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Unifly Operator App User Guide
Rel. 2.3

UNIFLY

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1 Introduction

BLIP is Unifly's high-quality drone tracking device providing maximum tracking accuracy, minimal update latency and secured communications to Unifly's cloud services.

Once mounted on the top or bottom (resulting in improved Bluetooth connectivity) of a drone, BLIP reports the drone's position and a series of other flight parameters to Unifly's cloud-based service infrastructure using LTE Cat 1 cellular network connectivity.

The device comes in a robust, weather-proof enclosure and is able to withstand a wide operating temperature range.

BLIP has a built-in lithium-ion polymer battery supporting Qi standard wireless charging.

The device features Bluetooth Low Energy (BLE) communication enabling wireless device firmware upgrades, pilot authentication, and device configuration.

BLIP combines tracking capabilities with eIdentification. Once the drone pilot has signalled the start of the flight using the Unifly Operator app, the BLIP automatically starts broadcasting collected data including identification, current position and take-off location over LTE. The collected data is also made available via BLE broadcasting allowing authorised authorities to access the data using a secured app. This way authorities can read out all details of drones flying within a distance of up to 200 meters.

BLIP fully complies with the requirements as defined in the new European legal framework for drone flights and operations, as well as the ASTM F3411 Remote ID standard.

2 BLIP Product

2.1 BLIP Hardware and Software

Figure 1 The BLIP

The BLIP is packaged in a weatherproof sealed enclosure.

The Bluetooth MAC address is used to identify and connect the Unifly Operator app to the BLIP.

It is encoded in the QR code printed on the front side of the enclosure and is also printed on the top label on the back side. The bottom label contains the certification symbols and the hardware revision number i.e. R2.3.

The free Unifly Operator app communicates with the BLIP over Bluetooth and can be used to:

- Configure the BLIP
- Control the flight status
- Readout and monitor the remote identification parameters
- Upgrade the BLIP firmware
- Show the flight path as reported by the BLIP

The tracking data is sent by the BLIP over the LTE 4G mobile network to the Unifly Data Collector service which makes the collected data available for further processing by other applications. In this way, the Unifly Monitoring system uses the collected BLIP data for real-time visualisation of a drone's location.

2.2 Features

- Highly accurate GNSS module (GPS, Galileo, Glonass)
- Multi-band cellular (LTE Cat 1) communication
- Bluetooth Low Energy v5.0 (BLE) communication for mobile app connectivity
- Secure pilot authentication via BLE
- Integrated battery with Qi-compliant wireless charging
- Weatherproof IP 67 enclosure
- Wide operating temperature range from -20 °C to +55 °C
- Pressure sensor (altimeter) measuring pressure altitude
- Temperature sensor
- Built-in 3-axis MEMS accelerometer
- Nordic-based MCU (ARM Cortex M4F processor)
- EEPROM memory for the flight data cache
- RGB LEDs for power, network and GNSS state indication
- Encrypted and authenticated communication
- Micro-SIM card slot
- Lithium Polymer battery (3.7V / 2100 mAh) with battery capacity and operation time estimation

2.3 Mounting BLIP on your drone

The BLIP can either be mounted on top or on the bottom of a drone.

The advice is to use a Dual Lock reclosable fastener (i.e. 3M brand) allowing to mount the BLIP on a variety of substrates.

Test results indicate that mounting the BLIP upside down on the bottom of the drone return the best Bluetooth range results (up to 200m).

Figure 2: A top mounted BLIP

Figure 3: A bottom mounted BLIP

3 Technical Characteristics

3.1 Physical Characteristics

Dimensions	126 mm x 79 mm x 20 mm
Protection level	IP 67
Weight	180 g
Enclosure material	ABS and silicone
Enclosure colour	White with UV printed logo

3.2 Electrical Characteristics

	Minimum	Typical	Maximum	Unit
Operating temperature range	-20		+55	°C
Battery capacity		2100		mAh
Current – Transportation mode		0.016	0.02	mA
Current – Standby mode		0.15	0.2	mA
Current – Pairing mode		0.5	0.6	mA
Current – Boarding mode		50	100	mA
Current – Tracking mode		100	150	mA

Note: peak current in case of LTE activity can be up to 600 mA.

3.3 Battery Characteristics

	Typical
Lifetime	7 h (8.5 h in test conditions) flight time, > 1 month in standby mode
Charging time	2.5 h
Capacity	2100 mAh
Charging current	1 A max.

Make sure your wireless charger is compatible with the Qi Wireless charging standard.

A few examples of compatible chargers:

- ISY Qi Wireless USB charger (5W) : price approx. 15 €
- Belkin Boost Up Qi charger 10W : price approx. 30 €

3.4 Cellular Network Support

BLIP is available in different hardware versions in function of the region in which the BLIP will be used:

Product Version	LTE Chipset	Countries	LTE Bands	Frequencies
EU	LARA-R211	LTE Cat 1 modules for Europe, Asia and other countries with 2G fallback	3, 7, 20	3 (1800), 7 (2600), 20 (800) MHz
A1	LARA-R202	LTE Cat 1 modules for AT&T with 3G fallback (anticipating Canada, USA, Mexico, South-America esp. Colombia)	2, 4, 5, 12	2 (1900), 4 (1700), 5 (850), 12 (700) MHz
A2	LARA-R204	LTE Cat 1 modules for Verizon Wireless (on request only)	4, 13	4 (1700), 13 (700) MHz
AP	LARA-R280	LTE Cat 1 module with 3G fallback for APAC	3, 8, 28	3 (1800), 8 (900), 28 (700) MHz
JP	LARA-R220	LTE Cat 1 module for Japan/NTT DOCOMO	1, 19	1 (2100), 19 (850) MHz

3.5 Certifications and Approvals

3.5.1 Bluetooth Chipset

Type approvals:

- Europe (ETSI RED)
- US (FCC/CFR 47 part 15 unlicensed modular transmitter approval)
- Australia (ACMA)
- New Zealand
- Brazil (Anatel)
- Canada (IC RSS)
- Japan (MIC – formerly TELEC)
- South Africa (ICASA)
- South Korea (KCC)
- Taiwan (NCC)

Health and safety:

- EN 62479
- EN 60950-1
- IEC 60950-1
- ISO 16750
- RoHS compliant (lead-free)

Medical electrical equipment:

- EN 60601-1-2

Bluetooth qualification v5.0 (Bluetooth low energy – BLE)

3.6 LTE Cat 1

Table 33 summarizes the main approvals for LARA-R2 series modules.

