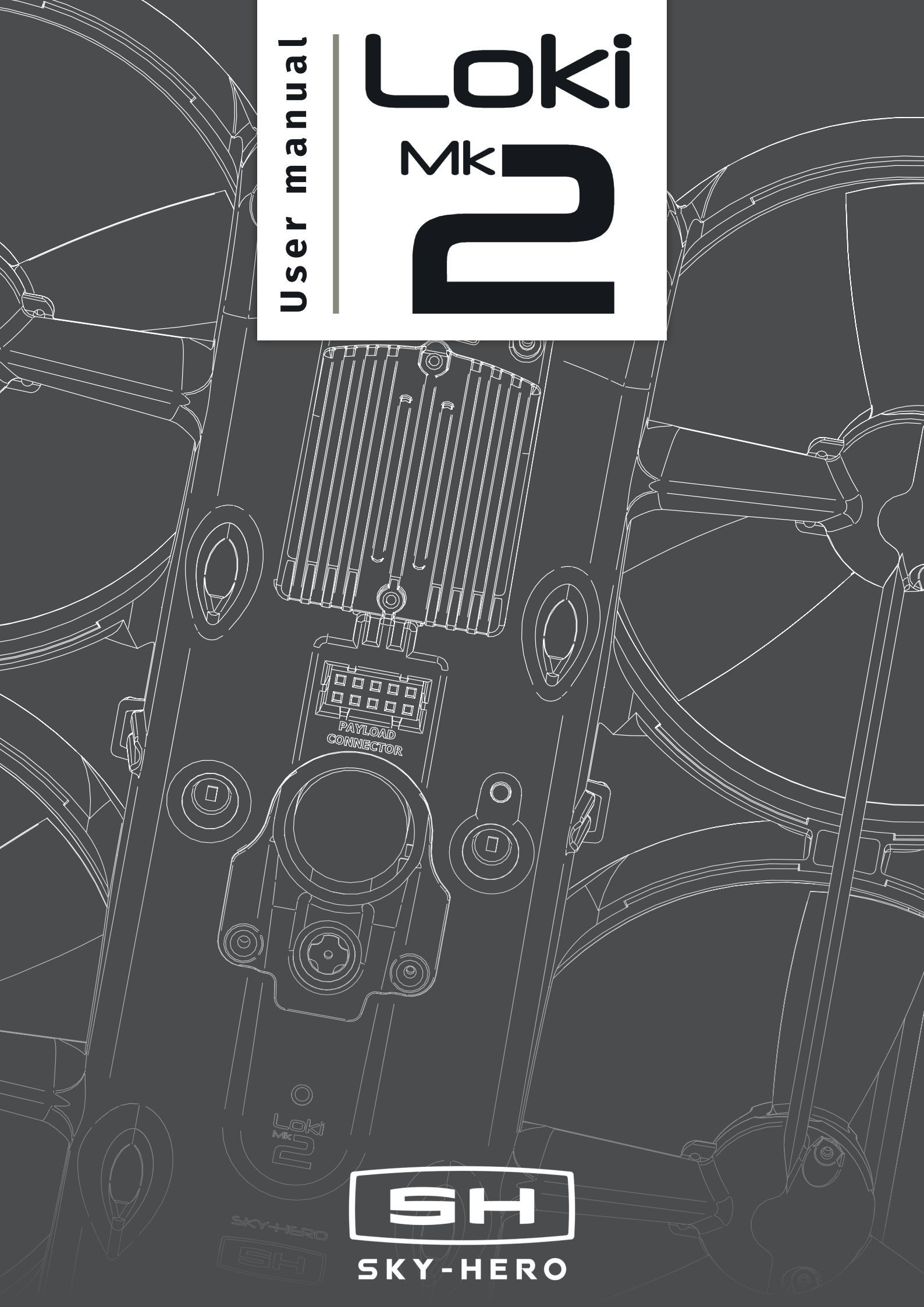
User manual

Loki Mk 2



SKY-HERO

User manual Loki MkII System

GCS VERSION : 2.10.1

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1. FIRST USE

With the success of the first Loki system, we are proud to introduce the completely new Loki MK2, which offer a broad array of possibilities when flying the UAV indoors or outdoors.

To ensure functionality in most situations, the Loki MK2 does not require GPS, WiFi, cellular, or other networks and will work as a standalone system. The Loki MK2 relies on embedded video captors and distance sensors to understand its position and movements. This not only improves the system's general capabilities and maximizes its resilience when flying indoors, but also strongly increases the ease of use. However, some limitations are explained in our additionnal guide : Precautions, good practices & maintenance

a. Disclaimer

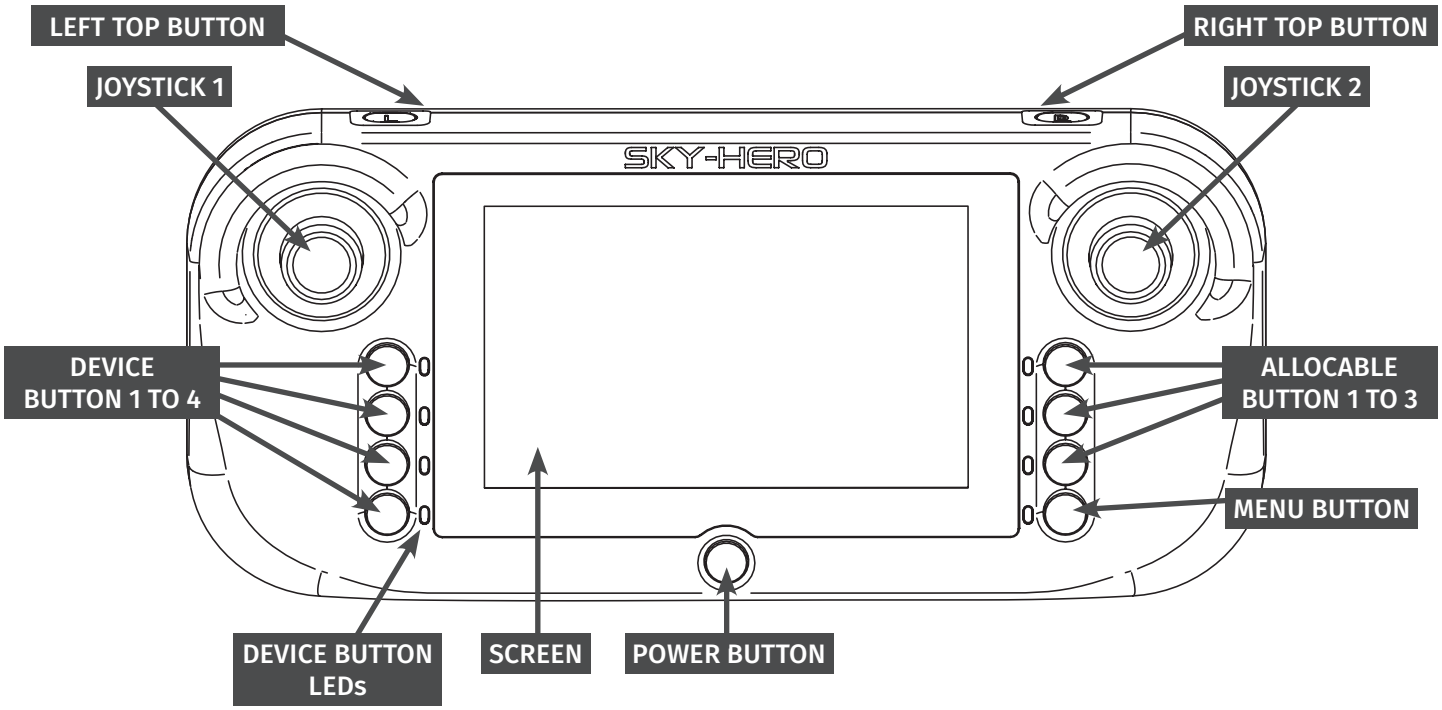
1. THE LOKI MK2 SYSTEM IS NOT A TOY AND SHOULD NOT BE USED OR HANDLED BY A PERSON UNDER 18 YEARS OF AGE.

