



HOVERFLY

LIVESKY™

TETHER-POWERED UAV



Quick Reference Guide

Model LSP-6205

Version 2.0

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**THIS DOCUMENT IS NOT A SUBSTITUTE FOR TRAINING
DO NOT OPERATE THE LIVESKY SYSTEM WITHOUT TRAINING
OBEY ALL SAFETY WARNINGS IN THIS DOCUMENT AND
OBSERVE AND OBEY ALL SYSTEM CONTROLLER MESSAGES**

THE FOLLOWING MASTER CAUTIONS APPLY TO ALL OPERATIONS

-  **VISUALLY INSPECT ALL EQUIPMENT PRIOR TO FLIGHT, AND DO NOT OPERATE IF DAMAGE IS VISIBLE TO PROPELLERS OR ANY PART OF THE LIVESKY SYSTEM**
-  **DO NOT OPERATE WITHOUT CORDON AREA OR DIRECTLY OVER PERSONNEL**
-  **DO NOT OPERATE OUTSIDE OF SPECIFIED CONDITIONS (SEE LIMITS SECTION)**
-  **DO NOT OPERATE IF LIGHTNING IS PRESENT WITHIN 10 STATUTE MILES AND DO NOT OPERATE IN THE PRESENCE OF RADAR ENERGY OR OTHER KNOWN SOURCES OF EMI**
-  **OBSERVE ALL SAFETY REGARDING LIPO BATTERIES, DAMAGED OR PUFFED BATTERIES CAN LEAD TO CATASTROPHIC FAILURE OR INJURY TO PERSONNEL**

1.0. System Limitations and Operational Requirements

In addition to the MASTER CAUTIONS, the following Limitations Apply to LiveSky Operations.
Weather and Site Conditions and Limits

Limit or Requirement	Measurement	CATEGORY AND RISK
Cordon Area Radius	15M / 50'	Recommended Radius, Place System on Level Surface
Electrical Power Lines	60M / 200'	Recommended Distance from Electrical Power Lines or other sources of EMI
Wind, Take Off / Landing	15 MPH	Recommendation, Observe Cordon Area Radius
Wind, Flying, Sustained	25 MPH	Above this Limit, System may Auto-Land / Self-Protect
Wind, Flying Gusts, 1 Sec	30 MPH	Above this Limit, System may Auto-Land / Self-Protect
Ambient Temperature Range	32F-120F	Below 32F, Safety Landing Battery May Fail. Pre-Heat LiPo Safety Landing Battery to 40F to Launch. Above 120F, System may Auto-Land / Self-Protect
Precipitation, Rain	4" per Hr	Non-Icing Conditions Only, Loss of Control in Icing. Do not fly during thunderstorms
Density Altitude (DA)	5,000 ft MSL	> 5K MSL, System may Auto-Land, Contact Hoverfly

System Physical Limits and Requirements

The Following Limits must be satisfied to the System to operate as intended:

Limit or Requirement	Measurement	CATEGORY, RISK, and MITIGATION
Input Power	90-240VAC at Minimum 2,000 Watts	Critical Mission Requirement, System will not operate. Verify power capacity from generator or inverter
GPS Navigation	Controller Shows ≥ 10 Satellites	Important Mission Requirement, System may not operate, or System may not hold position adequately, may Auto-Land
GPS Manifest Update	15 Minutes	If the most recent flight was 45 days ago, or if the System has been relocated more than 100 miles, a GPS manifest update is required that may take 15 min



WARNING:

FAILURE TO ALLOW THE GPS MANIFEST TO UPDATE FOR FIRST FLIGHT AFTER RELOCATING THE SYSTEM 100 MILES OR MORE, COULD RESULT IN AN UNCOMMANDED FLY OFF

2.0 System Unpack and Setup

- 2.1. Identify the two System (2) transit cases
- 2.2. Remove the Tether Kit (TK) and place on level surface noting the four (4) mounting holes on top
- 2.3. Remove the Landing Ring from the LiveSky case
- 2.4. Install the Landing Ring on the TK in OFFSET POSITION SHOWN.
- 2.5. Remove and Inspect the LiveSky from the transit case
- 2.6. Turn the LiveSky upside down and carefully place it on the TK Landing Ring and then carefully install the EO/IR payload to lock it in place