Certification Scheme	LARA-R202	LARA-R203	LARA-R204	LARA-R211	LARA-R220	LARA-R280
GCF			•	•		
PTCRB	•	•				
CE (Europe)				•		
FCC (United States)	•	•	•			
FCC identification number	XPY1EIQ24NN	XPY1DIQN3NN	XPY1EIQN2NN			
ISED (Canada) [23]	•	•	•			
IC certification number	8595A-1EIQ24NN	8595A-1DIQN3NN	8595A-1EIQN2NN			
Giteki (Japan)					•	
RCM (Australia)						•
NCC (Taiwan)						•
AT&T (US MNO)	•	•				
T-Mobile (US MNO) [24]	•	•				
Verizon (US MNO)			•			
Rogers Canada (MNO)		•				
Vodafone (MNO)				•		
NTT DoCoMo (MNO)					•	

Table 33: LARA-R2 series main certification approvals summary

3.7 Maximum transmit power table according to Directive 2014/53/EU

Operating frequency bands and maximum output power:

Frequency band	Maximum output power
BT / BLE	4.96 dBm Eirp
GSM900	33 dBm Conducted
DCS1800	30 dBm Conducted
LTE Band 3	23 dBm Conducted
LTE Band 7	23 dBm Conducted
LTE Band 20	23 dBm Conducted

3.8 FCC Warning

15.19 Labeling requirements.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

15.21 Information to user.

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

15.105 Information to user.

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

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

3.9 FCC Radiation Exposure Statement

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

2. This equipment should be installed and operated with distance more than 20cm between the radiator& your body.

3.10 CE Radiation Exposure Statement

1. Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

2. The device complies with RF specifications when the device used more than 20cm form your body.

Hereby, Unifly nv declares that this device is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. This product is allowed to be used in all EU member states.

4   Unifly Operator App User Guide

Unifly's BLIP tracking device comes with the Unifly Operator app which can be installed from Apple's App store.

The Unifly Operator app communicates with the BLIP tracking device using Bluetooth.

When the drone is within the Bluetooth range, the Unifly Operator app allows the user to configure the device, to control the flight status, to readout and monitor the remote identification parameters and to show the flight path of the BLIP tracking device.

4.1   Installation of the Unifly Operator app

The app is available for the Apple's mobile devices and a Google Android version will be made available at a later time.

The app is available through Apple's App Store:

- For Apple mobile devices: search for 'Unifly Operator' in Apple's App store.

4.2   BLIP Activation

4.2.1   BLIP in *Transportation* mode: place BLIP on the wireless charger

By default the BLIP is shipped from the factory in *Transportation* mode.

In this mode the device is switched off and the power consumption is less than 20 µA.

Transportation mode is deactivated by placing the device on a wireless charger.

Once charging is active, the power LED starts blinking:

LED	Behaviour	Description
Power (by colour)	Blinking red (- - - -)	Charging and battery level < 10%
	Blinking yellow (- - - -)	Charging and battery level < 50%
	Blinking green (- - - -)	Charging and battery level < 90%
	Blinking blue (- - - -)	Charging and battery level >= 90%
	Steady blue (———)	Battery is fully charged on wireless charger, 100%
Power (on wireless charger)	Flashing (·······)	Problem detected, not charging
	Blinking (- - - -)	Battery charging
	Steady (———)	Battery fully charged
Power (not charging)	Off	BLIP is in standby mode
	Flashing (·······)	BLIP is in pairing mode
	Blinking (- - - -)	BLIP is in boarding mode
	Steady (———)	BLIP is in tracking mode

4.2.2 BLIP in *Standby* mode: shake the BLIP to activate

In *Standby* mode, BLIP has the lowest possible power consumption. Fully charged, it supports several months of operation while in *Standby* mode.

In this mode, the only active components are the accelerometer and the microcontroller awaiting activation.

When movement of the device is detected by the accelerometer by shaking the BLIP for example, the BLIP automatically transitions to *Pairing* mode (see below).

In *Standby* mode the LED driver is only activated when the device is placed on a wireless charger.

4.2.3 Pairing mode: connecting mobile app and BLIP

In this mode BLIP activates the Bluetooth subsystem and the LED driver and the app can connect to the device.

The default timeout of this mode is 30 minutes – if the device does not detect an operational Bluetooth connection after this time, it automatically falls back to the *Standby* Mode.

Successful Bluetooth connection transitions the device from *Pairing* mode to *Boarding* mode.

4.2.4 Starting the Unifly Operator app

First make sure Bluetooth is active on your mobile device.

Shake the BLIP to make sure it is in *Pairing* mode.

Now start the Unifly Operator app to discover the active BLIP.

When several BLIPs are active, make sure to verify the Bluetooth MAC address, D2:93:52:18:3E:AB in the figure below, against the MAC address found on BLIP QR code (front) or label (back).
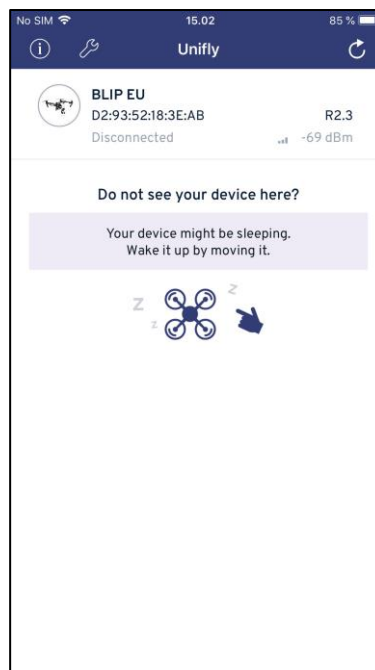

Figure 4 Pairing the BLIP

4.3 Connect the mobile device to the BLIP

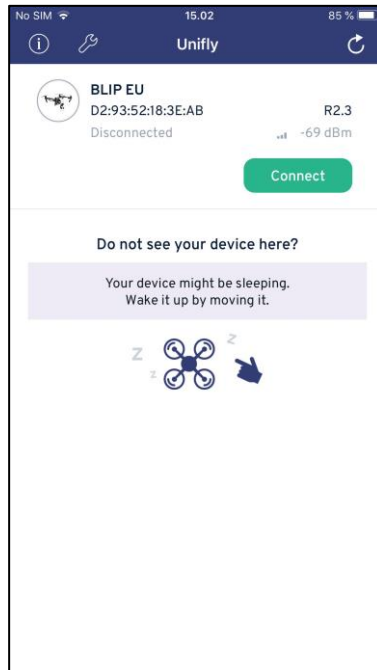Tap the green "Connect" button to transition the BLIP to *Boarding* mode:

Figure 5 Connecting the app to the BLIP

Upon the first connection via Bluetooth to the BLIP:

- Select the "Tool" menu and select "Production"

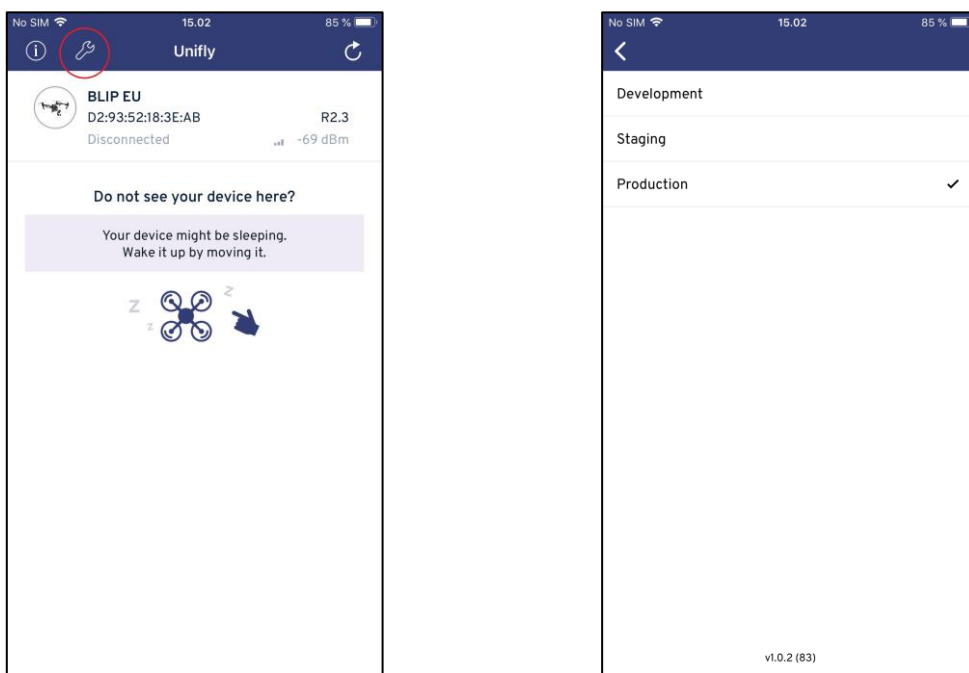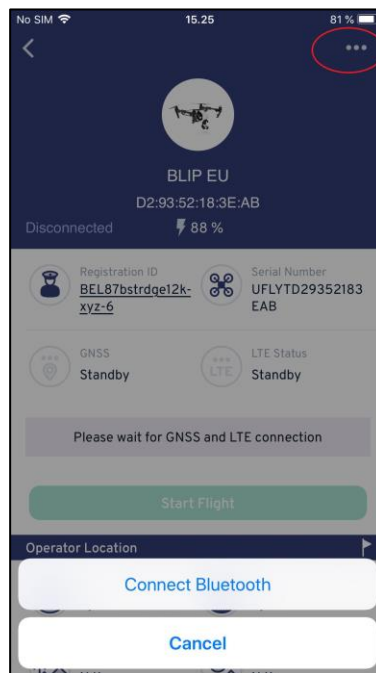 Note: connecting to "Staging" and "Development" is not supported!

Figure 6 Selecting "Production"

- Now tap the "Connect Bluetooth" button:

Figure 7 Tapping the "Connect Bluetooth" button

- The "Bluetooth Pairing Request" dialog box appears: enter the Bluetooth passkey (`123456` by default) and tap the "Pair" button. This code is only requested at the very first pairing of a mobile device and the Unifly Operator app.
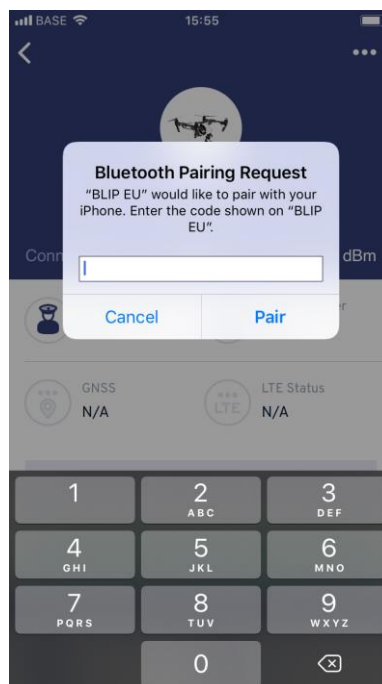
Figure 8 Entering the pairing code

- Notes:
  - First Bluetooth connection to BLIP

For the very first Bluetooth connection to the mobile device it is possible you will be required to reconnect to the BLIP as the BLIP is initially not in the list of known Bluetooth devices of your mobile device.

o   Firmware upgrade for BLIP hardware R2.1

Make sure the BLIP R2.1 is using firmware v1.8.30 or higher. Upgrade the firmware manually if required.

If you are using a BLIP R2.1 (see label on the back) the current Unifly Operator app will automatically prompt to upgrade to firmware v2.1.5.

4.3.1   BLIP Boarding Mode

Boarding mode is activated once you authenticate the device by tapping the mobile app's "Connect" button.

Once the Bluetooth connection is established, the BLIP's GNSS module is activated and starts acquiring the position of the BLIP.

The app displays the "GNSS Connecting" status message and the GNSS LED blinks yellow to indicate the BLIP is acquiring its position.