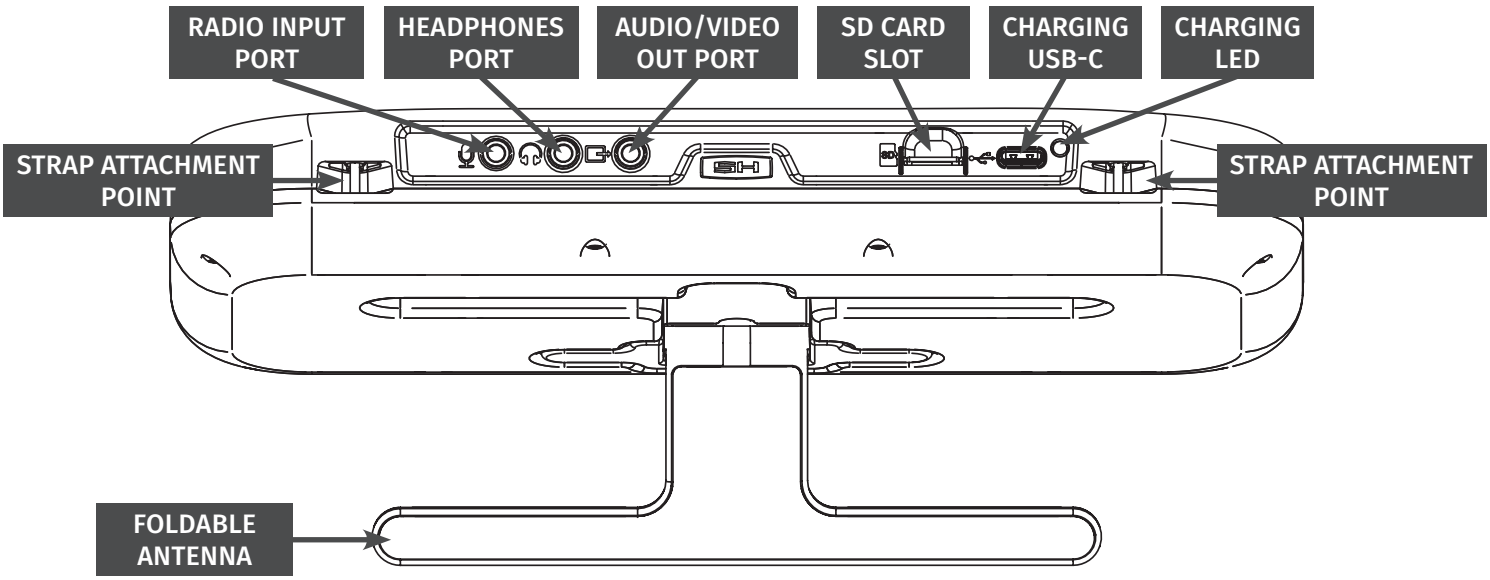
2. BEFORE USING THE LOKI MK2 SYSTEM :
- CAREFULLY READ THE USER MANUAL, THE PRECAUTIONS & GOOD PRACTICES AND ALL INFORMATION AND DOCUMENTATION AVAILABLE ON www.sky-hero.com, WHICH MAY BE UPDATED AT ANY TIME WITHOUT PRIOR NOTICE;
- SPECIAL ATTENTION SHOULD BE GIVEN TO THE PARAGRAPHS MARKED "CAUTION";
- ENSURE YOU ARE AWARE OF THE LOCAL REGULATIONS APPLICABLE TO THE USE OF UAVs AND THEIR ACCESSORIES;
- REMEMBER THAT THE LOKI MK2 SYSTEM MAY EXPOSE YOU OR OTHERS TO EQUIPMENT DAMAGE, PERSONAL INJURY, OR BOTH, WHICH COULD RESULT IN SERIOUS HARM OR DEATH.

3. BE AWARE THAT VIDEOS AND PHOTOS THAT ARE PROMOTED AND ADVERTISED BY SKY-HERO AND ITS AFFILIATES HAVE BEEN MADE BY EXPERIENCED PROFESSIONALS AND DRONE PILOTS. IN THE EVENT OF ANY UNCERTAINTY OPERATING YOUR LOKI MK2 SYSTEM AND ITS ACCESSORIES, ALWAYS REFER TO THE MOST RECENT VERSION OF THE SKY-HERO DOCUMENTATION.

4. TO THE EXTENT PERMITTED BY APPLICABLE LAW, SKY-HERO SA, ITS SUBSIDIARIES, AND THEIR RESPECTIVE DISTRIBUTORS AND RETAILERS SHALL NOT BE HELD LIABLE FOR ANY DAMAGES ARISING FROM, OR IN CONNECTION WITH, NON-COMPLIANCE WITH THE DOCUMENTATION OR THE APPLICABLE REGULATIONS BY YOU OR ANY PERSON USING YOUR LOKI MK2 SYSTEM..

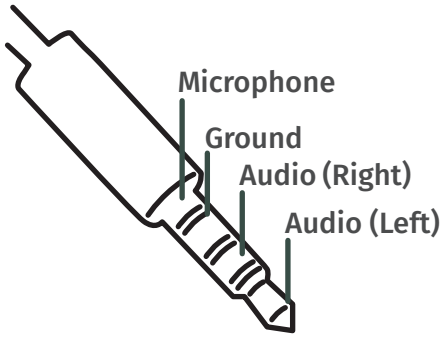
b. UAV and GCS Schematics





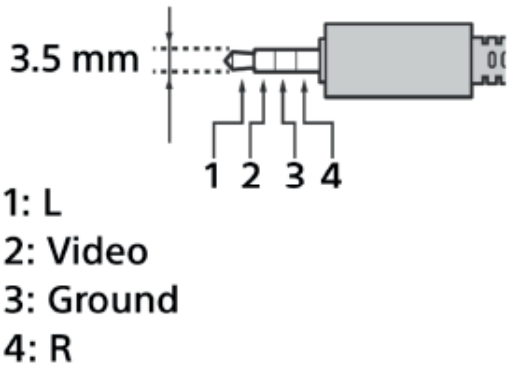
Radio input

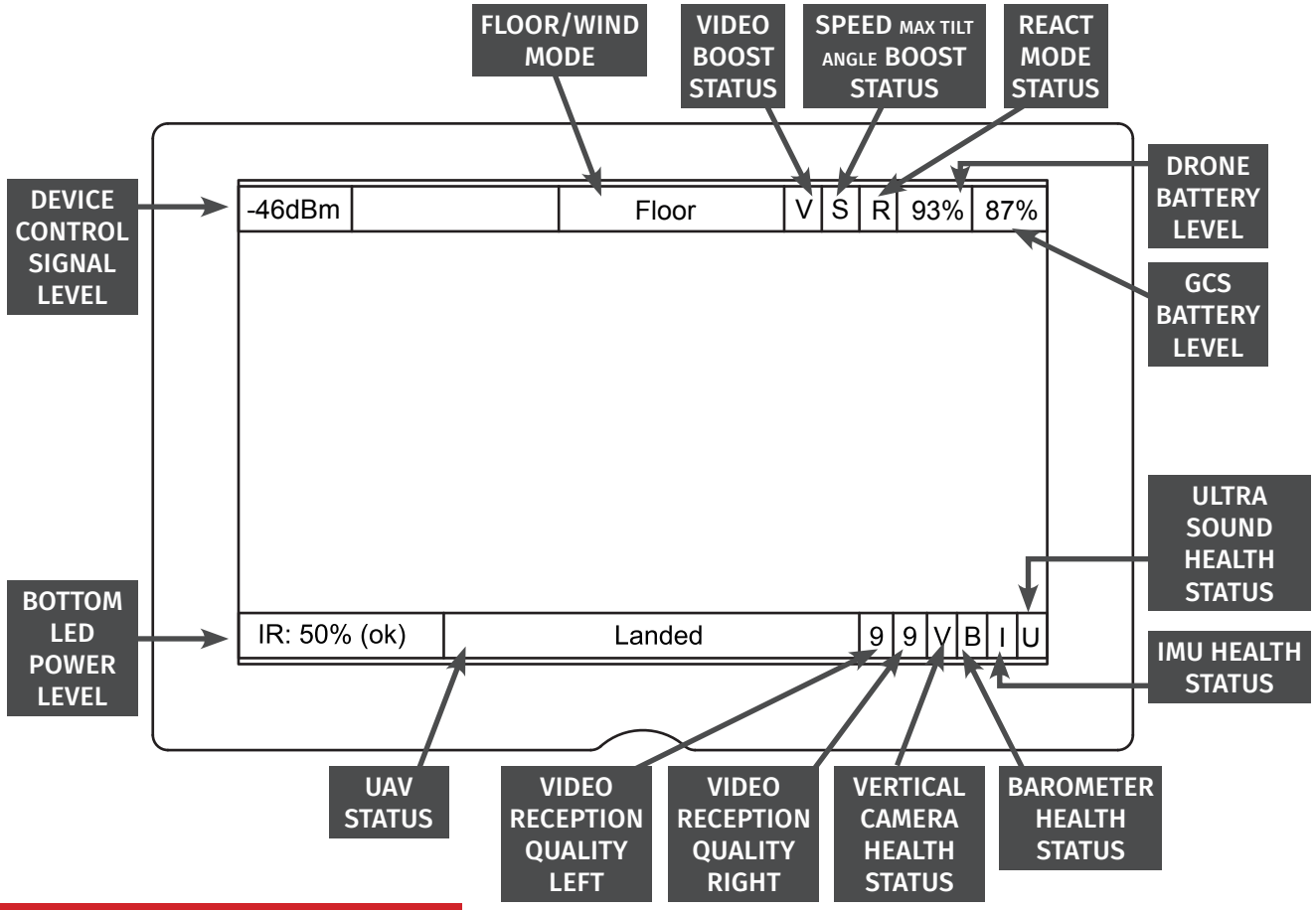
The radio input and headphones output follow the CTIA standard. The pinout on the jack is as follows:



Audio/video

The AV Line out follows the Sony convention:



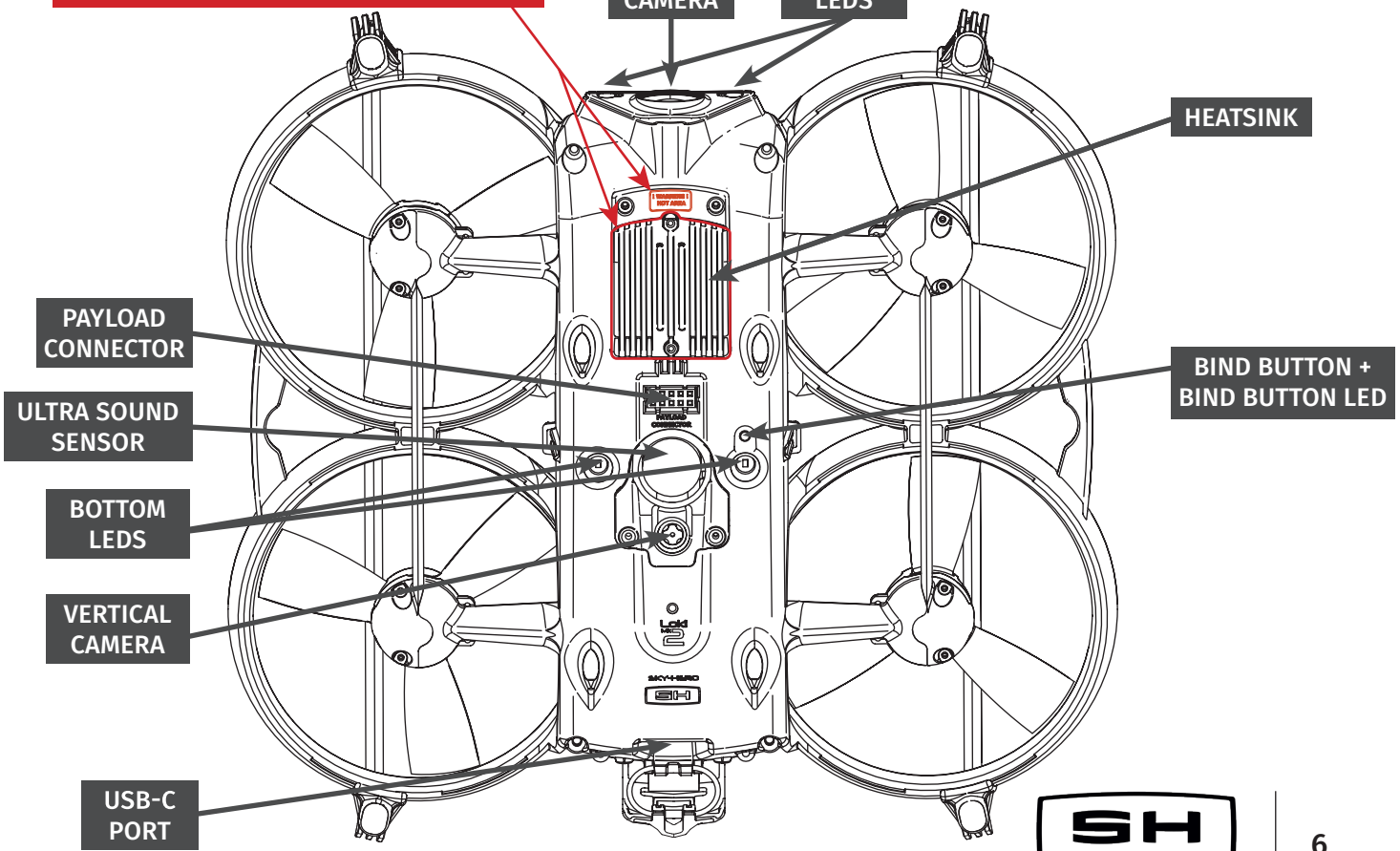


CAUTION :

- DO NOT COVER VERTICAL CAMERA, LEDs, OR ULTRA SOUND SENSOR.

- DO NOT TOUCH HEAT SINK AS IT CAN BE QUITE HOT

REMINDER OF THIS WARNING AFFIXED TO THE DRONE



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c. GCS Menu Navigation

Navigating the menu is accomplished using the Menu Button and the Joystick 2 only.

- ENTER MENU : Press the Menu Button, which enables you to enter/exit the menu at any time
- SCROLL : Use Joystick 2 to move up or down, which enables you to select the submenus
- ENTER : Push Joystick 2 to the right to enter the submenu
- CONFIRM : Push Joystick 2 to the right to confirm a choice in the menu/submenu
- BACK : Push Joystick 2 to the left to exit the current submenu and go back one level

d. Before First Flight

CAUTION: YOUR LOKI MK2 SYSTEM COMES READY TO USE AND HAS BEEN TEST-FLOWN IN OUR FACILITY. HOWEVER, SOME SETTINGS MIGHT NEED TO BE ADJUSTED TO GUARANTEE THE BEST PERFORMANCES FOR YOUR USER CASES.

I. Compliance

These settings allow adjustement of the power levels of both UAV control and video signal. By default, FCC or CE compliant mode is used (depending on your region). However, you may want to change these settings to «OPEN» in order to increase the general performances of your system. When switching to «OPEN», the Control will automatically be adjusted up to 250 mW; while the Video Power will need to be adjusted in the Video Power sub menu. Please refer to your local regulations before applying these changes.

a. Control

Mode	Max Power	Frequencies
FCC	100 mW	915 MHz
CE	25 mW LBT	868 MHz
Open	250 mW	868/915 MHz

b. Video

Mode	Max Power	Number of channels
FCC / CE	25 mW	8
Open	350 mW	37

II. Video Channel

Select the frequency you want to use for your audio video transmission. Be sure to use different frequencies when several devices are used during a same mission to avoid interference between devices. The UAV paired on Device Button 1 will be listed as Device 1, the UAV paired on Device Button 2 listed as Device 2, etc. By default, the system is limited to 8 channels (5725 MHz to 5865 MHz) and to Video Power 1 (=25 mW). However, when switching to «OPEN» in the Compliance menu, more frequencies and higher power levels are accessible. This mode is accessible via the “Compliance \ Video” menu. As those additional frequencies and power levels could be subject to special authorizations or licenses, please refer to the local regulation body for accurate information.

FCC settings	
Name	Frequency (MHz)
A1	5865
A2	5845
A3	5825
A4	5805
A5	5785
A6	5765
A7	5745
A8	5725

Open settings									
Name	Frequency (MHz)	Name	Frequency (MHz)	Name	Frequency (MHz)	Name	Frequency (MHz)	Name	Frequency (MHz)
A1	5865	E1	5705	SH10	5251	SH18	5547	SH26	5843
A2	5845	E2	5685	SH11	5288	SH19	5584	SH27	5880
A3	5825	E3	5665	SH12	5325	SH20	5621	SH28	5917
A4	5805	E4	5645	SH13	5362	SH21	5658	SH29	5954
A5	5785	E5	5885	SH14	5399	SH22	5695	SH30	5991
A6	5765	E6	5905	SH15	5436	SH23	5732		
A7	5745	E7	5925	SH16	5473	SH24	5769		
A8	5725	E8	5945	SH17	5510	SH25	5806		

III. Video power

The Loki MK2 system uses an analog video transmission which offers greater reliability while eliminating screen freezing, latency, and reboot time. The system broadcasts around the 5.8 GHz frequency band, producing good performance even when multiple devices are connected.

You can select a specific value for each device used. Please note that Video Power 0 is used for ultra short range to control functions without disturbing other users.