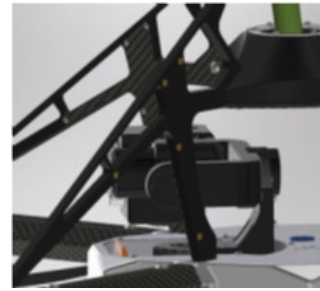
Step 1: Rotate



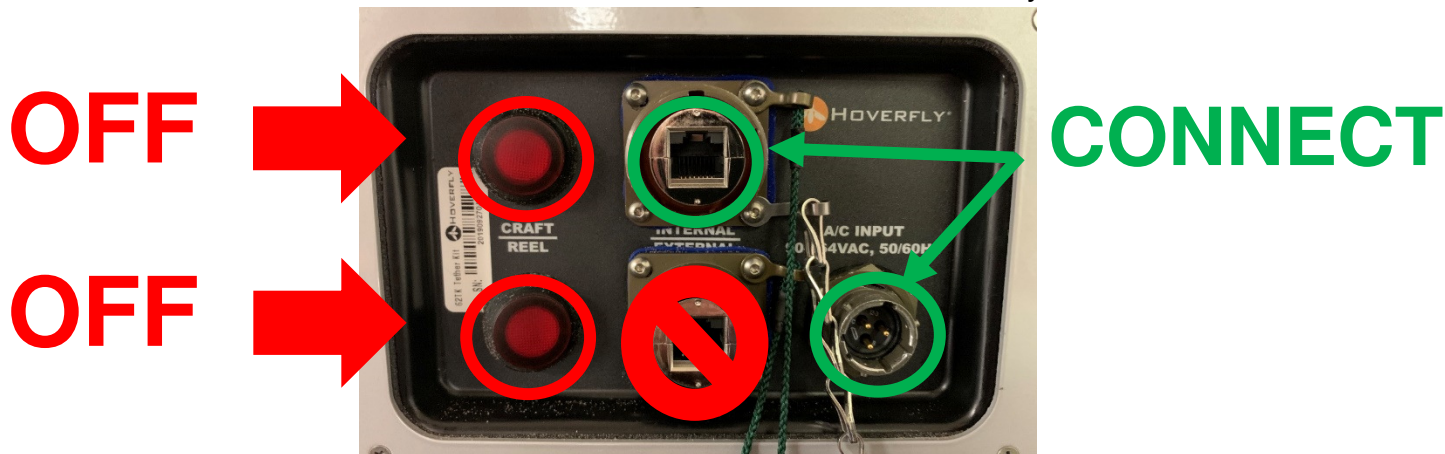
Step 2: Click lock



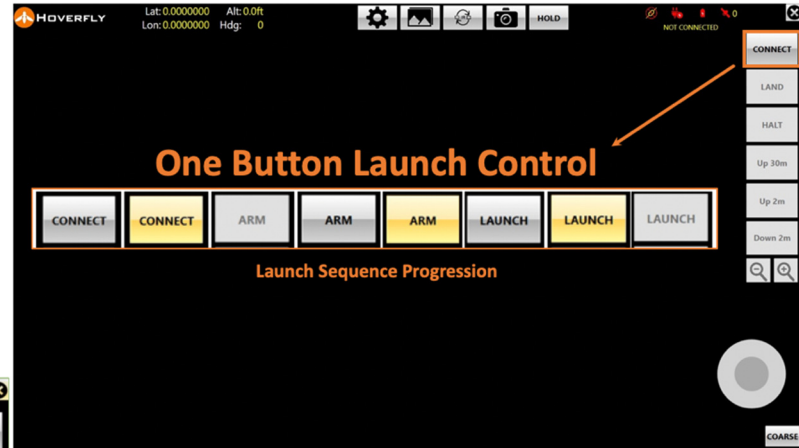
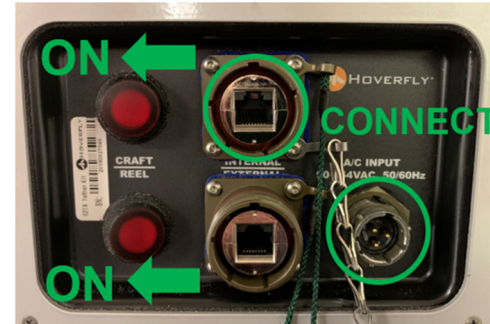
Step 3: Tug check



- 2.7. Remove the Controller and Ethernet and power cables from the transit case. DO NOT CONNECT THE SYSTEM TO A POWER SOURCE
- 2.8. INSURE THE TWO (2) RED POWER SWITCHES ARE OFF BY MOVING THEM TO THE RIGHT POSITION
- 2.9. Connect the AC power cable to the TK and verify the “click lock”
- 2.10. Plug in the AC power cable to a 2,000W power source
- 2.11. Connect the Ethernet cable to the Internal Port on the Tether Kit. Verify “click lock”