Also, the LTE module is activated to establish the communication link with the Unifly cloud services at the start of the flight.
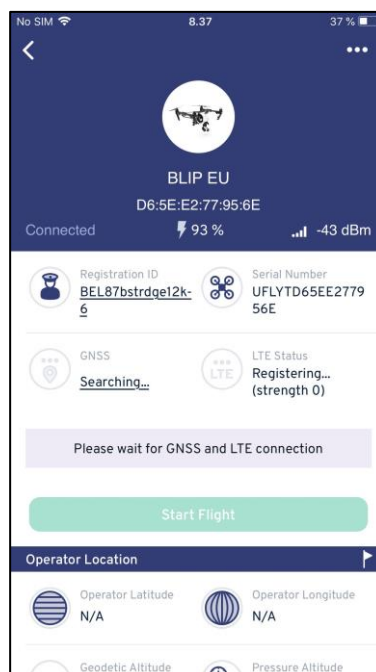
Figure 9 BLIP initialisation

- Notes:
  - o   There is a 30 minutes timeout on this mode: if the BLIP doesn't transition to *Flight* mode within this period, the BLIP automatically falls back to *Standby* mode. Do note this timeout is disabled as long as there is an active Bluetooth connection between the BLIP and the Unifly Operator app.
  - o   When activating a BLIP for the first time the initial GNSS satellite acquisition can take up to 5 minutes. This can also happen when the BLIP has been moved to a new location.

In order to speed up the GNSS synchronisation, tapping GNSS "Searching…" string will force the BLIP to download the GNSS almanac information over LTE. This LTE download will take approximately 90 seconds to complete. Once this download has been done the GNSS synchronisation process will proceed much faster.
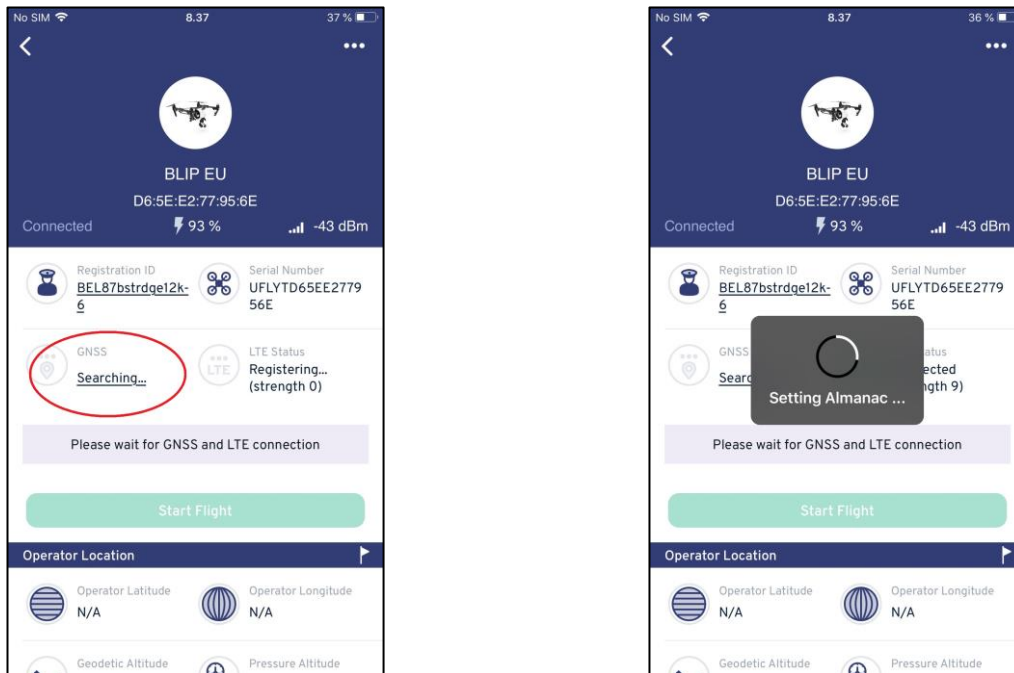

Figure 10 GNSS initialisation

4.4 BLIP in Tracking mode – ready for flight

The app's "Start Flight" button is only active when:

- The operator's registration ID is manually entered by tapping the underlined text:
  - Operator Registration ID: is "NULL" by default. The format needs to be EASA regulation compliant e.g. **FIN87astrdge12k-xyz-8**:
    - **FIN** is the ISO 3166 Alpha-3 country code for Finland in this example
    - **87astrdge12k** is the CAA generated 12 characters random string
    - **xyz** is the CAA generated 3 characters random string (not displayed nor broadcasted)
    - **8** is the Luhn mod-N checksum on the 12 and 3 characters random strings
  - Entering an invalid registration ID will result in the BLIP displaying/broadcasting "NULL" as registration ID.
  - The unique serial number complies with the ANSI/CTA-2063 formatting rules concatenating a 4 character alphanumerical manufacturer code (UFLY for Unifly) and the unique Bluetooth MAC address.
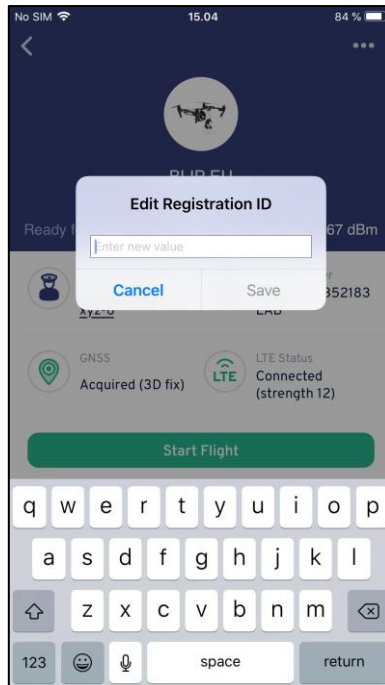
Figure 11 Entering your Registration ID

- Once the BLIP has acquired its position the app will display GNSS status *Acquired* and the GNSS LED is lit green or blue.
- Once the BLIP's LTE connection is available the app will display LTE status *Connected* after transiting the LTE *Standby* and *Registering* statuses.

