Lucid

DRONE TECHNOLOGIES

Flight Operations

Training Manual

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Lucid Drone Technologies Inc. 980-498 -1894

Operations Manual Purpose

Lucid Drone Technologies is happy to welcome you to the C1 Cleaning Drone and operations manual! The C1 Drone is a large hexacopter designed to make your cleaning operations more efficient and effective. The C1 Drone is a tool and should be treated as such. The C1 Drone can offer you the ability to evolve from cleaning on the ground… to cleaning from the sky.

The purpose of this operations manual is to educate you on drone operations, the C1 Drone, operational procedures, maintenance, and care procedures. By following this operations manual, you can expect to get the most out of the drone, create seamless workflows, and maintain the maximum working capacity of the drone.

This manual and our subsequent training will transform you into a Lucid Certified Operator. As a pilot, you will hold the ultimate responsibility. To become a pilot, you must first acquire a Part 107 Remote Pilot Certificate. To become a Lucid Certified Pilot (LCP), you must acquire a Federal UAS Certificate and demonstrate an understanding of aerial cleaning operations with the C1 Drone. Our all-inclusive training program provides an in-depth understanding of drone operations, pertinent federal legislation, the C1 Drone, and operational protocols thereof, as well as how to navigate various cleaning scenarios using the drone. All pilots must follow federal, state, and local regulations at all times. Federal law supersedes most local regulations in the United States, and the FAA is the only regulatory agency controlling American skies. Pilots must operate with caution and adhere to this operations manual to avoid operation failure, crash, and catastrophic loss.

It is imperative to understand that, like any technology, drone technology comes with its limitations. In some instances, use of the C1 Drone may be ideal for the circumstances. In other instances, use of the drone must be limited to cautiously functional. There are some situations in which drone cleaning is not a viable solution for the specified job. Understanding the unique circumstances of each job is imperative to using the C1 cleaning drone properly. This Operator's Manual explains the limitations of the C1 cleaning drone so that you can determine whether the drone should be used in any given situation.

This operations manual provides systematic workflows for implementing the use of the C1 cleaning drone. Pilots will learn the nuances of the aircraft, maintenance, and care. Operating any drone entails the ability to understand nuance. Our goal is to simplify the nuances of drone operation to form habits that develop into routines. Through these routines, your operations will become seamless and provide greater results to your business. By following this operations manual, pilots and companies will maximize the return on investment from the C1 Drone. This underscores a theme throughout the Operator's Manual: the C1 Cleaning Drone is a tool with important, yet precise, capabilities.

It is the responsibility of the pilot to ALWAYS operate safely. The number one priority of the pilot must always be safety. As pilot-in-command, you must ensure a safe operation for every

team member involved. It is the pilot's responsibility to ensure a safe flight, and much of this involves understanding the limitations of cleaning with drones.

Do not fly the C1 cleaning drone until you have completed the Lucid Training Program. To activate your warranty and customer service, you must complete the training program provided to you.

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Training & Operations Manual Navigation

This operations manual was developed in conjunction with our training program. As a C1 Drone owner, you will gain exclusive access to the included training portal. The training portal was developed with the help of Drone U. Whether you are just taking flight, or getting your systems right, the training program will transform your team into competent and knowledgeable pilots. Your pilots should know the drone inside and out. They should understand the regulatory environment and how to operate within this environment. The training portal includes all the necessary training to acquire Part 107, teaches you the basics of drones and drone operations, and demonstrates how to operate and maintain the C1 cleaning drone.

If you are reading this manual prior to accessing the training portal, stop right here. **Lucid flight crew recommends that you start with the training portal and use the manual as a resource to augment the training. Begin the learning process by logging into the training portal.**

Training Program & System

The Lucid drone training program was built to bring pilots from zero to hero. The training program will be vital to help pilots to gain their Part 107 certification, learn drone systems, and understand how to properly operate and maintain the C1 Drone.

The Lucid Drone training program, powered by PROPS from Drone U, is built to not only train your pilots but also ensure completion and success. With so many nuanced systems to remember and follow, it is necessary to simplify these systems by creating and maintaining unified routines for pilots.

The training portal can help you to manage pilot training progression. It will empower program managers by organizing all pilot data, training information, and equipment information in one place. The program is vital to the successful implementation of the C1 Drone technology in your business. Your pilots will be operating on the same systems and following the same routines, resulting in more consistent operational success, less downtime, and continuity among all team members.

Training Program Navigation & Onboarding

Begin by opening the training portal. Managers will have initial access and can invite pilots or crew access to the portal to get started.

Log Into Your Portal Here: Lucid.propsflightschool.com

Invite your pilots, have them enter their information and start the program.

Pilot Navigation:

1. Welcome and Explanation Video
2. Legalities and Regulations
3. Part 107 Preparation
    a. Pilots have the option to skip this course by providing their P107 certificate number.
4. Operations Course
    a. Pilots have the option to skip this course by completing a quiz with a score of higher than 80%.
5. Comprehensive Drone Course
6. Lucid C1 Aircraft
7. Aircraft Care and Transportation
8. Operational Protocols
9. Training Procedures and Protocols
10. Operations Planning
11. Operational Scenarios
12. Certification Quiz
13. Extra Option Courses and Flight Practice Guidelines

The operations manual navigation parallels the training program to create a more seamless experience. The manual can also aid in recall while conducting drone operations in the field. Print this operations manual and use it as a reference when taking the training programs.

The training program is built to help pilots to more fully understand drone operations. Pilots will be educated on operational procedures for flight operations. Pilots will then move on to the C1 cleaning drone and the specific operational protocols for the aircraft. By following this order, pilots can become comfortable with drone operations before moving into the C1 Drone. With this navigation path, pilots will gain confidence and learn the habits to conduct drone cleaning operations effectively and safely.

As a part of the training program, you will be given resources to aid fellow pilots in the field. These resources include documentation such as a pre-flight checklist, workflow guide, and more. Your pilots will only gain access to these resources once they reach a training threshold. Once pilots progress to this threshold, they will unlock these resources to use in the field.

We hope you enjoy the training platform. This guide will transform your cleaning crews from zero to hero!

Safety

Safety & Responsibility

The pilot operating the C1 Drone holds the ultimate responsibility during operations. According to FAA regulations, the pilot in command is ultimately responsible for the safety of the operation as well as the crew.

When taking flight with the C1 Drone, pilots should conform to all applicable Federal Regulations as advised under Part 107 of the regulations. Pilots should also adhere to any state or local regulations regarding the limitations of take-off and landing or privacy. It is the responsibility of the pilot and program manager to know these regulations.

The pilot in command will be held responsible for the actions of the crew, manager, and him/herself. The pilot in command should ensure that every operation begins with a safety briefing.

Safety Briefings

The pilot in command is required to conduct a safety briefing prior to every flight. The FAA states that the safety briefing should address the following:

1. Notate area for take-off and landing.
2. Describe area of flight operations.
3. Showcase how pilot and VO will ensure bystanders do not enter take-off and landing area(s).
4. Pilot should notate emergency landing areas.
    a. If something should go wrong, where will the drone be dumped?
    b. Where is a secondary landing location?
    c. Communication protocols to notate an in-flight emergency
        i. I.e., Communicating “Red, Red, Red.”
5. Pilot should notate operational conditions.
    a. Weather
    b. Airspace
    c. KP Index
    d. RFI or EMI (Interference to the radio, i.e., Wi-Fi dense environments)
        i. Operational protocol if communications cease with drone
6. Pilot should notate local point of contact.
7. Pilot should showcase goal and deliverables of flight mission.
8. Pilot should notate operating environment and obstacles.
    a. Pilot should communicate “MOCA,” or Minimum Obstacle Clearance Altitude.
9. Pilot should notate nearest bathroom, hospital, and emergency communication procedures in case of an emergency.
10. Pilot should notate any precautionary measures due to chemical(s) being sprayed.
11. Pilot should notate minimum safe distances from aircraft and identify person(s) responsible for keeping bystanders and crew members clear of the area of operation.

Operating Limitations

Operating the C1 cleaning drone outside of FAA regulations and in a manner other than described in this manual is unsafe and could lead to catastrophic failure. While drones limit liability for cleaning, they can also increase liability if not used in accordance with this operating manual or federal regulations.

C1 Operational Limitations

1. Drone should not be operated within 30' of any person or crew member.
2. Take-off and landing area should be cordoned off with cones, high visibility tape, or other means.
3. Drone should never be operated above people.
4. Lucid recommends that the flight area, in addition to the take-off area, be cordoned off to eliminate foot traffic when possible.
5. Pilot should notify and communicate that drone operations are in progress.
    a. Lucid recommends posting the following sign: “Aerial Cleaning Operations in Progress, Please Stay Clear of the Drone and Pilot.”

Safety Equipment & Recommendations

Lucid recommends that all pilots and crew be easily identifiable during aerial operations. Pilots should be wearing the following personal protective equipment during operations.

1. High Visibility Vest
2. Hardhat
3. Eye Protection

Additional Safety Equipment

1. Microfiber towel and approved cleaner to spray the drone down
2. Purple K Fire Extinguisher in case of battery fire
3. Medical Kit for Emergencies including a trauma kit for lacerations

Additional Recommendations

1. Pilot and VO or pilot assistant should have a hands-free means of communication via radio. Various options are available on Amazon. Pilots may find the BB-talk radios a viable solution, as the radios are waterproof and offer a hands-free method of communication. Find the radios here: https://www.bbtalkin.com/product-page/kite-wind-surf-1
2. Pilot and VO or pilot assistant should identify any potential areas for a hose snag. A hose snag can cause the aircraft to enter a death roll. VO or pilot assistant should know potential hose snag points and avoid these areas as best as possible. VO or pilot assistant should have a plan to ensure hose slack and direct hose **WITHOUT STANDING BELOW THE DRONE.**

C1 Cleaning Drone Components and Specifications

C1 Drone Specifications

The C1 cleaning drone is a large hexacopter with multiple sensor fail safes. It was built to carry hose lines to perform cleaning operations. Due to the specific nature of this drone, the operational protocols may differ from other drones and subsequent operations.

Please note that while these specifications are accurate, the data used was aggregated from the drone flying in pristine flight conditions.

The specifications of this drone are malleable due to the operating conditions. Specific operating conditions will change the operating specifications of the aircraft.

Environmental Conditions that could change operating expectations from the C1:

1. Wind
    a. Higher winds decrease flight times
2. Elevation:
    a. Higher elevations decrease flight times
3. Temperature
    a. Greater temperature extremes affect flight times
4. Humidity and Dew Point
    a. Changes in humidity can change air density, altitude, and impact aircraft performance
5. Payload
    a. Heavier payloads decrease aircraft performance
    b. Lighter payloads increase aircraft performance
6. Batteries
    a. Improper battery care can decrease aircraft performance

Drone Specifications

(Data aggregated from low winds, moderate temperature, and low altitude)

C1 Weight (At Take-off without hose attached):	27 lb.
Flight Time	12-20 minutes
Aircraft Diameter	53"
Aircraft Height	24"
Operating Altitude	Limited to 115'
Operating Radius	Limited to 200'
Batteries	Dual (2x) 6s 16000mah LiPo
Hose Connection	Ball Valve hold up to 1500 psi

C1 Drone Components

Aircraft Frame

The C1 cleaning aircraft is built on a carbon-fiber hexacopter frame. The frame is analogous to a plane's "fuselage," and it should be treated with care. The carbon fiber frame provides a rigid platform to attach the flight controller, motors, ESCs, propellers, and sensors.

The aircraft frame is designed specifically to support the aircraft and all ancillary components.

Pilots should not move, adjust, attach, or remove any part of the aircraft. The aircraft is balanced to ensure that the center of gravity is directly below the flight controller and IMU. If the aircraft becomes unbalanced, it will lead to a catastrophic failure or crash.

The frame is built with three essential parts:

1. Body
2. Arms
3. Landing Gear

Arms

The arms of the C1 cleaning drone house the aircraft's ESCs and provide the mount points for the motors. The ESCs control the speed of the props down to the microsecond. The arms should always be fully elevated and locked into place when preparing for flight. If the arms become unstable, twist, or do not lock into place, **DO NOT FLY**. Over time, and dependent on usage, arm mount screws may need to be tightened to ensure tight fit and proper flight. Vibrations can cause screws to loosen over time, and pilots should always ensure that the arms are fully locked into place without any play.

Landing Gear

Landing gear allows the drone to take off and land safely with proper clearance from the ground. The landing gear is made up of four (4) carbon fiber poles that support the aircraft frame. The landing gear is designed to allow for maximum hose flexibility in flight. With this landing gear design, the hose must be prevented from getting snagged on the landing gear or inhibiting a safe landing.

The landing gear is permanently attached to the aircraft and cannot be removed. Pilots should ensure that screws remain tight. Over time, vibrations can cause screws to loosen.

Batteries

The C1 cleaning drone requires dual batteries for every flight. This battery setup provides necessary redundancy to pilots. In the event of a battery cell error, the aircraft should remain airborne. Battery

care is **VITAL** to continued success with the C1 Drone. This operations manual will cover proper battery care, storage, and charging to ensure that your batteries maintain the maximum life span.

