PPK geotagging according to chapter 7.7.2.

**11.3.3 Notes**

1. Depending on the amount of pictures, the RedEdge-M pictures are saved in multiple folders (1000 pictures per folder).
2. The calibration pictures are saved in the folders as well.
3. Please do not insert or eject the SD card when the UAV is powered.
4. The Mica Sense Altum does only work with the SD card as a data storage device. Inserting a USB stick does not work due to GPS interferences.

**11.3.4 MicaSense RedEdge-M/MX/Altum camera updates**

1. Please download the firmware (.bin file) on the official Mica Sense website: <https://www.micasense.com/firmware-updates>  
Note: in order to download the firmware a free Atlas account is required. <https://atlas.micasense.com>
2. Connect the payload compartment to the Trinity. Please make sure the SD card is connected to the Mica Sense camera.
3. Connect the battery to the Trinity and power it.
4. Establish the WiFi connection between the camera and your computer.  
Camera WiFi name: rededge [serial number], password: micasense
5. Open <http://192.168.10.254> in your web browser in order to access the Mica Sense web interface.
6. Select „Storage and Firmware“ and then „Update Firmware“.
7. Click the „Choose File“ or „Browse“ button to select the downloaded .bin file on your computer.
8. Once the file of choice is selected, click the „Update Firmware“ button to begin the update process.
9. Wait until the progress bar completes and prompts you to restart your camera.
10. Disconnect the battery of the Trinity in order to turn off the camera.
11. Please repeat steps 3. - 5. in order to verify that the update was successful

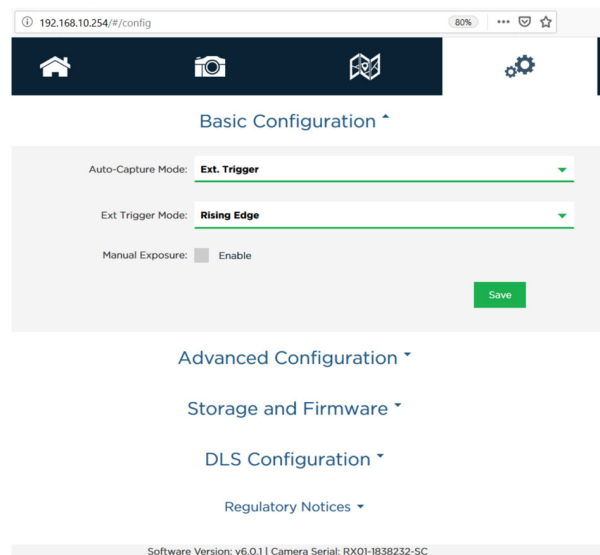
12. Verify the software was updated by checking the “Settings” page on the Mica Sense web interface. The firmware version number is shown at the bottom of the page.

### 11.3.5 MicaSense RedEdge-M/MX configuration

1. Connect the payload compartment to the Trinity. Please make sure the SD card is connected to the Mica Sense camera.
2. Connect the battery to the Trinity.
3. Establish the WiFi connection between the camera and your computer.  
Camera WiFi name: Rededge MX-[serial number],  
password: micasense
4. Open <http://192.168.10.254> in your web browser in order to access the Mica Sense web interface.
5. Configure the MicaSense Altum camera according to the following settings by opening the tab Settings in the MicaSense webinterface.

#### Basic configuration section

6. Click Save button on the bottom of this section to save the basic configuration.



## Advanced configuration section

192.168.10.254/#/config

Basic Configuration ▾

Advanced Configuration ▲

### Audio Options

Audio Enable: **Enabled**

### Format for RAW files

DNG: Smaller files, not compatible with all software

TIFF: Larger files, most compatible file format

RAW format: **TIFF (16-bit)**

### Pin Configuration

Some pins on the camera can be reconfigured as various inputs or outputs. Each function can only be assigned to one pin.

⚠ **WARNING:** Damage to the camera may occur if another output pin, such as the PPS output on a GPS receiver, is connected to a pin set to an Output mode.

=====

- Advanced configuration section - block present only in FW versions 6.x.x +

Pin Name	Disabled	PPS Input	External Trigger Input	PPS Output	Top of Frame Output
Pwr/Trg Pin 1	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GPS Pin 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
GPS Pin 5	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

192.168.10.254/#/config

Top of Frame Pulse Polarity: **Pulse high, rest low**

Streaming Allowed: ☒ Allowed

### Enabled Output files

Select type of file(s) to be saved to storage media for each band

Camera	Raw
1	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>
5	<input checked="" type="checkbox"/>

### Multi-Camera Configuration

Network Mode: **Master**

Multi-camera setups must have exactly one master

The camera must be rebooted for a mode change to take effect

Type	Mode	Serial	Software	GPS
Camera	master	RX01-1838232-SC	v5.1.12	
DLS 2	slave	DA01-1834248-SC	v0.4.3	direct

### Ethernet Configuration

Select a static IP address that is not already used on your network

The camera must be rebooted for an IP change to take effect

IP Address: **192.168.183**

**Save**

7. Click Save button on the bottom of this section to save the advanced configuration.

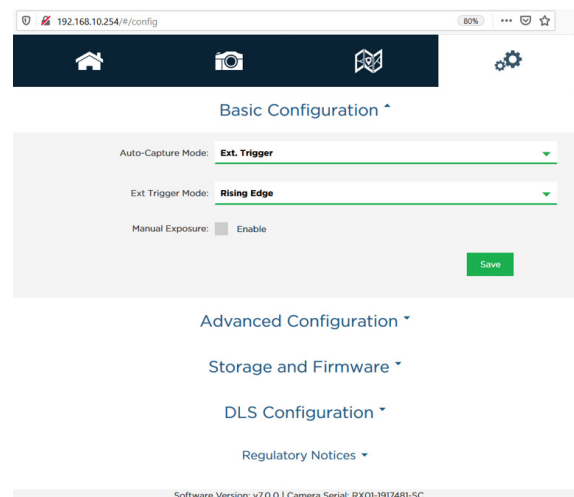
### 11.3.6 MicaSense RedEdge-M/MX Double configuration

General Setup for both cameras

1. Connect the payload compartment to the Trinity. Please make sure the SD card is connected to the Mica Sense camera.
2. Connect the battery to the Trinity.
3. Establish the WiFi connection between the camera and your computer.  
Camera WiFi name:  
Red: rededgeRX-[serial number] or  
Blue: rededgeBX-[serial number], password: micasense
4. Open <http://192.168.10.254> in your web browser in order to access the Mica Sense web interface.
5. Configure the cameras according to the following settings by opening the tab Settings in the MicaSense webinterface.
6. Configure the **Red camera (RededgeRX-SN)**:

#### Basic configuration section

7. Click Save button on the bottom of this section to save the basic configuration.



## Advanced configuration section

192.168.10.254/#/config

Basic Configuration ▾

Advanced Configuration ▸

### Audio Options

Audio Enable: **Enabled**

### Format for RAW files

DNG: **Smaller files, not compatible with all software**

TIFF: **Larger files, most compatible file format**

RAW format: **DNG (12-bit)**

### Pin Configuration

Some pins on the camera can be reconfigured as various inputs or outputs. Each function can only be assigned to one pin.