Now the "Start Flight" button is active and can be tapped when starting the drone flight:
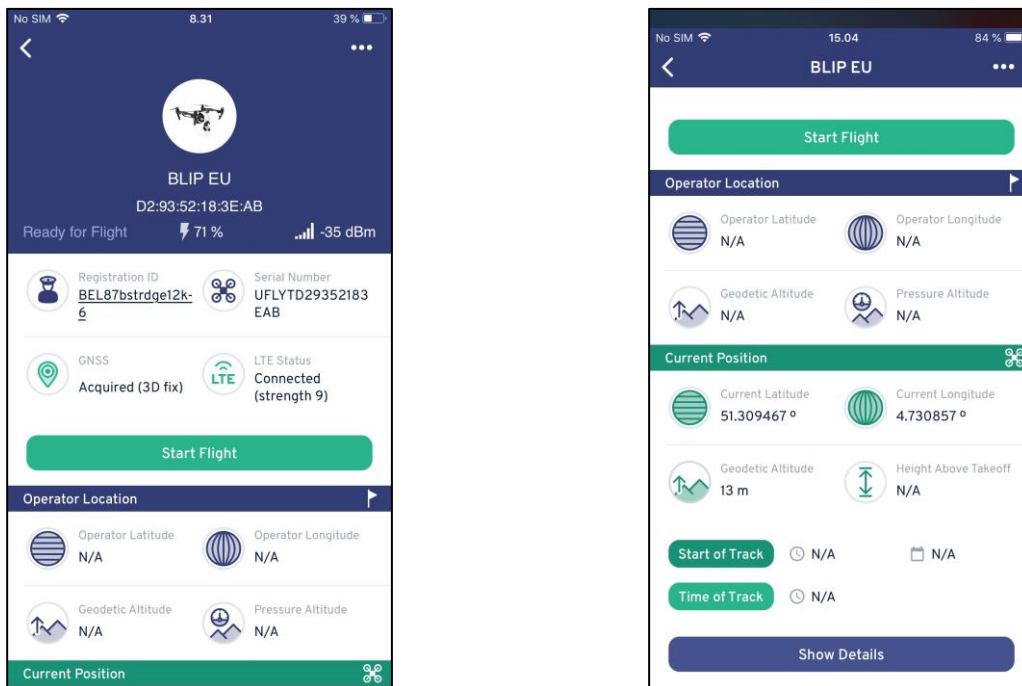
Figure 12 Ready to start the flight

Tapping the "Show Details" button results in more detailed information being displayed as required by the ASTM F3411 standard and the EU legislation:
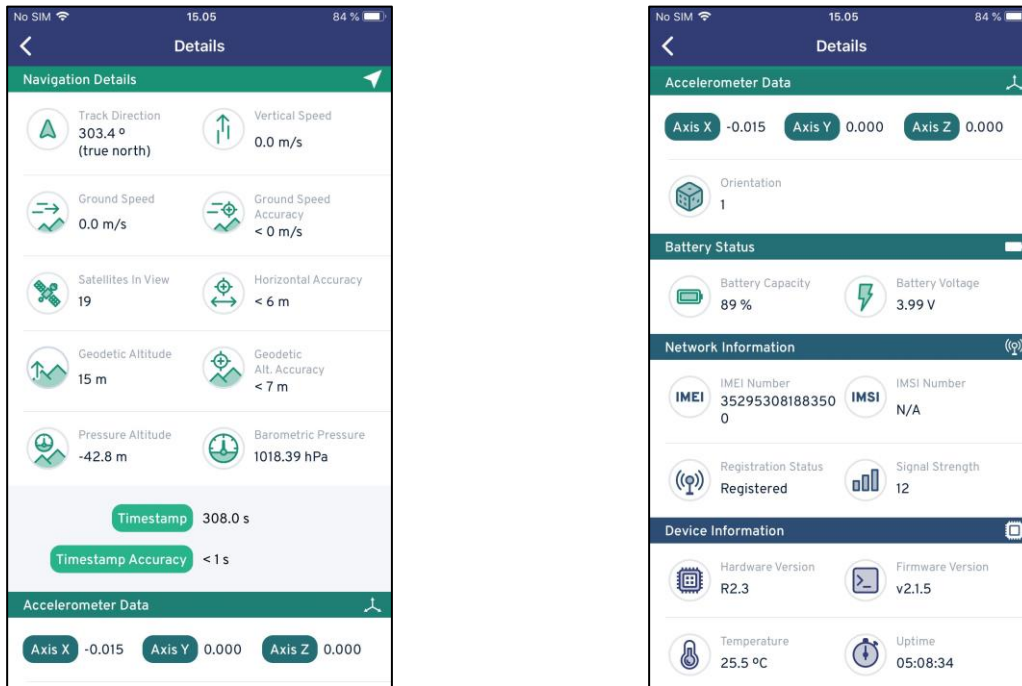

Figure 13 Displaying additional details

4.5 BLIP in *Flight* mode

Tap the "Start Flight" button just before your drone takes off.

In absence of internet connectivity on your mobile device (i.e. no wireless or no cellular data network connection), following error message is displayed:
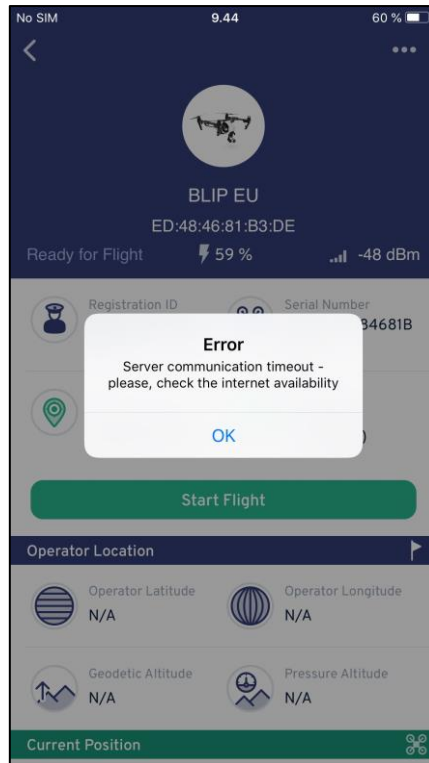
Figure 14 No internet connectivity

Once the flight is started, BLIP feeds data to the Unifly cloud services once per second by default.

The app transitions to *In Flight* mode and "STOP FLIGHT" and "IN FLIGHT – SHOW MAP" buttons are displayed.