Each battery is a 6s 16000mah with operating voltages between 3.3 - 4.2 volts per cell. Each battery has six (6) cells wired in serial. Battery cell voltages are displayed as an aggregate voltage, rather than a per cell voltage. Each battery operates at a maximum aggregate cell voltage of 25.2 volts. When both batteries are installed, the remote shows an aggregate voltage of both batteries combined. That is, the battery voltage will display as 50.4 voltages to 42 volts. When aggregate battery voltage depletes to 42 volts, pilots must **land immediately**.

There are two (2) sets of wires protruding from the cell pack of each battery. The larger, thicker gauge wires are connected to an EC5 port and provide power to the drone. The blue EC5 port connectors are plugged into the corresponding receiver on the drone. The second set of smaller, thinner wires provides battery information to the flight controller and power the battery indicator/warning lights. These smaller and thinner sets of wires are defined as balance wires. The seven (7) smaller balance wires have a smaller white connection port.

When plugging the batteries into the drone, ensure that the battery port connector is properly aligned with the corresponding port. Ensure that the red wires are plugged into the corresponding port correctly, so the red wires from the battery are matching the red wires on the aircraft. Ensure that the black wires on the battery are plugged into the corresponding port matching the black wires on the aircraft. Crossing these power lines can cause catastrophic failure to the battery and drone.

C1 Drones should never be flown without FULLY CHARGED BATTERIES. Do not fly the C1 Drone on batteries that have been flown previously without being recharged. Do not fly the C1 on partially charged batteries, as cell depletion is accelerated and can lead to catastrophic failure.

Batteries should always be stored in fire-proof bags. Batteries should always be charged on a fire-proof surface. Batteries should never be left unattended while charging. Do not charge batteries while you are sleeping or if a person is not present.

Do not ship batteries via air, ever, per FAA regulations. When traveling via air carrier or plane, do not check your batteries. Batteries must be carried onboard the aircraft. The FAA has set limitations on batteries that can be brought on an aircraft. It is the pilot's responsibility to know and follow these FAA regulations.

Handle batteries with extreme care. Do not puncture the batteries and do not drop the batteries. If a battery is dropped, ensure that the protective shield has not been

damaged or cut. If the battery is indented, do not fly with the battery. Replace it immediately.

Batteries should maintain their shape. If a battery becomes PUFFED, immediately replace the battery, and do not fly with it. Puffed batteries indicate a battery failure.

Motors

The motors on the C1 Drone spin the propellers to generate thrust and lift. The motors are brushless electric motors. The C1 Drone's hexacopter design requires six (6) motors on the aircraft. Motors on the drone are quintessential to sustain flight. These motors are waterproof and will operate in wet weather conditions.

The C1's hexacopter design offers protection and redundancy in-flight by offering six (6) motors. The drone can still sustain flight if one motor fails mid-flight. When one motor fails, the drone will begin spinning aggressively. Pilots can inhibit excessive spin by actuating the yaw command in the opposite direction of the spin. The drone will not stop spinning but can still land.
Aircraft motors should remain clean and free of debris. Prior to any flight, the pilot in command should rotate motors and props. The motors should spin freely and silently. If motors make noise or do not spin freely, you must clear the debris from the motors prior to the flight. Any material can inhibit the motor from spinning, which is why it is **VITAL** to clean the drone and motors after every cleaning flight.

Propellers

The C1 Drone is outfitted with six (6) propellers that spin at up to 10,000 rpm while in flight. The folding propellers offer significant advantages over fixed propellers. These propellers offer additional stability and reduced noise via micro-vibrations sustained in flight.

The propellers should always be stored in a folding position. Prior to any flight, the propellers should be unfolded to create a straight line. Do not allow the propellers to become unfolded by starting the drone motors. Over time, this will cause significant vibrations and cause the aircraft to age faster than it should.

Once the aircraft has been turned on, the propellers should not be touched by any individual. Do not touch the propellers upon landing until the aircraft has been powered down. Never attempt to touch the motors while the propellers are spinning or mid-flight.

Lucid Drone Technologies recommends that you always have a spare set of propellers. Propellers should be replaced after 50 hours of flight. That amounts to approximately 150 - 300 flights, dependent upon operating conditions. Propellers are the most sensitive part of the aircraft. If propellers become unbalanced at any point, the propellers will fail, resulting in catastrophic failure.

If the propellers strike any object, they should be replaced immediately. If the C1 Drone hits a bush, tree branches, or even small vegetation, replace the propellers. Propellers are inexpensive to replace, but the C1 Drone is not.

Never touch the propellers when the drone is powered on. Never approach the propellers or the drone, under any circumstance, when the propellers are in motion.

Spray Nozzle

C1 cleaning drone offers a detachable spray nozzle that connects to the drone. The spray nozzle should only be affixed to the drone prior to a flight. The spray nozzle should not stay affixed to the drone while in storage or transport.

The spray nozzle attaches to the aircraft via a quick connect propeller, located beneath the main frame of the aircraft. The spray nozzle offers multiple tips to empower users for various spraying applications. The primary nozzle tip will provide a flow rate of 6.5 - 7.5 gallons per minute.

Hose Attachment

Lucid Drone Technologies has selected the Banjo Polypropylene Cam & Groove fitting to attach a pump hose to the drone. The fitting is mounted below the drone and plumb to the ground. The fitting offers a ¾" coupling size created to support a ½" hose.

C1 users may need to purchase a male counterpart to attach this fitting/connector to a ½” hose.

Prior to take-off, ensure your hose is properly attached to the aircraft. Failure to do so may cause an in-flight emergency.

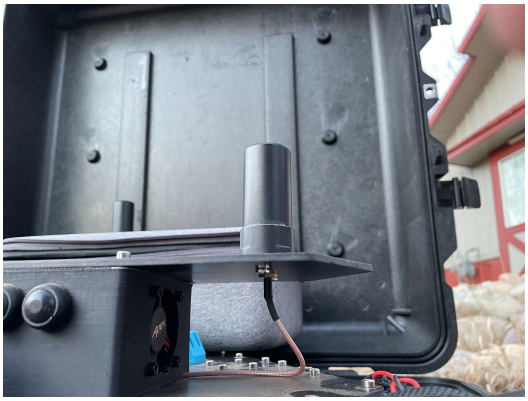
Prior to take-off, ensure the sprayer nozzle is properly attached to the aircraft. Failure to do so may cause the nozzle to act as a projectile and cause damage to nearby persons or objects.

GPS Antennas

The C1 Drone comes with two (2) detachable GPS antennas used to provide heading and direction to the aircraft. The two (2) antennas are small black cylinders that can be found in your remote case. Prior to each flight, install the two (2) antennas on the top of the aircraft. Antennas are affixed to the drone via small ¼" screws. Screw the antennas onto the drone and **hand tighten only. DO NOT OVER-TIGHTEN THE ANTENNAS.**

The antennas must be affixed to the aircraft prior to each flight. Take the antennas off the aircraft after each flight to transport the aircraft.

Prior to take-off, GPS antennas must be attached to the drone.



Remote Controller

The C1 cleaning drone comes with an H16 Remote Controller which the drone pilot will use to control the drone. The remote controller allows the pilot to actuate the aircraft, control obstacle avoidance, view the camera feed, and provide live telemetry from the aircraft.

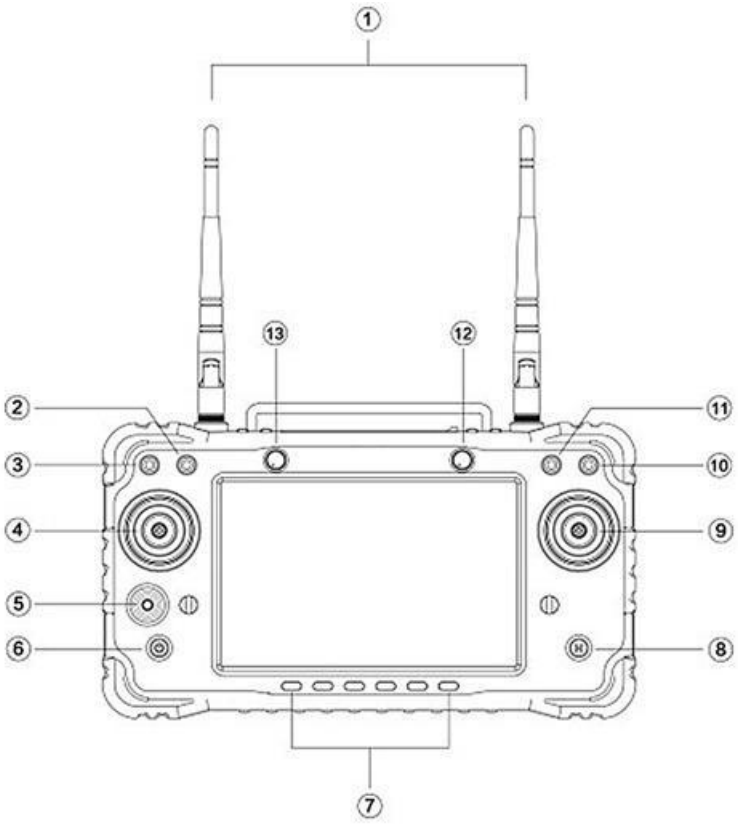
The remote control comes with a built-in tablet displaying flight-necessary information in real time. During the flight, pilots are informed of their altitude, heading, distance, GPS data, camera view, and current battery status.

The remote control will come in a grey case to protect the buttons and sticks. Never store or transport the remote control unless it is in the case. If the control sticks rest against anything, they can be thrown out of balance. The sticks will no longer be at zero, resulting in permanent damage to the remote.

The Controller Case Includes:

1. Remote Controller
2. USB-C Wall Charger
3. USB-C Charging Cords
4. Neck Strap
5. Antenna Covers
6. GPS Antennas (as discussed above)

Remote Control Diagram

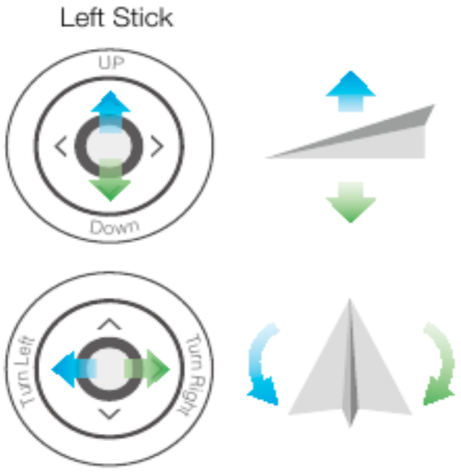


1. Di Pole Antennas
2. Sprayer Control
3. Not in Use
4. Left Joystick (Controls elevation and yaw/rotation)
5. D-Pad for Menu Navigation
6. Power Button
7. Flight Control Modes
    a. ABC Buttons = Loiter or GPS Mode
    b. DEF= Landing mode
8. Aircraft Flashlight
9. Right Joystick (Controls pitch and roll)
10. Obstacle Avoidance Switch
11. Light Activation Switch
12. Aux (Not in use)

Remote Controls Explained

1. Di Pole Antennas
    a. Antennas allow for radio communication between the remote and the aircraft.
    b. In typical operations, the antennas should be unfolded to approximately a 45-degree angle. Each antenna should be twisted toward the outside edge of the remote.
    c. The radio signals do not come from the tip of the antennas; rather, the signals radiate from the facade of the antenna.

2. Sprayer Relay
    a. Upward Toggle Position = Sprayer On
    b. Downward Toggle Position = Sprayer Off
3. Not in Use.
4. Left Joystick (Controls elevation and yaw or rotation)
    a. Pushing the left stick forward (UP) will cause the aircraft to elevate or ascend.
    b. Pushing the left stick backward (Down) will cause the aircraft to descend.
        i. Note: Never fly the aircraft straight down.
    c. Pushing the left stick to the left (Turn Left) will cause the aircraft to rotate horizontally in a counterclockwise direction.
    d. Pushing the left stick to the right (Turn Right) will cause the aircraft to rotate horizontally in a clockwise direction.

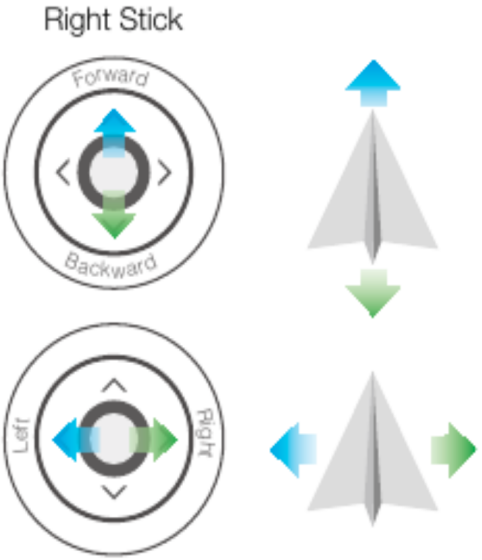


5. Arm / Disarm the Aircraft (Starts and stops motors)
    a. To arm the aircraft, the Pilot will push the left stick down and to the right, holding this until the motors start up. Let go of the stick as soon as the motors begin to spin. To take off, simply push the left stick up to elevate.
6. Power Button
    a. Pressing and holding this button for three (3) seconds will turn on the remote.
    b. Pressing and holding this button while the remote is on will turn off the remote.
7. Flight Control Modes
    a. ABC Buttons = Loiter Mode or GPS Mode
        i. Loiter Mode, or GPS Mode, is the default flight control mode. This control mode assists the pilot to maintain altitude and straight-line flight by utilizing GPS positioning. When the pilot releases the sticks, the aircraft will continue to hover in place.
    b. DEF = Landing mode

i. Landing Mode will cause the aircraft to descend straight down and land. This flight mode should **not be used for regular landing**.
ii. This flight mode will cause the aircraft to descend rapidly **in the case of an emergency.**
iii. The pilot can still “nudge” the drone by using pitch and roll while the aircraft is landing.