**⚠ WARNING: Damage to the camera may occur if another output pin, such as the PPS output on a GPS receiver, is connected to a pin set to an Output mode.**

Pin Name	Disabled	PPS Input	External Trigger Input	PPS Output	Top of Frame Output
Pwr/Trg Pin 1	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
GPS Pin 4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
GPS Pin 5	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Top of Frame Pulse Polarity: **Pulse high, rest low**

Streaming Allowed: ☐ Allowed

192.168.10.254/#/config

### Enabled Output files

Select type of file(s) to be saved to storage media for each band

Camera	Raw
1	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>
5	<input checked="" type="checkbox"/>

### Multi-Camera Configuration

Network Mode: **Main**

Multi-camera setups must have exactly one main camera

The camera must be rebooted for a mode change to take effect

Type	Mode	Serial	Software	GPS
Camera	main	RX01-1917481-SC	v7.0.0	
Camera	auxiliary	RB01-1937100-SC	v7.0.0	
DLS 2	auxiliary	DA01-1834248-SC	v1.2.3	direct

### Ethernet Configuration

Select a static IP address that is not already used on your network

The camera must be rebooted for an IP change to take effect

IP Address: **192.168.1.83**

**Save**

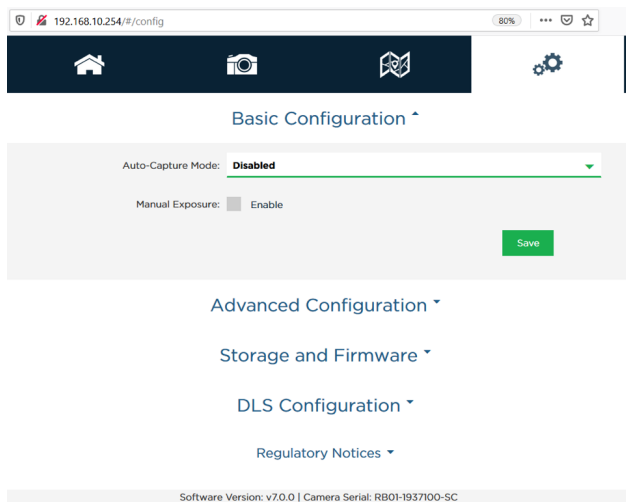
11

8. Click Save button on the bottom of this section to save the advanced configuration.

## Configure the blue Camera (RedEdgeBX-SN)

9. Please connect the **blue camera** (RedEdgeBX-SN) via Wifi according to steps 1. - 4. in order to configure it.

### Basic configuration section



The screenshot shows a web browser interface for configuring a camera. The address bar displays '192.168.10.254/#/config'. The top navigation bar is dark blue with icons for Home, Camera, Map, and Settings. The main content area is titled 'Basic Configuration' with an upward arrow. It contains two settings: 'Auto-Capture Mode' set to 'Disabled' and 'Manual Exposure' with an 'Enable' checkbox. A green 'Save' button is at the bottom right. Below the main content are links for 'Advanced Configuration', 'Storage and Firmware', 'DLS Configuration', and 'Regulatory Notices'. At the bottom, a status bar shows 'Software Version: v7.0.0 | Camera Serial: RB01-1937100-SC'.

10. Click Save button on the bottom of this section to save the basic configuration.



Advanced configuration section

192.168.10.254/#/config

80%

Basic Configuration ▾

Advanced Configuration ▲

Audio Options

Audio Enable: 

Enabled

Format for RAW files

DNG: **Smaller files, not compatible with all software**

TIFF: **Larger files, most compatible file format**

RAW format: 

DNG (12-bit)

Pin Configuration

Some pins on the camera can be reconfigured as various inputs or outputs. Each function can only be assigned to one pin.

**A WARNING: Damage to the camera may occur if another output pin, such as the PPS output on a GPS receiver, is connected to a pin set to an Output mode.**

Pin Name	Disabled	PPS Input	External Trigger Input	PPS Output	Top of Frame Output
Pwr/Trg Pin 1	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GPS Pin 4	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GPS Pin 5	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Top of Frame Pulse Polarity: 

Pulse low, rest high

Streaming Allowed: ☐ Allowed

192.168.10.254/#/config

80%

Enabled Output files

Select type of file(s) to be saved to storage media for each band

Camera	Raw
1	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>
5	<input checked="" type="checkbox"/>

Multi-Camera Configuration

Network Mode: 

Auxiliary

Multi-camera setups must have exactly one main camera

The camera must be rebooted for a mode change to take effect

Type	Mode	Serial	Software	GPS
Camera	main	RX01-1917481-SC	v7.0.0	
Camera	auxiliary	RB01-1937100-SC	v7.0.0	
DLS 2	auxiliary	DA01-1834248-SC	v1.2.3	direct

Ethernet Configuration

Select a static IP address that is not already used on your network

The camera must be rebooted for an IP change to take effect

IP Address: 

192.168.1.83

Save

Storage and Firmware ▾

11

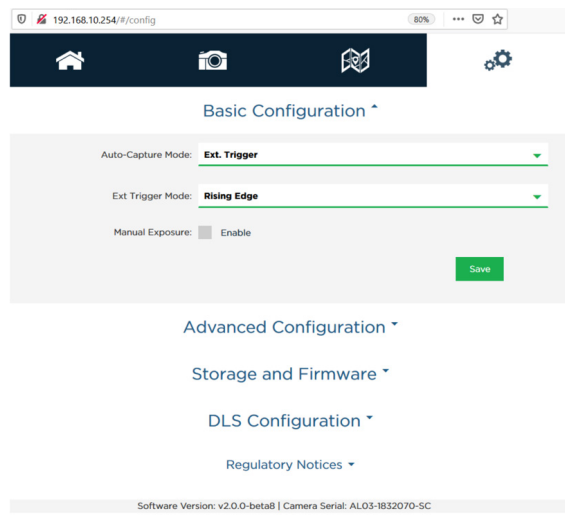
11. Click Save button on the bottom of this section to save the advanced.

### 11.3.7 MicaSense RedEdge Altum configuration

1. Connect the payload compartment to the Trinity. Please make sure the SD card is connected to the Mica Sense camera.
2. Connect the battery to the Trinity and power it.
3. Establish the WiFi connection between the camera and your computer.  
Camera WiFi name:  
Red: ALTUM-[serial number], password: micasense
4. Open <http://192.168.10.254> in your web browser in order to access the Mica Sense web interface.
5. Configure the MicaSense Altum camera according to the following settings by opening the tab Settings in the MicaSense webinterface.

#### Basic configuration section

6. Click Save button on the bottom of this section to save the basic configuration.



Advanced configuration section

Basic Configuration ▾

Advanced Configuration ▲

Audio Options

Audio Enable: 

Disabled

Format for RAW files

DNG: 

Smaller files, not compatible with all software

TIFF: 

Larger files, most compatible file format

RAW format: 

DNG (12-bit)

Pin Configuration

Some pins on the camera can be reconfigured as various inputs or outputs. Each function can only be assigned to one pin.

⚠ WARNING: Damage to the camera may occur if another output pin, such as the PPS output on a GPS receiver, is connected to a pin set to an Output mode.

Pin Name	Disabled	PPS Input	PPS Output	Top of Frame Output
Pin 3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Pin 7	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Top of Frame Pulse Polarity: 

Pulse high, rest low

Streaming Allowed: ☐ Allowed

192.168.10.254/#/config

80%

Enabled Output files

Select type of file(s) to be saved to storage media for each band

Camera	Raw
1	<input checked="" type="checkbox"/>
2	<input checked="" type="checkbox"/>
3	<input checked="" type="checkbox"/>
4	<input checked="" type="checkbox"/>
5	<input checked="" type="checkbox"/>
6	<input checked="" type="checkbox"/>

Multi-Camera Configuration

Network Mode: 

Main

Multi-camera setups must have exactly one main camera

The camera must be rebooted for a mode change to take effect

Type	Mode	Serial	Software	GPS
Camera	main	AL03-1812070-SC	v2.0.0-beta8	
DLS 2	auxiliary	DA01-1834248-SC	v1.2.3	direct

Flash Configuration

7. Click Save button on the bottom of this section to save the advanced.

## 11.4 SONY RX1R II CAMERA

### 11.4.1 RX1RII settings

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1. Disconnect the payload compartment according to chapter 11.1.
2. Remove the battery dummy.
3. Insert the original camera battery. Make sure it is charged. Charging is possible via the supplied charger.
4. Turn on the camera using the on/off switch on top of the camera.  
The screen of the camera will power up.