Level	Video power
0	1 mW
1	25 mW
2	250 mW (“OPEN” mode only)
3	350 mW (“OPEN” mode only)

IV. Video Scrambling

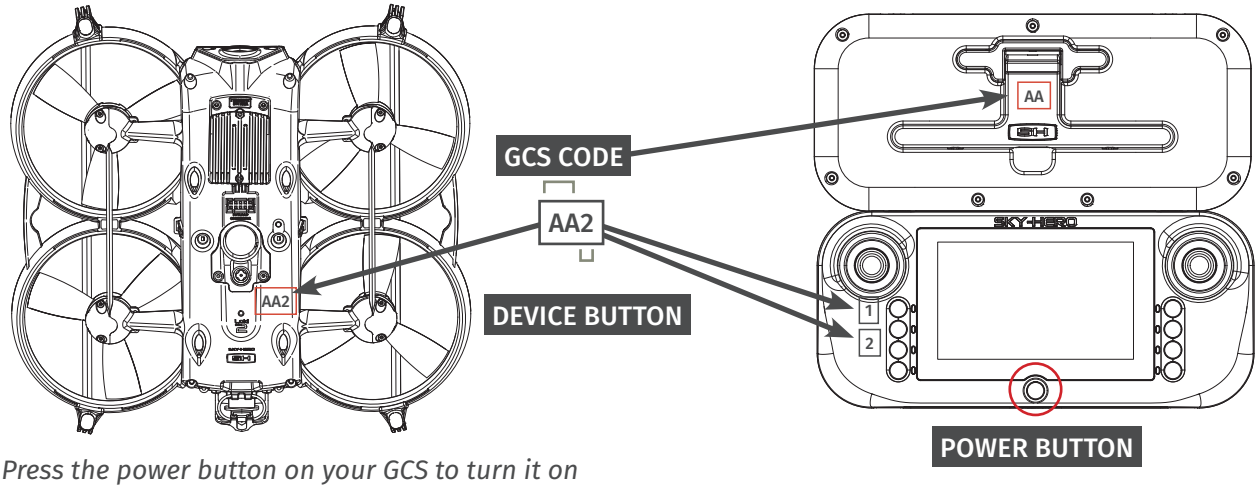
CAUTION: USING SCRAMBLING WILL LIMIT THE MAXIMUM RANGE YOU CAN REACH WITH YOUR VIDEO SYSTEM AS THE GLITCHES FROM THE ANALOG SIGNAL WILL HAVE AN INFLUENCE ON THE WHOLE PICTURE’S QUALITY.

This setting is common to all connected devices
Turning scrambling ON will enable you to make your video signal unreadable by non-Loki MK2 users.

e. Take off

CAUTION: BEFORE USING THE LOKI MK2 SYSTEM, PLEASE READ THE USER MANUAL AS WELL AS PRECAUTIONS & GOOD PRACTICES TO UNDERSTAND ALL FUNCTIONNALITY AND REQUIRED PRECAUTIONS.

STEP 1 : *Check for matching labels on your GCS and UAV(s)*

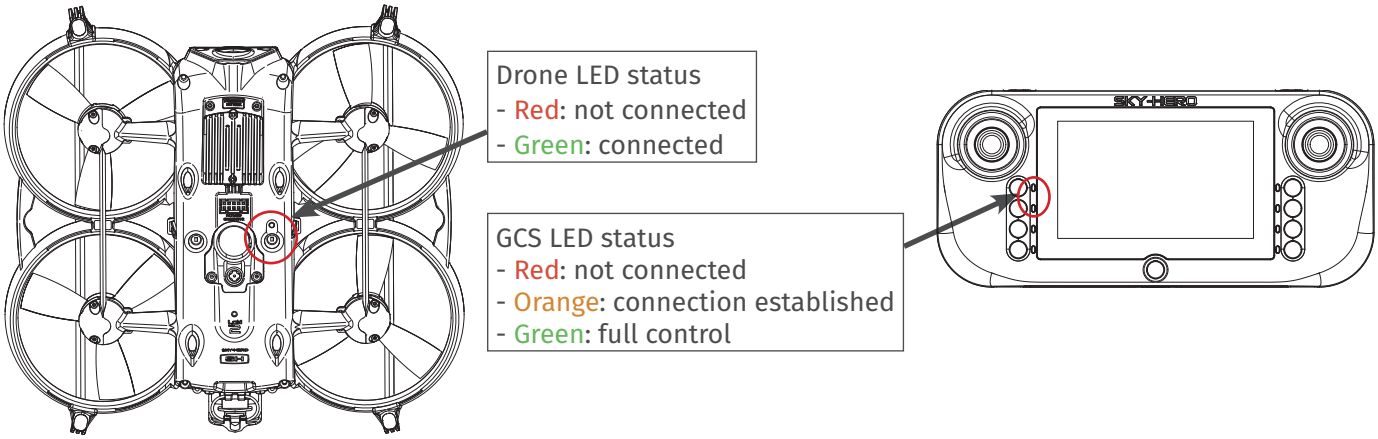


STEP 2 : *Press the power button on your GCS to turn it on*

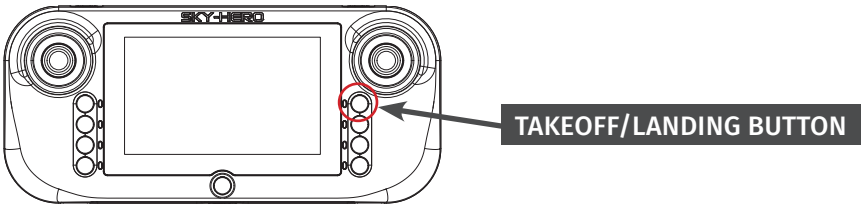
STEP 3 : *Plug a fully charged battery in your UAV(s)*

STEP 4 : *Select the drone by pressing the matching device button on your GCS*

STEP 5 : *Wait until a connection is established (the first time it can take up to 30s due to encryption negotiation)*



STEP 6 : *Press the takeoff/landing button*

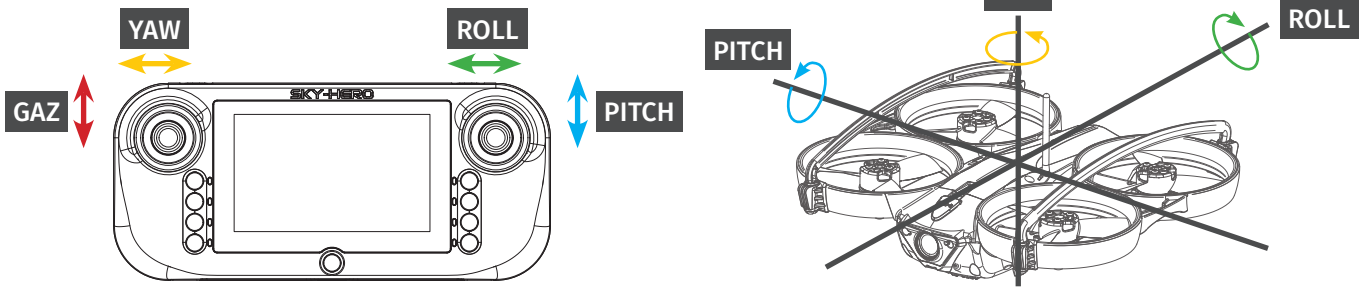


STEP 7 : *Wait until hovering*

IR: 50% (ok)	HOVERING	9	9	V	B	I	U

Hovering status will show up on the bottom bar of the GCS screen

STEP 8 : *Start flying using the joysticks, mode 2 is set by default*



STEP 9 : *Press the takeoff/landing button to land your UAV.*

CAUTION : MAKE SURE TO REMOVE THE BATTERY ONCE YOUR FLIGHT HAS BEEN COMPLETED

f. Switching to another device

When two or more UAVs are ready to fly (the process described in the previous section has been completed for all devices), you can easily switch between devices by pressing the matching device button on your GCS. This will stop the link with your actual device and create a link with the new device you want to control.

It is recommended to land the UAV before switching to another as the UAV will not be controlled anymore and will only refer to embedded sensors to hold its position, switching between devices can take up to 5 seconds, because of the encryption process.

