

December 09, 2014

U.S. Department of Transportation, Docket Operations  
West Building Ground Floor, Room w12-140  
1200 New Jersey Ave., SE Washington, DC 20590

Re: Petition of M&G Enterprises for an Exemption Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012

Dear Gentlemen:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("Reform Act") and 14 C.P.R. Part 11, M&G Enterprises hereby applies for an exemption from the Federal Aviation Regulations ("FARs") identified below, to allow commercial operations of small unmanned aerial vehicles.

This exemption is made based on information outlined in this petition, as well as the accompanying DJI Phantom 2 Operators Manual (Appendix B) and the M&G Enterprises Operational Limitations (Appendix C). The DJI Phantom 2 UAS was selected because it has a proven capability for controlled flight as well as a gyro stabilized flight mode, GPS aided navigation, a compass, blinking LED's on the bottom, a failsafe mode for returning home, and prop guards. These devices are offered for general sale around the world and have often been used as Model Aircraft in the USA.

**Specifically, the UAS is:**

A lightweight (< 7.0 lb gross weight with all on-board equipment), battery operated 4-motor rotorcraft in the form of a quadcopter that takes off and lands vertically, manufactured by DJI, Model Phantom 2 , with the following equipment:

- An on-board flight computer with GPS navigation and location ability that receives signals for flight controls from a ground-based transmitter/controller;
- An on-board camera capable of capturing imagery in the form of full color, high definition still photos and video;
- An on-board telemetry system that delivers flight data from the on-board flight computer to the on-board radio transmitter including altitude AGL, horizontal and vertical speed, compass direction of flight and direction back to its launch site;
- A 600mW, 5.8GHz on-board radio transmitter that transmits live video from the on-board camera plus all the flight data from the telemetry system described above;

## **The Ground Station Includes:**

- A Pilot in Command (PIC) in operational control of a flight operation from beginning to end and who controls the UAS while in the air;
- A 100mW, 2.4GHz radio transmitter/controller operated by the PIC to control the UAS while in flight;
- A radio receiver receiving live video and flight data from the on-board camera and computer projects it all together onto a screen for the PIC to view during flight;
- A Visual Observer (VO) is a person who provides a second pair of eyes to visually track the UAS while in flight.

## **Proposed Operations**

M&G Enterprises intends to use UAS in three general areas. First, M&G Enterprises seeks an exemption to perform video filming and photographing by air for public and private use. Second, it will employ UAS's to inspect land, residential commercial and industrial structures and property. Third, M&G Enterprises seeks permission to use UAS to offer training to persons, from both private and public entities, which are interested in the safe operation of UAS.

Specifically, M&G Enterprises will use UASs which are equipped with cameras and sensors, in order to engage in the following commercial activities:

- (a) Video filming by air and photographing for public and private purposes, including: television, cinematography, advertising, promotions, public or news mass events.
- (b) Video filming by air and photographing to support professional operations in engineering, land surveying, architecture, real estate and other related professional activities.
- (c) Inspections by air of agricultural areas.
- (d) Inspections by air of infrastructure such as bridges, highways, electrical installations, dams, aqueducts, photovoltaic power stations, wind farms and pipes. These inspections will only be done under contract with the owners or with any local government authority.
- (e) Inspection by air of land and residential, commercial and industrial structures, only under contract with the owners or with any local government authority.
- (f) Inspections by air to detect sources of pollution and gas emissions, under contract with the owners in the area or with any local government authority.
- (g) Support provided to search and rescue operations and reconnaissance in cases of need, emergency or natural disasters and only when government authorities have requested it by contract or donation.

(h) M&G Enterprises is passionate about offering training to persons, private and public entities, which are interested in the safe use of UASs, for purposes of enhancing the skills and safety controls which make the NAS safer and for the protection of persons and property.

### **Relevant Statutory Authority**

This Petition for Exemption is submitted pursuant to Section 333(a) through (c) of the FAA Modernization and Reform Act of 2012 ("Reform Act"). Congress has directed the FAA "to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system." Pursuant to Section 333 of the Reform Act, the FAA Administrator is to permit unmanned aircraft systems to operate in the National Air Space ("NAS") where it is safe to do so based on the following considerations:

- The UAS's size, weight, speed and operational capability;
- Operation of the UAS in close proximity to airports and populated areas; and
- Operation of the UAS within the visual line of sight of the operator.

Additionally, the FAA Administrator has general authority to grant exemptions from the agency's safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest. See 49 U.S.C. § 106(f) (defining the authority of the Administrator); 49 U.S.C. § 44701(f) (permitting exemptions from §§ 44701(a), (b) and §§ 44702-44716, et seq.). A party requesting an exemption must explain the reasons why the exemption: (1) would benefit the public as a whole, and (2) would not adversely affect safety (or how it would provide a level of safety at least equal to the existing rules). See 14 C.F.R. § 11.81 (petitions for exemption).

### **M&G Enterprises Proposed UAS Operations Meet the Requirements of Section 333 of the Reform Act**

M&G Enterprises proposed operations in this Petition for Exemption qualify for expedited approval pursuant to Section 333 of the Reform Act as each of the statutory criteria and relevant factors are satisfied.

### **Approval is Warranted Based on the UAS Size, Weight, Speed, and Operational Capability**

M&G Enterprises will employ the DJI Phantom 2 quadcopters for the operations specified in this Petition for exemption. The Phantom 2 UASs have a maximum take-off weight of less than 7 pounds, the flight speed will not exceed 35 miles per hour, and it will not be flown in controlled airspace or at an altitude that exceeds 400 feet AGL. All flights will be flown in such a way that they can be safely terminated with a reserve battery power of 25% of the battery's maximum charge. The DJI Phantom 2 UAS do not carry any flammable propellant or fuel. The Phantom 2 UAS also has an integrated GPS system that calculates the UAS's position and height and relays that information via a secure connection to the operator. Additionally, the Phantom 2 UAS contain a failsafe mode if its connection to the remote control is lost, and

this system permits the UAS to return to a predetermined location and land without injury or damage. For additional safety, the Phantom 2 will be retrofitted with prop guards.

### **Approval is Warranted Based on the Operational Restrictions Set Forth in the Operations Manual.**

The M&G Enterprises Operations Limitations and the DJI's operators manual contain all of the procedures and limitations necessary to successfully perform the operations specified in this Petition for Exemption. (Appendices B & C).

### **Public Interest**

The public interest will be served by granting M&G Enterprises Petition for Exemption. Congress has established a national policy that favors early integration of UASs into the NAS in controlled, safe working environments such as those proposed in this Petition. In addition, the public also has an interest in reducing the hazards associated with alternate methods of conducting similar operations. Currently operations are conducted using teams that physically climb onto structures using ladders, using low flying helicopters or aircraft, or simply not available by traditional means. By using UAS, exposure to physical hazards will be reduced of conducting the operation while remaining safely on the ground.

Additionally, M&G Enterprise intended uses for the UAS's have identifiable safety benefits that include reducing the danger and emissions associated with full size helicopters, UAS have no fuel to ignite or explode, no crew, adds a greater degree of flexibility, which supplements the current capabilities offered by manned aircraft, and public interest for a ground impact for of a small lightweight UAS is further minimized from an ecological and safety standpoint.

### **Federal Register Summary**

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the Federal Register, should it be determined that publication is needed:

M&G Enterprises seeks an exemption from the following rules:

Parts 21; §§ 45.23(b); 27; 61.113(a) and (b); 61.3; 91.7(a); 91.9(b)(2); 91.103; 91.109; 91.119; 91.121; 91.151(a); 91.203(a) and (b); 91.405(a); 91.407(a)(1); 91.409(a)(2); and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR).

The exemption will enhance safety by reducing risk to the general public and property owners from the substantial hazards associated with performing equivalent work with conventional aircraft, rotorcraft, or other methods.

### **Conclusion**

M&G Enterprises Petition for Exemption satisfies the criteria articulated in Section 333 of the Reform Act of 2012 including weight, speed, operating capabilities, proximity to

airports and populated areas, operation within visual line of sight and national security. Additionally, the Petition provides more than adequate justification for the grant of the requested exemptions to permit M&G Enterprises to operate the selected UAS for the operations specified herein.

Granting the exemption will benefit the public interest as a whole in several ways, including (1) significantly improving safety and reducing risk by alleviating human exposure to danger, and (2) improving the quality of services and decreasing operating costs compared with conventional flight operations.

Very Respectfully,  
Mark Pickens  
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## **Appendix A**

The regulations from which the exemption is requested are listed below. Beside each regulation number is the page of the attached Appendix A upon which each may be found together with our proposed equivalent level of safety for each regulation:

Parts 21, §§ 45.23(b); 27, 61.113(a) and (b) 61.3; 91.7(a); 91.9(b)(2); 91.103; 91.109; 91.119; 91.121; 91.151(a); 91.203(a) and (b); 91.405(a); 91.407(a)(1); 91.409(a)(2); and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR).

### **Exemptions Requested**

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined under § 40101 of the Act, including UASs, from its safety regulations and minimum standards when the Administrator decides a requested exemption is in the public interest.

M&G Enterprises seeks an exemption from several interrelated provisions of 14 C.F.R. Parts 21, 27, 45, 61 and 91 for purposes of conducting the requested operations using a UAS. Listed below are the specific sections of 14 C.F.R. for which exemption is sought:

### **14 C.F.R. Part 21, Subpart H - Airworthiness Certificates**

The FAA has stated that no exemption is needed from this section if a finding is made under the Reform Act that the UAS selected provides an equivalent level of safety when compared to aircraft normally used for the same application. (Regulatory Docket No. FAA-2014-0352). These criteria are met, and therefore no exemption is needed.

### **Equivalent Level of Safety**

The UAS selected by M&G Enterprises is safe when taking into account their size, weight, speed, and operational capability. The UAS weigh less than 7 pounds and will be flown at less than 35 miles per hour and completely outside controlled airspace. Additionally, the UAS carry neither pilots nor passengers, carry no explosive materials and or flammable liquid fuels, and operate exclusively within the parameters stated in the Operator's Manual and Operations Limitations.

Operations under this exemption will be closely controlled and monitored by the operator and will be conducted in compliance with local public safety requirements, to provide security for the area of operation. M&G Enterprises will also provide the FAA with advance notice of all operations via NOTAMS and coordination with the local FSDO. In all cases, the UAS operated under the proposed conditions, will be at least as safe as, or safer than conventional rotorcraft operating with an airworthiness certificate without the restrictions and conditions of the proposed UAS operations.

#### **14 C.F.R. Part 27 Airworthiness Standards: Normal Category Rotorcraft**

14 C.P.R. Part 27 sets forth the procedural requirements for airworthiness certification of normal category rotorcraft. To the extent the M&G Enterprises UAS would otherwise require certification under Part 27, we seek an exemption from Part 27's airworthiness standards for the same reasons identified in the request for exemption from 14 C.F.R. Part 21, Subpart H.

#### **14 C.F.R. §§45.23(b), Display of marks; general**

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 2 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station. The UAS does not have an entrance in which the word "EXPERIMENTAL" can be placed, and may not have a registration number assigned to it by the FAA.