8. Aircraft Flashlight
    a. Pressing this button will turn the aircraft’s flashlight On and Off.

9. Right Joystick (Controls Pitch & Roll)
    a. The right joystick controls all lateral motions of the aircraft.
    b. Pushing the joystick forward (Forward) will cause the drone to move forward.
    c. Pushing the joystick backward (Backward) will cause the drone to move backward.
    d. Pushing the joystick to the left (Left) will cause a lateral motion to the left.
    e. Rolling the aircraft to the right (Right) will cause a lateral motion to the right.



10. Obstacle Avoidance Switch
    a. This toggle controls the obstacle avoidance system, which limits the drone’s motion if an obstacle is detected. When the obstacle avoidance system is turned on, the drone will prevent the pilot from flying the aircraft into an object **that is in front of the drone.**

Obstacle avoidance only works in front of the aircraft. Objects to the side of or behind the drone cannot be detected. Obstacle avoidance should also be a last resort for the pilot. While the obstacle avoidance system is a great aid, it should not be relied upon. Objects that reflect light may cause obstacle avoidance to fail.

11. Light Activation Switch
    a. Move the switch forward to activate the onboard light. The light faces forward to the aircraft’s orientation. The light should illuminate any area within 5-20 feet of the aircraft.

Avoid Disarming the drone when in flight.

12. Aux (Not in use)
13. Aux (Not in use)

Batteries & Charging

Battery Management

The most common drone crashes occur due to a **lack of battery management.** Lack of battery management can look like:

1. Flying the C1 Drone without fully charged batteries.
2. Failure to check the battery voltage level in flight.
3. Failure to calculate the environmental conditions for the flight.
4. Pushing the battery beyond its operating voltage.
5. Failure to deep cycle batteries every 10 flights.
6. Failure to store batteries properly.
7. Failure to protect batteries from drops/damage.

Pilots can avoid most drone-related problems by caring for batteries and creating operating systems to ensure safe flights. With simple habits, pilots can avoid most common pitfalls and problems.

The Lucid C1 Drone should only be flown with FULLY CHARGED BATTERIES.

The Lucid C1 Drone requires Dual (2) 6S batteries to take flight.

Flight times are not guaranteed. Flight times are affected by environmental conditions including weather, temperature, wind, and humidity.

Pilots must monitor battery status throughout the flight. Immediate landing must be initiated when the aircraft reaches 42 volts.

As per FAA guidelines, the pilot is ultimately responsible for the safety of the flight, operation, and crew. As such, the pilot should always ensure that **both batteries are fully charged prior to the flight.** Pilots should not fly the C1 Drone with **partially charged batteries.**

Typical Flight Times

Flight time on the C1 Drone can vary due to payload, hose size, and environmental factors.

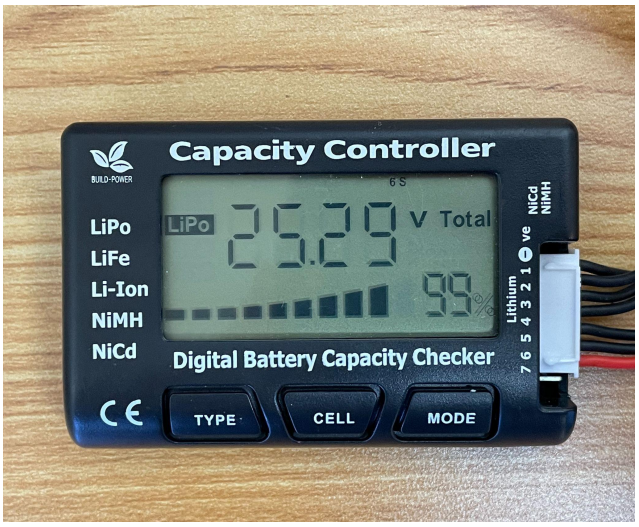
Flight times for the C1 Drone are as follows:

8-16 minutes in a hover.

How to Confirm Batteries are Fully Charged

1. Battery Voltage Gauge
    a. To display the battery voltage, plug the Battery Balance cable into the Battery Voltage indicator.
        i. To plug the battery balance cable into the voltage indicator, ensure that the red wire is closest to the bottom of the battery indicator. Balance plug plastic guides will be on top of the balance plug facing the pilot when plugging it in.
    b. A fully charged battery will display 25 to 25.29 volts.

2. Drone Voltage Display
    a. Plug the batteries into the drone, then turn on the remote. Enter the QGround Control application on the remote and press the battery icon located on top of the app interface to display the aggregate battery voltage.
    b. A fully charged battery will display over 50 volts (Aggregate of both batteries combined).



Note that the C1 Drone will not take off if the battery voltage is below 42 volts.

Checking Battery Status & Remaining Flight Time

To check battery status or remaining flight time, the pilot must understand how to gauge the remaining flight time.

1. Battery Voltage will fluctuate between 50 - 42 volts
    a. Full Battery = 50 volts
    b. Empty Battery = 42 volts

Drone batteries are typically built as Lithium Polymer batteries and have an exponential depletion. These batteries are typically functional at between 100 to 30% capacity. Below a particular percentage or voltage level, batteries will lose power exponentially, which can result in a crash.

Pilots must keep an eye on battery voltage throughout the flight to monitor the available remaining flight time.

Battery Warning Light

The Lucid C1 Drone includes a battery status light. This battery warning light begins flashing when the battery voltage has depleted to 42 volts.

The battery warning light is powered by the balance wires from the drone batteries. The depleted voltage level will power the battery lights, which will begin flashing as the batteries lose power.

When the battery warning lights flash, *land the aircraft as soon as possible to avoid a crash.*

Continuing to fly when the battery warning light is flashing can lead to permanent damage to the aircraft and the batteries.

When installing the batteries prior to flight, ensure that main power cables are plugged into the corresponding connector with the correct orientation (i.e., red wires connect to corresponding red wires). Do not cross the wires, as doing so will create a short circuit and cause damage to the batteries and aircraft.

Battery Fail Safe

After the battery warning light has begun to flash, the pilot has approximately 2 minutes to land. Following these 2 minutes, the battery fail safe will trigger and the auto-landing procedure will begin.

When the battery fail safe is activated, the drone will begin to descend, commencing the auto-landing feature.

In this case, the pilot will not have control over the altitude of the drone. However, the pilot can nudge the aircraft with the roll inputs and pitch inputs. This way, the pilot can control where the aircraft lands.

Battery Safety Protocols

Experienced drone pilots understand that the most dangerous aspect of the aircraft is the battery. The batteries are the most sensitive part of the aircraft hardware.

If you have experience using power tools, the batteries built for those tools are much more robust and safer to use. LIPO Batteries, on the other hand, must be treated with extreme care.

Battery Storage Procedures

When batteries are not in use, they should be stored as follows:

1. Store in LIPO safe bags to prevent fires.
2. Store in temperatures between 40 and 80 degrees Fahrenheit.
3. Never leave in direct sunlight.

Battery Storage During Operations:

1. Keep out of direct sunlight.
2. Keep in a cool place; do not store in a hot vehicle.

Storing batteries while they are fully charged can damage the battery.

Never store drone batteries fully charged. Never leave batteries fully charged and in storage for longer than 10 days.

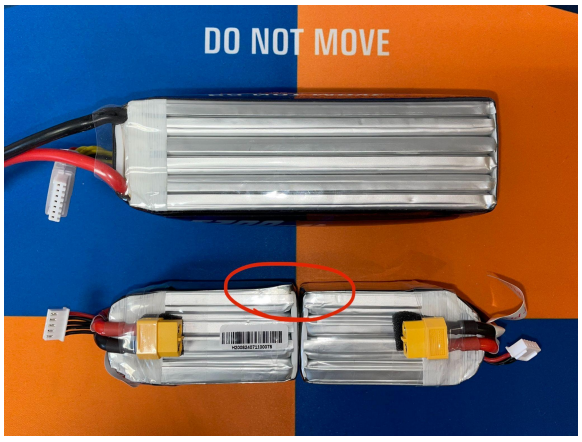
Battery Damage

Damage to battery cells must be taken extremely seriously. Dropping a battery from even a few feet can cause an indentation in the battery. If the battery casing becomes dented, the battery should be recycled and discarded.

Example of Swollen Batteries

Battery on top: swollen or puffy from improper storage.

Batteries on bottom illustrate battery cell damage



Smoke

If the battery is emitting even a small amount of white smoke, immediately evacuate the area and follow local fire protocols. The smoke emanating from these batteries is extremely toxic and can cause choking and death.

Do attempt to handle the battery if it is smoking. While all patrons should evacuate the area, you can spray the battery with a fire extinguisher. The extinguisher must be a "purple K" rated extinguisher.

Fire

If a battery catches fire, follow internal emergency procedures. It is not advised to fight the fire with water or traditional methods of fire retardation. ***Only a purple k fire extinguisher will put out a LiPo fire.***

The fire will emit toxic gas as it is emitting smoke, so the area should be cleared of personnel immediately.

Battery Disposal

When batteries reach the end of their life cycle, it is the pilot's responsibility to properly dispose of the batteries. Failure to do so can result in additional liability. If a battery shows signs of damage or distress, discharge the battery, and recycle the batteries at the nearest battery recycling center (i.e., Batteries Plus).

Batteries must be discharged before recycling. Fill a non-metallic bowl or bucket with water and salt. Ensure that there is enough water to fully submerge the batteries. Add roughly ¼ cup of salt for every liter of water. The battery should be left submerged for a minimum of 24 hours. Do not use a metallic bucket; some plastics can be broken down, as well. We recommend a glass or porcelain bowl for discharging batteries.

How to Discharge Batteries for Recycling (Recap)

1. Fill glass or porcelain bowl/bucket with water.
2. Add ¼ cup salt for every liter of water.
3. Fully submerge batteries in water.
4. Leave batteries submerged in water for 24 hours.
5. Remove batteries from water, allow to dry, and transport to nearest battery recycler.

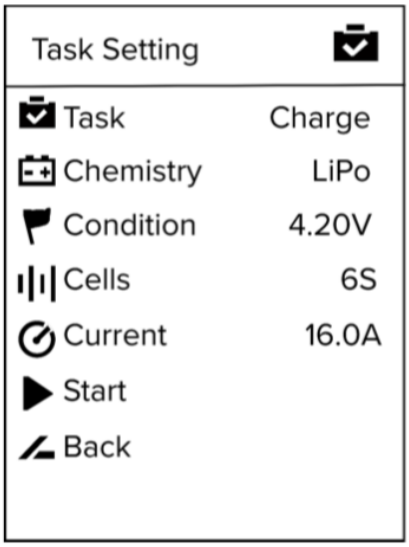
Battery Charger

Each Lucid C1 Drone comes with a dual battery charger housed in a case. The charging case contains one (1) dual battery charger, two (2) battery charging cables, and two (2) balance cables. The battery charger will allow users to charge two batteries at once when plugged into a standard 110 outlet. Typically, users must plug the provided cables into the charger prior to use.

How to Charge Batteries

Lucid charging cases come pre-programmed, so the user does not need to alter settings for initial charging. To charge the batteries, follow the steps provided below:

1. Plug in power connectors from charger to batteries.
2. Plug in balance cable from charger to batteries (Use notches to align plug).
3. After plugging batteries into charger, charger should display a 6-cell battery with operating voltages from 2.5 volts to 4.2 volts (per cell).
4. Press circle button once to bring up charging menu.
5. Ensure charging screen matches image shown to right.
6. Press circle button again to “Start” charging.
7. The screen will turn **red**, and batteries will begin charging.
    a. Typical full charge time will vary but can be expected to take around 40-60 minutes.
8. Once the batteries are almost finished charging, the screen will turn **green**. This means the charger has entered the balancing phase to ensure the battery is fully charged.
9. Once the balance phase is complete, the charger will beep twice, and the screen will turn **blue**.
10. To finish charging, press circle button to end balance cycle and unplug batteries.



How to Discharge Batteries

Batteries must be discharged to be stored properly. Typically, battery discharging is used when batteries need to be stored for longer than 10 days, batteries need to be deep cycled, or battery cells have become unbalanced (i.e., cell deviation of .5 volts or greater).
To discharge the batteries, follow the steps provided below:

1. Follow steps 1-3 as stated above in the “How to Charge Batteries” section.
2. Press circle button to navigate to options screen.
3. Press upper triangle button to navigate to task menu (at the top).
4. Select “Discharge” option to deep-cycle batteries or balance them.
5. Select “Storage” option if you are storing the batteries for longer than 10 days.

6. After selecting “Correction” option, press lower triangle button to navigate back to start icon.
7. Select “Start” with circle button to begin discharge or storage cycle.
8. Discharging the battery will take several hours to complete.