#### 5. Change settings:

##### Default settings via camera hardware controls

Access the settings by switching to Manual Mode M with the control wheel on top of the Camera.

Exposure: 1/2000 s (a small control wheel on the camera hind top right).

Aperture: F4 (The F-Stop wheel on the camera lens).

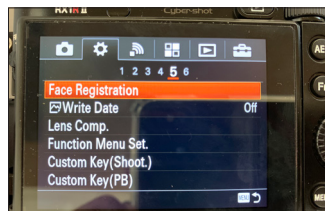
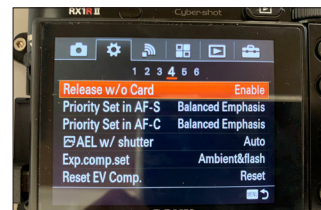
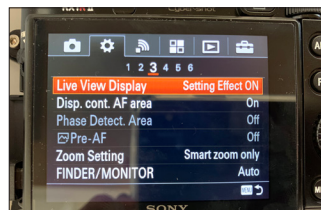
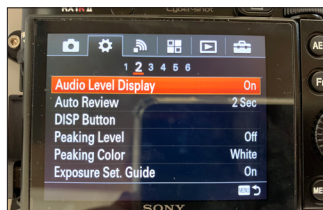
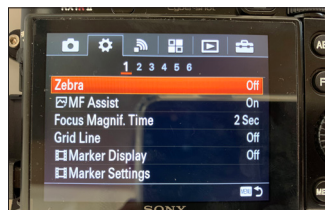
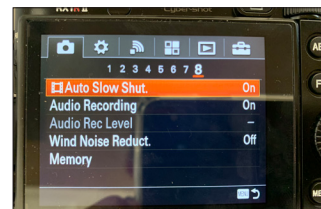
Focus: MF manual focus (a small control wheel on the front of the camera).

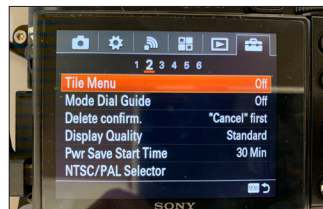
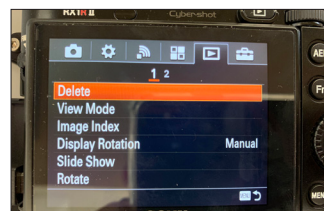
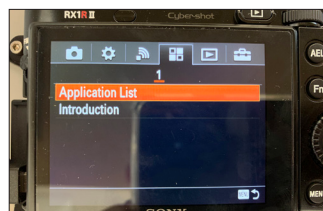
Focus: ∞ (via the manual focus wheel on the camera lens).

##### Default settings via camera display menu

- Access the settings menu by selecting **MENU**.
  - Change the Menu by pressing the camera wheel left and right.
  - In order to access the sub menus please press ↓.
  - Navigate through the corresponding submenu by turning the camera wheel.
  - To change the setting please use the silver button.
6. In order to save the settings please turn the camera off using the on-off switch on camera top. Wait for 3 seconds and switch the camera on.
  7. Turn the camera off again and disconnect the battery.
  8. Insert the battery dummy.
  9. Turn the camera on.
  10. Connect the payload compartment to the UAV.

## RX1RII Menu default settings





## 11.4.2 Trigger speed

---

### JPEG (~32 MB/picture)

- 1.5 sec/capture for an indefinite picture row
- 1.4 sec/capture for a 500 pic flight leg
- 1.3 sec/capture for a 160 pic flight leg
- 1.2 sec/capture for a 95 pic flight leg
- 1.1 sec/capture for a 70 pic flight leg
- 1.0 sec/capture for a 55 pic flight leg

1.3 sec/capture is a reasonably safe trigger limit.

### Compressed RAW (~43 MB/picture)

- 1.7 sec/capture for a 1470 pic flight leg
- 1.6 sec/capture for a 197 pic flight leg
- 1.5 sec/capture for a 115 pic flight leg
- 1.4 sec/capture for a 80 pic flight leg
- 1.3 sec/capture for a 57 pic flight leg
- 1.2 sec/capture for a 47 pic flight leg
- 1.1 sec/capture for a 40 pic flight leg
- 1.0 sec/capture for a 35 pic flight leg

1.5 sec/capture is a reasonably safe trigger limit.

### Uncompressed RAW (~85 MB/picture)

- 2.2 sec/capture for a 173 pic flight leg
- 2.1 sec/capture for a 81 pic flight leg
- 2.0 sec/capture for a 55 pic flight leg
- 1.8 sec/capture for a 32 pic flight leg
- 1.6 sec/capture for a 24 pic flight leg
- 1.5 sec/capture for a 22 pic flight leg

2.2 sec/capture is a reasonably safe trigger limit.

---

### 11.4.3 Storage capacity

---

An RX1 picture with best resolution is in average 32 MB. For an 82 minutes flight and 1 sec/picture it results in ~153.8 GB required storage space, so a 256 GB SD card is recommended.

If the trigger speed is reduced to the relatively safe 1.3 sec/picture, 118.3 GB are required (which can be provided by a 128 GB SD card).

---

### 11.4.4 Deleting the pictures from the SD card

---

Please **do not format** the SD card to delete the pictures. Please only delete them.

In case the SD card is formatted please:

1. Insert the SD card into the camera
2. Directly power the camera via the Sony battery and turn on the camera.
3. Please confirm the start-up dialogue on the camera to reconfigure the root folders on the SD card.
4. Remove the battery without turning the camera off on the on-off switch.
5. Reinsert the battery dummy.

The root folders are required for problem-free connection between the camera and the SD card.



## 11.5 TX-THERMAL CAMERA

The TX Thermal is only available as a combined payload compartment with the Sony UMC R10C camera. The camera is recording a thermal video for every flight leg. In between the flight legs the camera is automatically calibrating. With the help of the free 3<sup>rd</sup> party software ThermoViewer the recorded videos can be converted into .tif or .jpg files for the further post-processing in e.g. Pix4Dmapper or Agisoft Metashape.

### 11.5.1 QBase setup

---

As soon as the TX camera is recognized upon start-up the recording symbol will turn yellow (pause recording). As soon as the camera is recording during the flight legs the recording symbol will turn green.

Please make sure that also the camera symbol will turn green indicating a successful connection to the Sony UMC R10C camera. For good data results it is mandatory to keep the front and side overlap at 75%. When processing the results in Pix4D it is furthermore mandatory to enable the crossleg function. The standard flight altitude is set to 100 meters.

### 11.5.2 Processing the data

---

The video streams are written in the form of \*.TMC files that need to be further processed with the Teax ThermoViewer software. Please download the software here: <https://thermalcapture.com/thermoviewer-download/>

1. Please download the video \*.TMC files from the SD card inside the payload compartment and save them on your computer.
2. Please open the ThermoViewer software

## Merge the individual \*.TMC files to create one \*.TMC file for the entire flight

3. Please select Edit -> Merge Files in the top left corner of the software
4. Please select Add file(s) and choose the correct \*.TMC files from the windows directory
5. Please make sure the parameters are set as shown below
6. Please select Merge and select the output directory.
7. Once the merging process is finished please select the merged .TMC file from the directory in the left section of ThermoViewer.