M&G Enterprises proposes to achieve an equivalent level of safety by including the word "EXPERIMENTAL" as large as practicable on the top of the aircraft, where the PIC, VO and others in the vicinity of the aircraft while it is preparing for launch will be able to see the designation. Finally, the ground station will display a high contrast flag or banner that contains the words "Unmanned Aircraft Ground Station" in letters 3 inches high or greater. Since the aircraft will operate within 3/4 NM of the ground station, the banner should be visible to anyone that observes the aircraft and chooses to investigate its point of origin.

In a previous Grant of Exemption, Regulatory Docket No. FAA-2014-0352, the FAA determined that exemption from these requirements was warranted provided that the aircraft "have identification (N-Number) markings in accordance with 14 C.F.R part 45, Subpart C if the markings are as large as practicable."

#### **14 CFR § 61.113 (a) and (b); 61.3 (c,2-v): Private Pilot Privileges and Limitations, Medical Certificate**

In addition, M&G Enterprises seeks exemption from 14 C.F.R § 61.113, which restricts private pilot certificate holders from flying aircraft for compensation or hire, and which would also require a second class medical certificate. The purpose of this section is to ensure the skill and competency of any PIC where the aircraft is carrying passengers or cargo for hire. In this case, while the UAS will be operated as part of a commercial operation, it carries neither passengers nor cargo. In the Grant of Exemption in FAA Docket No. FAA-2014-0352, the FAA determined that the unique characteristics of UAS operation outside of controlled airspace did not warrant the additional cost and restrictions attendant with requiring the PIC to have a commercial pilot certificate and class II medical certificate. Additionally, instead of having a second or third class medical, we suggest that the PIC exercise the privileges similar to that of a sport pilot, requiring only a valid US driver's license.

#### Safety Mitigation

Petitioner seeks to ensure safe operation by ensuring that any PIC is thoroughly versed in airspace and communication issues pertaining to all aircraft operators but also in the unique aspects of UAS flight. The owners of M&G Enterprises have commercial pilot's license, however, the experience obtained beyond a private pilot certificate in pursuit of a commercial pilot certificate in manned flight does not necessarily aid a pilot in the operational environment proposed. To that end, M&G Enterprises will require a PIC to have a minimum of a private pilot's license and adhere to the flight limitations listed in Appendix C.

We find that the combination of aeronautical knowledge, UAS airmanship skills, and verification through remaining current is a sufficient method to evaluate a pilot's qualifications, given that operations will be conducted within the limitations outlined in this petition.

#### **14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness**

M&G Enterprises seeks an exemption from 14 C.F.R. § 91.7(a), which requires that a civil aircraft be in airworthy condition to be operated. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required to the extent that the requirements of Part 21 are waived or found inapplicable.

#### **14 C.F.R. § 91.9(b)(2): Civil Aircraft Flight Manual in the Aircraft**

Given its size, configuration, and load capacity, the Phantom 2 has no ability to carry such a manual on the aircraft, not only because there is no pilot on board, but because there is simply no room or capacity to carry such an item on the aircraft.

#### Safety Mitigation

The safety related purpose of this manual requirement can be equally satisfied by maintaining the Phantom 2 Manual at the ground control point where the pilot flying the Phantom 2 will have immediate access to it. Accordingly, we request an exemption from § 91.9(b) (2)'s flight manual requirements, on the condition that the Phantom 2 flight manual be available at the control point during each operation.

#### **14 C.F.R. § 91.103: Preflight Action**

M&G Enterprises seeks an exemption from 14 C.F.R. § 91.103, which requires a PIC to become familiar with specific information before each flight, including information contained in the FAA-approved Flight Manual on board the aircraft. While the PIC will be familiar with all information necessary to safely conduct the flight, an exemption is requested to the extent that an FAA-approved Flight manual is required.

##### Safety Mitigation

An equivalent level of safety will be provided by following the Aircraft Operations Manual and flight manual provided by the manufacturer. The PIC will take all required preflight actions- including performing all required checklists and reviewing weather, flight requirements, battery charge, landing and takeoff distance, aircraft performance data, and contingency landing areas- before initiation of flight. The Operators Manual and Operational Limitations will be kept at the ground station with the operator at all times.

#### **14 C.F.R. § 91.109(a): Flight Instruction**

M&G Enterprises seeks an exemption from 14 C.F.R. § 91.109(a), which provides that "no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls." UAS and remotely piloted aircraft, by their design, do not have functional dual controls. Instead, flight control is accomplished through the use of a device that communicates with the aircraft via radio communications.

##### Safety Mitigation

Given the size and speed of the UAS employed by M&G Enterprises, an equivalent level of safe training can still be performed without dual controls because no pilot or passengers are aboard the UAS, and all persons will be a safe distance away in the event that the UAS encounters any difficulties during flight instruction. In addition, we will conduct flight training at our Research and Development test sites, which are located on its own property. These training flights will be conducted in a sterile area and will otherwise comply with the provisions in the Operator's Manual for flights at the R&D facility. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required.

#### **14 C.F.R. § 91.119: Minimum Safe Altitudes**

M&G Enterprises requests an exemption from the minimum safe altitude requirements of 14 C.F.R. § 91.119. Section 91.119 prescribes the minimum safe altitudes under which aircraft may not operate, including 500 feet above the surface and away from any person, vessel, vehicle, or structure in non-congested areas. See 14 C.F.R. § 91.119(c). Section 91.119(d) allows for a helicopter to operate at less than those minimum altitudes when it can be operated "without hazard to persons or property on the surface," provided that "each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA."

### Safety Mitigation

Compared to flight operations with rotorcraft weighing far more than the maximum weights proposed herein, and given the lack of flammable fuel, any risk associated with these operations is far less than those that presently exist with conventional aircraft. An equivalent level of safety will be achieved given the size, weight, and speed of the UAS, as well as the location where it is operated. In order to avoid any risk to aircraft, flight operations will be restricted to 400' AGL or below.

### **14 C.F.R. § 91.121: Altimeter Settings**

This petition seeks an exemption from 14 C.F.R. § 91.121, which requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. An exemption is required to the extent that the UAS do not have a barometric altimeter, but rather a GPS altitude read out.

### Safety Mitigation

The FAA has stated that an equivalent level of safety can be achieved if the UAS will be operated at 400' AGL or below and within visual line-of-sight in addition to GPS based altitude information relayed in real time to the operator. See Grant of Exemption to Astraeus Aerial, Docket No. FAA-2014-0352. As the attached Operations Manual indicates, the chosen UAS meets these requirements, and a zero altitude initiation point will be obtained prior to flight

### **14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions**

M&G Enterprises requests an exemption from 14 C.F.R. § 91.151(a)'s fuel requirements for flight in VFR conditions. Section 91.151 states:

- (a) No person may begin a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed -
  - (1) During the day, to fly after that for at least 30 minutes; or
  - (2) At night, to fly after that for at least 45 minutes.

Here, the technological limitations on UAS battery power means that no meaningful flight operations can be conducted while still maintaining a 30 minute reserve. M&G Enterprises proposes that all flights comply with this requirement by mandating that the aircraft be safely landed with no less than 25% of battery life remaining.

### Safety Mitigation

The FAA has stated that an equivalent level of safety is provided if the UAS flight is terminated with at least 25% reserve battery power still available. See Grant of Exemption to

Astraeus Aerial, Docket No. PAA-2014-0352. The Operations Manual conforms to this limit, providing an equivalent level of safety.

#### **14 CFR 91.203(a) & (b) Civil aircraft: Certifications required.**

The regulation provides that an airworthiness certificate, with the registration number assigned to the aircraft and a registration certificate must be aboard the aircraft. Additionally, subparagraph (b) provides that the airworthiness certificate be "displayed at the cabin or cockpit entrance so that it is legible to passengers or crew."

At a maximum gross weight of less than 7 pounds, the UAS is too small to carry documentation, does not have an entrance, and is not capable of carrying passengers or crew. To obtain an equivalent level of safety and meet the intent of 91.203, we propose that documents deemed appropriate for this aircraft by the FAA will be co-located with the crew at the ground control station and available for inspection upon request. The FAA has stated (Regulatory Docket No. FAA-2014-0352) that no exemption is required.

#### **14 C.F.R. 91.405(a); 91.407(a)(1); 91.409(a)(2); and 91.417(a) and (b) Maintenance Required**

M&G Enterprises seeks an exemption from the maintenance inspection requirements contained in 14 C.P.R. § 91.405(a), 91.407(a)(1), 91.409(a)(2); 91.417(a) and (b). These regulations specify maintenance and inspection standards in reference to 14 C.P.R. Part 43. See, e.g., 14 C.P.R. § 91.405(a) (stating that each owner or operator of an aircraft "[s]hall have the aircraft inspected as prescribed in subpart E of this part and shall between required inspections ...have discrepancies repaired as prescribed in part 43 of this chapter"). An exemption from these regulations is needed because Part 43 and these sections only apply to aircraft with an airworthiness certificate, which the UASs will not have.

#### Safety Mitigation

An equivalent level of safety will be achieved because maintenance and inspections will be performed in accordance with the Operators Manual. As provided in the Operators Manual, flights will not be conducted unless a flight operations checklist is performed that includes all of the aircraft's components.

## **Appendix B:**

### **PHANTOM 2 User Manual V1.2**

For PHANTOM 2 Flight Controller Firmware version V3.08  
& PHANTOM 2 Assistant version V3.4  
& PHANTOM RC Assistant version V1.1  
2014.10

Congratulations on purchasing your new DJI product. Please thoroughly read the entire contents of this manual to fully use and understand the product.

It is advised that you regularly check the PHANTOM 2's product page at [www.dji.com](http://www.dji.com) which is updated on a regular basis. This will provide services such as product information, technical updates and manual corrections. Due

to any unforeseen changes or product upgrades, the information contained within this manual is subject to change without notice.

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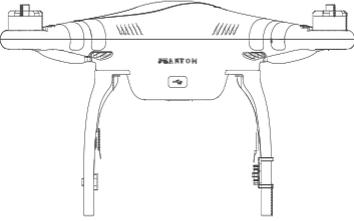
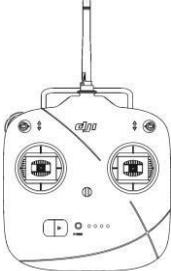
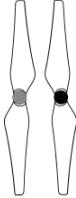
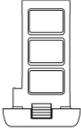
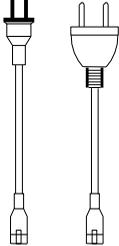
If you have any questions or concerns regarding your product, please contact your dealer or DJI Customer Service.