Charging Safety

Ensure never to cross the wires for charging. Crossing the wires will cause the battery to short circuit, resulting in serious harm to the user and destruction of the battery. When charging batteries, adhere to the following guidelines:

1. Charge batteries in a climate-controlled environment, near room temperature (approximately 70 degrees).
2. Never charge hot batteries. After a flight, batteries are typically warm to the touch. Batteries should be cooled down before charging. Failure to do so will result in decreased battery lifespan.
3. Do not unplug the battery charger while the batteries are plugged into the charger. Always disconnect batteries from the charger prior to unplugging the charger from the wall.
4. Always charge batteries on a fire-proof surface.
5. Keep batteries in fire-resistant case while transporting, storing, or charging the batteries.
6. Keep a purple k fire extinguisher within close proximity of the charger in case of fire.

Transporting the Drone

Drone Transportation Case

The Lucid C1 Drone case is approximately 24 cubic inches in volume. The case is waterproof. Lucid recommends placing the drone in the case while traveling to and from a job site. We recommend a secure location for storing the drone indoors.

Note: When transporting the Lucid C1 Drone in the case, secure the case so that it cannot move around. For example, do not put the case in the back of a trailer and allow it to bounce around. Excessive vibrations will cause problems with the drone.

Drone Transportation Wagon (If Purchased)

The drone transportation wagon should be loaded with all the accessories needed at the job site. This includes:

1. Batteries
2. Battery Charger
3. Remote Controller
4. Cones, Tape, High Visibility Vest, Protective Equipment

Customer Repair Kit

The customer repair kit is offered to clients to provide tools to make on-the-job adjustments easier. Lucid has also provided additional propellers and accessories to aid in the maintenance of the aircraft.

Items Included in Customer Repair Kit (If purchased)

1. 1.5 mm Hex Key
2. 2 mm Hex Key
3. 2.5 mm Hex Key (Most uses)
4. Loctite Screw Adhesive
5. 3 m Adhesive Mountain Pads (10)
6. Level
7. M3 x 8 mm screws (10)
8. Spare CW Propeller
9. Spare CCW Propeller

Personnel

Lucid Certified Pilot (LCP or RPIC)

The Lucid Certified Pilot (LCP) or Remote Pilot in Command (RPIC) is responsible for the safety of any given operation. This person is ultimately responsible for all aspects of the operation. Lucid recommends that the LCP perform the following:

1. Familiarize themselves with this Operators Manual.
2. Refrain from deviating from the manual unless necessary to ensure the safety of the operation and the personnel.
3. If the LCP encounters a problem not addressed in the manual, suspend operations and contact the Lucid support team.
4. The LCP should always use his/her judgment to determine whether a safe operation is plausible.

Pre-Flight Lucid Certified Pilot Operations

It is the responsibility of the LCP to complete the required pre-flight procedures and checklist **PRIOR** to every flight. If the LCP is unable to complete the pre-flight procedures, it is the responsibility of the LCP to ensure that the drone is used safely. This drone is an industrial tool and is not intended for recreational use.

Pilot Assistant / Visual Observer (PA or VO)

A Pilot Assistant (PA) or Visual Observer (VO) is a crew member that aids the pilot before, during, and after the flight. Lucid recommends using a PA for every flight. The PA will help the pilot in command to determine potential obstacles in the flight path, monitor the operations area, keep pedestrians clear of the operations area, and help the pilot to notate proximity to objects. The PA will also be responsible for ensuring that the hose does not snag on obstacles.

The FAA requires UAS pilots to always be able to “see and avoid” any potential obstacles or other aircraft. A PA or VO is necessary for all flights to fulfill this requirement. In addition, the PA will aid the pilot in understanding the depth perception of the drone’s true position in space.

Pre-Flight Pilot Assistant Operations

The PA is responsible for assisting the RPIC or LCP with completing the required pre-flight procedures. The PA also aids the pilot in the setup of the take-off and landing area, as well as the operational area, and aids in pump/hose operation. The PA is further tasked to lay out the hose to allow for maximum flexibility in flight. If the PA observes any deviation from the pre-flight checklist, it is this person’s responsibility to notify the LCP. The PA should also notate any potential hazards, notate Minimum

Obstacle Clearance Altitude, and double-check the operating environment/airspace for potential last-minute Temporary Flight Restrictions (TFRs).

During Flight Operations

The primary responsibility of the PA is to support the LCP by monitoring the drone and hose during the flight. The PA is responsible for constantly surveying the operating area for obstructions, hazards, bystanders, inclement weather, other aircraft, and wildlife.

Pilots may face excited onlookers asking repetitive questions. The PA is responsible for keeping the Pilot clear of distractions and communicating to onlookers that any questions will be answered upon completion of the flight. Every minute counts.

The PA is also responsible for ensuring that the hose does not snag on any objects during the flight. The PA will be responsible for moving the hose to ensure that it does not get stuck on bushes, trees, gutters, or other foreign objects that may inhibit flight safety.

The pilot assistant should never stand directly beneath the drone. The PA should maintain a safe distance from the aircraft while it is in flight.

Crew

Frequently, large-scale operations may require additional crew members. Collectively, the LCP, PA, and any additional crew members are referred to as the “Crew.”

If the operation dictates a need for additional crew members, set up standard forms of communication to ensure effective communication while in flight. Crew members should be briefed prior to the operation. Crew members should be aware of their roles, responsibilities, and hierarchy in the operation.

Pre-Flight Checklist & Operations

Following the pre-flight checklist is mandatory prior to the operation of the C1 aircraft. Pre-flight checks usually begin well before the operation starts. From checking an operation's location and airspace to ensuring proper preparation of the entire aircraft, pre-flight checks end the moment before take-off to ensure a safe operation. If the pre-flight checklist cannot be completed, it is the ultimate responsibility of the LCP or pilot in command to determine whether a drone operation can be completed safely.

Weather & Environmental Factors

For any drone operation, safe weather conditions are vital for a safe flight. When conducting flight planning for any operation, pilots must check the predicted weather conditions for the date of the operation to ensure a safe flying environment. The pilot will check the weather again just prior to the operation, during the pre-flight period.

Lucid recommends checking the weather at the following points in an operation:

1. During flight planning
2. The day before the operation
3. Just before take-off during operations

If the recommended weather conditions cannot be met, it is the ultimate responsibility of the LCP to determine whether a safe flight is possible and whether the flight should be terminated.

Wind

Lucid C1 Drone should not be flown in strong winds exceeding 15 mph. High wind speeds can affect the safety and stability of the aircraft. Additionally, winds can cause significant drift when the drone is spraying chemicals or water. This can lead to improper coverage and overspray of unintended surfaces. The LCP and PA are responsible for checking the following wind speeds prior to flight:

1. General forecast wind speeds
2. Wind speed at spray elevation
    a. Using ryancarrolton.com, pilots can determine winds at various altitudes, as altitude can affect wind speed

Advanced Pilots can use an anemometer to determine the wind speeds at the operation location. A consumer drone allows a pilot to fly to a given altitude, change the flight mode to altitude mode, and let the drone drift. The maximum drift speed will showcase current wind speeds. If flying in urban environments, be aware that buildings may cause pockets of wind that can impede the flight operation.

Fog

The Lucid C1 Drone should not be flown in the presence of **fog**. Fog creates numerous visibility issues and creates an unsafe flying environment. Drone pilots should maintain a 500' distance below a cloud or a 2000' lateral distance from clouds to remain compliant with FAA regulations.
In addition, if the temperature/dew point spread is within 5 degrees, the pilot should not fly. When the air temperature is 70 degrees Fahrenheit, and the dew point is 65 degrees (or a 5-degree spread), moisture will build up on the bottom of the propellers. This decreases the available thrust, and the aircraft will compensate by over-rotating the propellers. Do not fly the drone in these conditions, as this could cause damage to the batteries and, in extreme cases, result in catastrophic failure.

Rain

The Lucid C1 Drone is not fully waterproof. While pilots can fly in the rain, two conditions must be met:

1. The regulatory condition requiring at least 3 miles of visibility to fly.
2. The rain is a light mist or there is only very light precipitation.

If it begins to rain mid-flight, it is the responsibility of the LCP to determine whether the flight should be terminated.

KP Index

The KP index is a measurement of the solar radiation penetrating the earth's electromagnetic field. The KP index is indicative of the overall interference that the GPS will face. If the KP index is above 5, do not fly the C1 aircraft.

Civil Twilight

Flights occurring 30 minutes prior to sunrise or 30 minutes after sunset are allowed if the drone and pilot can meet regulatory conditions. If flying the drone in this time frame, pilots must mount a strobe to the aircraft. The strobe light must be positioned on top of the aircraft and be visible at least 3 miles away. To be eligible to fly in this time frame, pilots must take the 107 Recency course on the FAA website in compliance with federal regulations.

Obstructions

When surveying a potential job site, scan the area for potential obstructions that could inhibit the GPS connection. The Lucid C1 Drone requires a stable GPS connection to function properly. Ensure that the drone is flying in an area free of overhead obstructions and with a clear view of the sky to operate. Potential problems may arise with trees, overhangs, tall buildings, or other obstructions near the operation site. Pilots and PAs should notate any magnetic objects, as these objects can interfere with the GPS.

Take-off & Landing Area

Lucid recommends that the take-off and landing areas be determined during the flight planning process. On the day of the operation, the LCP should confirm that the take-off and landing areas are clear of objects to ensure a safe operation. Typically, if issues present themselves, they will occur during the take-off and landing portions of the flight. The take-off and landing areas should have the following:

1. 20' clearance in all directions.
2. Level surface area for landing.
3. Cones to designate the area.
4. At times, tape may be needed to cordon off the area.

Flight Planning

Before the flight, the LCP should determine the flight path of the aircraft for the operation. Typically, flight planning will occur prior to the operation. During the flight planning period, the LCP should determine:

1. Whether the airspace is clear, or file for airspace authorization
2. Weather & KP Index
3. Operations Area
4. Take-off Area
5. Flight Path
6. Notate Obstacles or Obstructions

Crew Preparation

Once the LCP has determined the flight path, the LCP must communicate this plan to the PA and all relevant crew members. The LCP must also instruct the crew as to their roles, responsibilities, and hierarchy in the operation to ensure a safe flight. Finally, the LCP must communicate all aspects of the flight and allows the crew members to ask any questions relevant to the operation. During crew preparation, all crew members should outfit themselves with all the necessary PPE and take their assigned positions.

FAA regulations require a pre-flight safety briefing to inform all crew members of potential hazards and communicate a plan to keep civilians clear of the operating environment.

Drone Setup

Upon completion of the pre-flight safety briefing, operations setup and drone setup may begin. Complete the following steps to ensure a safe operation:

1. Set up take-off and landing areas.
2. Set drone in take-off position.
3. Lift and lock arms into place.
4. Remove propeller guards and straighten propellers.
5. Screw GPS antennas on top of aircraft.
6. Connect hose to connector underneath drone frame.
7. Connect sprayer nozzle to drone using quick connect.
    a. Ensure that you hear a click when connecting the nozzle to ensure the sprayer is attached.
    b. You may pull gently on the sprayer nozzle to confirm that it is fully sealed.
8. Place both batteries in respective positions and strap down batteries.

Drone Hardware Checklist

Once drone setup is complete, check for damage to any integral part of the drone. Damage could have occurred during transportation, during a previous flight, in storage, or from a crew member fiddling with the drone. The LCP holds the ultimate responsibility to ensure that a hardware check has been completed prior to the flight operation.

Pilots should check the following areas for potential issues prior to the flight:

1. ***Propellers***: Propellers should not be chipped, cracked, or bent. This will cause an unstable flight and result in the potential for catastrophic loss. There should not be excess debris or material on the propellers. If the propellers become unbalanced, they will fail mid-flight. As noted in our training course, propellers are the most commonly replaced part of any drone. Follow the maintenance schedule for instructions on propeller replacement. If the propellers hit a tree, bush, or other objects, they should be replaced immediately.
2. ***Motors***: Motors should be level and spin freely upon testing. The crew should confirm that the motors are level and spin freely without making any noise. The motors should also be free of any debris.
3. ***Screws***: Inspect the drone for loose or missing screws. Any loose screws should be tightened.
4. ***Landing Gear***: Inspect the landing gear for damage or loose screws. Confirm that the landing gear is not bent, dented, or cracked.
5. ***Hose Mount***: Ensure that the hose is properly aligned underneath the drone. The hose should be attached securely and laid out to ensure an effective and safe operation.

Connecting the Drone

Once the take-off area has been set up, the drone hardware has been checked, and safety briefing has been completed, the LCP is ready for the final stages of prep prior to take-off. At this point, you are ready to conduct the operation. Follow the steps provided below to connect the drone and prepare for take-off:

1. Connect battery plugs to aircraft plugs.
    a. Connect the power cables and the balance cables.
2. Turn on remote controller by pressing power button once, then pressing and holding.
3. Unlock tablet by swiping up on screen.
4. Open QGroundControl application on controller.
5. At top left of screen, find “Q” icon and press it.
6. Click “Application Settings.”
7. Click “Comm Links.”
8. Select communication channel, then click “Disconnect.”
    a. This takes approximately 10-20 seconds to complete.
    b. Click communication channel again.
    c. Click “Connect.”
9. Click paper airplane icon at top left of screen to return to home screen.
10. Wait for drone to finish downloading parameters.
11. Ensure drone has full GPS connection. Screen shows message “RTK Fixed” if GPS connection is full.
    a. If the drone takes more than 5 minutes to show the “RTK Fixed” message, consider moving the take-off location for better GPS reception.