The GCS is equipped with a failsafe. As such, all devices will have the following behavior when switching to another device :

If flying: they will try to hover

If flying below 50cm: they will try to hover but after a couple of seconds without reaching any position hold, they will initiate a landing

If on Floor Mode: they will cut their motors

If standing still: they will keep their state

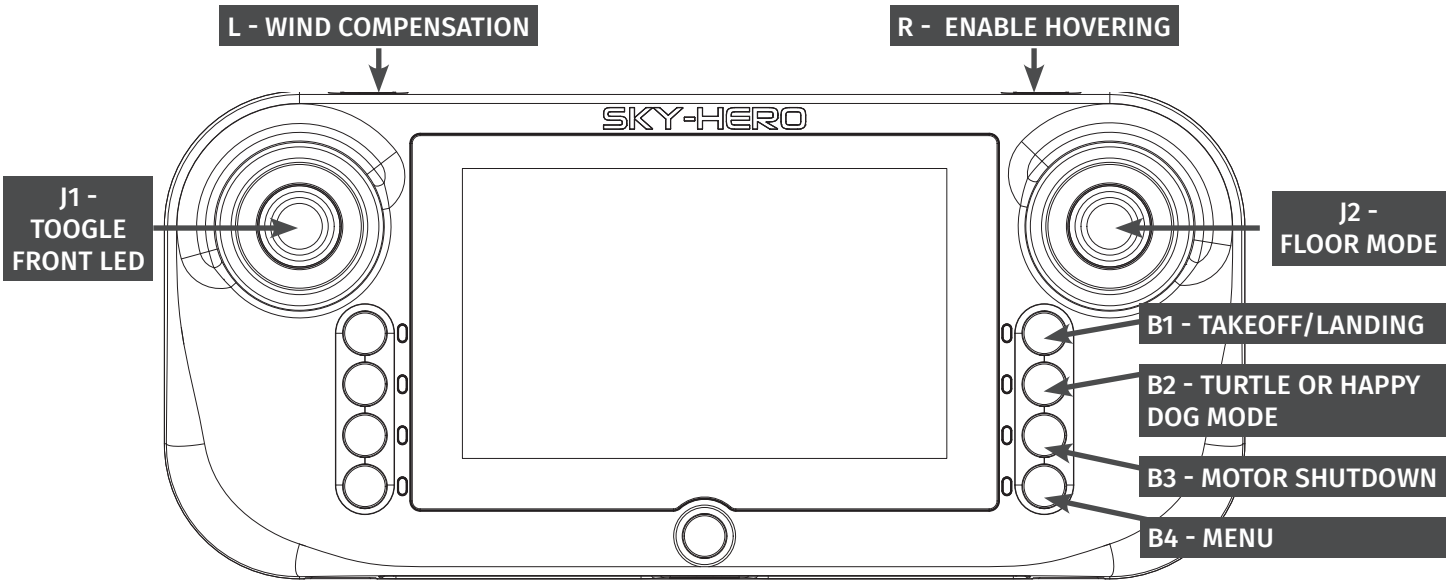
In the case where there is an unintentional loss of communication between the GCS and the UAV (extensive range, or GCS turned off), the actively controlled UAV will automatically land. Any other connected, but non-communicating UAV will keep its state.

In all cases, the devices will keep broadcasting audio-video on the set video channel and power. Settings changes done in the GCS regarding any non-communicating device will only be effective when communicating again to those devices.

a. Default GCS button allocation.

B1 – Takeoff /Landing
B2 – Turtle or Happy Dog mode
B3 – Motor Shutdown
B4 - Menu

L – Wind compensation
R – Enable hovering
J1 – Toogle Front LED
J2 – Floor mode



b. B1 – Takeoff /Landing

CAUTION: PRESSING THE TAKEOFF BUTTON WILL START THE MOTORS AND SPIN THE PROPELLERS AT HIGH SPEED. TAKE ALL THE PRECAUTIONS NEEDED TO AVOID ANY POSSIBLE CONTACT WITH THEM, AS ROTATING PROPELLERS CAN CAUSE SEVERE INJURIES.

I. Takeoff

Automatic takeoff of the UAV, with a smooth acceleration of the propellers' spinning speed. The UAV will automatically reach a hovering position, about 1 meter from the ground, joysticks should not be moved during the takeoff process. Motors and propellers must be able to rotate freely or your Loki MK2 will stop the process to avoid damage; in this case, "Emergency" will appear on the bottom of the GCS screen.

The pilot can always decide to cancel the automatic hovering process and altitude gain by moving its joysticks as soon as the UAV leaves the ground. In that case, it is advised to press the Hovering button ("R") as soon as possible to achieve the best UAV performances. At least 1 hovering process is needed every time a new battery is connected, as this allows your UAV's computer to calibrate its sensors.

The takeoff procedure can be cancelled at any time by pressing the allocated button again.

II. Landing

CAUTION: THE BEST WAY TO ACHIEVE A PERFECT SMOOTH LANDING IS TO FIRST ASK FOR A HOVERING, WAIT FOR SYNCRONIZATION, AND THEN PERFORM THE LANDING.

Automatic landing of the UAV, with a smooth deceleration of the propellers' spinning speed.
The UAV will remain controllable during the landing, as to allow the pilot to adjust the landing area; the whole procedure can be cancelled at any moment by pressing the takeoff landing button again.

c. B2 – Turtle or Happy Dog mode

I. Turtle

If for any reason your Loki MK2 should arrive on the floor upside down, the Turtle function allows you to flip it back to the correct position. A pop-up message will light up on your GCS when the UAV is inverted. As the Loki MK2 understands its position, it will flip over in the most favorable direction.

II. Happy Dog

The Loki MK2 can be used as a high-power IR light generator; just land the UAV in the space you want to lighten and engage the Happy Dog function. This function will turn the drone upside down and switch all IR LED on full power. To exit, press the button again and it will flip back to normal position and recover the previous LED settings.

This function can also be used to get your UAV out of a trapped situation. For example, partially locked under an obstacle.

d. B3 – Motor Shutdown

Also called as emergency shutdown, this function will immediately cut all four motors, regardless of the UAV's current situation or position, leading to instant UAV crash down. This can be used if the UAV starts to exhibit abnormal flight behaviour and cannot be recovered by the operator.
After this emergency, the UAV can be flown again by pressing takeoff landing (B1) but it is recommended to first proceed to a closer mechanical inspection after the crash of the UAV.

e. L – Wind compensation

CAUTION: WIND COMPENSATION SHOULD ONLY BE USED OUTDOOR AND AS FAR AWAY AS POSSIBLE FROM WALLS, WINDOWS OR OBSTACLES

In Wind Mode, the drone will automatically adjust its angle to "fight" the wind. As a result, the max tilt angle of your drone will be increased by the additional angle needed to fight the wind.
The Wind Mode can be activated at any time, except in conjunction with Floor Mode, by pressing the appropriate allocated button (L) or via the Command Action Menu. "Wind" will appear on your GCS.
It is strongly advised not to enter Wind Mode indoors. Since this will make max tilt angle relative, your UAV may interpret a wall, a window or obstacle, as very strong wind, and as a result will compensate by adding more and more angle to generate movement, which could result in a crash.

f. R – Enable hovering

CAUTION: HOVERING (= 3D POSITION HOLD) IS AUTOMATICALLY ACTIVATED AFTER TAKEOFF SO TRY NOT TO TAKE OFF TOO CLOSE FROM WALLS OR UNDER LESS THAN 1M HIGH CEILINGS. HOVERING AND ALTITUDE GAIN WILL BE ABORTED IF THE OPERATOR MOVES THE JOYSTICKS DURING THE TAKEOFF PROCESS. **SKY-HERO STRONGLY RECOMMENDS THAT YOU LET THE UAV PERFORM AT LEAST 1 STABLE HOVERING AFTER EACH BATTERY CONNECTION** AS THIS ALLOWS THE COMPUTER TO UNDERSTAND THE PHYSICS OF THE UAV AND GUARANTEE OPTIMAL UAV PERFORMANCES WHILE FLYING. IT IS ALSO RECOMMENDED TO ACTIVATE HOVERING OCCASSIONALLY DURING FLIGHT (EVEN FOR MORE EXPERIENCED USERS), ESPECIALLY AFTER STRONG IMPACTS TO THE UAV, TO RESET THE GYROSCOPES ESTIMATED VALUES.

I. Hovering-Altitude-Gaz

When actively flying, your UAV will perform in "GAZ" mode, entailing a potential drift against walls, ceilings, floors, etc... but you can ask for a hovering (3D position hold) performed by the embedded sensors: simply press your GCS «R» button.

When activated, the "Hovering" mode will hold the UAV's 3D position in space. This position holding feature relies on all embedded sensors, therefore the position holding has a few limitations:

- Minimum focus distance of the Vertical Camera is 50cm from the ground; no hovering can be achieved below this height.
- Maximum accurate distance sensing is 25 meters; no hovering can be achieved above this height in day light.
- Maximum focus distance of the Vertical Camera is affected by ambient light; if light is getting low, the Vertical Camera will not be able to focus on objects. The embedded vertical IR lights will then power on and generate light in total darkness to provide confortable IR illumination for the frontal camera but will not be suffisant to guarantee a stable hovering.
- The Vertical Camera cannot isolate its own shadow. In low contrast environment, where the UAV's shadow is the most contrasting feature on the ground, the UAV might start to follow its own shadow and will not be able to achieve position holding. In those cases, it is advised to fly a bit further from the ground to diminish the contrast of the shadow.
- In very low contrast or reflecting environment (such as reflective flooring, snow, water, etc.) hovering will also tend to be difficult, as the UAV will not be able to isolate any anchoring feature on the ground.

While hovering, changing the Throttle or Yaw (J1 for Mode 2 users) will keep the UAV position hold. This allows the pilot to modify the orientation or altitude of the UAV while still hovering.