**Range adjustments**

Gain low: [Slider] [17,6]

Gain high: [Slider] [25,6]

Gain mid: [Slider] [21,6]

Automatic gain: ☒ Automatic for current image

Temperature change: [100] Percent

[Reset] [-57,15] [86,85]

**Color adjustments**

Color: [BlackHot] ☐ Invert

Bi-Color: ☐ enable

low: [Slider] -13.1

high: [Slider] 26.8

**Image rotation**

Rotate: ☒ 0° ☐ 90° Clockwise ☐ 90° Counter Clockwise ☐ 180°

**Daylight Image Offset**


Offset: [3]

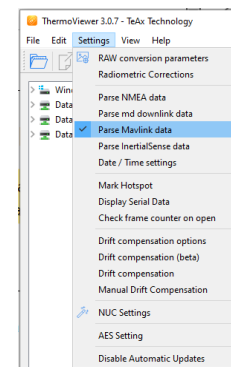
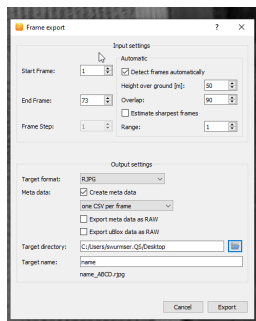
**Temperatures**

TLinear mode: [TLinear high gain °C]

Show legend: ☐

## Convert the \*.TMC file into \*.rjpg or \*.tif files

8. Please select Settings in the header section and make sure all options except Parse Mavlink data are unticked.
9. Please select Frame export .
10. Please apply the following settings for the export:  
Please adjust the altitude to your actual flying altitude.



- \*.rjpg needs to be selected when afterwards processing in Pix4D
- \*.tif needs to be selected when afterwards processing in AgiSoft.



11. The pictures can now be post-processed in Pix4Dmapper or AgiSoft Metashape



# 12

## STORAGE

# 12 STORAGE

For storage, please keep the UAV as well as the QS modem, the transmitter and the battery charger in the transportation box and store the box inside a building at a normal room temperature.

## **Battery pack**

Always store the battery disconnected from the UAV. For battery storage instructions see chapter 2.2.3 & 6.3.

# 13

## INSPECTION & REPAIRS

# 13 INSPECTION & REPAIRS

Do not do any other repair or maintenance work than the one listed. Contact your reseller for further repair assistance.

## 13.1 REPAIRING AND CLEANING THE AIRFRAME

Small cracks can be repaired by using polystyrene/styrofoam glue. In case of doubt, contact your reseller for further assistance. To clean the airframe please use window cleaner and a microfiber cloth. Make sure to only use a small amount when cleaning it.

## 13.2 CALIBRATING THE MAGNETOMETER

If the heading of the UAV is not correct, the magnetometer needs to be recalibrated. The heading needs to be checked before each flight. The heading is not correct if the direction of the UAV displayed in QBase does not align with the direction of the UAV.

Also the magnetometer needs to be recalibrated if the actual flight location is more than 50km away from the location where the magnetometer was calibrated before.

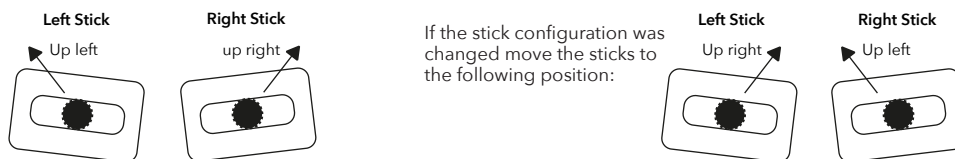
**Always calibrate the magnetometer outside. Make sure no buildings, cars or other obstacles that distract the calibration are within 10 m (33 ft) around you.**

**Also make sure that no metal (like parking decks, steel buildings or other metal structures, ships, cars or other machines) or any devices causing electric or magnetic fields (power lines, generators, mobile phones) are close.**

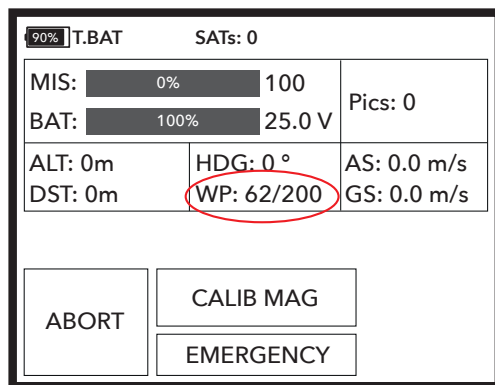
For the calibration, the main body of the UAV, the battery pack and the transmitter are needed. Please do not carry your mobile phone or similar items with you as they might disturb the calibration process.



1. Turn on the transmitter.
2. Connect the battery pack to the main body of the UAV and power the UAV. The payload compartment must be attached to the main body of the UAV.
3. Ensure that the link between the UAV and the transmitter is established.
4. Simultaneously move the sticks to the following position.



5. When the calibration mode is started the message CALIB. MAG. is shown on the transmitter.
6. During the calibration, 200 measuring points are recorded. Move the main body as described below. The counter on the display of the transmitter counts up until 200.

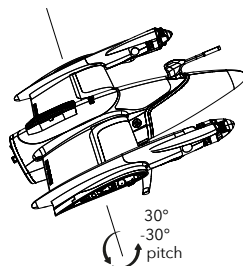
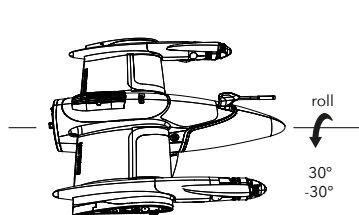


## MOVE THE MAIN BODY LIKE THIS

- I. Hold the main body of the UAV on both nacelles.
- II. Turn 360° around yourself while moving the UAV from +30° to -30° around the roll axis and simultaneously +30° to -30° around the pitch axis.
- III. Flip the UAV main body 180° around the roll axis (the payload compartment is on the top).
- IV. Turn 360° around yourself while moving the UAV from +30° to -30° around the roll axis and simultaneously +30° to -30° around the pitch axis.
- V. Flip the UAV main body 180° around the roll axis (the payload compartment is on the bottom).



Find the magnetometer calibration video tutorial on our YouTube channel.  
Just search for [www.youtube.com/c/QuantumSystems](https://www.youtube.com/c/QuantumSystems)

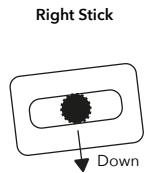


7. An audio signal informs you about the successful calibration. Furthermore, the message **FINISHED** is displayed on the transmitter.  
If the calibration was not successful, **ERROR** will be displayed. Please try again.

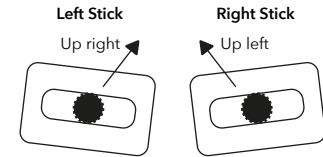
## 13.3 CALIBRATING THE ACCELEROMETER

1. Turn on the transmitter.
2. Connect the battery pack to the main body of the UAV and power the UAV.
3. Simultaneously move the sticks to the following position
4. Now you are in calibration mode.

The UAV needs to be calibrated in 9 different positions.



In every position, you need to pull the right stick down and hold it for 2 seconds to confirm the position.



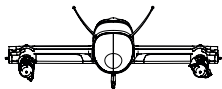
If the stick configuration was changed move the sticks to the opposite position:

5. During the calibration, 9 measuring points are recorded. Place the main body as shown below.  
The counter on the transmitter counts up until 9.