The pilot must disconnect and reconnect the communication port before every flight. Automatic connections can cause application display issues and lead to delayed telemetry.

In-Flight

READ THIS ENTIRE SECTION PRIOR TO FLYING THE DRONE.

FLIGHT FAIL-SAFES

The Lucid C1 Drone offers multiple flight fail-safes to remind the pilot of potential issues. The fail-safes were programmed into the drone to minimize potential dangers while flying.

Radio Fail-safe

Radio fail-safes were built into the C1 Drone programming to aid the pilot in the event of a loss of remote-control connection or power loss of the remote. If the remote control becomes disconnected or the battery dies, the Lucid C1 Drone will hover for 5 seconds, then initiate an automatic landing procedure.

Operational Geofence

The C1 Drone has a pre-programmed altitude limit of 115’ and a lateral limitation of 200'. The cylindrical geofence creates a 200' radius from the initial take-off position. The purpose of this geofence is to prevent the pilot from flying beyond the range of the attached hose. If the pilot flies beyond the geofence boundary, the drone automatically switches the flight mode to “brake,” and movement of the drone becomes restricted. The pilot must switch the flight mode to “loiter” to regain control of the drone.

It is important to note that pilots can bypass the limitations of the drone. Pilots should only bypass the drone limitations when the operation requires a higher altitude or longer distance to fly.

Obstructions & Obstacle Avoidance

As stated previously, the LCP is ultimately responsible for the safety of the operation. The pilot may use discretion when operating the C1 Drone and may determine when to use obstacle avoidance on the aircraft.

Obstacle Avoidance

The Lucid C1 Drone is equipped with forward-facing obstacle avoidance. This radar-based system operates within a 45-degree field of view from the front of the drone. When activated on the remote, the obstacle avoidance system provides a 15' buffer from any obstacle in front of the drone.

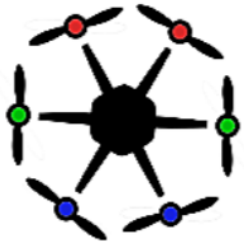
To activate obstacle avoidance when taking flight, ensure that the obstacle avoidance toggle is depressed forward. Prior to cleaning operations on a building, activate the toggle to engage obstacle avoidance.

Obstacle avoidance is only available for forward-facing objects. Maintain a safe flight distance or buffer of at least 20' between the drone and other obstacles, including side-facing and rear-facing objects.

Pilots should always maintain a 9' physical distance from any obstacle, regardless of the operation.

Flight Orientation

During flight operations, the orientation of the Lucid C1 Drone should match the pilot's orientation. This is recommended to avoid inadvertent flight controls. Lateral motions on the controller are inverted when the drone is facing the pilot. The Lucid C1 Drone was designed to easily discern drone orientation.



There are two (2) red lights equipped below the motors at the front of the Lucid C1 Drone, as well as two (2) blue lights equipped below the back-facing motors. The pilot should always be looking at the back of the drone when flying, meaning that they will see the blue lights for most of the flight. Drone orientation can also be discerned by looking for the sprayer nozzle, which is fitted to the front of the aircraft. Pilots can add reflective red tape to the front arms of the drone to make orientation easier to discern. It is recommended not to add too much tape, so as not to throw off the weight and balance of the drone.

Take-off Protocols & Rules of Take-off

One of the most dangerous aspects of drone flight centers around take-off and landing. Many liabilities and risks can be mitigated by following the same workflow every time you fly the C1 Drone. Pilots can create habits by practicing the rules of take-off to further mitigate liability.
The pilot and crew should stay clear of the drone upon take-off. Lucid recommends staying 20' clear of the drone upon take-off. Prior to take-off, follow the hardware checklist and pre-flight checklist. The LCP should also confirm that all participants are clear of the take-off area and are wearing the proper safety equipment.

1. Ensure all pre-flight checks are complete.
2. Ensure all hardware checks are complete.
3. Once remote has required "RTK Fix" message, it is time to take off!
4. Articulate Left stick down and to the right in order to Arm Drones, let go when motors start spinning.
5. Allow propellers and motors to spin
6. Push left stick, or elevation stick, up to about 75% to take off.

7. Take off and move up and away from take-off position.
8. Allow drone to hover for a few seconds; make sure drone is not “toilet bowling.”
    a. Toilet bowling indicates a GPS error; land immediately if this occurs.
9. Conduct control sweep to ensure remote and drone are responding normally.
10. Conduct battery test.

Rules of Take-off

Every time the C1 Drone is flown, the pilot should follow the rules of take-off to avoid potential errors during the flight. Following the rules of take-off creates habits with the pilot that will support safety-enhancing routines. These routines will become automatic and help you systematically eliminate liability in flying the drone.

The rules of take-off include:

1. Take off facing into the wind.
2. Drone and pilot should have same orientation.
3. On take-off, move up 10’ and out 10’.
4. Conduct control sweep and battery test.

The control sweep is a quick test of the drone and remote. During the control sweep, the pilot moves the roll stick to the right, moving the drone a few feet, then to the left to return to the original position. Next, the pilot pitches the drone forward a few feet, then pitches the drone back to the original position. The control sweep ensures that the remote and drone are communicating properly, without any latency. If the drone lags during this test, you could be flying in a dense Wi-Fi environment. A dense Wi-Fi environment subjects the drone to significant radio interference. If the pilot notices any latency from inputting the controls to control execution, they should land the drone immediately.

Battery tests are the ultimate indicator of a safe flight. This is the only way to determine whether your batteries are safe to fly. The battery test also accounts for all environmental factors that impact the flight. Battery percentage accounts for elevation, temperature, relative humidity, wind, and other factors.

The pilot must conduct a battery test, as stated in the third rule of take-off. To conduct a battery test, push the elevation stick in the upwards direction for approximately 5 seconds. If the aggregate battery voltage drops below 44 volts, land immediately. For other consumer drones, look to see whether the battery cell voltage drops below 3.6 volts per cell.

The battery test is the ultimate indicator of a safe flight. It is analogous to an “engine run-up test” on a fixed-wing aircraft.

Flying with Hose Attached

Flying the Lucid C1 Drone with the hose attached will feel different for the pilot from flying the drone without the hose. There will be a noticeable difference in the way that the drone handles. Agility will be greatly reduced to maintain the stability of the drone.

The pilot will notice that the C1 Drone is more sluggish with the hose attached due to the increased weight and payload of the system. The pilot must constantly account for any drag caused by the hose when flying the drone ("hose drag"), especially when flying away from the pump or anchor point. Lucid recommends that the pilot lay out the hose prior to take-off to ensure the optimum amount of slack on the hose.

If the drone seems appears to be tilted or is working hard to maintain its position without input, this could be due to excess dragging of the hose on the ground. The pilot assistant should constantly check the hose to allow for enough slack in the hose line. This helps to prevent the drone from working too hard and using too much battery power. The drone will have drastically reduced flight times if hose management is not executed properly throughout the flight.

Pilots and pilot assistants should constantly monitor the hose to ensure that the hose does not get snagged on any objects or obstacles. If the hose becomes snagged on an object, the pilot must input commands to release tension on the hose. Typically, the pilot will move the drone back to its prior position to prevent increased tension on the hose and drone.

The pilot and pilot assistant should attempt to lay out the hose to match the spraying/rinsing flight pattern of choice. The drone should not be dragging the hose line on the ground.

Landing Protocols & Rules of Landing

To land the drone, the pilot either returns to the take-off area or lands in another predetermined landing zone. Upon entering the landing zone, allow the drone to stop and hover in a fixed location.

The pilot then commands the drone to descend as slowly and consistently as possible to land the aircraft. The pilot may face increased "prop wash" when landing the drone and should focus on small and consistent remote-control inputs to land the drone.

Landing the drone is the ONLY time that the pilot should fly the drone straight downwards. The pilot should always descend the aircraft in some sort of pattern to avoid flying straight downwards.

When landing, ensure that the drone is free of obstructions and other obstacles. The pilot assistant should wrangle the hose to avoid snags while the drone is landing. Once the drone has landed, it must be disarmed.

Protocol for Landing:

1. Approach designated landing zone, keeping drone's orientation identical to pilot's orientation.
2. Begin descending aircraft by lowering elevation stick (left stick on the controller).
    a. This should be done as slowly and consistently as possible.
3. When flying with hose attached to drone, pilot may need to roll aircraft back and forth to lay out hose to inhibit prop strike on landing.
4. As drone approaches ground (<5' altitude), ensure hose is not bunched up beneath drone.
5. As drone touches down, and once it has touched down, hold elevation stick (left stick) all the way down.
6. Upon touchdown, hold the left stick down, straight down, and the motors will stop spinning.
7. After drone has landed, unplug batteries from aircraft.

Recap: How to Arm The drone for take off.

1. All of your Pre-Flight Checklist is Complete, Area is safe for takeoff.
2. Batteries Plugged in, arms unfolded, props unfolded.
3. Once you have RTK Fixed position
4. Articulate Left Stick down, then to the right to arm the drone
5. Let go of the left stick once the motors start
6. Articulate left stick up to take off, and complete rules of takeoff.

C1 Spraying/Rinsing Flight Patterns

Lucid recommends four separate flight patterns for utilizing the C1 Drone. These four patterns are broken down into two distinct categories.

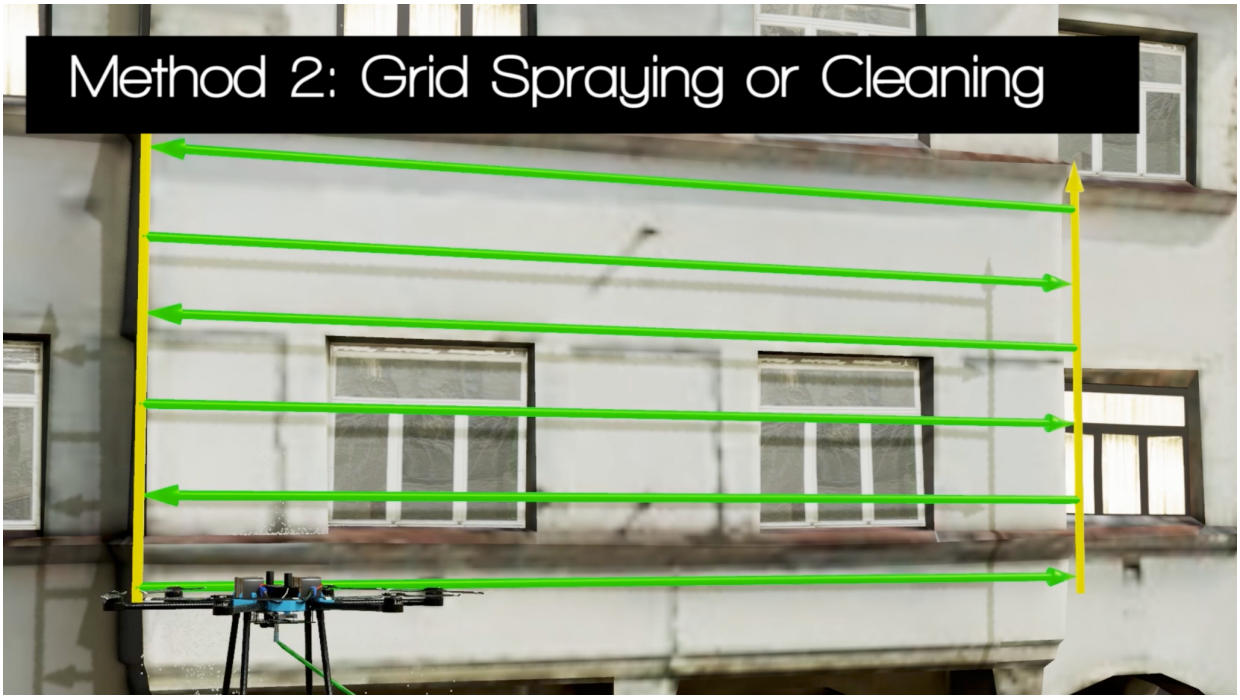
Category 1: For spraying, cleaning, or spraying a solvent.
This category has two flight patterns. The major differentiator with spraying patterns is that the aircraft always starts the pattern at the BOTTOM of the building.

Category 2: For rinsing.
This category also has two flight patterns, yawing and grid. The major differentiator with rinsing patterns is that the flight pattern always starts at the TOP of the building. For this category, the drone's propeller wash can be used to accelerate the rinsing process.