You will also see the starting position GPS coordinates being displayed. Tapping "IN FLIGHT – SHOW MAP" will show a flag signalling the starting position on a map and will start flight tracking:
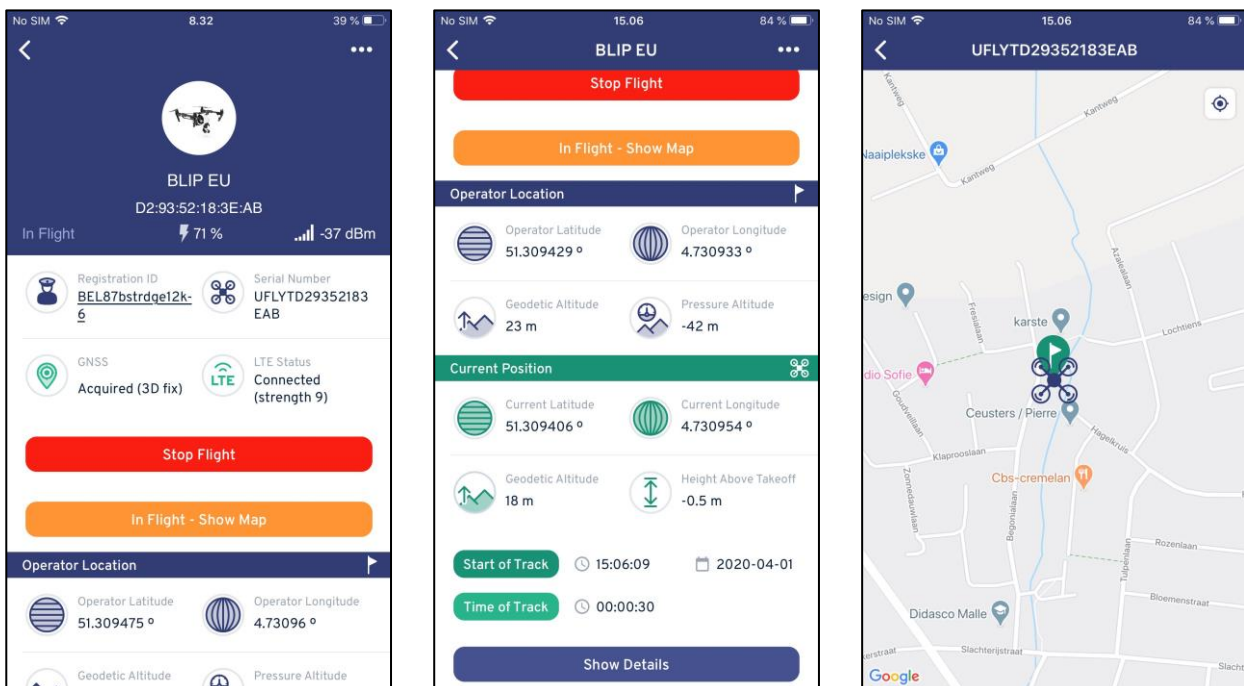

Figure 15 BLIP in flight mode

Once the BLIP starts moving, its position is visualised in real-time on the app's map screen and the BLIP starts transmitting data to the Unifly UTM system:
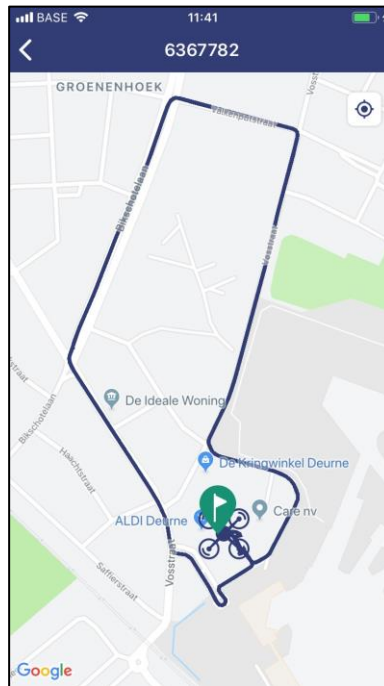

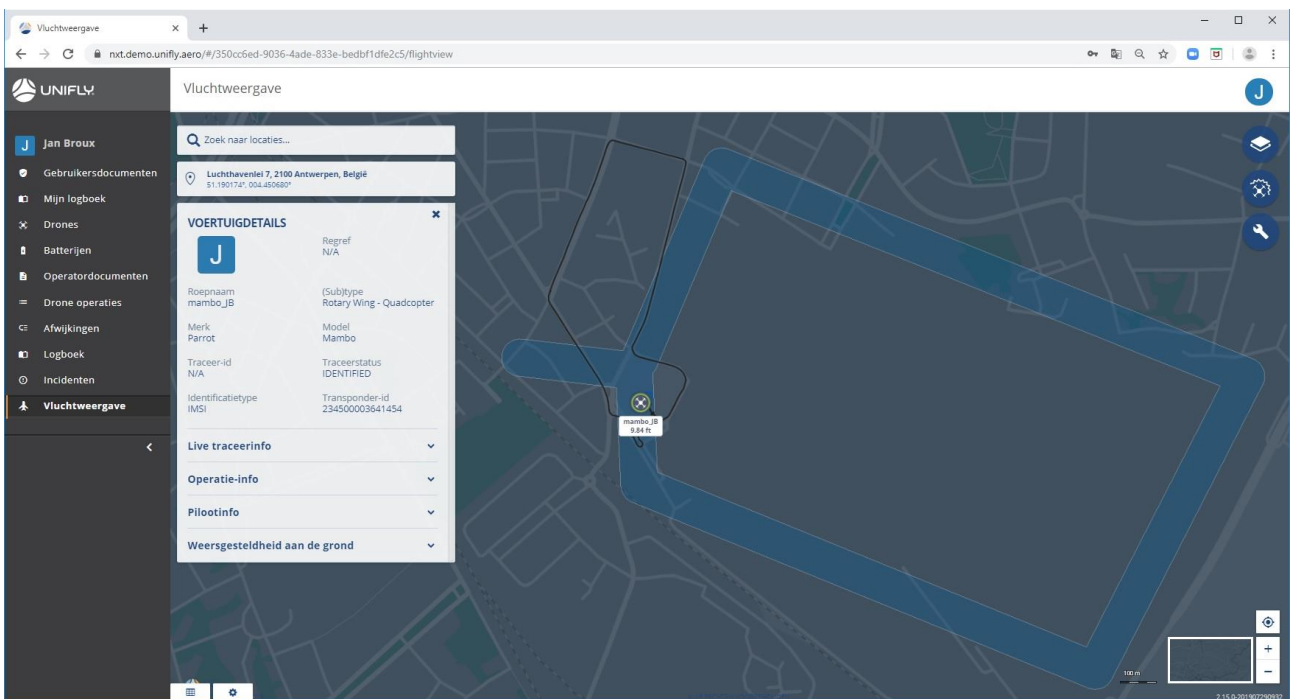**Figure 16 Drone flight visualisation in the app**