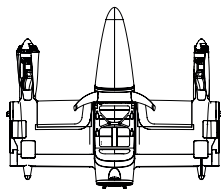
1



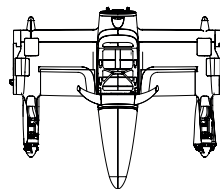
2



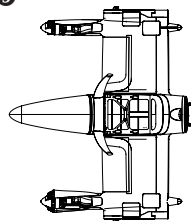
3



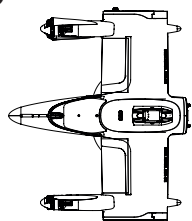
4



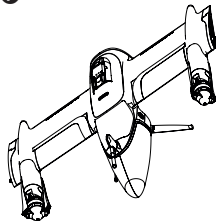
5



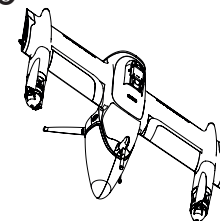
6



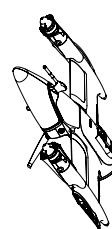
7



8



9



6. There will be three different voice outputs:

1. **OK** = Measured value was OK
2. **Aircraft is moving** = The UAV is not stable enough
3. **Success** = Appears after step 9 was completed successfully

## 13.4 EXCHANGE A DEGRADED BATTERY PACK

After **150 charging cycles** it is recommended to exchange the UAV Battery pack. In order to check the amount of charging cycles please check the BID Info menu on the charger – therefore, the battery must be connected to the charger.

The battery will age over time. Therefore, the warranty of the complete UAV system expires when batteries with more than 150 charging cycles are used. Batteries itself are not covered as part of the standard warranty (see chapter 2.2.4).

Note: The UAV is equipped with a feature to return home if the battery is low.

## 13.5 INSPECTION SCHEDULE

After every **10th flight** of the UAV it is recommended to perform a short maintenance check according to the following steps. In case the check shows any erratic behaviour please contact your reseller for further assistance.

### 13.5.1 Battery voltage check

- Please connect the battery to the charger after every **10th flight of each battery**.  
This check must be done **after the flight, before recharging** the battery.
- Please check the [Data View] menu and ensure that the 6 single cells are within a range of 0.1 V to each other.

max-min <0.1V: <b>OK ✓</b>
[Data View]
Main: 21.30 V
Max: 3.59 V
Min: 3.50 V
3.50 V 3.55 V 3.59 V
3.59 V 3.50 V 3.57 V

max-min >0.1V: <b>NOT OK ✗</b>
[Data View]
Main: 21.29 V
Max: 3.63 V
Min: 3.50 V
3.63 V 3.50 V 3.55 V
3.50 V 3.60 V 3.51 V

### 13.5.2 Keep your UAV and the equipment clean

---

- Please clean the parts of the UAV and all additional equipment with a slightly moist cleaning tissue.
- Clean the transportation box with the help of a vacuum cleaner.

It is recommended to perform the following steps outside. Furthermore, a short mission must be planned.

### 13.5.3 Check the UAV for damages

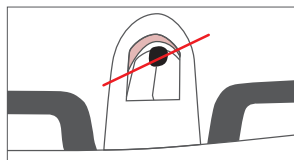
---

- Please carefully inspect every part of the UAV for damages.
- Thereby, please also check the propellers for dents, cracks and scratches.

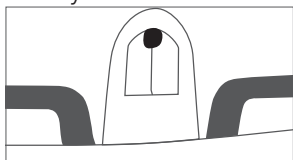
### 13.5.4 Check all connections

---

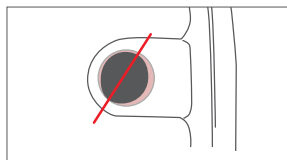
- Please assemble the unit and make sure that all lock mechanisms are locked correctly.
- Do not connect the battery.



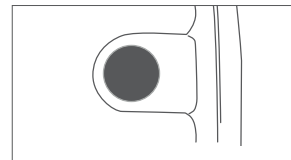
Elevator  
**WRONG**



Elevator  
**CORRECT**



Wing/Rear Fuselage/Nose  
**WRONG**



Wing/Rear Fuselage/Nose  
**CORRECT**

### 13.5.5 Clean the Airspeed Sensor

---

- Please remove the airspeed sensor from the main body via the magnetic connection.
- Please use compressed air in order to clean the sensor. The sensor can be cleaned from both directions. To finish the process please make sure that no more dust or dirt is visible inside the tube

Only relevant for UAV's delivered as of Q2 2021 starting with serialnumber 00686.

### 13.5.5 Check the tilt mechanism

- Please check the two front tilt mechanisms by carefully moving the motors up and down.
- Can the motor be moved smoothly? Is there any irregular friction or noise?
- Please check if the motor wires are aligned as shown in the picture.



### 13.5.6 Check the connections between the UAV, QBase & the RC

- Please connect the battery to the UAV main body.
- Open QBase and connect the QBase modem.
- Power the RC.
- Are both connections established?

### 13.5.7 QBase final check

---

#### Obstacle clearance in reality

- No obstacle within a radius of 20 m around Home Waypoint
- Re-/transition, Descent circle, Flight paths: altitude 20 m higher than obstacles

#### UAV heading

- Ensure the direction of the displayed UAV corresponds to the direction of the UAV on the ground
- Do not fly if the heading on the ground is not correct: **critical deviation  $\geq 10^\circ$**

#### Wind direction

- Re-/transition is set against the wind direction!
- **Retransition with tailwind: per 1m/s tailwind ~ 20 meter deviation**
- Wind check in the immediate surrounding
- Do not take-off in a wind sheltered area (lee) as turbulences may occur

### 13.5.8 Upload the mission

---

Upload the mission  → 

**Make sure the Home Waypoint in QBase  is adjusted to the real take-off position .**

### 13.5.9 Preflight check

---

#### Preflight

Select **PREFLIGHT (CHECK)** on the display of the transmitter or in QBase3D.

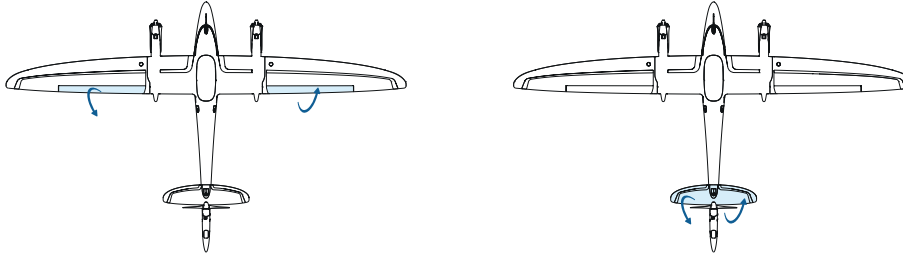
If the preflight check is not successful a message will be displayed on the transmitter.

Within the preflight check the actual take-off position is transferred to QBase.



### 13.5.10 Check the control surfaces

Move the right stick to the sides to check the ailerons. Move the same stick up and down to check the elevator. If the stick configuration was changed, use the left stick to check the ailerons and the elevator.

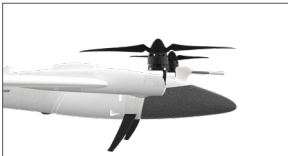


Make sure the control surfaces are moving while moving the stick. Do not fly if a control surface is not moving. See chapter 14.2 for troubleshooting.

### 13.5.11 Arm

**!!NEVER ARM AN AIRCRAFT WITH A DAMAGED PROPELLER!!**

- Due to safety reasons the UAV will **turn off the motors automatically** after **30 seconds** if no button has been pressed.
- Make sure the motors are **spinning freely**. If the spinning of the motors emits an untypical sound, turn off the motors.
- Make sure **all three motors are tilted 90° upwards**. If not, turn off the system. Contact your reseller for further assistance.



Front alignment: tilted upwards  
**CORRECT**



Rear alignment: tilted upwards  
**CORRECT**

## 13.6 CLEAN THE AIRSPEED SENSOR

Only relevant for UAV's delivered as of Q2 2021 starting with serialnumber 00686.