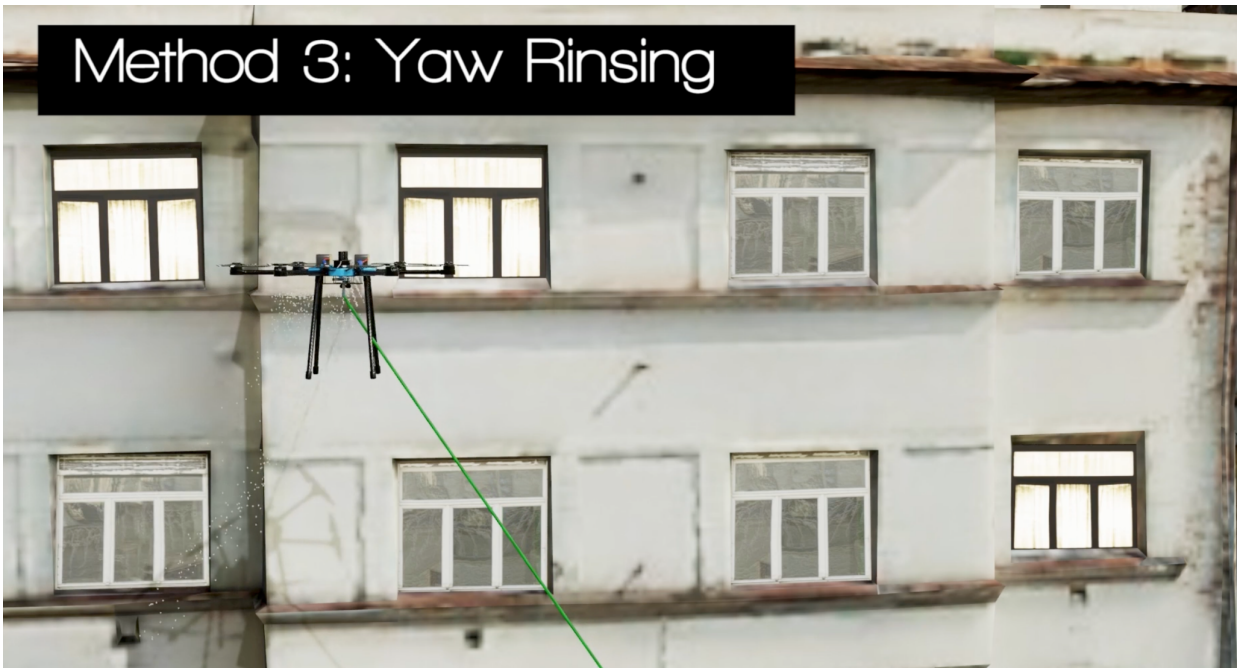
Pilots may find one pattern more efficient to use than the other for the given circumstances of an operation. The two patterns for spraying are broken down by the Yaw Pattern and the Grid Pattern.

1. Spray Yaw Pattern: Start at the bottom of the building, elevate and yaw the aircraft back and forth. Move the aircraft along the building, to one direction ie. right. Then descend and yaw the aircraft to continue spaying.

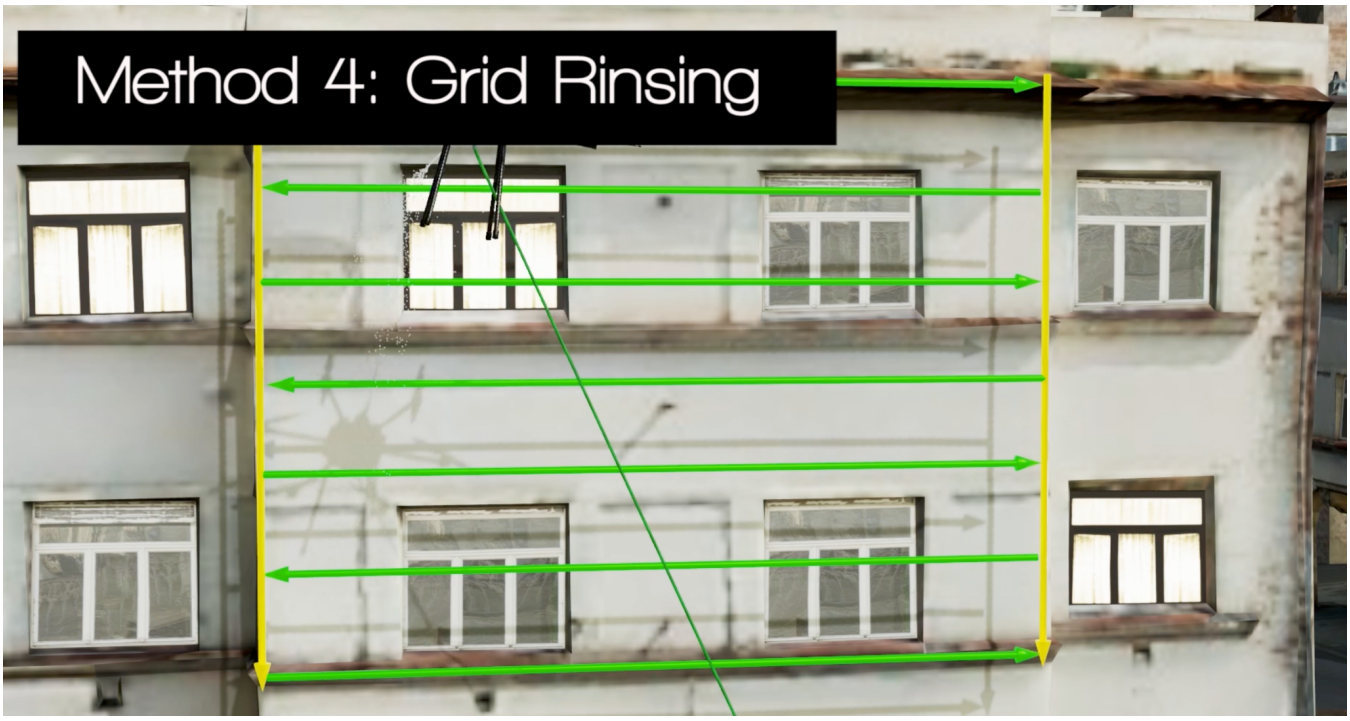
2. Spray Grid Pattern: Starting at the bottom of the building, we will roll the aircraft along the building. This will spray the bottom portion first and create a lateral path of spraying.



3. Rinsing Yaw Pattern: Starting at the top of the building, the drone descends slowly. As the aircraft descends, the pilot rotates the drone left and right to spray the wall. Once the aircraft reaches the bottom of the building, the pilot will guide the drone back to the top, roll slightly along the wall, and continue descending while yawing.



4. Rinsing Grid Pattern: The Grid pattern is much simpler and does not require the use of Yaw, or rotation. Let us use the rinsing example one more time. Starting at the top of the building, we will roll across the building, then descend a few feet and roll in the opposite direction across the building.



Again, pilots may find one method more effective than another, dependent upon the type of cleaning operation. After flying the Lucid Drone for six months, the Drone U flight crew has found that grid patterns allow for longer flight times. Note that we are not cleaning specialists or chemists, so pilots, use your best judgment when choosing a flight pattern for your operation.

Post Flight Process

Once a drone operation is complete, the drone team must dismantle and store the C1 Drone properly. The post-flight process is simply the inverse of the operation setup process. Proper post-flight procedures are critical to maintaining the drone over time.

Post Flight Procedures

1. Land drone.
2. Turn off ground-based pump.
3. Allow sprayer to continue to run to release hose pressure.
4. Turn off sprayer.
5. Unplug aircraft batteries and place them in fire-resistant container.
6. Turn off remote controller.
7. Disconnect hose from drone.
    a. Ensure steps 2 & 3 have been completed prior to disconnecting the hose.
    b. Disconnecting the hose under pressure will cause rapid discharge of water or liquid, which could damage the aircraft or cause contamination to personnel.
8. Disconnect sprayer nozzle from drone using quick release.
9. Detach GPS antennas and place them in remote controller case.
10. Wipe drone down.
    a. If BLEACH was used in the operation, spray the drone with bleach neutralizer during cleanup.
11. Attach propeller guards to arms, fold propellers, and place propellers in propeller guards.
12. Fold all six drone arms.
    a. Pilots will see two (2) red buttons at the mount of the arm.
    b. Press both red buttons at the same time to release the arms and lower them.
13. Place drone in carrying case
14. Place remote in carrying case
15. Place sprayer in carrying case or other case.

Cleaning Drone & Site

After each operation with the Lucid C1 Drone, it is recommended that pilots take time to clean up the aircraft and operation site. There are various methods of cleaning the drone, which differ based on the chemicals or liquid used during the cleaning operation. Use the following protocol to clean the drone, based on the material that was used for the operation:

If spraying just water from the drone:

1. Wipe drone down with microfiber cloth.
2. Ensure no water is pooling or collecting in any areas of drone.
3. Use cleaning putty on drone to clean difficult-to-reach areas of aircraft.

If spraying bleach from the drone:

1. Wipe drone down with microfiber cloth.
2. Use bleach neutralizer to remove excess material from drone.
3. Wipe again to remove excess neutralizer.
4. Use cleaning putty on the drone to clean difficult-to-reach areas of aircraft.

If spraying chemicals from the drone:

1. Wipe drone down with microfiber cloth.
2. Use any necessary chemical or neutralizing agent to remove hazardous chemicals from drone.
3. Wipe down again using clean cloth.

Professionalism is key when operating complex machinery or aircraft. As such, pilots and crew should always plan for time to clean up the operations area following an operation. After a drone operation has been completed, ensure to perform the following steps:

1. Pack up all drone equipment.
2. Pack batteries in a fire-resistant container and store the batteries in a climate-controlled environment.
3. Pack any auxiliary equipment.
4. Pack any cones, pick up tape, and ensure that the area is left as you found it.

Do not pack or store batteries in your work vehicle. Do not leave batteries in direct sunlight or extreme temperatures. It is highly recommended to have systems in place to properly store the aircraft and batteries.

Mission Planning & Scouting Job Sites

Cleaning companies often bid on jobs using various equipment and tools to perform the job. The Lucid C1 Drone offers a strategic advantage to cleaning companies to offer a more efficient and safe means of completing certain jobs. It is important to note that there are limitations when using drones to clean. Oftentimes, airspace can introduce additional complexities and require increased administrative time to complete jobs.

Lucid recommends that the pilot or Lucid Certified Pilot participate in the bidding process whenever operations are considering drone utilization. Even if a job is awarded to the cleaning company, the LCP is ultimately responsible for safe use of the drone. Certain jobs may dictate a higher-risk profile, which may make it too dangerous to use the drone. The LCP must ensure that implementing the drone in the cleaning process is executed with safety in mind.

When bidding for cleaning jobs that require the use of the Lucid Cleaning drone, the estimator or bidder should consider the following:

1. Location of Cleaning Operation
    a. Is the location in controlled airspace?
    b. Does the airspace offer Low Altitude Authorization and Notification Capability (LAANC) access or autonomous airspace approval?
    c. If the airspace is in a zero grid, is there ample time to file for a Wide Area Authorization?
2. Building Type and Operational Environment
    a. Even if the airspace is clear and flyable, is the location sufficiently clear of obstacles to operate the aircraft?
3. Logistics of Drone Operations
    a. Will there be sufficient access to water?
    b. Can the operational area be accessed with ease?
    c. Can a pump or vehicle be placed close enough to the operation to use the Lucid C1 Drone?
4. Weather conditions
    a. Consider the time of year, expected temperature, and potential wind.

Take-off & Landing Areas

The Lucid C1 Drone requires a flat and level surface sufficient for take-off. While not all job sites provide a perfectly level take-off area, it is up to the LCP to determine the best area for take-off and landing. Taking off from or landing on an uneven surface can cause the drone to become unstable, difficult to control, and could lead to a crash. During the bidding process, consider the suitability of the operations area for the Lucid C1 Drone. Identify potential areas for take-off and landing. If there is no appropriate location for the take-off and landing zone(s), then the drone may not be suitable for the job.

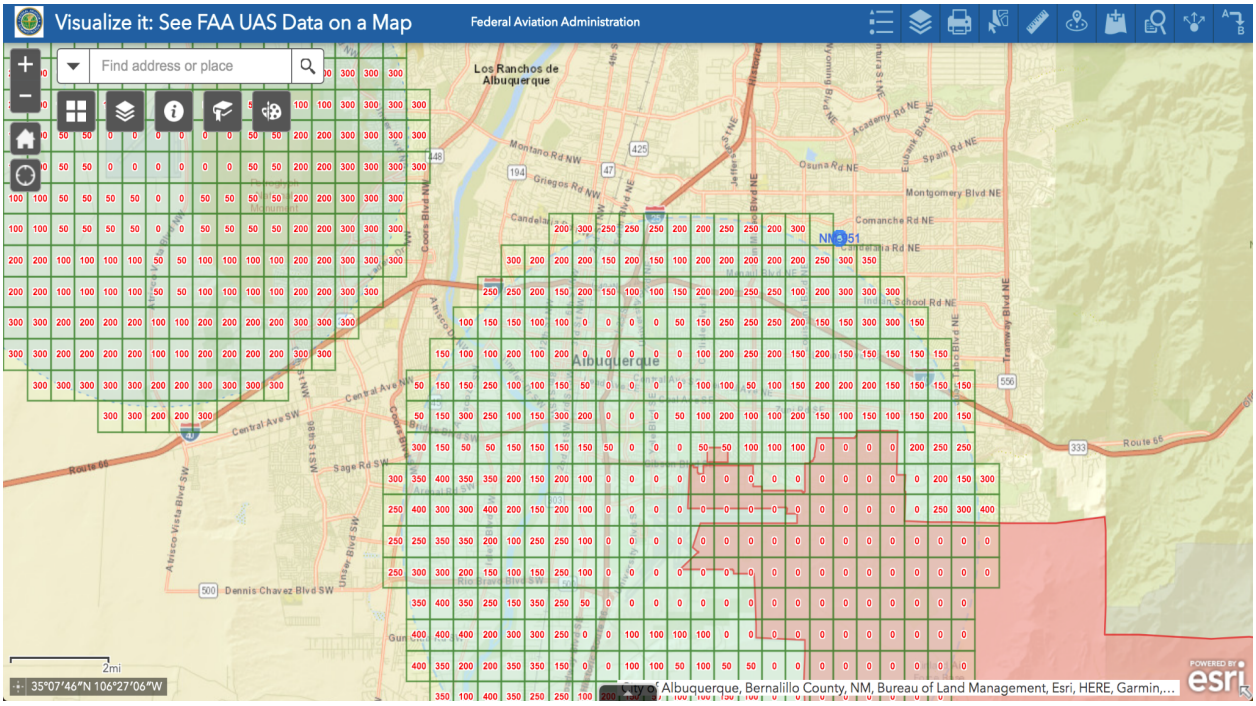
Pilots should also consider any potential obstructions or obstacles in or near the take-off and landing zone(s). Conder trees, flagpoles, access areas, traffic areas, pedestrian traffic, and distance from tall buildings. Consider any logistics issues that may present themselves when operating the drone. Should parking spaces be cordoned off to create a safe area? If so, plan for this, and communicate with the building manager to plan appropriately for any additional actions that must take place to create a safe operating environment for the drone.