# Content

<b>CONTENT</b> .....	<b>2</b>
<b>IN THE BOX</b> .....	<b>4</b>
<b>LEGEND</b> .....	<b>4</b>
<b>1. PHANTOM 2 AIRCRAFT</b> .....	<b>5</b>
1.1 BUILT-IN FLIGHT CONTROL SYSTEM INSTRUCTIONS.....	5
1.2 CONNECTIONS WITH OTHER DJI PRODUCTS.....	5
<i>Important Notes of Using with Other DJI Products</i> .....	6
<i>Connections with Other DJI Products</i> .....	7
1.3 LED FLIGHT INDICATORS DESCRIPTION .....	11
1.4 NOTES FOR PHANTOM 2 USING WITH OTHER DJI PRODUCTS .....	12
<b>2 PROPELLERS</b> .....	<b>13</b>
2.1 ASSEMBLY.....	13
2.2 DISASSEMBLY .....	13
2.3 NOTES .....	13
<b>3 REMOTE CONTROL</b> .....	<b>14</b>
3.1 POWER ON THE REMOTE CONTROL.....	14
3.2 REMOTE CONTROL LED INDICATOR STATUS .....	15
3.2.1 <i>Remote Control Power LED Indicator Status</i> .....	15
3.2.2 <i>Remote Control Battery Level Indicator Status</i> .....	15
3.3 ANTENNA ORIENTATION .....	16
3.4 REMOTE CONTROL OPERATION .....	16
3.5 LINKING THE REMOTE CONTROL & BUILT-IN RECEIVER.....	18
<b>4 INTELLIGENT BATTERY</b> .....	<b>19</b>
4.1 CHARGING PROCEDURES.....	19
4.2 INSTALL THE BATTERY .....	20
4.3 BATTERY USAGE.....	20
4.4 DESCRIPTION OF THE BATTERY LEVEL INDICATOR.....	21
4.5 CORRECT BATTERY USAGE NOTES .....	22
<b>5 CALIBRATING THE COMPASS</b> .....	<b>23</b>

5.1 CALIBRATION WARNINGS .....	23
5.2 CALIBRATION PROCEDURES .....	23
5.3 WHEN RECALIBRATION IS REQUIRED.....	23
<b>6 FLIGHT .....</b>	<b>24</b>
6.1 FLYING ENVIRONMENT REQUIREMENTS .....	24
6.2 STARTING THE MOTORS .....	24
6.3 TAKEOFF/LANDING PROCEDURES.....	24
6.4 FAILSAFE FUNCTION.....	25
6.5 LOW BATTERY CAPACITY WARNING FUNCTION .....	27
6.6 FLIGHT LIMITS FUNCTION.....	27
<i>Max Height &amp; Radius Limits</i> .....	27
6.7 FLIGHT LIMITS OF SPECIAL AREAS .....	28
6.8 CONDITIONS OF FLIGHT LIMITS .....	30
<i>Disclaimer</i> .....	30
<b>7 ASSISTANT INSTALLATION AND CONFIGURATION .....</b>	<b>31</b>
7.1 INSTALLING DRIVER AND PHANTOM 2 ASSISTANT.....	31
7.2 USING THE PHANTOM 2 ASSISTANT ON A PC.....	32
7.3 FIRMWARE UPGRADE OF PHANTOM 2 .....	33
7.4 PHANTOM RC ASSISTANT DESCRIPTION .....	33
<b>8 APPENDIX .....</b>	<b>35</b>
8.1 SPECIFICATIONS.....	35
8.2 LED FLIGHT INDICATORS DESCRIPTION .....	35

## In the Box

PHANTOM 2	Remote Control-2.4GHz	Propeller Pair
		
Intelligent Battery	Charger	Plug Set
		
Screwdriver	Assistant Wrench	Cables
		
Micro-USB Cable	Screws	Accessories Box
		

## Legend



Forbidden(Important)



Caution



Tip



Reference

# 1. PHANTOM 2 Aircraft

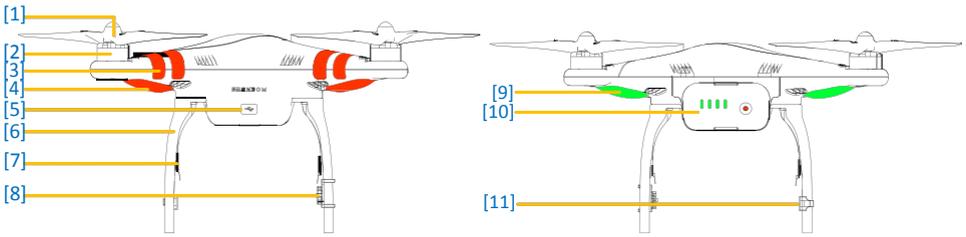


Figure 1-1

Figure 1-2

[1]Propeller [2]Motor [3]Front Side [4]Front LEDs [5]Micro-USB Port [6]Landing Gear [7]Receiver Antenna [8]CAN-Bus Connector [9]LED Flight Indicators [10]DJI Intelligent Battery [11]Compass

## 1.1 Built-in Flight Control System Instructions

The built-in flight control system is used to control the entire aircraft’s functions in flight such as Pitch (forwards and backwards), Roll (left and right), Elevator (up and down) and Yaw (turn left or right). The flight controller contains the MC (Main Controller), IMU, GPS, compass, receiver.

The IMU (Inertial Measurement Unit) has a built-in inertial sensor and a barometric altimeter that measures both attitude and altitude. The compass reads geomagnetic information which assists the GPS (Global Position System) to accurately calculate the aircrafts position and height in order to lock the aircraft in a stable hover. The receiver is used to communicate with the remote control and the MC acts as the brains of the complete flight control system connecting and controlling all the modules together.



The PHANTOM 2 can be configured in the Assistant, by choosing Naza-M mode or Phantom 2 mode.

This manual is for Phantom 2 mode. Please refer to the [Naza-M V2 Quick Start Manual](#) for more information.

## 1.2 Connections with Other DJI Products

PHANTOM 2 is compatible with other DJI products, including ZENMUSE H3-2D and H3-3D gimbal , iOSD mini , iOSD Mark II. Below are connections for these products and wireless video transmission module.

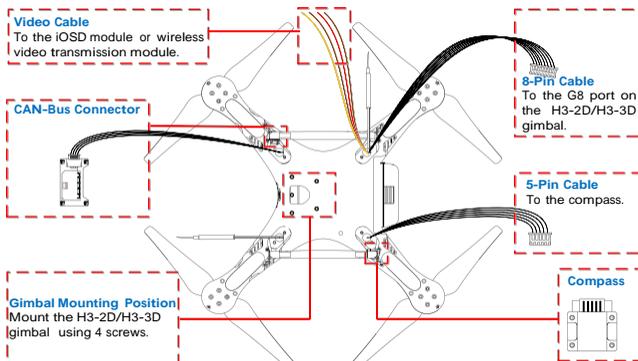


Figure 1-3

## Important Notes of Using with Other DJI Products

- ( 1 ) The video cable can provide power for the wireless video transmission module with a battery voltage (11.1V-12.6V) and a maximum current 2A.
- ( 2 ) Make sure the working current of the wireless video transmission module you connect can work with an operational voltage between 11.1V-12.6V and the total working current of the iOSD and wireless video transmission module is under 2A, as an overcurrent will damage the central board's components. If the total current exceeds 2A, please be sure to provide power supplied from a separate power source for the wireless video transmission module.
- ( 3 ) PHANTOM 2 uses a 2.4GHz RC system. To avoid communication interference, it's not recommended to use other 2.4GHz devices (including 2.4G Wi-Fi or 2.4G wireless video transmission module) except the 2.4G Bluetooth and 2.4G Datalink.
- ( 4 ) Be sure to keep the wireless video transmission module and other communicating devices away from the compass during installation and connection to avoid interference.
- ( 5 ) To improve the compatibility with ZENMUSE gimbals, the latest factory deliveries of PHANTOM 2 has updated to the Version 2 shown below. H3-2D/H3-3D gimbal can be directly installed for the Version 2 while for Version 1, a H3-3D adapter kit (coming soon) is required to install the H3-3D gimbal.

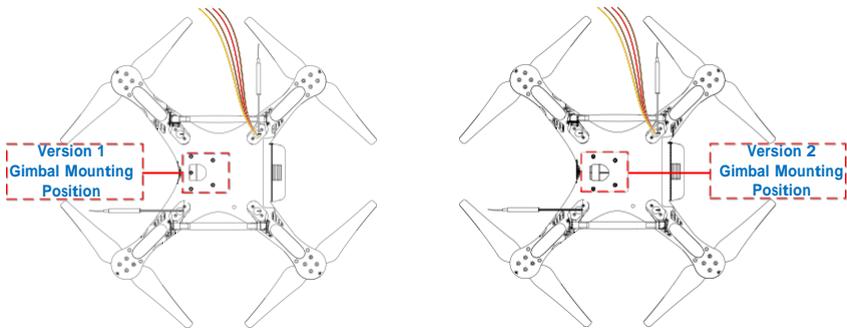


Figure 1-4

- ( 6 ) When using the H3-3D gimbal, please connect the 8-Pin cable of PHANTOM 2 to the G8 port of H3-3D shown below.

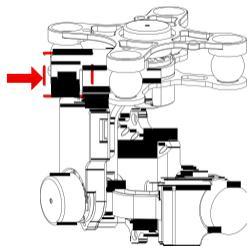


Figure 1-5

## Connections with Other DJI Products

- ( 1 ) Connecting the H3-2D and H3-3D gimbal and wireless video transmission module, the figure below uses H3-2D as an example.

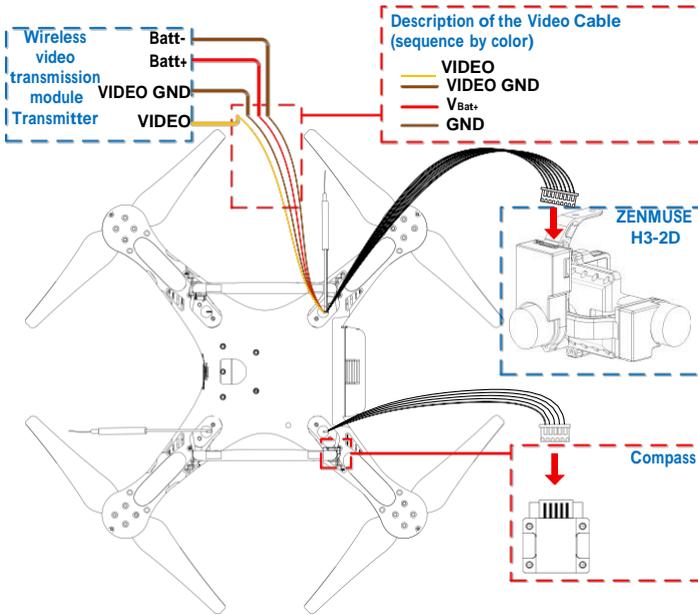


Figure 1-6

- ( 2 ) Connecting the H3-2D and H3-3D gimbal, iOSD mini and wireless video transmission module, the figure below uses H3-2D as an example.