Figure 17 Drone flight visualisation in the Unifly UTM system

In Flight mode can be deactivated manually by tapping the "STOP FLIGHT" button. It is also deactivated automatically when the BLIP does not move for more than 30 minutes. In both cases the BLIP transitions to *Boarding* mode and is ready to be used in a new flight.
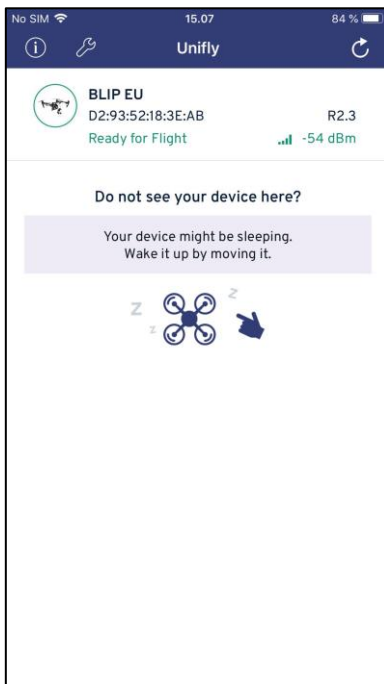
The app allows for keeping the map centred on the BLIP's reported position. Tap the current position icon at the top right on the map to keep the drone's position centred on the map:
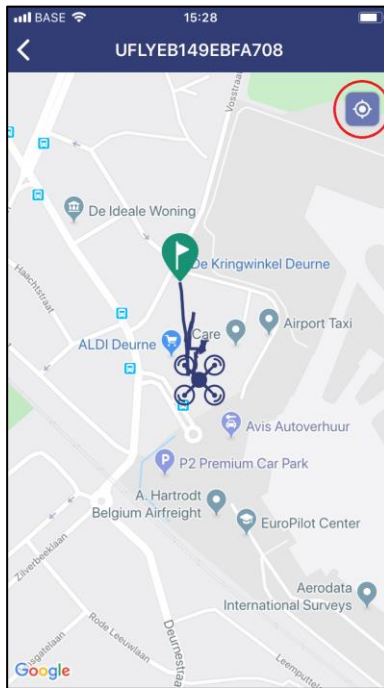
Figure 18 Keeping the map centred on the drone

4.6 BLIP: Stopping the flight

Tap the "STOP FLIGHT" button on the app's main screen to end the flight. The BLIP remains connected to the app:

Figure 19 Flight ended

Tap the < icon top left until you are back on the app's main screen. Then tap the … at the top right of the screen to display the main menu and tap "Disconnect Bluetooth". The BLIP will now transition to *Standby* mode.

Once the BLIP is disconnected from your mobile device it is ready to be rediscovered over Bluetooth by the mobile app.

5   Understanding the LEDs

LED	Behaviour	Description
POWER by colour	Red	Charging and level < 10%
	Yellow	Charging and level < 50%
	Green	Charging and level < 90%
	Blue	Charging and level >= 90%
	Steady blue	Level 100%
POWER on charger	Flashing (·······)	Not charging, some problem
	Blinking (- - - -)	Charging
	Steady (———)	Charging completed
POWER not on charger	Off	In standby mode
	Flashing (·······)	In pairing mode
	Blinking (- - - -)	In boarding mode
	Steady (———)	Tracking mode
DATA by colour	Red	Modem fault
	Yellow	Modem initialising
	Green	Data connection operational
	Blue	Bluetooth connection active
DATA by mode	Off	Modem off and no Bluetooth connection
	Flashing (·······)	Modem off and Bluetooth connected
	Blinking (- - - -)	Modem error or initialising
	Steady (———)	Data connection operational
GNSS by colour	Red	GNSS hardware error
	Yellow	Acquiring GNSS position
	Green	Position acquired with accuracy worse than 10 m
	Blue	Position acquired with accuracy better than 10 m
GNSS by mode	Off	GNSS hardware off
	Blinking (- - - -)	Searching for GNSS position
	Steady (———)	Position acquired

6 The main menu

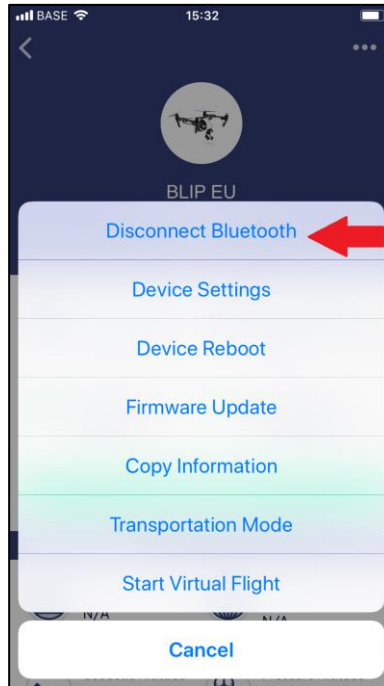Open the main menu by tapping the … icon at the top right of the screen.

Figure 20 The main menu
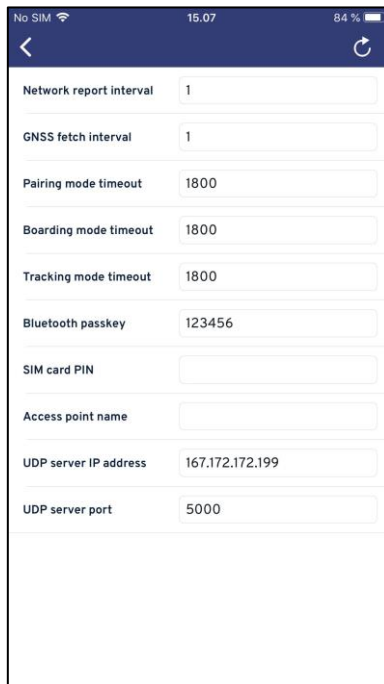
6.1 Device Settings

Figure 21 The Device Settings screen

- **Network report interval:** the default reporting rate is once per second. Range: 1-300 seconds.