The new airspeed sensor provides the user with the possibility to easily clean and exchange the pitot tube.

Please clean or exchange the pitot tube in case **AIRSPEED SENSOR MALFUNCTION** is triggered.

1. Please remove the airspeed sensor from the main body via the magnetic connection.
2. Please use compressed air in order to clean the sensor. The sensor can be cleaned from both directions. To finish the process please make sure that no more dust or dirt is visible inside the tube.



# 14

## TROUBLESHOOTING

# 14 TROUBLESHOOTING

## 14.1 LED STATUS MAIN BODY

**Color:** green **Sequence:** fast blinking

- USB connection

**Color:** blue **Sequence:** normal blinking

- System is initializing/performing sensor self test
- System is waiting for a GPS lock
- System is waiting for payload to be connected

**Color:** blue green **Sequence:** alternating

- Magnetometer calibration

**Color:** green yellow **Sequence:** alternating

- Accelerometer (ACC) calibration

**Color:** blue **Sequence:** fast blinking

- System is armed

**Color:** green **Sequence:** breathing

- All sensor states are nominal and payload is connected
- System is ready for PFC/flight

**Color:** purple **Sequence:** fast blinking

- System is still logging PPK data

**Color:** yellow **Sequence:** fast blinking

- Sensor not found (e.g. Searching for GPS, Airspeed sensor not mounted, ...)

**Color:** red **Sequence:** fast blinking

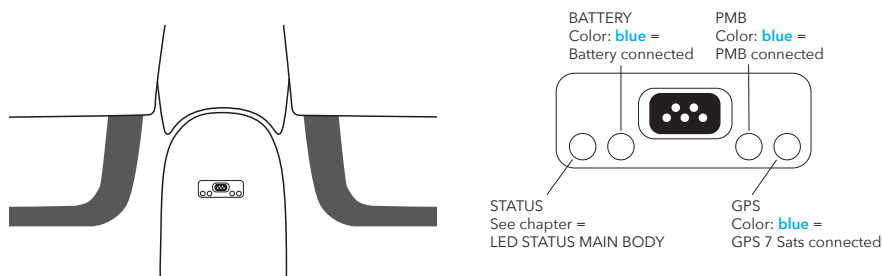
- System encountered a severe error during startup (e.g. sensor fault, sensor selftest failure, ...)

The following LED status is only relevant for UAVs delivered as of Q2 2021 starting with serialnumber 00686:

**Color:** blue **Sequence:** LEDs run left/right

- System is booting. This sequence is active right after connecting the battery

## 14.2 ADDITIONAL LED STATUS MAIN BODY



These additional LEDs are only relevant for UAVs delivered as of Q2 2021 starting with serialnumber 00686:

## 14.3 CONNECTION BETWEEN QBASE AND THE UAV CANNOT BE ESTABLISHED

To guarantee a stable connection between QBase and UAV via the QBase modem, ensure that both devices have the same temperature.

**Option 1:** Ensure that the QBase modem is recognized by the computer, laptop or tablet.

1. Check your Windows device manager for the modem (COM-Port).
2. If it is not recognized, try another USB port.

**Option 2:** Disconnect the battery and connect it again. Switch on the UAV again. Restart QBase. Do not disconnect the modem inbetween.

If none of the options is successful, contact your reseller.

## 14.4 THE CONTROL SURFACE CHECK IS NOT SUCCESSFUL

1. Disconnect the battery from the UAV.
2. Make sure every part is assembled correct.
3. Connect the battery again.
4. Switch on the UAV again.
5. If the control surface check is still not successful, contact your reseller.

# 14.5 THE WEATHER CONDITIONS CHANGE DURING THE FLIGHT

- If the weather conditions change during the mission and are unsuitable for flying, abort the mission by selecting **COME HOME** on the transmitter display or on the UAV command interface in QBase.

# 14.6 AFTER A CRASH OF THE UAV

In the event of a crash follow the steps:

1. Select **EMERGENCY** and **Hard Abort** on the transmitter or in the UAV command interface in QBase to ensure that the motors are switched off. Confirm to switch off the motors by selecting **Yes!**.
2. Locate the UAV and disconnect the battery pack.

Open the enclosed red envelope in your Trinity box and follow the instructions. Provide all necessary data and contact your reseller for further assistance. Do not use the UAV again.

# 14.7 IMPORTANT MESSAGES

TEXT	DESCRIPTION	WHAT TO DO
ABORTED	The calibration was aborted manually.	-
ACC ERROR	An acceleration sensor error occurred during the preflight check.	1. Make sure the UAV is not moving during the preflight check. 2. Disconnect the battery from the UAV and connect it again. Turn on the UAV again. 3. Repeat the preflight check. 4. If the problem persists, contact your reseller.
ACTUATOR MALFUNCTION! REMOVE BATTERY IMMEDIATELY!	A malfunction of an actuator has been detected.	Remove the battery immediately to prevent further damage. Contact your Quantum-Systems reseller. The actuator has to be replaced.
AILERON MALFUNCTION!	Reduced roll control effectiveness was detected in flight, pointing to a mechanical problem with the aileron control surfaces.	→ COME HOME is automatically initiated. In severe cases, an immediate retransition and landing is performed. → Wait for the UAV to come home. → Do not fly again, contact your reseller.

<b>AIRSPPEED ERROR</b>	An airspeed sensor error occurred during the preflight check or during the transition.  Possible reasons are a transition with tail wind or a blocked airspeed sensor tube.	<b>During preflight check:</b> 1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again.  <b>During transition:</b> 1. The transition is aborted. 2. The UAV will return home and land automatically. 3. For Trinity F90+ from serialnumber 00686: Please perform the airspeed sensor cleaning according to chapter 13.6 4. For Trinity F90+ (other): Please contact your reseller.
<b>AIRSPPEED INITIALIZATION ERROR</b>	Sensor init error during startup	Disconnect the battery from the UAV and connect it again.
<b>AIRSPPEED SENSOR MALFUNCTION</b>	The airspeed sensor does not work correctly	<b>No manual input necessary</b> except for collision avoidance. <b>1. The UAV will return home and land automatically.</b> 2. The mission cannot be continued. 2. The mission cannot be continued. 3. For Trinity F90+ from serialnumber 00686: Please perform the airspeed sensor cleaning according to chapter 13.6 4. For Trinity F90+ (other): Please contact your reseller.
<b>ASSISTED FLIGHT</b>	The UAV is controlled manually in assisted mode.	Control the UAV according to the commands of the assisted mode (see chapter 9.1) or select CONT to switch to automatic mode.
<b>AUTOPILOT INFO ERROR</b>	Autopilot configuration error.	Contact your reseller.
<b>BARO ERROR</b>	A baro sensor error occurred during the preflight check.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check.
<b>BARO INITIALIZATION ERROR</b>	Sensor Init Error during Startup	Disconnect the battery from the UAV and connect it again.
<b>BATTERY CRITICAL</b>	During preflight check: The remaining battery capacity is below minimum. During flight: The remaining capacity is needed to return and to land.	No manual input necessary except for collision avoidance. → The UAV will return home and land automatically. → The mission cannot be continued.
<b>BATTERY LOW</b>	A warning 10 minutes before the UAV will return home due to low battery capacity.	Please select COME HOME.