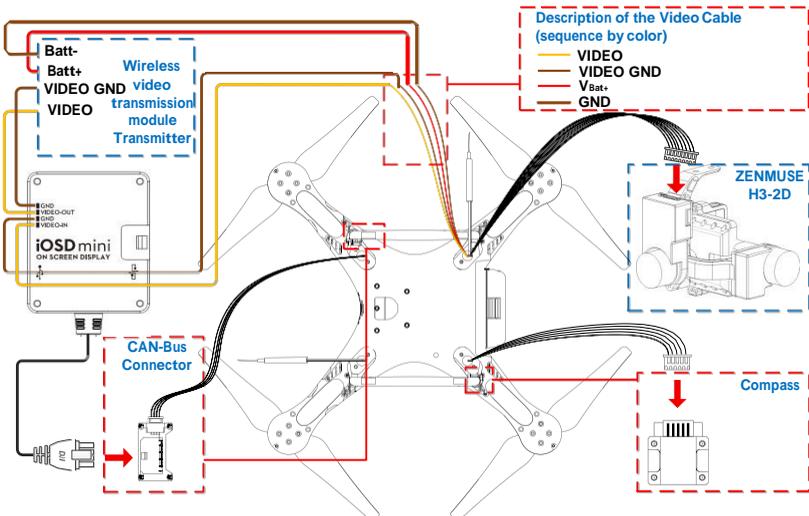


Figure 1-7

( 3 ) Connecting the H3-2D and H3-3D gimbal, iOSD mini and DJI specified wireless video transmission module AVL58, the figure below uses H3-2D as an example.

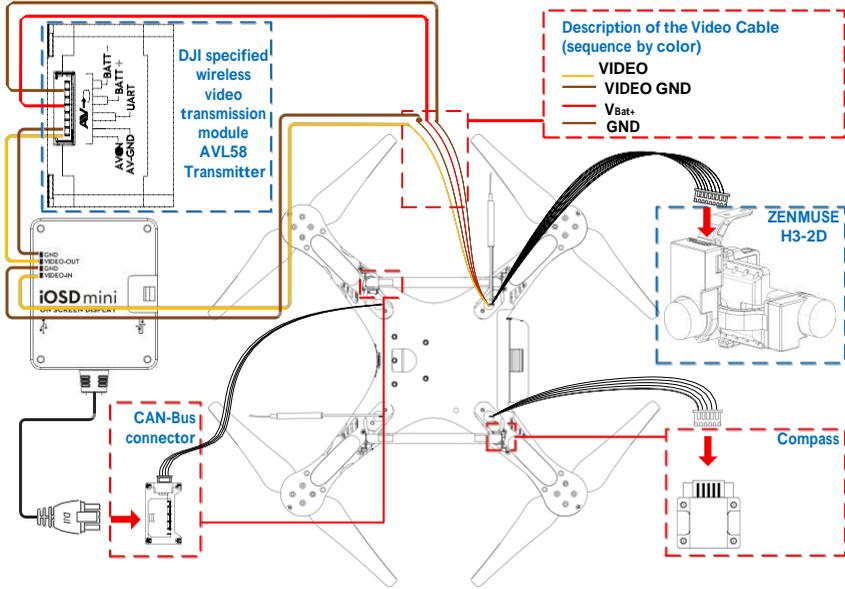


Figure 1-8



We recommend connecting the V<sub>Bat+</sub> port of the video cable to the two BATT+ ports of the AVL58 simultaneously. The same is true of the GND port of the video cable and two BATT- ports.

( 4 ) Connecting the H3-2D and H3-3D gimbal, iOSD Mark II and wireless video transmission module, the figure below uses H3-2D as an example.

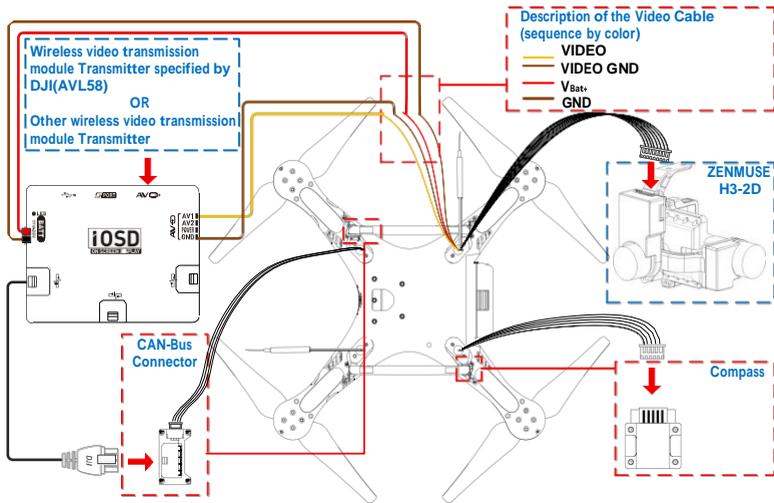
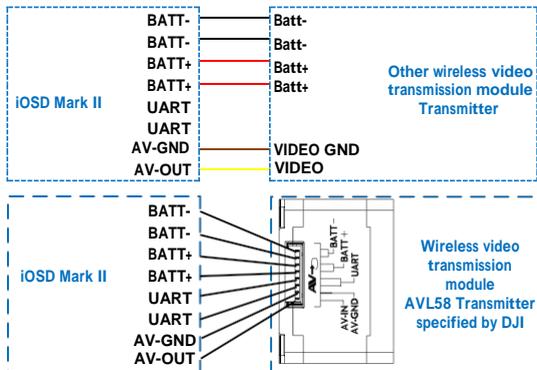


Figure 1-9

The diagram below illustrates the connection between the iOSD Mark II and the wireless video transmission module.



Use the 8-Pin cable in the iOSD Mark II package when connecting to the DJI specified wireless video transmission module AVL58.

( 5 ) Using the iPad Ground Station

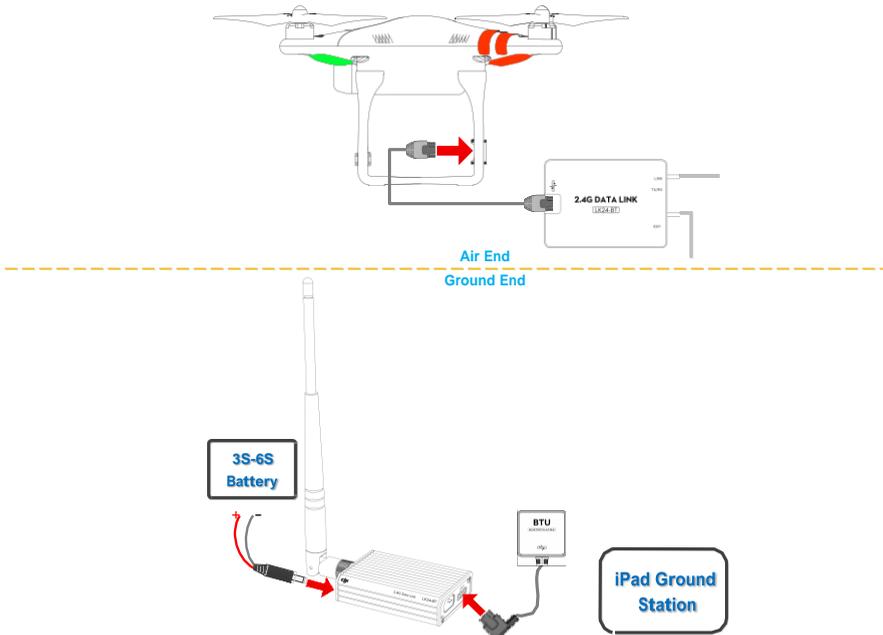


Figure 1-10



Connect the Air End of 2.4G Bluetooth Datalink to a spared CAN-Bus port of iOSD if an iOSD is used.

( 6 ) Using the PC Ground Station

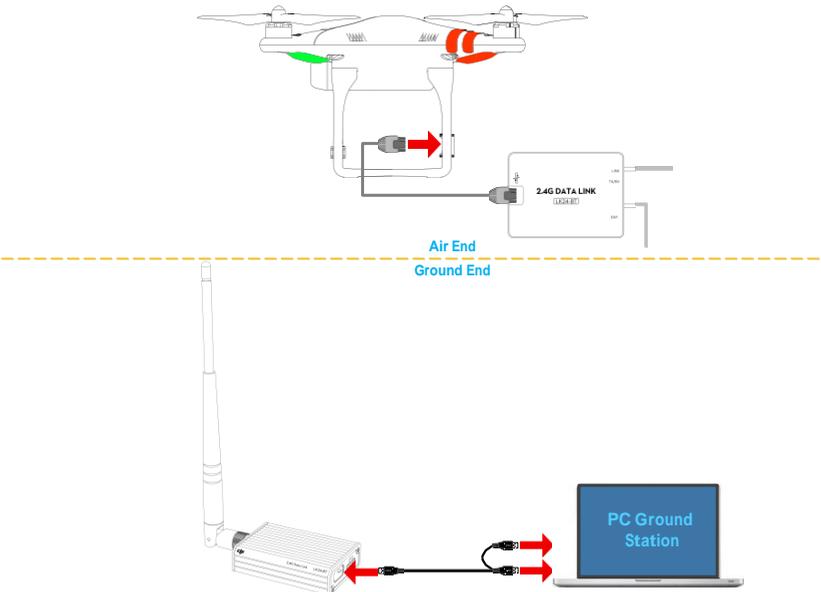
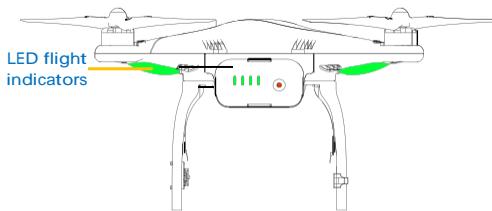


Figure 1-11

### 1.3 LED Flight Indicators Description

- LED flight indicators are used to show the aircraft's current status. Once powered on, the indicators will light up.

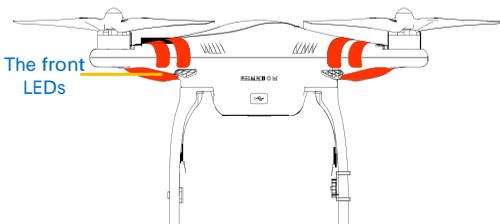


Aircraft in Normal status	Descriptions
●●●●●●	Power On Self-Test
●●●●●●	Warming Up & Aircraft cannot take off during warming up
●●●●●●	Ready to Fly
●●●●●●	Ready to Fly (non-GPS)
Aircraft in abnormal status	Warnings and errors
●●●●●●	Remote Control Signal Lost
●●●●●●	1 <sup>st</sup> Level Low Battery Capacity Warning
●●●●●●	2 <sup>nd</sup> Level Low Battery Capacity Warning
●●●●	Not Stationary or Sensor Bias is too big
	Errors & Aircraft cannot fly.
●●●●●●	Compass data abnormal because of ferro-magnetic interference or the compass needs calibration.



- The LED indicators diagram above are for Phantom 2 mode. In Naza-M mode, LED indicators will work according to the Naza-M flight control system.
- Connect to the PHANTOM 2 Assistant for detailed information about warnings and errors.

- The front LEDs are for indicating where the nose of the aircraft is. They light up solid red only after the motors have spooled up.



#### 1.4 Notes for PHANTOM 2 using with other DJI products

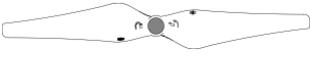
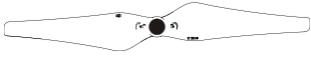
Before using PHANTOM 2 with other DJI products, users should connecting the products correctly and upgrade the firmware as requirements below .