Please note: The UAV status on the screen might show "Flying" which indicates that the UAV is looking to reach a position hold following a request from the pilot, but has not yet managed to do so. Once enabled, "hovering" will show up on your GCS status bar.

II. Altitude

Once in Hovering Mode, you can switch to Altitude Mode by altering the Roll or Pitch of the UAV (J2 for Mode 2 users). Your UAV is now capable of holding its absolute altitude using barometric pressure and distance sensing and will maintain the altitude as long as you don't increase or decrease the throttle.

Since the UAV will maintain its altitude, the pilot can focus on the orientation of the UAV without any need to adjust the vertical position (altitude). In addition, flying over an object will not cause the UAV to increase its altitude. However, if that object is close to the UAV, a slight altitude increase may be experienced as a result of the pressure generated by the nearby object.

III. Gaz

Once in Altitude Mode, you can switch to Gaz Mode by altering the Throttle of the UAV (J1 for Mode 2 users). Since Gaz Mode only requires limited use of the embedded sensors, there are no minimum or maximum altitude limits (you can fly below 50cm or above 25m) and the pilot has more direct control the UAV.
Even if the altitude is not locked, the embedded computer will control the optimal up and down speed to help you fly more smoothly.
While in Gaz mode, your UAV will drift slightly with the movement of the air. If you experience constant drifting, please perform a "flat trim," explained in a dedicated section of the manual, on the connected UAV. If all UAVs connected to the GCS are drifting in same direction, perform a GCS Joystick calibration as explained in the Advanced Settings User Manual.

g. J1 – Toogle Front LED

CAUTION : 840nM IR LIGHT USED IN THE LOKI MK2 CAN BE HARMFUL TO YOUR EYES. TAKE ALL PRECAUTIONS NECESSARY TO AVOID ANY DIRECT IR BEAM CONTACT WITH YOUR EYES, SUCH AS IR BLOCKING GLASSES.

This function will power the front LEDs to the preset brightness level set in the corresponding menu in the GCS (refer to "ADVANCED SETTINGS USER MANUAL"). Toggle again to power off.

h. J2 – Floor mode

I. Floor

Floor Mode offers a lot of additional operational capacities as it transforms your UAV into a rover with a jumping option. This mode will allow pilots of any experience level to cover large areas with minimal crash risks and increased flight time.
Floor Mode is commonly used to fly under objects like beds and cars, or to move in a confined environment with little to no space above the UAV (false ceilings, small pipes, etc.)

II. Access During flight

You can enter Floor Mode at any time by pressing the appropriate allocated button (J2) or via the Command Action Menu. The UAV will start to descend until it reaches the floor, and "Floor" will appear on your GCS. You can exit the mode at any time with the same button or via Command Action, and the UAV will automatically regain altitude.
It is strongly advised to hover after exiting Floor Mode to reset the gyroscopes estimated values. Please remember to reach the 50cm threshold before attempting to enter hovering.

III. Access From Takeoff

You can also takeoff (and land) in Floor Mode, which allows for a low altitude takeoff if doing so from under objects or close to a ceiling. Activate the mode before takeoff by pressing the appropriate allocated button or via Command Action Menu and then perform a standard takeoff.

3. ADDITIONAL GCS MENU FEATURES

a. Video Brightness

Lets you adjust the brightness of the video display on the screen (0 to 240), default value is 128.

b. Device Microphone level

This setting is common to all connected devices

This value will set the UAV's embedded HD microphone level. By default, the level is set to 15%. It can be changed at any time if higher levels are required.

c. Observe Device

This mode allows the use of the GCS as an image reception device. Users can navigate using the 4 Device Buttons (Device Button LEDs will be powered on blue) and, thus, capture the image of nearby devices (whether Sky-Hero devices or not) broadcasting in the frequencies set for each Device in the Video Channel menu. In addition, the user can navigate all frequencies using the SCROLL of Joystick 2.

The status of the Scrambled Mode will affect the Observer Mode; if Scrambling is ON, the Observer Mode will not be able to display unscrambled images, and vice-versa.

The GCS audio-video output will stream the selected channel.

d. Version

This submenu informs the GCS user about the current GCS (= "Remote") version, the current communicating UAV (= "Drone") version and the Crossfire (embedded UHF transmitter) version.

e. Command action

This menu lets you activate functions/flight modes that are not allocated to any Allocable Button. Once in the menu, SCROLL through the list and CONFIRM when the desired function is highlighted.

To make access as fast as possible, the Command Action submenu is the first one in the GCS menu. This enables you to press MENU BUTTON and then immediately ENTER the Command Action submenu without the need to SCROLL.

Motor Shutdown is listed last in the Command Action menu to enable quick access if this function is not already allocated to a button; SCROLL up once when in the Command Action menu to highlight the Motor Shutdown function.

Only Takeoff/Landing will require a further confirmation; the user needs to exit the menu after CONFIRM.

I. Thrown takeoff

CAUTION: THIS FUNCTION WILL ACTIVATE THE MOTORS AND START TO SPIN THE PROPELLERS. EXTENSIVE CAUTION MUST BE TAKEN AS SPINNING PROPELLERS CAN CAUSE SEVERE INJURIES. WEARING GLOVES IS A MUST. NEVER THROW THE UAV TOWARD A PERSON OR AN ANIMAL.
DO NOT THROW THE UAV BEFORE THE MOTORS HAVE REACHED A REGULATED CONSTANT RPM.
TRY TO THROW THE UAV AS FLAT AS POSSIBLE, AVOIDING SPIN AND ERRATIC ROTATIONS.

This function enables you to takeoff without starting from the ground. This should be used in dusty environments, high grass, watery or snowy environments, or any other situations where taking off from the ground is not viable.

Hold the UAV in one hand, making sure that your fingers are clear of the propellers, and engage the function on the GCS with the other hand. Wait for the propellers to accelerate and reach the optimal continuous rotation speed, which is indicated by a constant propeller sound; this should take a couple of seconds. Once the propellers are spinning at the appropriate speed, you can throw the UAV in the air, preferably with an upward movement, without any UAV rotation.

II. Turtle or Happy Dog mode

II. I. Turtle

If for any reason your Loki MK2 should arrive on the floor upside down, the Turtle function allows you to flip it back to the correct position. A pop-up message will light up on your GCS when the UAV is inverted. As the Loki MK2 understands its position, it will flip over in the most favorable direction.

II. II. Happy Dog

The Loki MK2 can be used as a high-power IR light generator; just land the UAV in the space you want to lighten and engage the Happy Dog function. This function will turn the drone upside down and switch all IR LED on full power. To exit, press the button again and it will flip back to normal position and recover the previous LED settings.

This function can also be used to get your UAV out of a trapped situation. For example, partially locked under an obstacle.

III. Toggle Front LED

CAUTION : 840nM IR LIGHT USED IN THE LOKI MK2 CAN BE HARMFUL TO YOUR EYES. TAKE ALL PRECAUTIONS NECESSARY TO AVOID ANY DIRECT IR BEAM CONTACT WITH YOUR EYES, SUCH AS IR BLOCKING GLASSES.

This function will power the front LEDs to the preset brightness level set in the corresponding menu in the GCS (refer to “ADVANCED SETTINGS USER MANUAL”). Toggle again to power off.

IV. Toogle Bottom LED

CAUTION : 840nM IR LIGHT USED IN THE LOKI MK2 CAN BE HARMFUL TO YOUR EYES. TAKE ALL PRECAUTIONS NECESSARY TO AVOID ANY DIRECT IR BEAM CONTACT WITH YOUR EYES, SUCH AS IR BLOCKING GLASSES.

This function will power the bottom LEDs to the preset brightness level set in the corresponding menu in the GCS (see «ADVANCED SETTINGS USER MANUAL»). Toggle again to power off.

V. Flat Trim

CAUTION: THE FLAT TRIM CAN ONLY BE DONE WHEN THE UAV IS LAYING PERFECTLY FLAT AND NOT MOVING. ONLY USE THIS FUNCTION WHEN YOU HAVE YOUR UAV IN SIGHT OR ARE 100% SURE THAT IT IS PERFECTLY FLAT AS THE NEW RECORDED VALUE WILL BE USED AS THE HORIZONTAL ABSOLUTE REFERENCE.

The Flat Trim will reset the UAV's gyroscope flat value. It is advised to use a Flat Trim before first use, or after big impacts to reset the gyroscope.

If you observe completely erratic UAV movements, or a constant strong drifting, it is usually helpful for the UAV to undergo a Flat Trim.

VI. Floor mode

VI.I Floor

Floor Mode offers a lot of additional operational capacities as it transforms your UAV into a rover with a jumping option. This mode will allow pilots of any experience level to cover large areas with minimal crash risks and increased flight time.
Floor Mode is commonly used to fly under objects like beds and cars, or to move in a confined environment with little to no space above the UAV (false ceilings, small pipes, etc.)