<b>CAL ERROR</b>	One of the sensors is not calibrated correctly.	Please check QBase for detailed information.
<b>CAL ERROR ACC</b>	The accelerometer has not been calibrated correctly.	The last accelerometer calibration failed. Please calibrate the accelerometer and try again (see chapter 13.3).
<b>CHECK LINK REEST. ALTITUDE</b>	There is an issue with the link reestablishing waypoint.	Adjust the altitude of the link reestablishing waypoint in QBase and upload the flight plan to the UAV again.
<b>CHECK LINK REEST. LOITER RADIUS</b>	There is an issue with the loiter radius.	Adjust the radius of the link reestablishing waypoint in QBase and upload the flight plan to the UAV again.
<b>CHECK LINK REEST. LOITER TIME</b>	There is an issue with the loiter time.	Adjust the loiter time of the link reestablishing waypoint in QBase and upload the flight plan to the UAV again.
<b>CHECK PMB! (NIR / EO) EXPOSURE AND TRIGGER NOT EQUAL</b>	10 or more missing exposures (per camera, NIR or EO)	1. If you have a stabil telemetrylink please be aware that there might be pictures missing afterwards. 2. This error occurs if you don't have a stabil link. Please check your SD card or the kml. file afterwards.
<b>CHECK PMB! NOT TRIGGERING</b>	Trigger count is 0 (per camera)	1. Check connection of payload compartment and manual trigger on ground. 2. This error also occurs if you are using a CPC Payload and one camera is not triggering. 3. This error occurs if you don't have a stable telemetry link. Please check your SD card or the .kml file afterwards.
<b>CHECK PMB! TRIGGER NOT EQUAL</b>	10 or more triggers difference between cam1 and cam2	Check connection of payload compartment and verify that both cameras are triggering through manual triggers on ground.
<b>CHECK QBASE</b>	An error occurred	Please check the message box in QBase for additional information.
<b>ELEVATOR MALFUNCTION</b>	Reduced pitch control effectiveness was detected in flight, pointing to a mechanical problem with the elevator or tilt nacelle actuators.	→ COME HOME is automatically initiated. In severe cases, an immediate retransition and landing is performed. → Do not fly again, contact your reseller.
<b>EMERGENCY LANDING</b>	Land immediately was selected. The landing is carried out automatically. Please be aware that the landing process might damage the UAV.	-
<b>ERROR</b>	An error occurred during the calibration.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the calibration process.



<b>ERROR LOADING MISSION</b>	Error loading the mission from the SD card.	1. Repeat write mission to UAV. 2. Repeat the preflight check.
<b>EXCEEDED MISSION TIME</b>	The warning comes up at an automatic COME HOME due to a 60 minutes flight time restriction.	-
<b>FINISHED</b>	The automated flight is finished.	Please land the UAV manually at the home waypoint by carefully pulling the left stick towards yourself.
<b>GPS ERROR</b>	A GPS sensor or reception error occurred during the initialization.	Disconnect the battery from the UAV and connect it again.
<b>GPS LOST</b>	The GPS signal is lost during the preflight check.	Please wait until enough satellites are found.
<b>GYRO ERROR</b>	A Gyro sensor error occurred during the preflight check.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check. 4. If still not working: contact your reseller.
<b>HARDWARE FAILURE CAN</b>	Communication problem to PMB during initialization.	Disconnect Battery, check the connection and latching of payload compartment and try again.
<b>HOME WAYPOINT TOO FAR AWAY</b>	The home waypoint in QBase can not be adjusted to the actual take-off position as the two positions are too far apart.	1. Ensure that the correct mission was uploaded to the UAV by downloading the flight plan from the UAV. 2. If the mission is correct: adjust the home waypoint and the retransition waypoint manually. 3. Upload the flight plan to the UAV again. 4. Repeat the preflight check.
<b>HOVER TIME</b>	A warning after 55 seconds of hovering.	Please land UAV as soon as possible. An automatic landing is initiated after 70 seconds hover time.
<b>HOVER TIME EXCEEDED</b>	A warning after 70 seconds of hovering.	<b>No manual input necessary</b> except for collision avoidance. → <b>The UAV will land automatically.</b> → The flight cannot be continued.

LINK LOST	<p><b>The message is shown on the transmitter and in QBase</b></p> <ul style="list-style-type: none"> <li>Both communication links are lost. The UAV will fly to the link reestablishing waypoint automatically and try to reestablish the communication.</li> </ul>	<p><b>Only the flight data link (QBase) can be reestablished.</b></p> <ul style="list-style-type: none"> <li>Either select COME HOME or CONTINUE in the UAV command panel in QBase.</li> </ul> <p><b>Only the RC link (transmitter) can be reestablished.</b></p> <ul style="list-style-type: none"> <li>Either select COME HOME or CONTINUE on the transmitter.</li> </ul> <p><b>Both communication links cannot be reestablished.</b></p> <ul style="list-style-type: none"> <li>The UAV will land at the home waypoint automatically. This landing option might damage the UAV.</li> </ul> <p><b>Both communication links can be reestablished.</b></p> <ul style="list-style-type: none"> <li>Either select COME HOME or CONTINUE.</li> </ul>
	<p><b>The message is only shown on the RC</b></p> <ul style="list-style-type: none"> <li>Only the RC link is lost.</li> </ul>	<p>The mission can be continued with the flight data link.</p>
IMU INITIALIZATION ERROR	Sensor communication error during startup.	<p>Disconnect the battery from the UAV and connect it again.</p> <p>If the error still occurs please contact your reseller for exchanging the autopilot.</p>
IMU SELFTEST FAILED	Sensor error during startup.	<p>Disconnect the battery from the UAV and connect it again.</p> <p>If the error still occurs please contact your reseller for exchanging the autopilot.</p>
<ul style="list-style-type: none"> <li>MAG ERROR</li> <li>MAG NOT CALIBRATED</li> <li>MAG MAGNITUDE TOO HIGH</li> <li>MAG VARIANCE ERROR</li> <li>MAG NOT FULLY COVERED</li> <li>MAG INCLINATION ERROR</li> <li>MAG DIVERGENCE ERROR</li> </ul>	A magnetometer sensor error occurred during the preflight check.	<ol style="list-style-type: none"> <li>1. Disconnect the battery from the UAV and connect it again.</li> <li>2. Turn on the UAV again.</li> <li>3. Repeat the preflight check.</li> <li>4. If it is still not working please calibrate the magnetometer</li> </ol>
MAG INITIALIZATION ERROR	Sensor initialization error during startup.	<p>Disconnect the battery from the UAV and connect it again.</p> <p>If the problem persists, please recalibrate the magnetometer (see chapter 13.2).</p>
MAG NOT CALIBRATED	The magnetometer has not been calibrated correctly.	The last magnetometer calibration failed. Please recalibrate the magnetometer and try again.

<b>MAG SELFTEST FAILED</b>	Sensor initialization error during startup.	Disconnect the battery from the UAV and connect it again.
<b>MISSION ERROR</b>	Mission is incorrect.	Please check the message box in QBase for additional information.
<b>MISSION FINISHED</b>	The automated flight is finished.	Please land the UAV manually at the home waypoint by carefully pulling the left stick towards yourself.
<b>MISSION NOT COMPLETE</b>	Missing data in mission.	1. Repeat uploading the flight plan to the UAV. 2. Repeat the preflight check.
<b>MOTOR CONTROLLER ERROR</b>	Motor (1,2 or 3) RPM too high or too low or motor current too high or too low Error during arming.	RPM: Please make sure that the UAV is aligned horizontally during arming. Current: Disconnect the battery from the UAV and connect it again.
<b>MOTOR TEMP. TOO HIGH</b>	Temperature monitoring during hover mode. Temperature of at least one motor controller (ESC) is too high during the preflight check or during hovering.  green: <65°C = fine yellow: >65° C = warning red: >95°C = emergency landing	During preflight check: Let the UAV cool down and try again. After Retransition: Land the UAV carefully as normal. Let the UAV cool down.  green: No action required. yellow: Let the UAV cool down after flight until it is green again. red: automatic emergency landing.  If available please use the ESC cooling station as described in chapter 6.7
<b>MOTORS ERROR</b>	Motor error during the preflight check or during arming. One of the motors / propellers does not run correctly.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check.
<b>MOVING</b>	The UAV is moving during the preflight check.	Ensure that the UAV is not moving to allow a correct initialization.
<b>NO TELEMETRY</b>	The remote control does not receive data from the UAV anymore. Without this link, the data displayed at the remote control can not be updated.	The UAV is too far away for the range of the RC telemetry link.
<b>OK</b>	The calibration was succesful.	-
<b>OUT OF TRANSITION DIRECTION</b>	The direction of the UAV does not comply with the allowed transition cone during auto climb.	Automatic hover to base and landing is initiated.
<b>PAYLOAD ERROR</b>	A communication error to the payload occurred during the preflight check.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check.