Items to upgrade	Firmware versions required	Assistant for upgrading	Assistant version
P330CB (built-in central board)	V1.0.119 or above	PHANTOM 2	V1.08 or above
Zenmuse H3-2D	CMU V1.0 , IMU V1.6 or above	PHANTOM 2	V1.08 or above
iOSD Mark II	V3.01 or above	iOSD	V4.0 or above
iOSD mini	V1.06 or above	iOSD	V4.0 or above

\*The iOSD Assistant is applied to both iOSD Mark II and iOSD mini.

## 2 Propellers

PHANTOM 2 uses the original 9-inch propellers which are classified by the color of each central nut. Damaged propellers should be replaced by purchasing new ones if necessary.

Propellers	Grey Nut (9450)	Black Nut (9450 R)
Diagram		
Assembly Location	Attach to the motor thread that does not have a black dot.	Attach to the motor thread that has a black dot.
Fastening/Un-fastening Instructions	 Lock: Tighten the propeller in this direction.	 Unlock: Remove the propeller in this direction.

### 2.1 Assembly

- ( Figure 2-1 ) Remove the four warning cards from the motors after you've read them.
- ( Figure 2-2 ) Prepare the two grey nut propellers and two black nut propellers. Make sure to match the black nut propellers with the correctly marked black dot motors. Tighten the propellers according to the fastening instructions.

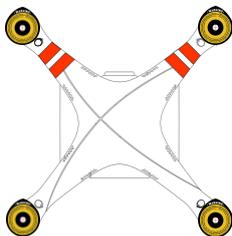


Figure 2-1

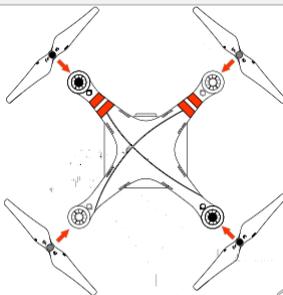


Figure 2-2

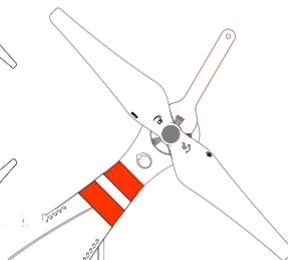


Figure2-3

### 2.2 Disassembly

( Figure 2-3 ) Keep the motor deadlocked in place with the assistant wrench (or one hand) and remove the propeller according to the un-fastening instructions.

### 2.3 Notes

- Propellers are self tightening during flight. DO NOT use any thread locker on the threads.
- Make sure to match the propeller nut colors with the corresponding motors.
- It is advised to wear protective gloves during propeller assembly and removal.
- Check that the propellers and motors are installed correctly and firmly before every flight.
- Check that all propellers are in good condition before flight. DO NOT use any ageing, chipped, or broken propellers.
- To avoid injury, STAND CLEAR of and DO NOT touch the propellers or motors when they are spinning.
- ONLY use original DJI propellers for a better and safer flight experience.

### 3 Remote Control

The PHANTOM 2 remote control can be configured in the PHANTOM RC Assistant. The sticks mode is Mode 2 on delivery.



For upgraded remote control (models: NDJ6 or NRC900), select “Upgrade Version” in Phantom Assistant.  
For basic remote control (models: DJ6 or RC900), select “Basic Version” in Phantom Assistant.

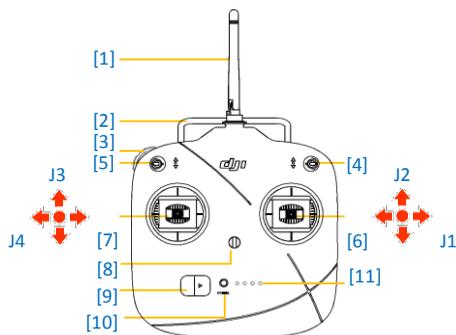


Figure 3-1

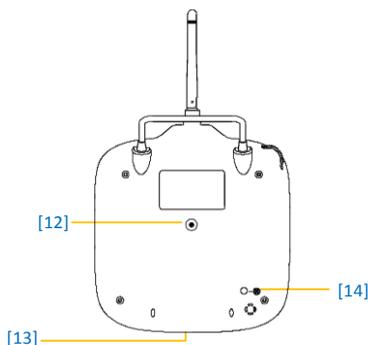
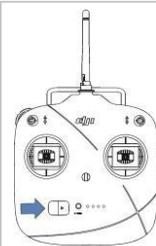


Figure 3-2

[1]Antenna [2]Carrying Handle [3]Left Dial [4]3-Position Switch S1 [5]3-Position Switch S2 [6]Joystick1(J1;J2)  
[7]Joystick2(J3;J4) [8]Neck Strap Attachment [9]Power Switch [10]Power Indicator  
[11]Battery Level Indicators LED1/LED2/LED3/LED4 (from left to right) [12]Trainer Port  
[13]Battery Charge & RC Assistant Port (micro-USB port) [14] Potentiometer

#### 3.1 Power on the Remote Control

1. Set the S1 and S2 switches to the upper most position and ensure both joysticks are at the mid-point position. Then toggle on the power switch.
2. Push the power switch to the right to power on the remote control. If the power LED indicator is solid on, the remote control is functioning normally. The battery level indicators display the current battery level.



1. Please make sure the battery level of remote control is enough. If the low voltage warning alert sounds (refer to <Remote Control Power LED Indicator Status>), please recharge the battery as soon as possible.



2. Charge the remote control’s battery by using the included micro-USB cable. Using the incorrect type of charging cable may cause damage.

3. Turn off the remote control before charging. The power LED indicator will display solid red when charging is in progress. The LED indicators will display solid green when the battery is fully charged.

### 3.2 Remote Control LED Indicator Status

#### 3.2.1 Remote Control Power LED Indicator Status

Power LED Indicator	Sound	Remote Control Status
	None	Functioning normally.
	None	Charging( remote control is powered off)
	None	Remote control joysticks calibration error, need to be re-calibrate.
	BB---BB---BB	Low voltage (from 3.5V-3.53V), recharge the remote control.
	B-B-B.....	Critical low voltage (from 3.45V-3.5V). Recharge the remote control immediately.
	B--B--B.....	Alert will sound after 15 minutes of inactivity. It will stop once you start using the remote control.

 The remote control will power off automatically when battery voltage drops below 3.45V. Land and recharge the battery as soon as possible when the low voltage alert occurs to avoid loss of control during flight.

#### 3.2.2 Remote Control Battery Level Indicator Status

The battery level indicators will show the current battery level during both the discharging process. The following is a description of the indicators.

 : The LED is solid on       : The LED will blink regularly

 : The LED is light off

Discharging process				
LED1	LED2	LED3	LED4	Current battery level
				75%-100%
				50%-75%
				25%-50%
				12.5%-25%
				0%-12.5%
				<0%

### 3.3 Antenna Orientation

The remote control's antenna should point skywards without obstructions for maximum communication range during flight.



Figure 3-3

### 3.4 Remote Control Operation

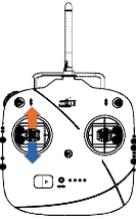
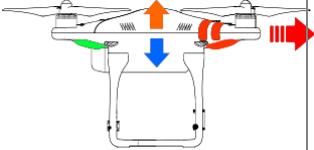
The operations of remote control are based on mode 2 stick configuration.

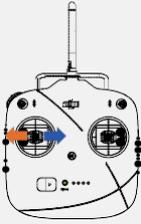
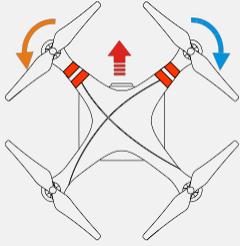
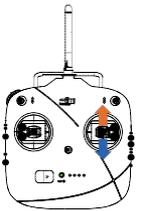
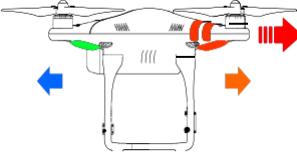
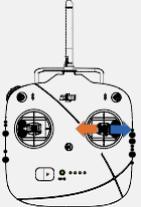
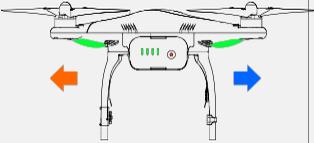
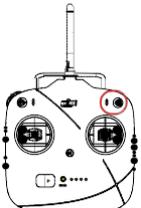
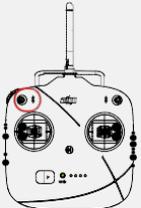
#### Definitions

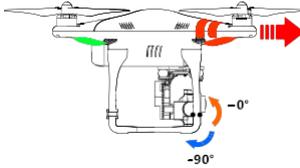
The 'stick neutral' positions and 'stick released' mean the control sticks of the remote control are placed at the central position.

To 'move the stick' means that the stick of remote control is pushed away from the central position.

Slide Lever is used for the pitch control of the H3-2D and H3-3D gimbal.

Remote Control (Mode 2)	Aircraft ( ← nose direction )	Operation details
		<p>The throttle stick controls aircraft altitude/elevation.            Push the stick up and the aircraft will rise.            Pull the stick down and the aircraft will descend.            The aircraft will automatically hover and hold its altitude if the sticks are centered.            Push the throttle stick above the centered (mid-point) position to make the aircraft take off. When flying, we suggest that you push the throttle stick slowly to prevent the aircraft from sudden and unexpected elevation changes.</p>

		<p>The yaw stick controls the aircraft rudder.</p> <p>Push the stick left and the aircraft will rotate counter clock-wise.</p> <p>Push the stick right and the aircraft will rotate clock-wise. If the stick is centered, the aircraft will remain facing the same direction.</p> <p>The yaw stick controls the rotating angular velocity of the aircraft. Pushing the stick further away from center results in a faster aircraft rotation velocity.</p>
		<p>The pitch stick controls the aircraft's front &amp; back tilt.</p> <p>Push the stick up and the aircraft will tilt and fly forward.</p> <p>Pull the stick down and the aircraft will tilt and fly backward. The aircraft will keep level and straight if the stick is centered.</p> <p>Pushing or pulling the stick further away from center will result in a larger tilt angle (maximum of is 35°) and faster flight velocity.</p>
		<p>The roll stick controls the aircraft's left &amp; right tilt.</p> <p>Push the stick left and the aircraft will tilt and fly left.</p> <p>Push the stick right and the aircraft will tilt and fly right.</p> <p>The aircraft will keep level and straight if the stick is centered.</p> <p>Pushing the stick further away from center will result in a larger tilt angle (maximum of 35°) and faster flight velocity.</p>
	 <p>Position-1      Position-2      Position-3</p>	<p>S1 is for compass calibration. Toggle the S1 switch from position-1 to position-3 and back to position-1 at least 5 times, which will force the aircraft to enter into compass calibration mode.</p> <p>Users can configure position 3(bottom position) of the S1 switch to trigger the Failsafe in the Assistant.</p>
	 <p>OFF      Course Lock      Home point Lock</p>	<p>S2 is the IOC mode switch. IOC (Intelligent Orientation Control) function can be enabled in the Assistant when in Naza-M mode. Only use the IOC function after you are familiar with flying.</p>

		<p>The left dial controls the pitch of the H3-2D and H3-3D gimbal. The position of left dial determines the pitch angle relative to the horizontal level.</p> <p>Turn the left dial to the right to make the gimbal pitch up.</p> <p>Turn the left dial to the left to make the gimbal pitch down.</p> <p>The gimbal will keep its current position if the dial is static.</p>
--	---	--

-  ( 1 ) For ‘Ready to Fly’ the aircraft will hover when all sticks are released.
- ( 2 ) For ‘Ready to Fly (non-GPS)’ the aircraft will only keep the altitude when all sticks are released.