VI.II Access During flight

You can enter Floor Mode at any time by pressing the appropriate allocated button (J2) or via the Command Action Menu. The UAV will start to descend until it reaches the floor, and "Floor" will appear on your GCS. You can exit the mode at any time with the same button or via Command Action, and the UAV will automatically regain altitude.
It is strongly advised to hover after exiting Floor Mode to reset the gyroscopes estimated values. Please remember to reach the 50cm threshold before attempting to enter hovering.

VI.III Access From Takeoff

You can also takeoff (and land) in Floor Mode, which allows for a low altitude takeoff if doing so from under objects or close to a ceiling. Activate the mode before takeoff by pressing the appropriate allocated button or via Command Action Menu and then perform a standard takeoff.

VII. Enable hovering

CAUTION: HOVERING (= 3D POSITION HOLD) IS AUTOMATICALLY ACTIVATED AFTER TAKEOFF SO TRY NOT TO TAKE OFF TOO CLOSE FROM WALLS OR UNDER LESS THAN 1M HIGH CEILINGS. HOVERING AND ALTITUDE GAIN WILL BE ABORTED IF THE OPERATOR MOVES THE JOYSTICKS DURING THE TAKEOFF PROCESS. **SKY-HERO STRONGLY RECOMMENDS THAT YOU LET THE UAV PERFORM AT LEAST 1 STABLE HOVERING AFTER EACH BATTERY CONNECTION** AS THIS ALLOWS THE COMPUTER TO UNDERSTAND THE PHYSICS OF THE UAV AND GUARANTEE OPTIMAL UAV PERFORMANCES WHILE FLYING. IT IS ALSO RECOMMENDED TO ACTIVATE HOVERING OCCASSIONALLY DURING FLIGHT (EVEN FOR MORE EXPERIENCED USERS), ESPECIALLY AFTER STRONG IMPACTS TO THE UAV, TO RESET THE GYROSCOPES ESTIMATED VALUES.

VII.I Hovering-Altitude-Gaz

When actively flying, your UAV will perform in "GAZ" mode, entailing a potential drift against walls, ceilings, floors, etc... but you can ask for a hovering (3D position hold) performed by the embedded sensors: simply press your GCS «R» button.

When activated, the "Hovering" mode will hold the UAV's 3D position in space. This position holding feature relies on all embedded sensors, therefore the position holding has a few limitations:

- Minimum focus distance of the Vertical Camera is 50cm from the ground; no hovering can be achieved below this height.
- Maximum accurate distance sensing is 25 meters; no hovering can be achieved above this height in day light.
- Maximum focus distance of the Vertical Camera is affected by ambient light; if light is getting low, the Vertical Camera will not be able to focus on objects. The embedded vertical IR lights will then power on and generate light in total darkness to provide confortable IR illumination for the frontal camera but will not be suffisant to guarantee a stable hovering.
- The Vertical Camera cannot isolate its own shadow. In low contrast environment, where the UAV's shadow is the most contrasting feature on the ground, the UAV might start to follow its own shadow and will not be able to achieve position holding. In those cases, it is advised to fly a bit further from the ground to diminish the contrast of the shadow.
- In very low contrast or reflecting environment (such as reflective flooring, snow, water, etc.) hovering will also tend to be difficult, as the UAV will not be able to isolate any anchoring feature on the ground.

While hovering, changing the Throttle or Yaw (J1 for Mode 2 users) will keep the UAV position hold. This allows the pilot to modify the orientation or altitude of the UAV while still hovering.

Please note: The UAV status on the screen might show "Flying" which indicates that the UAV is looking to reach a position hold following a request from the pilot, but has not yet managed to do so. Once enabled, "hovering" will show up on your GCS status bar.

VII.II Altitude

Once in Hovering Mode, you can switch to Altitude Mode by altering the Roll or Pitch of the UAV (J2 for Mode 2 users). Your UAV is now capable of holding its absolute altitude using barometric pressure and distance sensing and will maintain the altitude as long as you don't increase or decrease the throttle.

Since the UAV will maintain its altitude, the pilot can focus on the orientation of the UAV without any need to adjust the vertical position (altitude). In addition, flying over an object will not cause the UAV to increase its altitude. However, if that object is close to the UAV, a slight altitude increase may be experienced as a result of the pressure generated by the nearby object.

VII.III Gaz

Once in Altitude Mode, you can switch to Gaz Mode by altering the Throttle of the UAV (J1 for Mode 2 users). Since Gaz Mode only requires limited use of the embedded sensors, there are no minimum or maximum altitude limits (you can fly below 50cm or above 25m) and the pilot has more direct control the UAV.
Even if the altitude is not locked, the embedded computer will control the optimal up and down speed to help you fly more smoothly.
While in Gaz mode, your UAV will drift slightly with the movement of the air. If you experience constant drifting, please perform a "flat trim," explained in a dedicated section of the manual, on the connected UAV. If all UAVs connected to the GCS are drifting in same direction, perform a GCS Joystick calibration as explained in the Advanced Settings User Manual.

VIII. Takeoff /Landing

CAUTION: PRESSING THE TAKEOFF BUTTON WILL START THE MOTORS AND SPIN THE PROPELLERS AT HIGH SPEED. TAKE ALL THE PRECAUTIONS NEEDED TO AVOID ANY POSSIBLE CONTACT WITH THEM, AS ROTATING PROPELLERS CAN CAUSE SEVERE INJURIES.

VIII.I Takeoff

Automatic takeoff of the UAV, with a smooth acceleration of the propellers' spinning speed. The UAV will automatically reach a hovering position, about 1 meter from the ground, joysticks should not be moved during the takeoff process. Motors and propellers must be able to rotate freely or your Loki MK2 will stop the process to avoid damage; in this case, "Emergency" will appear on the bottom of the GCS screen.

The pilot can always decide to cancel the automatic hovering process and altitude gain by moving its joysticks as soon as the UAV leaves the ground. In that case, it is advised to press the Hovering button ("R") as soon as possible to achieve the best UAV performances. At least 1 hovering process is needed every time a new battery is connected, as this allows your UAV's computer to calibrate its sensors.

The takeoff procedure can be cancelled at any time by pressing the allocated button again.

VIII.II Landing

CAUTION: THE BEST WAY TO ACHIEVE A PERFECT SMOOTH LANDING IS TO FIRST ASK FOR A HOVERING, WAIT FOR SYNCRONIZATION, AND THEN PERFORM THE LANDING.

Automatic landing of the UAV, with a smooth deceleration of the propellers' spinning speed.
The UAV will remain controllable during the landing, as to allow the pilot to adjust the landing area; the whole procedure can be cancelled at any moment by pressing the takeoff landing button again.

IX. Wind compensation

CAUTION: WIND COMPENSATION SHOULD ONLY BE USED OUTDOOR AND AS FAR AWAY AS POSSIBLE FROM WALLS, WINDOWS OR OBSTACLES

In Wind Mode, the drone will automatically adjust its angle to "fight" the wind. As a result, the max tilt angle of your drone will be increased by the additional angle needed to fight the wind.
The Wind Mode can be activated at any time, except in conjunction with Floor Mode, by pressing the appropriate allocated button (L) or via the Command Action Menu. "Wind" will appear on your GCS.
It is strongly advised not to enter Wind Mode indoors. Since this will make max tilt angle relative, your UAV may interpret a wall, a window or obstacle, as very strong wind, and as a result will compensate by adding more and more angle to generate movement, which could result in a crash.

X. Toggle video boost

Using the Video Boost will enable you to increase the Video Power setting by 1 power level, without having to go into the dedicated menu. When active, a ‘‘V’’ will appear on top of your GCS screen, indicating your device is now flying with the boosted value. Deactivating the Video Boost will revert the video power setting back to the original value. This boost will not be affected by your compliance setting.

XI. Toggle angle boost

For each device you can select a max angle boost. When used, an ‘‘S’’ for Speed will appear on top of your GCS screen, indicating your device is now flying with the boosted value of your max tilt angle. This is very useful when you need to be able to quickly increase the max speed of the UAV.

By default, this value is set to 15 degrees and non boosted value to 9 degrees. This setting can be further adjusted please refer to «ADVANCED SETTINGS USER MANUAL».

XII. Toggle drone sleep

This function allows to put the current connected device into a sleep mode, generating a lower power drain and increasing the device’s battery lifetime. No audio-video signal is emitted and all LED are turned off. You can recover normal operation by reconnecting to the drone (by pressing the corresponding device button) or by toggling the function again. Your GCS remains fully functional.