- 2.12. SECURE THE CORDON PERIMETER AROUND THE SYSTEM
- 2.13. Connect the tether connector to the LiveSky, verify the “click lock”
- 2.14. Place LiveSky in the Landing Ring
- 2.15. Ensure LiveSky rotor blades rotate freely
- 2.16. Ensure generator fuel (if used) is full to capacity
- 2.17. Turn on the TWO (2) RED POWER SWITCHES
- 2.18. Obtain the Controller Tablet and Connect the Ethernet cable
- 2.19. Position the Controller at least 20 feet away from the TK
- 2.20. Once the craft has powered on start the Flight Software and press the CONNECT button
- 2.21. Observe the LiveSky GUI Status Indications illustrating Ethernet, Power, Batteries, and GPS status. ALL GREEN ALLOWS the System to ARM and LAUNCH



3.0 System Operation

- 3.1. Verify video on the GUI before ARM and LAUNCH
- 3.2. Verify clear overhead conditions before LAUNCH
- 3.3. Verify Site Conditions and Master Cautions including surface winds are within Limits before LAUNCH
- 3.4. NOTE: After ARM is asserted, System will DISARM after 10 seconds, unless LAUNCH is pressed.
- 3.5. Refer to Operator's Manual for complete description of Controls, Features and operation of the Controller GUI
- 3.6. BEFORE initiating any LANDING, verify Landing Zone and Cordon Area are clear
- 3.7. Verify surface winds are within Limits before LANDING
- 3.8. USE HALT COMMAND TO ABORT NORMAL MOVEMENTS/COMMANDS
- 3.9. USE E-STOP TO CUT POWER, IF UNCONTROLLED FLIGHT WILL ENDANGER PERSONNEL.
- 3.10. SEE EMERGENCY PROCEDURES SECTION HEREIN FOR ADDITIONAL INFORMATION



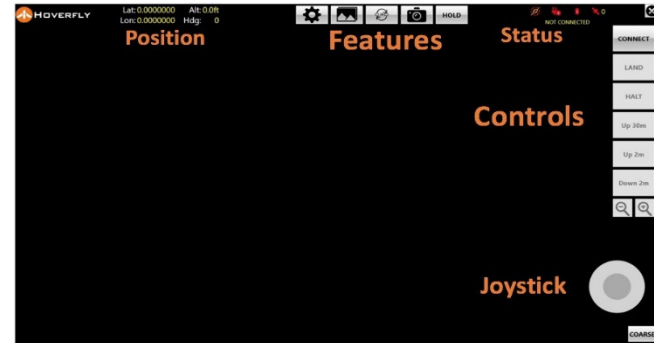
CAUTION:

E-STOP WILL CUT POWER TO ALL MOTORS; AIR VEHICLE WILL FALL TO THE GROUND

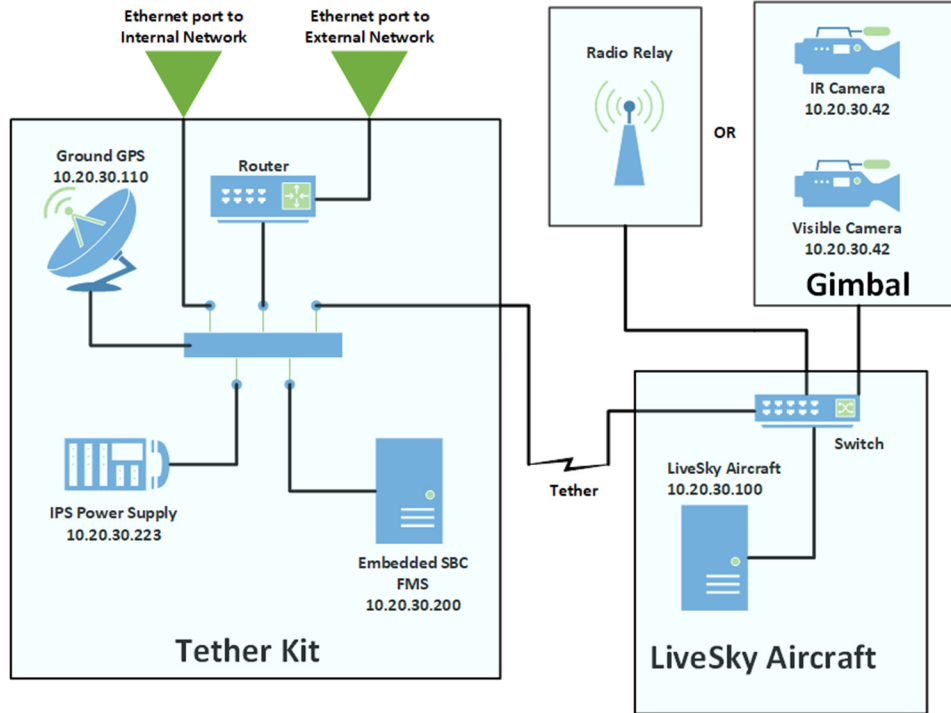


WARNING:

TETHER WILL STILL BE POWERED AFTER E-STOP IS INITIATED. IF TETHER HAS BEEN CUT, TURN OFF POWER BEFORE HANDLING TETHER TO AVOID HIGH VOLTAGE SHOCK



4.0 Network Reference Diagram



5.0 X-Box Controller Reference Diagram



NOTE: Pressing the UP 2M or DOWN 2M buttons, will execute the HALT function during LANDING

6.0 Emergency Procedures

ABORT TAKE-OFF

INDICATION – LAUNCH button has been pressed and the aircraft has begun take-off sequence

1. Immediately initiate **LAND** command
2. Pressing the **LAND** button immediately after **LAUNCH** will abort the take-off and land

UNCOMMANDED FLY AWAY

INDICATION – Aircraft begins moving in one direction, without being commanded to do so

1. Immediately initiate **LAND** command
2. When aircraft begins returning press the **HALT** button
3. Reposition the aircraft, centered over the landing ring
4. Initiate **LAND** command
5. Repeat steps 2-4 as necessary to land the aircraft

UNCOMMANDED ROTATION/SPIN

INDICATION – The aircraft begins to spin rapidly uncommanded

1. Immediately initiate **LAND** command
2. Visually observe that the rotation has ceased, and landing has begun
3. Clear the area and wait for the landing sequence to complete

MAGNETOMETER FAILURE/EMI**INDICATION – Aircraft begins flying in a large circular pattern uncommanded**

1. Immediately initiate **LAND** command, the circular pattern will get larger with time
2. Immediately clear the area and wait for the landing sequence to complete
3. Visually observe the aircraft is landing. The aircraft may or may not land in the ring

ABORT LANDING BELOW 15FT**INDICATION – The LAND button has been pressed and the aircraft has begun descending**

1. Immediately initiate **HALT** command
2. Allow the aircraft time to climb back to **MINIMUM ALTITUDE** to a stabilized hover
3. Reposition the aircraft, centered over the landing ring
4. Initiate **LAND** command
5. Repeat steps 1-4 as necessary to land the aircraft

TETHER LOCKUP**INDICATION – Aircraft is unable to climb to a commanded altitude and tether is not reeling out**

1. Immediately initiate **LAND** command
2. Immediately clear the area and wait for the landing sequence to complete
3. Visually observe that the aircraft is going to land in the ring
4. Use the **ABORT LANDING BELOW 15FT** checklist as needed
5. Repeat steps 2-4 as necessary to land the aircraft

COMMUNICATION FAILURE**INDICATION– User cannot control aircraft and/or data fails to update in the GUI**

1. Unplug and reconnect ethernet cable that goes to the control tablet or computer
2. Close and reopen the control GUI, then attempt to reconnect to the air vehicle
3. If unsuccessful, continue to step 4. Otherwise, resume normal operations
4. Unplug ethernet cable from control tablet or computer, leave cable unplugged
5. Immediately clear the area and wait for the landing sequence to complete
6. Disconnect power if observed that the craft will not land in the ring

MINIMUM ALTITUDE: Minimum altitude is 15 ft (5 m). When the aircraft is launched, it will ascend to minimum altitude and wait for the next command. The system will not descend below minimum altitude, unless the LAND button is pressed.

LAUNCH: When the LAUNCH button is pressed, the aircraft will ascend to minimum altitude and wait for the next command.

HALT: HALT will pause the air vehicle's climb or descent. Above 15 ft, the HALT function will abort the landing and remain at stabilized hover. Below 5 meters, HALT will abort landing and aircraft will climb to 15 ft and await next command.

E-STOP: When activated, will cut all power to the motors of the air vehicle, and it will fall to the ground. Activating E-STOP is a two-step process: Press E-STOP button; a new window will appear. Tap 3 times in the window, to activate E-STOP.