### 3.5 Linking the Remote Control & Built-in Receiver

PHANTOM 2 has a built-in receiver, the link button and indicator located on the bottom of the aircraft as illustrated in the Figure 3-4.

The link between the remote control and aircraft is already established for you so you can initially skip this procedure. If you ever replace the remote control, re-establishing the link is required.

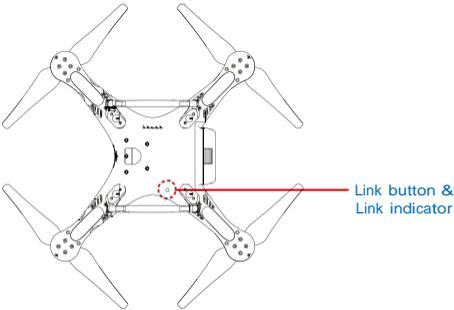


Figure 3-4

#### Linking procedures

1. Power on the PHANTOM 2.
2. Turn on the remote control and place it 0.5m~1m away from the aircraft.
3. Push the link button with a thin object and hold it until the Link indicator blinks red, then release it.
4. When the Link indicator turns solid green, the link between the remote control and the built-in receiver has been successfully established.

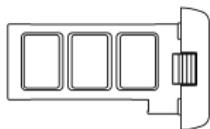
Link Indicator	Status
	The remote control is turned off and there is no 2.4GHz signal around, please turn on the remote control.
	The receiver is ready for linking.
	There is 2.4GHz signal around but the remote control is not linked with the receiver,

please carry out the linking procedures.

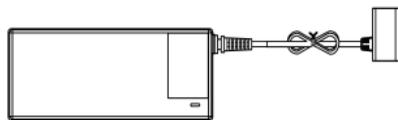
The remote control is linked with the receiver successfully.

## 4 Intelligent Battery

The intelligent battery is specially designed for the PHANTOM 2, with a battery capacity of 5200mAh, voltage of 11.1V and charge-discharge management functionality. The battery should only be charged with the DJI charger.



Intelligent Battery



Charger

DJI Intelligent Battery Functions	
( 1 ) Balance Charging	Automatically balance the voltage of each battery cell during charging.
( 2 ) Capacity Display	Display the current battery level.
( 3 ) Communicating	The main controller communicates with the battery via communication ports for battery voltage, capacity, current and other information.
( 4 ) Overcharging Protection	Charging stops automatically when the battery voltage reaches 12.8V to prevent overcharging damage.
( 5 ) Over Discharging Protection	Discharging stops automatically when the battery voltage reaches 8.4V to prevent over discharging damage.
( 6 ) Short Circuit Protection	Automatically cuts off the power supply when a short circuit is detected.
( 7 ) Sleep Protection	The battery will enter sleep mode after 10 minutes of inactivity to save power. The static current is 10nA in sleep mode when the battery is powered on without connecting to other devices.
( 8 ) Charging Temperature Detection	The battery will charge only when its temperature is within 0°C-55°C. If the battery temperature is out of this range, the battery will stop charging.

( 1 ) Before use, please read and follow the user manual, disclaimer, and the warnings on the battery.



Users take full responsibility for all operations and usage.

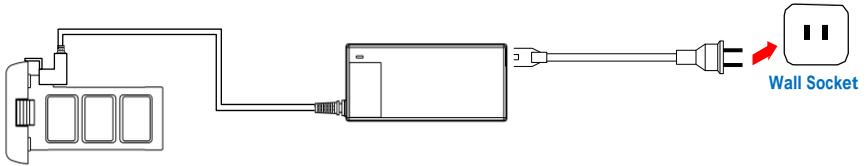
( 2 ) The battery should only be charged with the charger provided by DJI. DJI does not take any responsibility for operation of any charger from a third party.

### 4.1 Charging Procedures

1. Connect the charger to a wall socket (Use the plug set if necessary).
2. Connect the battery to the charger. If the current capacity of the battery is over 75%, you should power on the battery to begin charging.
3. The Battery Level indicators display current capacity level as the battery charges. Please refer to battery

level indicator description for details.

4. The battery is fully charged when the Battery Level indicator lights are off. Please disconnect the charger and battery when the charging is completed.



## 4.2 Install the Battery

Push the battery into the battery compartment correctly as the following diagram shows. Make sure to push the battery into the compartment until you hear a ‘click’ sound.

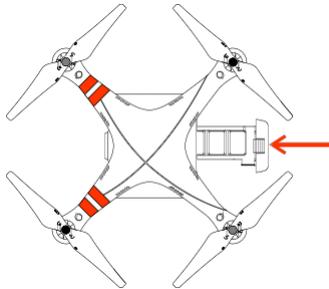


Figure 4-1



An incorrectly inserted battery may cause one of the following to occur: (1) Bad contact. (2) Unavailable battery information. (3) Unsafe for flight. (4) Unable to take off.

## 4.3 Battery Usage

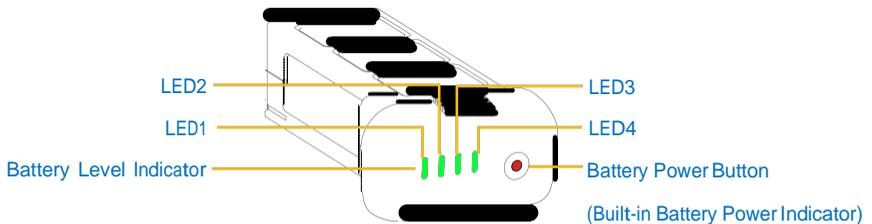


Figure 4-2

- (1) Checking the battery level: When the battery is powered off; pressing the battery power button once will indicate the current battery level. Refer to < Battery Level Indicator Description> for details.
- (2) Powering on: When the battery is powered off; press the battery power button once and then press and hold for 2 seconds to turn on the intelligent battery.
- (3) Powering off: When the battery is powered on; press the battery power button once and then press and hold for 2 seconds to turn off the intelligent battery.

(4) Checking the battery life: When the battery is powered off; press and hold the battery power button for 5 seconds to check the battery life. The battery level indicators will show the life and the battery power indicator will blink for 10 seconds, then all LEDs will light out and the intelligent battery will turn off. Refer to < Battery Level Indicator Description> for details.

 More battery information is available in the battery tab of the PHANTOM 2 Assistant.

#### 4.4 Description of the Battery Level Indicator

The battery level indicators will show the current battery level during both the charging and discharging process as well as battery life. The following is a description of the indicators.

 : The LED is solid on       : The LED will blink regularly

 : The LED is light off

Charging process				
LED1	LED2	LED3	LED4	Current battery level
				0%-25%
				25%-50%
				50%-75%
				75%-100%
				Full charged

Discharging process				
LED1	LED2	LED3	LED4	Current battery level
				87.5%-100%
				75%-87.5%
				62.5%-75%
				50%-62.5%
				37.5%-50%
				25%-37.5%
				12.5%-25%
				0%-12.5%
				<0%

Battery life				
LED1	LED2	LED3	LED4	Current battery life
				90%-100%

				80%-90%
■	■	■	■	70%-80%
				60%-70%
■	■	■	■	50%-60%
				40%-50%
■	■	■	■	30%-40%
				20%-30%
■	■	■	■	Less than 20%

#### 4.5 Correct Battery Usage Notes

1. **Never plug or unplug the battery into the aircraft when it is powered on.**
2. The battery should be charged in an environment that is between 0°C to 40°C, and be discharged in an environment that is between -20°C to 50°C. Both charging and discharging should be in an environment where the relative humidity is lower than 80%.
3. It's recommended to charge and discharge the battery thoroughly once every 20 charge/discharge cycles. Users should discharge the battery until there is less than 8% power left or until the battery can no longer be turned on. Users should then fully recharge the battery to maximum capacity. This power cycling procedure will ensure the battery is working at its optimal level.
4. For long term storage please place the battery with only a 40-50% capacity in a strong battery box securely. We recommend discharging and charging the battery completely once every 3 months to keep it in good condition. The capacity should be varied in such a cycle (40%-50%)—0%—100%—(40%-50%).
5. It's suggested you purchase a new battery after you have discharged your current battery over 300 times. Please completely discharge a battery prior to disposal.
6. It's suggested that you purchase a new battery if the current battery is swollen or damaged in any way.
7. Never try to recharge or fly with a battery that is swollen or damaged in any way.
8. Never charge the battery unattended. Always charge the battery on a non-flammable surface such as concrete and never near any flammable materials.
9. Safety is extremely important and users can get more information in the DISCLAIMER.

## 5 Calibrating the Compass

**IMPORTANT:** Make sure to perform the Compass Calibration procedures prior to the first flight.

The compass is very sensitive to electromagnetic interference which causes abnormal compass data and leads to poor flight performance or even flight failure. Regular calibration of the compass enables the compass to perform at its optimal level.

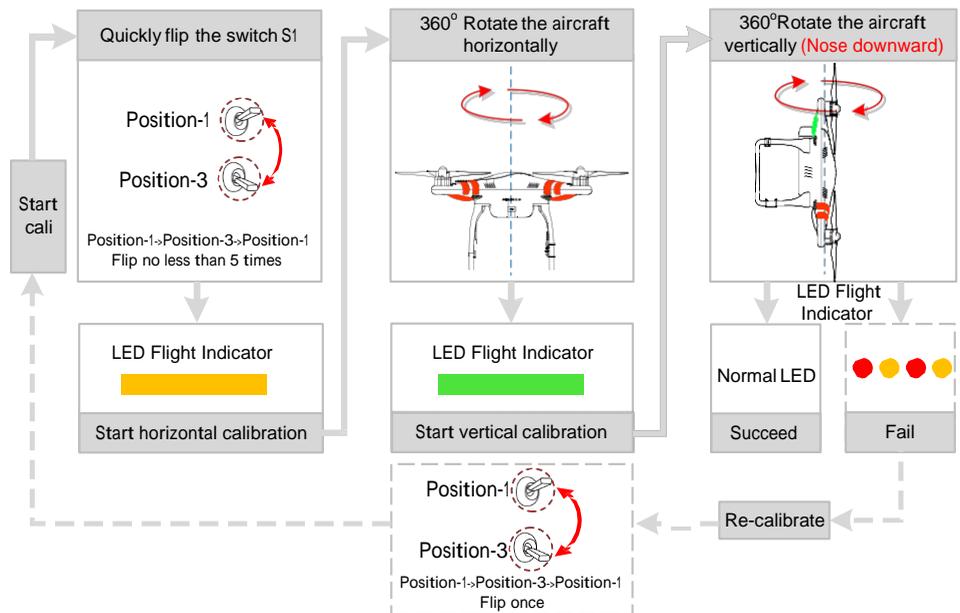
### 5.1 Calibration Warnings



- (1) DO NOT calibrate your compass where there is a possibility for the existence of strong magnetic interference such as magnetite, parking structures, and steel reinforcement underground.
- (2) DO NOT carry ferromagnetic materials with you during calibration such as keys or cellular phones.
- (3) Compass Calibration is very important; otherwise the flight control system will work abnormally.