XIII. Toggle push-to-talk

This function enables the use of one the GCS’ Allocatable Button as a PTT. The use of a dedicate cable for your radio system might be necessary. Please contact our customer service for detailed information : support@sky-hero.com

XIV. Motor shutdown

Also called as emergency shutdown, this function will immediately cut all four motors, regardless of the UAV’s current situation or position, leading to instant UAV crash down. This can be used if the UAV starts to exhibit abnormal flight behaviour and cannot be recovered by the operator.
After this emergency, the UAV can be flown again by pressing takeoff landing (B1) but it is recommended to first proceed to a closer mechanical inspection after the crash of the UAV.

f. System sleep mode

CAUTION : BE AWARE THAT ONLY THE COMMUNICATING DEVICE AND THE GCS WILL GO INTO SLEEP MODE; ALL OTHER NON COMMUNICATING DEVICE WILL REMAIN AWAKE. IF NEEDED, YOU WILL HAVE TO PUT THOSE MANUALLY INTO SLEEP VIA 'TOGGLE DRONE SLEEP' BEFORE SWITCHING TO YOUR LAST DEVICE AND SETTING IT INTO SLEEP MODE WITH THE GCS.

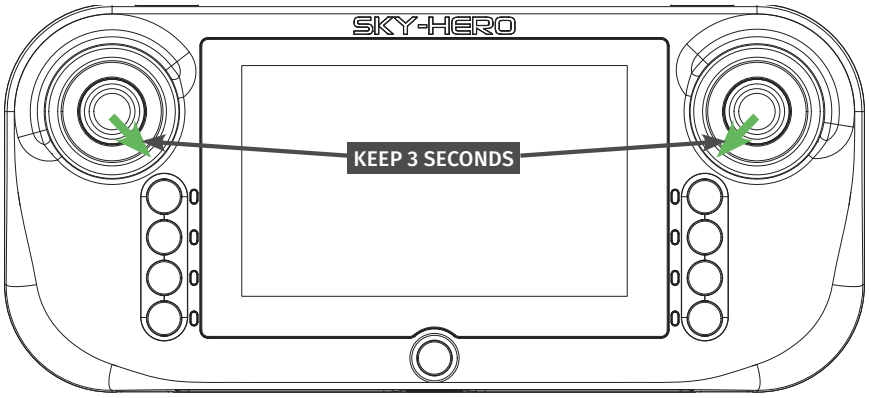
At any time, you can set your system (GCS + 1 device) into «SLEEP MODE» and be able to quickly reactivate it when needed in no more than 3 seconds.

Start your system normally, select one device, wait for connection.

Hold the two joysticks in down inward position for 3 seconds, until your system has entered « SLEEP MODE » with minimal power consumption for both the UAV and the GCS (1 hour sleep = 25% UAV battery drain, 10% GCS battery drain).

The B4 and device LED will show orange, GCS screen will turn off.

To recover normal operation and reconnect immediately to your device, hold the two joysticks in down inward position for 3 seconds.



4. ADVANCED SETTINGS

This submenu is locked by default and should only be used by experienced users, please refer to the ADVANCED SETTINGS user manual.

5. WARNINGS

a. Warnings | Loki MkII sUAV

- Loki MkII is tested for how much electrical energy it use during typical use : 11.1V ; 20A
- Loki MkII is not weatherproof – don't fly in rain, snow, puddles, etc. Do not immerse this product in any liquid. This can lead to a complete malfunction of the device.
- Also avoid operating the Loki MkII in environments where small particles could enter the device body, such as sand, dust, etc. This can lead to a complete malfunction of the device. This can lead to partial or complete blocking of the wheels, poor visibility due to particles accumulating on the camera lenses, etc.
- Keep away from fire.
- To clean or dust your device, use only a soft dry cloth. Do not apply any liquids of any kind (detergents, solvents, etc.) which could weaken the various parts of the appliance. Also do not apply any kind of lubricant or grease to the moving parts of the vehicle, especially the wheel bearings.
- Do not fly in extremely hot temperatures above 50°C | 122°F. Do not operate it in extremely cold temperatures below -20°C | -4°F
- When not in use, first remove the LiPo battery from the device. Then store the Loki MkII and the removed battery in a cool, dry place with a relative humidity of less than 75%.
- The operator in command is responsible for managing directions, range, and battery level and monitoring messages and alerts displayed by the associated controller.
- Exclusively use accessories such as battery chargers authorized by Sky-Hero. Using unapproved accessories will void warranty coverage.

b. Warnings | GCS MkII Controller

- Keep away from fire, wet and dusty environments.
- To clean or dust your controller, use only a dry cloth. Do not apply any liquids of any kind (detergents, solvents, etc.) which could weaken the various parts of the appliance.
- Store the GCS MkII in a cool, dry place with a relative humidity of less than 75%. Do not leave your GCS MkII for more than 3 months without charging it.

c. Warnings | LiPo Battery

- Loki MkII uses removable, lightweight, rechargeable Lithium-Polymer (LiPo) battery and GCS MkII uses also a built-in Lithium-Polymer (LiPo) battery, which provides higher specific energy than other traditional batteries. The user must have an appropriate understanding of lithium-polymer batteries before purchase.
- The batteries are foreseen for the use of system integrations with proper protection circuitry or battery packs with a battery management system or PCB (circuit board/module).
- Use caution when working with and using lithium-polymer batteries as they are very sensitive to charging characteristics and may explode, burn, or cause a fire if misused or mishandled.
- The operator is responsible for any damage or injury caused by the misuse or mishandling of lithium-polymer batteries and chargers.

- Charge only with the provided charger designed for this specific type of lithium-ion battery.
- Charging should be completed in an open area. Always charge in or on a fire-proof surface. Never leave batteries charging unattended.
- Please note that the Loki MkII and GCS MkI LiPo batteries cannot be charged at temperatures above 45°C (113°F). The temperature range for charging the LiPo battery is 10°C to 45°C. Do not disassemble the batteries or dual charging dock. Do not insert any foreign material into the battery terminal.
- Do not attempt to use batteries that are damaged, dented, or ruptured after a crash or drop. Avoid dropping or striking the batteries.
- Do not immerse the batteries or charging dock in water or other liquids
- If substances leak from the battery pack and get in your eyes, do not rub them. Seek emergency medical attention promptly.
- In storage as in operation, it's important not to allow the battery to come in close contact with moisture or heat sources. Store the battery in a dry and well-ventilated area at room temperature, ideally 20°C | 68°F to 28°C | 82°F.
- Do not store the battery in direct sunlight or near sharp items, moisture, metal, or reactive chemicals.
- Over time, some reduction in battery life is expected.

6. STORAGE

Knowing how to store your ground robot properly can extend its useful life. Keep in mind these tips for best storage practices:

a. Perform Visual Inspection

Before you ever put up your Loki MkII after an operation, you should always check it over for signs of wear. This is a simple, visual once-over, that takes a matter of seconds, but can help you catch minor issues before they become major ones. Look over the outer shell for cracks or any other signs of damage. Check the propellers for any damage or debris, and inspect the camera lenses for dust and dirt. Also, check the battery bay.

b. Clean the device

Cleaning your aerial robot includes removing any visible dirt from the shell and cameras. If you are planning to put your drone into storage for an extended length of time, make sure you do this beforehand.

c. Update firmware

Make sure you do any firmware updates on both sUAV and controller before putting your Loki MkII away, whether it's for a short break. If you're going to be back operating it in a week or two, then you'll be ready to deploy it for the next mission. If you're planning on a longer break, you may need to perform another update when you bring your drone out again. However, the updating process will be faster if you're not two or three versions behind.

d. Remove and discharge batteries

Proper care of your batteries will give them a much longer lifespan. Batteries should be discharged between 40% to 65% percent. This is extremely important, as batteries that are stored while fully charged, or with too low of a charge, may be permanently damaged. And be sure to unplug the batteries – never store batteries in the charger.

e. Store batteries separately

For safety's sake, your Loki MkII should never be stored with the batteries installed. Always store your batteries away from direct sunlight, ideally at around 25°C | 77°F. Also, make sure that the battery charger does not come into contact with other conductive materials.

f. Store Loki MkII in a cool, dry, non-magnetic area

Once all the prep work has been done to prepare your device for storage, make sure to store it in suitable conditions. Your Loki MkII, as well as batteries, GCS MkII controller, and any other attachments, should be stored in a climate-controlled setting. The ideal temperature for storage is between 20°C | 68°F to 28°C | 82°F. Extreme cold or heat can lead to permanent damage to batteries, and also to the electrical elements of the sUGV and the controller.

Your devices should be stored in a dry place away from humidity, as a humid environment can lead to corrosion of metal elements and mildew on plastic parts or packaging materials. In practical terms, this means that your drone should not be stored in a damp basement, an uninsulated attic, in a car, or in a non-climate-controlled storage unit. Also keep in mind that your drone should be stored away from any sources of magnetism, to avoid any scrambling of the computer or electrical components.