**CAUTION:**

E-STOP WILL CUT POWER TO ALL MOTORS; AIR VEHICLE WILL FALL TO THE GROUND

**WARNING:**

TETHER WILL STILL BE POWERED AFTER E-STOP IS INITIATED. IF TETHER HAS BEEN CUT, TURN OFF POWER BEFORE HANDLING TETHER TO AVOID HIGH VOLTAGE SHOCK

7.0 Troubleshooting

7.1 Craft does not power on*

- Check tether connector and tether for damage
- Check ground power supply, cables, and connections
- Reboot the system

7.2 Will not connect*

- Check ethernet connection
- Ensure ethernet is plugged into the “Internal” port on the Tether Kit

7.3 No video (EO/IR gimbal installed) *

- Ensure the craft and EO/IR gimbal are powered
- Lens cap removed and lens free of debris
- Ensure the system has been powered on for at least 5 minutes
- Ensure you have connected to the craft
- In the Settings/Network Tab of the GUI: Set as in Figure 1.

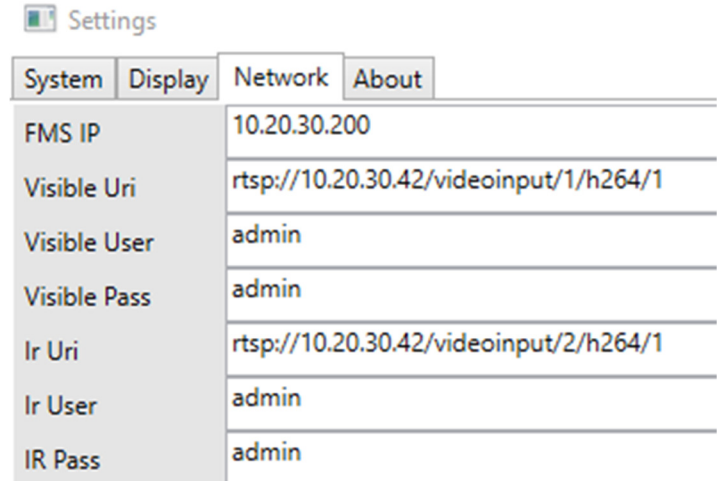


Figure 1

7.4 Craft will not arm*

- Ensure the craft is in the Ready to Arm state
- Open Settings menu and turn on Show Status Msg
- Identify any error messages during arm process
- Reboot the system

7.5 Craft will not launch*

- Check GPS Signal and number of satellites
- Check battery voltage
- Check ethernet connection
- In the GUI check Settings/Display and enable System Status Messages
- Reboot the system

7.6 Failsafe Landings

Pilot actions during failsafe landings:

1. Visually locate and observe the aircraft
2. Confirm that the aircraft is landing
3. FAILSAFE landings cannot be aborted or halted except for Loss of Communication. If comms are reestablished flight can continue as normal
4. Clear the area and wait for the landing sequence to complete
5. Determine cause of failsafe landing and troubleshoot IAW Table below

Troubleshooting Failsafe Landings

FAILSAFE LANDING	INDICATIONS	TROUBLESHOOTING
Loss of Power	TK Power Switch Light off, No Video	<ol style="list-style-type: none">1. Check all power cables connected & secure2. Check input power source (e.g. circuit breaker, generator fuel or oil, etc.)3. Check tether for any cuts, scars or severe kinks
Loss of Communications	Video frozen, Metadata frozen	<ol style="list-style-type: none">1. Check all ethernet cables connected & secure2. Restart GUI on controller3. Check Ethernet cable for damage
Loss of GPS	GPS Icon turns RED	Wait for GPS to acquire more satellites Recommend >10 satellites
Backup Battery Low	B/U Battery Icon turns RED	Swap batteries with a fully charged one
Barometer Failure	Inaccurate altitude readings	Check the tether kit for debris in and around the ground Barometer cover.

If failsafe conditions persist, contact Hoverfly Tech Support

SAFETY LANDING BATTERY

Replace the Battery if any of the following is true:

- Low battery indication on the GUI
- Battery voltage measures $< 24.5\text{v}$



WARNING:

DAMAGED OR PUFFED BATTERIES CAN LEAD TO FIRE OR EVEN EXPLOSION CAUSING PERSONAL INJURY; DO NOT FLY WITH DAMAGED BATTERY



CAUTION:

IF AMBIENT TEMPERATURES ARE BELOW 32 DEG F, PRE-HEAT LIPO SAFETY LANDING BATTERY TO 40F PRIOR TO LAUNCH. LiPo Batteries rapidly lose capacity below 32F. Even though battery voltage is reading above 24.5 V, capacity will be diminished significantly in cold temperatures and Safety Landing Battery (SLB) may fail. If main or tether power is lost, while SLB is compromised, aircraft will lose ALL power and fall to the ground, causing damage or destruction of the aircraft. Above 120F, System may Auto-Land / Self-Protect



Tether Kit Exploded View



Air Vehicle Exploded View