### 5.2 Calibration Procedures

Please carry out the calibrating procedures in the flight field before flight. Please watch the quick start video of the PHANTOM 2 for more compass calibration details.



### 5.3 When Recalibration is required

- (1) When Compass Data is abnormal, the LED flight indicator will blink alternating between red and yellow.
- (2) Last compass calibration was performed at a completely different flying field/location.
- (3) The mechanical structure of the aircraft has changed, i.e. changed mounting position of the compass.
- (4) Evident drifting occurs in flight, i.e. the aircraft doesn't fly in straight lines.

## 6 Flight

### 6.1 Flying Environment Requirements

- ( 1 ) Before your first flight, please allow yourself some flight training (Using a flight simulator to practice flying, getting instruction from an experienced person, etc).
- ( 2 ) DO NOT fly in bad weather, such as rain or wind (more than moderate breeze) or fog.
- ( 3 ) The flying field should be open and void of tall buildings or other obstacles; the steel structure within buildings may interfere with the compass.
- ! ( 4 ) Keep the aircraft away from obstacles, crowds, power lines, trees, lakes and rivers etc.
- ( 5 ) Try to avoid interference between the remote control and other wireless equipment (No base stations or cell towers around).
- ( 6 ) The flight control system will not work properly at the South Pole or North Pole.
- ( 7 ) Never use the aircraft in a manner that infringes upon or contravenes international or domestic laws and regulations.

### 6.2 Starting the Motors

A Combination Stick Command (CSC) is used to start the motors. Push the sticks according to one of the options below to start motors. Once the motors have started, release both sticks simultaneously. The same CSC is used to stop the motors.

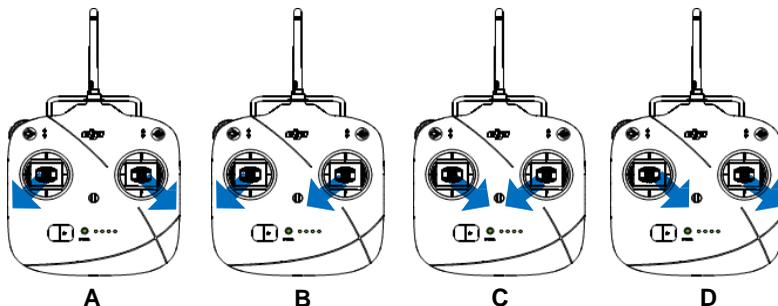


Figure 6-1

### 6.3 Takeoff/Landing Procedures

1. Start by placing the PHANTOM 2 on the ground with the battery level indicators facing you.
2. Turn on the remote control.
3. Power on the aircraft by turning on the intelligent battery.
4. When LED flight indicator blinks green/yellow, the PHANTOM 2 is entering Ready to Fly/Ready to Fly (non-GPS) mode. Start the motors with the CSC command.
5. Push the throttle stick up slowly to lift the aircraft off the ground. Refer to <Remote Control Operation> for more details.
6. Be sure you are hovering over a level surface. Pull down the throttle stick to descend. The stick will lock into

place and the aircraft will descend steadily.

7. After landing, leave the throttle stick down for 3 to 5 seconds to stop the motors. Return throttle stick to middle position after the motors have stopped.



You **SHOULD NOT** execute the CSC during normal flight! This will stop the motors and cause the aircraft to descend rapidly and drop without any type of control.

( 1 ) When the LED flight indicator blinks yellow rapidly during flight, the aircraft has entered into Failsafe mode, refer to <Failsafe Function> for details.

( 2 ) A low battery capacity warning is indicated by the LED flight indicator blinking red slowly or rapidly during flight. Refer to the <Low Battery Capacity Warning Function> for details.

( 3 ) Watch the quick start video about flight for more flight information.



( 4 ) Aircraft and battery performance is subject to environmental factors such as air density and temperature. Be very careful when flying 3000 meters (9800 feet) or more above sea level, as battery and aircraft performance may be reduced.

( 5 ) When used with a H3-3D gimbal, a GoPro camera, and the iOSD mini, your Phantom 2 will be very close to its maximum takeoff weight. It is not recommended that you attach the Phantom 2 propeller guards at this weight. Otherwise, the aircraft will be unable to fly normally.

## 6.4 Failsafe Function

The aircraft will enter Failsafe mode when the connection from the remote control is lost. The flight control system will automatically control the aircraft to return to home and land to reduce injuries or damage. The following situations would make the aircraft fail to receive a signal from the remote control and enter Failsafe mode:

- ( 1 ) The remote control is powered off.
- ( 2 ) The remote control is powered on but the S1 is toggled in the position triggering the Failsafe (this must have been configured in the PHANTOM 2 Assistant).
- ( 3 ) The aircraft has flown out of the effective communication range of the remote control.
- ( 4 ) There is an obstacle obstructing the signal between the remote control and the aircraft, essentially reducing the distance the signal can travel.
- ( 5 ) There is interference causing a signal problem with the remote control.

Failsafe works differently depending on the mode the aircraft is in when Failsafe mode is initiated whether it is in the Ready to Fly or Ready to Fly (non-GPS) mode.

Ready to Fly (non-GPS) ---- Automatic landing

The flight control system will try to keep the aircraft level during descent and landing. Note that the aircraft may be drifting during the descent and landing process.

Ready to Fly ---- Automatic go home and land

The flight control system will automatically control the aircraft to fly back to the home point and land.

## Home Point

When the aircraft is initializing the Ready to Fly status, the aircraft will record the current GPS coordinates as the home point. It is recommended to lift off only after Ready to Fly status is confirmed for the safety of being able to fly back to home point successfully in case the Failsafe mode is initiated.

## Go Home Procedures

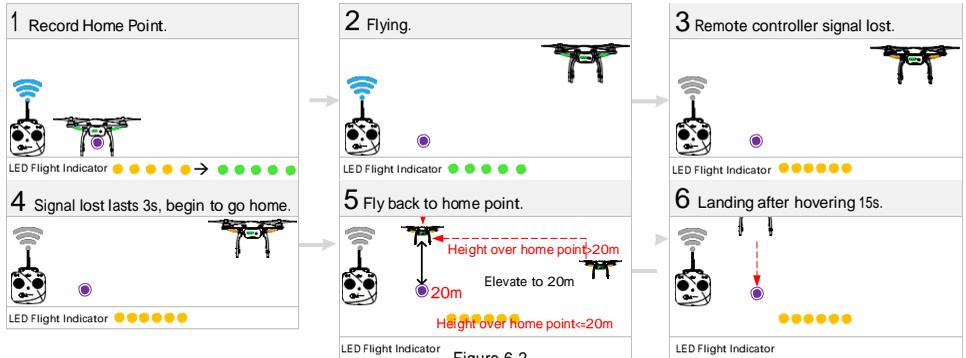


Figure 6-2



- (1) In a Failsafe situation, if less than 6 GPS satellites are found for more than 20 seconds, the aircraft will descend automatically.

In Phantom 2 mode, users can set a new home point manually when the aircraft is in “Ready to fly” status as long as a home point has been recorded automatically. Quickly flipping the S2 switch of the remote control from upper most to lower most positions 5 times or more will reset the current aircraft position as a new home point of PHANTOM 2. When successfully reset, you will see a series of rapid green blinks on the LED Flight Indicator. The definition of “home point” is:



- (1) The home point is the place PHANTOM 2 returns to when the control signal is lost, which is recorded last time.
- (2) The home point is used to calculate the horizontal distance between you and the aircraft, the

distance will be displayed as  $D_1$  if using iOSD module.

## Regaining Control during Failsafe Procedure

Position of Switch S1	 Position-1	 Position-2	 Position-3 (No triggering the Failsafe)
How to regain control	When the S1 switch is switched to Position-1, toggle the S1 switch to any other position once to regain control. If remote control's signal is recovered, control is returned back to the pilot.	Regain control as soon as signal is recovered.	

## 6.5 Low Battery Capacity Warning Function

The low battery capacity warning alerts users when the battery is close to depletion during flight. When it appears, users should promptly fly back and land to avoid accidental damage. The PHANTOM 2 has two levels of low battery capacity warning. The first appears when the battery has less than 30% power and the second appears when it has less than 15% power.

- ( 1 ) When battery power drops below 30% and LED indicator will blink red slowly.
- ( 2 ) At lower than 15% the LED indicator will blink red rapidly, the PHANTOM 2 will also begin to descend and land automatically. After it has landed, keep the throttle stick at its lowest point or execute CSC.
- ( 3 ) There is a hidden third low battery threshold in addition to the 1st and 2nd level warnings. This uses 10.65V as its threshold. Both this voltage threshold and the 2nd Level Low Battery Warning will trigger auto-landing. Altitude can be maintained if necessary by pushing up on the throttle stick.



( 1 ) Remember to fly your PHANTOM 2 back as soon as you see a low battery capacity warning.

( 2 ) Keeping the battery contact needles and pads clean is very important. Any dirt and dust may cause a communication failure.

## 6.6 Flight Limits Function

All UAV (unmanned aerial vehicle) operators should abide by all regulations from such organizations at ICAO (International Civil Aviation Organization) and per country airspace regulations. For safety reasons, the flight limits function is enabled by default to help users use this product safely and legally. The flight limits function includes height, distance limits.

In Ready to Fly status, height, distance limits works together to restrict the flight. In Ready to Fly (non-GPS) status, only height limit works and the flying height restricted to be not over 120m.



- (1) The default parameters in the Assistant is compliant within the definitions of class G ruled by ICAO. (Refer to [Airspace Classification](#) to get more details). As each country has its own rules, make sure to configure the parameters to comply with these rules too, before using the PHANTOM 2.

### Max Height & Radius Limits

The Max Height & Radius restricts the flying height and distance. Configuration can be done in the PHANTOM 2 Assistant. Once complete, your aircraft will fly in a restricted cylinder.



Figure 6-3

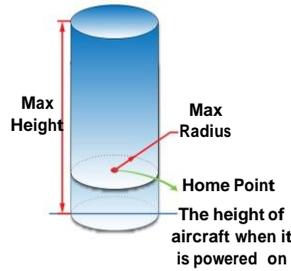


Figure 6-4

Ready to Fly			
	Limits	Ground Station	Rear LED flight indicator
Max Height	The flight height is restricted to fly under the max height.	Warning: Height limit reached.	None.
Max Radius	The flight distance is restricted to fly within the max radius.	Warning: Distance limit reached.	Rapid red flashings when close to the Max radius limit.