Airspace and FAA Regulations

Remember, the pilot or LCP is ultimately responsible for compliance with all Federal regulations set forth by the Federal Aviation Administration (FAA). The pilot should always consider airspace when planning for a drone operation. Pilots can access airspace maps through a variety of methods.

Desktop:

The FAA provides an online registry of all LAANC-activated airports. The FAA's UASFM (Unmanned Aerial Systems Facility Maps) displays a comprehensive map of all airspace across the United States. These maps showcase airspace specific to UAS or drones. The maps also show the maximum allowed altitude in a given area. Pilots can fly in these grids and gain autonomous airspace authorization if they fly below the given altitude limit. If a pilot needs to fly higher than the prescribed limit, they must apply for an airspace authorization through the FAA's online portal (discussed on the next page).



Mobile Apps:

The pilot can view airspace on mobile applications to discern operational applicability.

Open Sky by Google
UA Sidekick

To operate in controlled airspace, pilots may have to apply for a LAANC airspace authorization. This can be done using a variety of methods using phone applications. Pilots can apply through the Open Sky application or the UA Sidekick application.

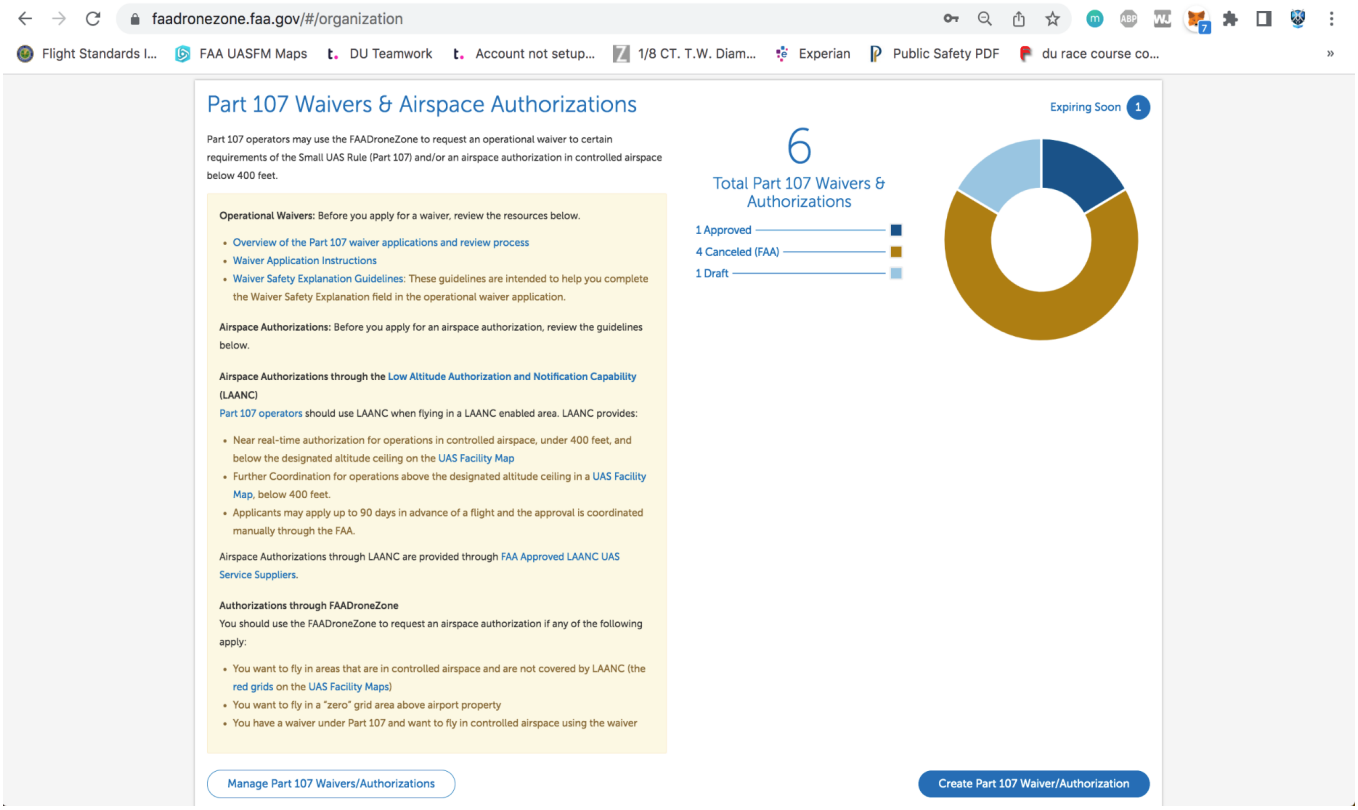
If a pilot cannot gain autonomous airspace authorization through LAANC, they will have to file for an airspace authorization through the FAA portal. Reasons to file for WAAS authorization include:

1. Need to fly higher than altitude limit
2. Need to fly in “zero grid”
3. Airport is not LAANC-activated

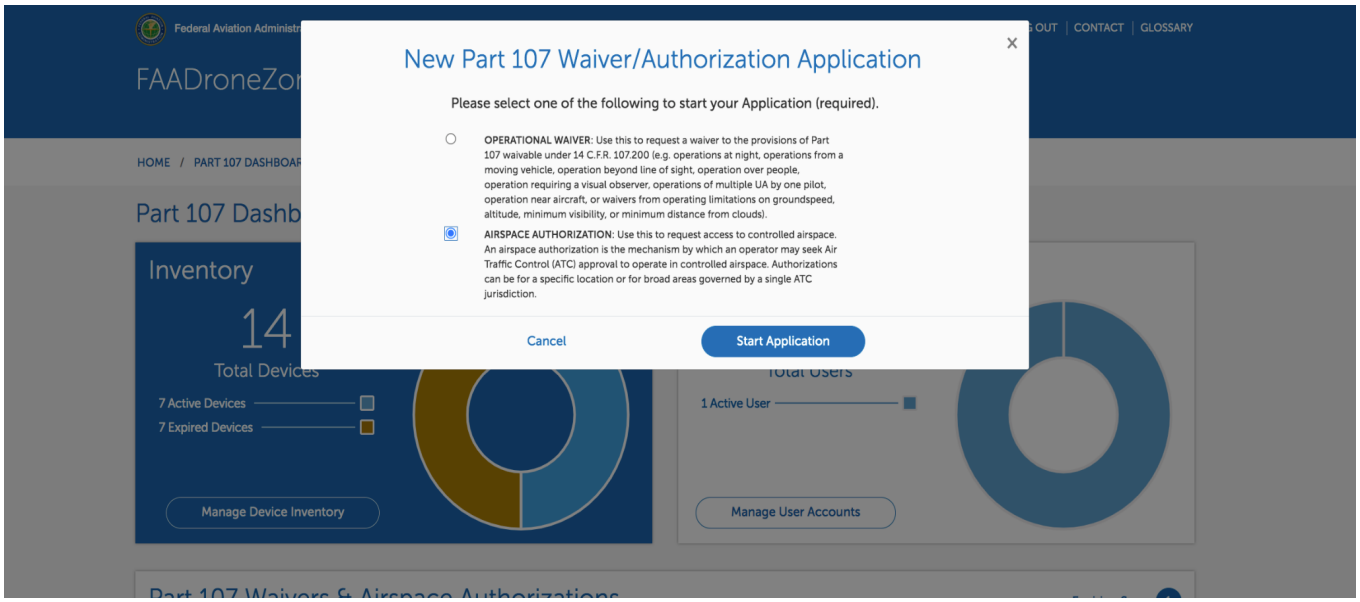
FAA Airspace Authorization (Non-Laanc)

To gain airspace authorization for a given area, pilots can apply through the FAA online portal.
To do so, visit: https://faadronezone.faa.gov/

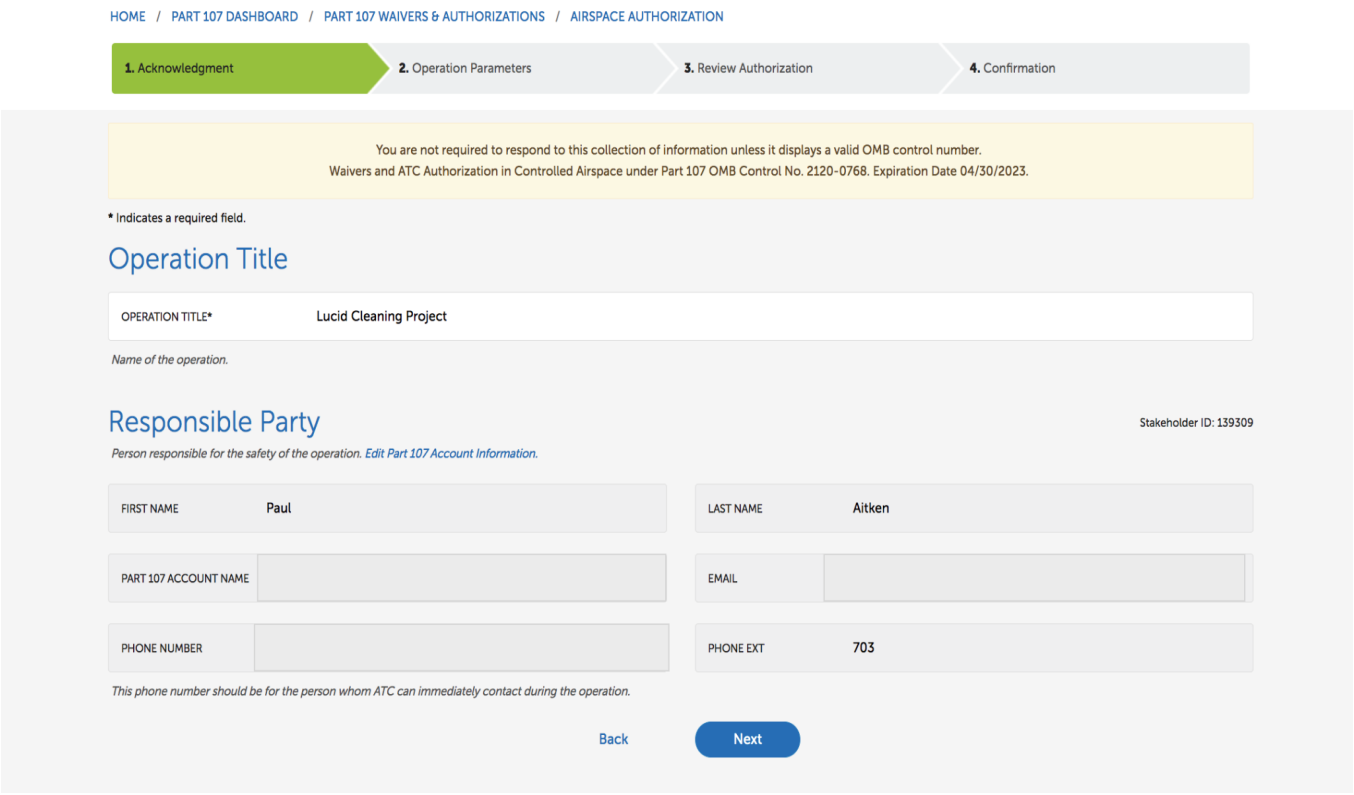
After creating a login, pilots can apply for airspace authorizations. After logging in, you will be taken to your dashboard. Scroll down until you see “107 Airspace Authorizations,” and click “Create 107 Waiver/Authorization.”



1. Click " Airspace Authorization."
2. Click "Start Application" to begin the application process for acquiring an authorization.