<b>PMB NOT FOUND</b>	The connection to the payload could not be established during preflight check.	Disconnect Battery, check connection and latching of payload compartment and try again.
<b>POSSIBLE COLLISION IN RETURN PATH</b>	Low altitude in come home path (come home path = path from current UAV position to re-transition waypoint including descend circle and landing path). Come home path is estimated in case of low battery, manual come home command, exceeding of flight time restriction or finish of the mission.	Check come home path displayed in map if necessary assume manual control to avoid collision
<b>MOTOR (NR) RPM TOO HIGH OR TOO LOW</b>	Error during arming.	Please make sure that the UAV is aligned horizontally during arming.
<b>REAR TILT MALFUNCTION!</b>	Occurs when hardware is defective or in case of a tilt mechanism malfunction.	1. Automatic retransition and landing is initiated 2. <b>Do not fly!</b> Contact your reseller.
<b>RTR TOO FAR AWAY</b>	The retransition waypoint is too far away from the take-off position.	1. Relocate the retransition waypoint closer to the home waypoint 2. Write mission to UAV again. 3. Repeat the preflight check.
<b>SD CARD ERROR</b>	An error with the autopilot SD-card occurred during the preflight check.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check.
<b>SENSOR ERROR</b>	A sensor error occurred during the preflight check.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again. 3. Repeat the preflight check.
<b>SENSOR INIT ERROR</b>	Error during the sensors initialization.	1. Disconnect the battery from the UAV and connect it again. 2. Turn on the UAV again.
<b>TOO MANY WAYPOINTS</b>	Waypoint limit has been exceeded.	Re-plan the mission with a lower number of waypoints.
<b>TRANSITION AIRSPEED TOO LOW</b>	The airspeed could not build up during transition. Minimum flight speed could not be reached during transition.	1. The transition is stopped 2. The UAV will return home and land automatically. 3. For Trinity F90+ (from serial number 00686): Please perform the airspeed sensor cleaning according to chapter 13.6 4. For Trinity F90+ (other): Please contact your reseller.
<b>WIND SPEED/WIND TOO STRONG</b>	The wind is too strong either during launch or in-flight.	<b>Launch:</b> The UAV will abort the mission and return to the launch point. <b>In-Flight:</b> If wind speed exceeds 12 m/s, an automatic COME HOME is initiated.

# 15

## FLYING MULTIPLE UAV SIMULTANEOUSLY

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# 15 FLYING MULTIPLE UAV SIMULTANEOUSLY

It is possible to operate multiple UAV simultaneously.

Please note that you need one QS RC Transmitter and one tablet, laptop or PC with an attached ground modem per UAV.

The network ID of every air ground modem pair has to be unique. It is not possible to operate two UAV on the same network ID.

Remember: For every UAV that you wish to operate one safety pilot is required.

# 16

## iBASE FILE NAMES

# 16 iBASE FILE NAMES

Year 2021

Quantum- Systems | Day 341  
01. Jan. = 001  
**Q5341B00.21R**  
B = 01:00 (UTC Time, UK) | File format  
A = 00:00 | Year 2021  
X = 23:00 | Counter of logs within the hour

JANUARY				FEBRUARY				MARCH				APRIL				MAY				JUNE			
Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File
1	1	17	17	1	32	17	48	1	60	17	76	1	91	17	107	1	121	17	137	1	152	17	168
2	2	18	18	2	33	18	49	2	61	18	77	2	92	18	108	2	122	18	138	2	153	18	169
3	3	19	19	3	34	19	50	3	62	19	78	3	93	19	109	3	123	19	139	3	154	19	170
4	4	20	20	4	35	20	51	4	63	20	79	4	94	20	110	4	124	20	140	4	155	20	171
5	5	21	21	5	36	21	52	5	64	21	80	5	95	21	111	5	125	21	141	5	156	21	172
6	6	22	22	6	37	22	53	6	65	22	81	6	96	22	112	6	126	22	142	6	157	22	173
7	7	23	23	7	38	23	54	7	66	23	82	7	97	23	113	7	127	23	143	7	158	23	174
8	8	24	24	8	39	24	55	8	67	24	83	8	98	24	114	8	128	24	144	8	159	24	175
9	9	25	25	9	40	25	56	9	68	25	84	9	99	25	115	9	129	25	145	9	160	25	176
10	10	26	26	10	41	26	57	10	69	26	85	10	100	26	116	10	130	26	146	10	161	26	177
11	11	27	27	11	42	27	58	11	70	27	86	11	101	27	117	11	131	27	147	11	162	27	178
12	12	28	28	12	43	28	59	12	71	28	87	12	102	28	118	12	132	28	148	12	163	28	179
13	13	29	29	13	44			13	72	29	88	13	103	29	119	13	133	29	149	13	164	29	180
14	14	30	30	14	45			14	73	30	89	14	104	30	120	14	134	30	150	14	165	30	181
15	15	31	31	15	46			15	74	31	90	15	105			15	135	31	151	15	166		
16	16			16	47			16	75			16	106			16	136			16	167		



JULY				AUGUST				SEPTEMBER				OCTOBER				NOVEMBER				DECEMBER			
Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File	Date	File
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2	183	18	199	2	214	18	230	2	245	18	261	2	275	18	291	2	306	18	322	2	336	18	352
3	184	19	200	3	215	19	231	3	246	19	262	3	276	19	292	3	307	19	323	3	337	19	353
4	185	20	201	4	216	20	232	4	247	20	263	4	277	20	293	4	308	20	324	4	338	20	354
5	186	21	202	5	217	21	233	5	248	21	264	5	278	21	294	5	309	21	325	5	339	21	355
6	187	22	203	6	218	22	234	6	249	22	265	6	279	22	295	6	310	22	326	6	340	22	356
7	188	23	204	7	219	23	235	7	250	23	266	7	280	23	296	7	311	23	327	7	341	23	357
8	189	24	205	8	220	24	236	8	251	24	267	8	281	24	297	8	312	24	328	8	342	24	358
9	190	25	206	9	221	25	237	9	252	25	268	9	282	25	298	9	313	25	329	9	343	25	359
10	191	26	207	10	222	26	238	10	253	26	269	10	283	26	299	10	314	26	330	10	344	26	360
11	192	27	208	11	223	27	239	11	254	27	270	11	284	27	300	11	315	27	331	11	345	27	361
12	193	28	209	12	224	28	240	12	255	28	271	12	285	28	301	12	316	28	332	12	346	28	362
13	194	29	210	13	225	29	241	13	256	29	272	13	286	29	302	13	317	29	333	13	347	29	363
14	195	30	211	14	226	30	242	14	257	30	273	14	287	30	303	14	318	30	334	14	348	30	364
15	196	31	212	15	227	31	243	15	258			15	288	31	304	15	319			15	349	31	365
16	197			16	228			16	259			16	289			16	320			16	350		







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