- **GNSS fetch interval:** the default fetching rate is once per second. Range: 1-300 seconds.
- **Pairing mode timeout:** controls the transition from *Pairing* to *Sleep* mode provided the BLIP is not moving. Default is 1800 seconds. Range: 60-86400 seconds (24 hours). A value of 0 disables the transition to *Sleep* mode.
- **Boarding mode timeout:** controls the transition from *Boarding* to *Sleep* mode provided the BLIP is not moving. Default is 1800 seconds. Range: 60-86400 seconds (24 hours). A value of 0 disables the transition to *Sleep* mode.
- **Tracking mode timeout:** controls the transition from *In Flight* to *Sleep* mode provided the BLIP is not moving. Default is 1800 seconds. Range: 60-86400 seconds (24 hours). A value of 0 disables the transition to sleep mode.
- **Bluetooth passkey:** this is the passkey you have to enter to establish the Bluetooth connection between app and BLIP. This scenario supports an A to B flight, where mobile phone 1 starts the flight at location A and mobile phone 2 stops the flight at location B. In order for both mobile phones to be able to connect to the BLIP, the Bluetooth passkey needs to be agreed between both pilots. The default passkey is `123456`.
- **SIM card PIN:** `0000` by default, minimum 4 and maximum 8 characters.
- **Access point name:** automatic APN detection if left empty. Otherwise enter the APN as provided by the mobile network operator.
    - Jersey Telecom network SIM card: `JTM2M`, For roaming agreements per country see here.
    - Local SIM card (Estonia): `internet`
- **UDP server IP address:** `167.172.172.199`
- **UDP server port:** `5000` for the production environment

6.2 Device Reboot

Tap this entry to reboot the BLIP.

6.3 Firmware Update

The ASTM F3411 firmware is supported as of BLIP R2.1 v1.9.x. This menu entry allows you to update firmware version R1.8.x (versions that are not ASTM compliant) to R1.9.x and up (ASTM compliant versions).
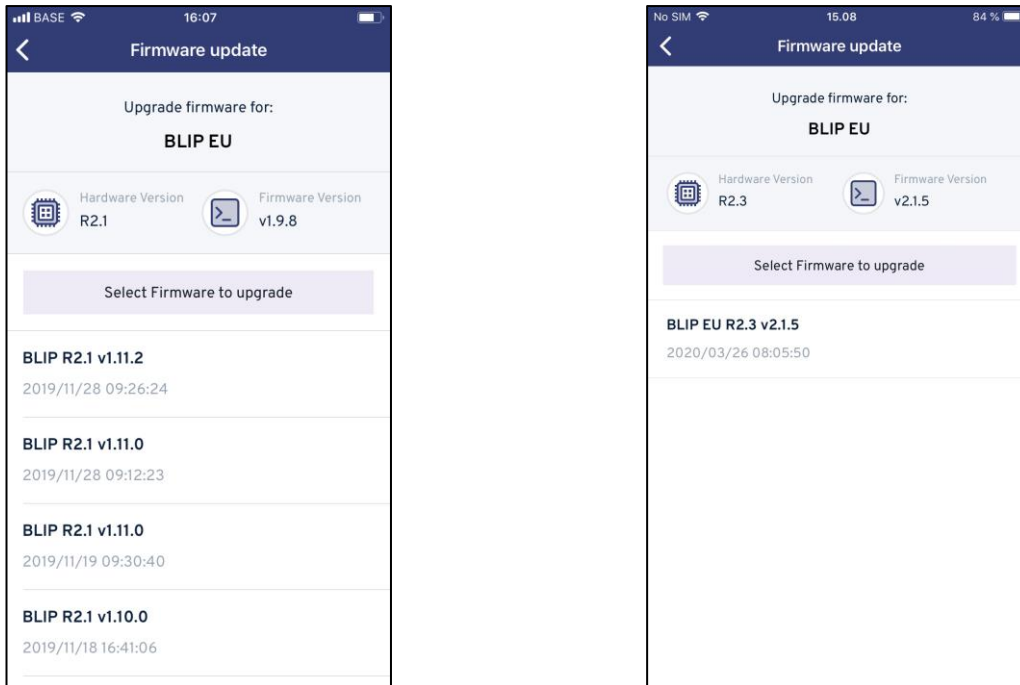
Figure 22 Updating the firmware

Note: during the firmware update all LEDs are lit white.

Important: after a firmware update make sure to review the access point name setting as explained in section Device Settings. 6.1

6.4 Copy Information

Currently not used.

6.5 Transportation Mode

Tap this menu entry to put the BLIP in *Transportation* mode i.e. the mode in which the BLIP was delivered to you. Confirm by tapping "Yes" in the dialog box:
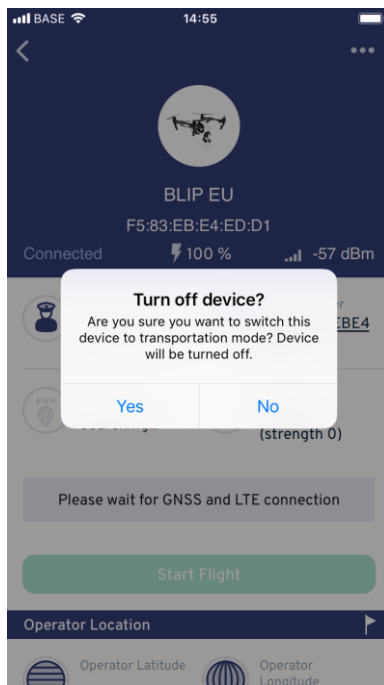
Figure 23 Confirming the power off

6.6 Start Virtual Flight

Puts the BLIP in demo simulation mode without the need for a Bluetooth or LTE connection.

7 Firmware and app compatibility

Firmware Version	App Version	App Distribution
< 1.8.30	Unifly BLIP v1.0.2	• iOS via Apple App Store
> 1.9.x < 1.12.5	Unifly BLIP Operator v1.0.2(2)	• iOS via Apple App Store
> 2.1.x	Unifly Operator v2.0.0(4)	• iOS via Apple App Store

8 Release Notes Rev. 2.0

8.1 New functionality

- Operator app identification by Bluetooth MAC address
- Operator app version 2.0
- BLIP hardware R2.3 support
- BLIP firmware 2.1.x supporting regionalized firmware versions ie BLIP EU R2.3 v2.1.5
- GNSS Almanac download over LTE
- Editable registration ID compliant with EASA, i.e. `FIN87astrdge12k-xyz-8`, including checksum validation
- Unique serial number per ANSI/CTA-2063 standard format, i.e. `UFLYD29352183EAB`