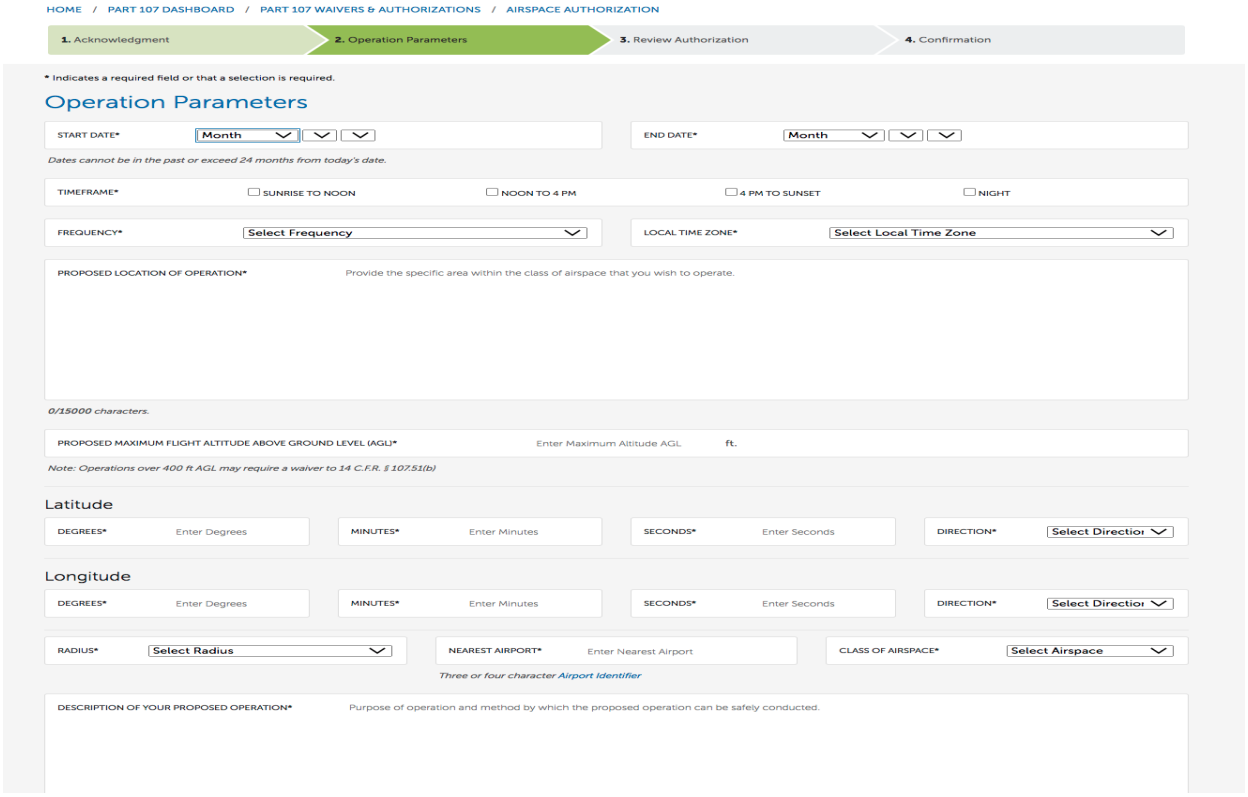
3. Enter the operational title. Create a system to name cleaning jobs to keep track of airspace authorizations. Consider naming the operations based on the client's name or site address.



4. Enter the operational parameters of the application. Use the following tips to make this process easier:

    a. If you are applying for an airspace waiver in controlled airspace with LAANC active, you must apply for a single, specific date. The system will not allow you to set a date range if LAANC is active in the controlled airspace.
        i. If you are planning on flying on multiple dates, input the date range or proposed days of operation in the comments section.
    b. Pull up the location for the proposed operation in Google Maps. If you double-click on a location, the pin that appears will provide the GPS coordinates of the location. Copy the coordinates and enter this information in the FAA website application (See training video for guidance).
    c. Give yourself flexibility due to weather. The FAA understands the need to operate safely and asking for a window of flight time due to potential weather issues is completely acceptable. Contingencies allow for safe drone operation. Do not confine yourself to a specific flight time.
    d. When applying for a certain altitude, note the nearest Minimum Obstacle Clearance Altitude (MOCA) to the operation in the comments section. If the FAA knows there is a

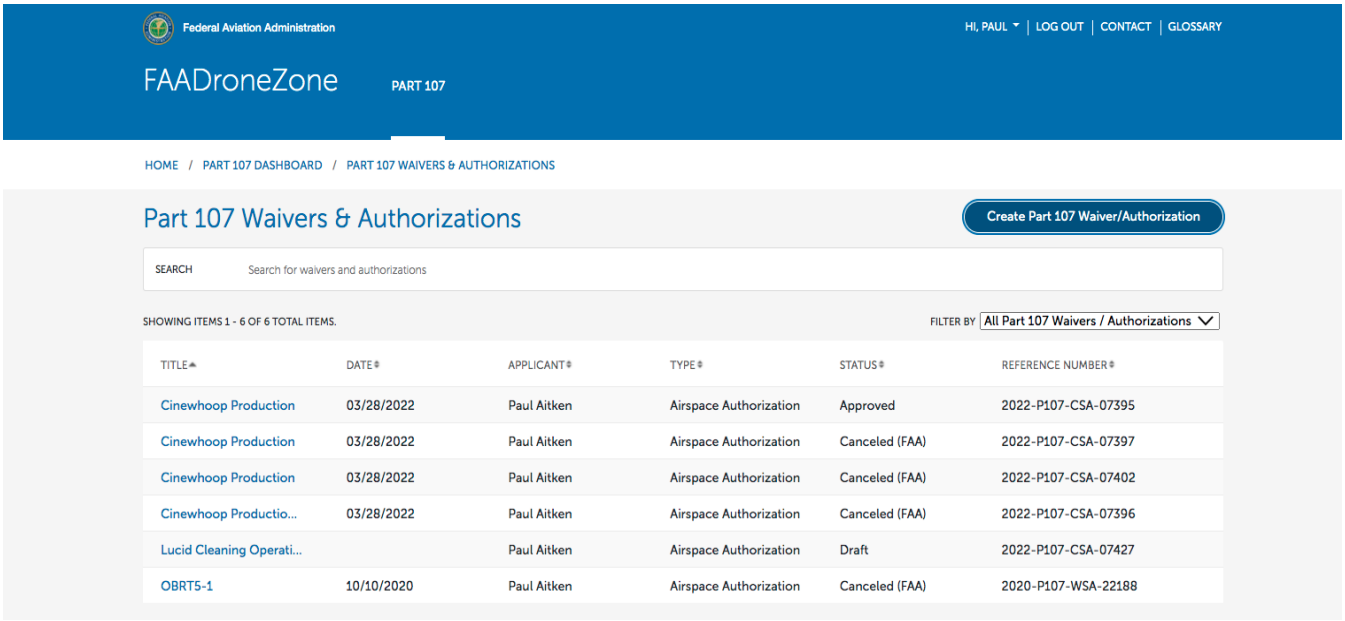
building or radio tower at a much higher altitude than the proposed operation, they are more likely to approve the request.



5. Review the application and submit the application. The FAA states to allow 90 days for review, but during the filming of this course, we acquired same-day authorization. Provide as much time as possible for the review and authorization.

6. Once you have submitted the application, you can find a list of airspace authorizations on your dashboard.

    a. KEEP A CLOSE EYE on your email, as the FAA may email you with clarifying questions. The faster you respond, the faster the process will go for you.
    b. Generally, you should receive an answer within 72 hours, if not sooner.


Federal Aviation Administration
HI, PAUL | LOG OUT | CONTACT | GLOSSARY
FAADroneZone
PART 107
HOME / PART 107 DASHBOARD / PART 107 WAIVERS & AUTHORIZATIONS
Part 107 Waivers & Authorizations
Create Part 107 Waiver/Authorization
SEARCH
Search for waivers and authorizations
SHOWING ITEMS 1 - 6 OF 6 TOTAL ITEMS.
FILTER BY All Part 107 Waivers / Authorizations
TITLE DATE APPLICANT TYPE STATUS REFERENCE NUMBER
Cinewhoop Production 03/28/2022 Paul Aitken Airspace Authorization Approved 2022-P107-CSA-07395
Cinewhoop Production 03/28/2022 Paul Aitken Airspace Authorization Canceled (FAA) 2022-P107-CSA-07397
Cinewhoop Production 03/28/2022 Paul Aitken Airspace Authorization Canceled (FAA) 2022-P107-CSA-07402
Cinewhoop Productio... 03/28/2022 Paul Aitken Airspace Authorization Canceled (FAA) 2022-P107-CSA-07396
Lucid Cleaning Operati... Paul Aitken Airspace Authorization Draft 2022-P107-CSA-07427
OBRT5-1 10/10/2020 Paul Aitken Airspace Authorization Canceled (FAA) 2020-P107-WSA-22188

Limitations

When planning drone operations, remember the limitations of flight operations as a whole.

1. Plan for obstructions.
    a. Trees
    b. Powerlines
    c. Interference
2. Always check airspace.
3. Ensure drone is registered.
4. Ensure pedestrians can be restricted from operating area
5. Plan for vehicle and foot traffic. You cannot operate over people, or over moving cars.

Maintenance Schedule

Just like automobiles, drones require regular maintenance. However, drones typically require MUCH LESS maintenance than cars. Attention to detail could mean the difference between a successful operation and a catastrophic crash.

We have developed the following maintenance schedule as a guide to help pilots to maintain the aircraft and keep the C1 Drone in peak operating condition.

The maintenance schedule is broken down by the number of hours that have been flown on the drone.

10 Flight Hours

1. Deep cycle charge batteries.
2. Check GPS antennas.
3. Check for frame cracks.
4. Check propeller tightness.
5. Check for loose arms.
6. Check hose connection.
7. Spin motors and props to ensure they are clear of debris.
8. Tighten landing gear screws.
9. Tighten folding arm mount screws.
10. Clean the drone (consider using putty).
    a. Arms
    b. Frame
    c. Connectors

50 Flight Hours

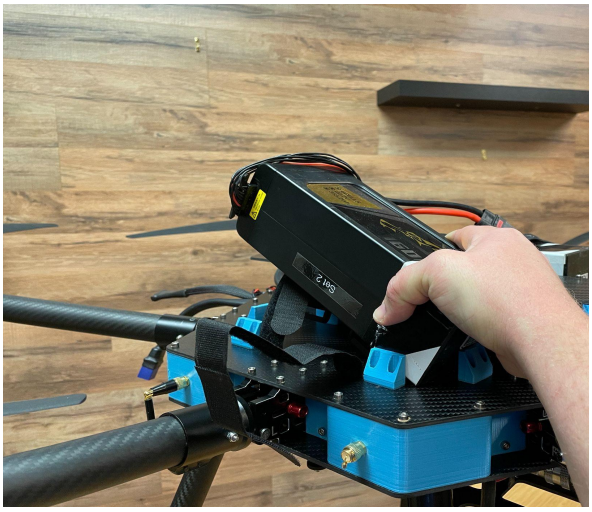
1. Deep cycle charge batteries.
a. Perform frame checkup.
    a. Check upper and lower plates for cracks and damage.
    b. If cracks/damage exist, call Lucid for additional support.
2. Check frame arm locks for wear.
3. Check frame arms to ensure still tight and not loose.
4. Turn on aircraft and check for abnormal noise.
5. Check payload plate, or isolate plate; tighten screws if necessary.
6. Check cables; do not move them aggressively.
7. Tighten any screws that seem loose.
8. Apply thread locker to any screws that need it.

9. Check motor bases for cracks or damage.
10. Ensure arms lock in place at correct altitude.
11. Check landing gear screws; tighten screws if necessary.
12. Spin motors and propellers; ensure they spin freely.
13. Confirm remote controller is working properly and check for damage.
14. Check remote controller antennas for damage.
15. Spray motors with keyboard duster to ensure motors are free of debris.

100 Flight Hours

1. Deep cycle charge batteries.
2. Perform frame checkup.
    a. Check upper and lower plates for cracks and damage.
    b. If cracks/damage exist, call Lucid for additional support.
3. Check frame arm locks for wear.
4. Check frame arms to ensure still tight and not loose
5. Turn on aircraft and check for abnormal noise
6. Check payload plate, or isolate plate; tighten screws if necessary.
7. Check cables; do not move them aggressively
8. Tighten any screws that seem loose.
9. Apply thread locker to any screws that need it.
10. Check motor bases for cracks or damage.
11. Ensure arms lock in place at correct altitude.
12. Check landing gear screws; tighten if necessary.
13. Spin motors and propellers to ensure they spin freely.
14. Confirm remote controller is working properly and check for damage.
15. Check remote controller antennas for damage.
16. Spray motors with keyboard duster to ensure motors are free of debris.
17. TAKE PROPS OFF MOTORS.
18. TURN ON DRONE AND START MOTORS TO CHECK MOTOR SPIN AND LOOK FOR DEBRIS.
19. Listen to the motors for abnormal sounds.
20. REPLACE THE PROPELLERS. DO NOT INSTALL OLD PROPELLERS.
21. Check battery cables for abrasions.
22. Update drone firmware if necessary.

2 Years of Ownership



After owning the drone for a period of 2 years, conduct the following precautions:

1. Conduct a 100-hour maintenance inspection.
2. Replace all propellers.
3. Replace all batteries.
    a. Batteries last up to150 cycles. At Drone U, we recommend replacing the batteries at about 2 years, no matter the usage frequency.
4. Renew Part 107 Certificate.

Thank You

For completing this operations manual.

Enjoy taking flight with your Lucid C1 Drone.