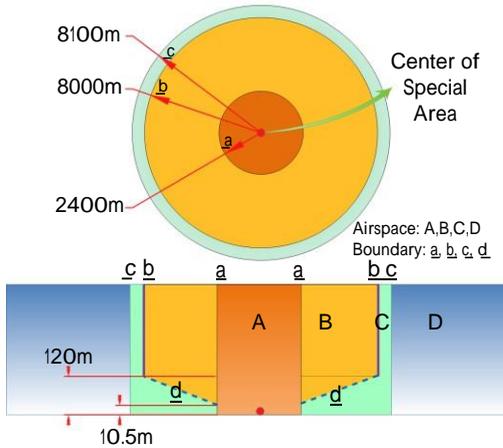
Ready to Fly(non-GPS)			
	Flight Limits	Ground Station	Rear LED flight indicator
Max Height	The flight height is restricted to fly under the minor height between the Max height and 120m.	Warning: Height limit reached.	None.
Max Radius	Not limited, no warnings or LED indicators.		



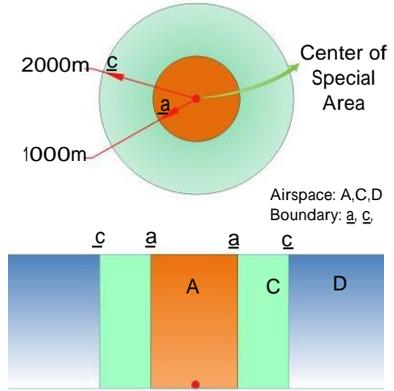
- (1) If the aircraft flies out of the limits, you can still control your aircraft except to fly it further away.
- (2) If the aircraft is flying out of the max radius in Ready to Fly (non-GPS) status, it will fly back within the limits range automatically if 6 or more GPS satellites have been found.

## 6.7 Flight Limits of Special Areas

Special areas include airports worldwide. All special areas are listed on the DJI official website. Please refer to <http://www.dji.com/fly-safe/category-mc> for details. These areas have been divided into category A and category B.



Category A



Category B

Ready to Fly		
Airspace	Limits	Rear LED Flight Indicator
A Orange	Motors will not start.	●●●●●●
	If the Phantom flies into a special area in Ready to Fly (non-GPS) mode and Ready to Fly mode activates, it will automatically descend and land then stop its motors.	
B Yellow	If the Phantom flies into a special area in Ready to Fly (non-GPS) mode and Ready to Fly mode activates, it will descend to airspace C and hover 5 meters below edge <u>d</u> .	
C Green	No restrictions of flight, but the Phantom will not enter Category A, the aircraft can fly free, but it will not enter Airspace B through Boundary <u>b &amp; d</u> . Around Category B sites, the phantom can fly freely, but it will not enter into Airspace A through Boundary <u>a</u> .	
D Blue	No restrictions.	None.



Semi-automatic descent: All stick commands are available except the throttle stick command during the descent and landing process. Motors will stop automatically after landing. Users must toggle the S1 switch to regain control. This is the same as regaining control during Failsafe. Please refer to [Regaining Control During Failsafe Procedure \(Page23\)](#).



- When flying in the airspace (A/B/C) of restricted special area, LED flight indicators will blink red  quickly and continue for 3 seconds, then switch to indicate current flying status and continue for 5 seconds at which point it will switch back to red blinking.
- For safety reasons, please do not fly close to airports, highways, railway stations, railway lines, city centers and other special areas. Try to ensure the aircraft is visible.

## 6.8 Conditions of Flight Limits

In different working modes and flight modes, flight limits will differ according to number of GPS satellites found. The following table demonstrates all the cases(√: available; ×:unavailable).

**All flights are restricted by height, distance and special areas simultaneously.** The Failsafe and Ground Station operations are not restricted to flight limits, but if Ground Station function is used, the flight will be restricted the special area limits built in to Ground Station. Refer to the Ground Station manual for details.

Phantom mode			
Flight Status	Limits of Special Area	Max Height	Max Radius
Ready to Fly	√	√	√
Ready to Fly (non-GPS)	×	√	×

Naza-M mode				
Control Mode	number of GPS found	Limits of Special Area	Max Height	Max Radius
GPS	≥6	√	√	√
	< 6	×	√	×
ATTI.	≥6	√	√	×
	< 6	×	√	×
Manual	≥6	×	×	×
	< 6	×	×	×

### Disclaimer

Please ensure that you are kept up to date with International and Domestic airspace rules and regulations before using this product. By using this product, you hereby agree to this disclaimer and signify that you have read this fully. You agree that you are responsible for your own conduct and content while using this product, and for any direct or indirect consequences caused by not following this manual, violate or disregard any other applicable local laws, administrative rules and social habits thereof.

## 7 Assistant Installation and Configuration

### 7.1 Installing Driver and PHANTOM 2 Assistant

#### Installing and running on Windows

1. Download driver installer and Assistant installer in **EXE** format from the download page of PHANTOM 2 on the DJI website.
2. Connect the PHANTOM 2 to a PC via a Micro-USB cable.
3. Run the driver installer and follow the prompts to finish installation.
4. Next, run the Assistant installer and follow the prompts to finish installation.
5. Double click the PHANTOM 2 icon on your Windows desktop to launch the software.

 The installer in EXE format only supports Windows operating systems (Win XP, Win7, Win8 (32 or 64 bit)).

#### Installing and running on Mac OS X

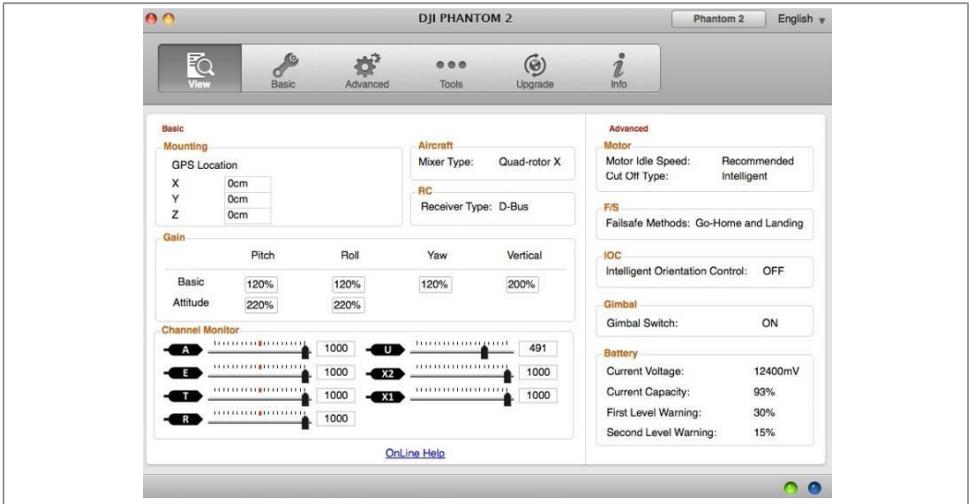
1. Download the Assistant installer in **DMG** format from the download page of PHANTOM 2 on the DJI website.
2. Run the installer and follow the prompts to finish installation.



3. **When launching for the first time** if use Launchpad to run the PHANTOM 2 Assistant, Launchpad won't allow access because the software has not been reviewed by Mac App Store.



4. Locate the PHANTOM 2 icon in the Finder, press the Control key and then click the PHANTOM 2 icon (or right-click the PHANTOM 2 icon using a mouse). Choose Open from the shortcut menu, click open in the prompt dialog box and then software will launch.
5. After the first successful launch, directly launching of the software can be achieved by double-clicking the PHANTOM 2 icon in the Finder or using Launchpad.

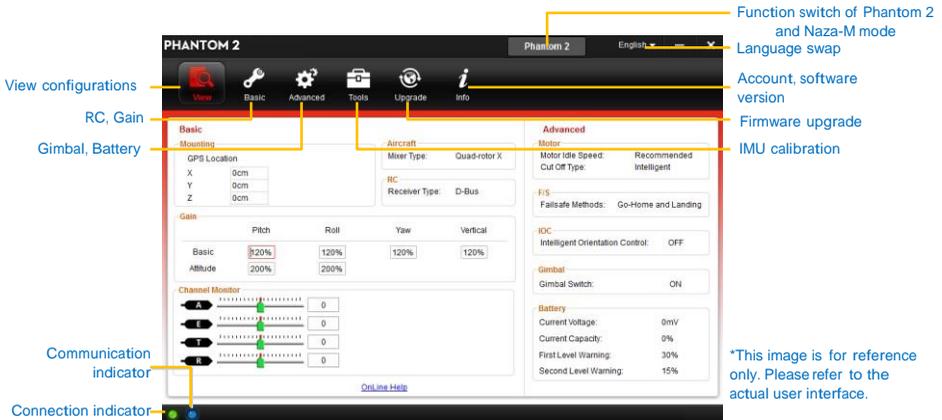


 Installer in DMG format supports only Mac OS X 10.6 or above.

 Usage of PHANTOM 2 Assistant on Mac OS X and Windows are exactly the same. The Assistant pages appear in other places of this manual are on the Windows for example.

### 7.2 Using the PHANTOM 2 Assistant on a PC

1. Start up the PC, power on the PHANTOM 2, then connect the PHANTOM 2 to the PC with a Micro-USB cable. DO NOT disconnect until configuration is finished.
2. Run the PHANTOM 2 Assistant and wait for the PHANTOM 2 to connect to the Assistant. Observe the indicators  on the bottom of the screen. When connected successfully, the connection indicator is  and communication indicator is blinking .
3. Choose [Basic] or [Advanced] configuration pages.
4. View and check the current configuration in the [View] page.



- (1) Users should not enable the Naza-M function before finishing Advanced Flight Maneuvers procedure in the " PHANTOM Pilot Training Guide". If the Naza-M mode is enabled, users can switch the control mode between ATTI. Mode, GPS Mode or Manual Mode, and access the advanced settings (e.g. IOC). In addition, the LED located on the rear frame arms will display



Naza-M flight status indications instead of the PHANTOM 2's indicators. Do not enable the Naza-M mode unless you are an experienced user or guided by a professional.

- (2) You can change to the Phantom 2 mode by clicking the same button used to turn on the Naza-M mode. This operation will disable the Naza-M mode and enable Phantom 2 mode. All parameters will be returned to factory settings.

### 7.3 Firmware upgrade of PHANTOM 2

Please refer to the PHANTOM 2 Assistant to install driver and PHANTOM RC Assistant, and then follow the procedures below to upgrade the software and firmware; otherwise the PHANTOM 2 might not work properly.

1. An internet connection is required to upgrade PHANTOM 2's firmware.
2. Click the [Upgrade] icon to check the current firmware version and whether the installed firmware is the latest version. If not, click the relative links to upgrade.
3. Be sure to wait until the Assistant shows "finished". Click OK and power cycle the PHANTOM 2 after 5 seconds. Once completed, the firmware is up to date.

Loader	Hardware ID	Firmware	Upgrade
Main Controller	1000694463	1.0.4	Latest version 1.05
GPS	6.1.1.2	6.0.1.4	
Receiver-Phantom 2	15.0.0.6	040000426	No updates
P330CB	26.0.0.0	02F0028130	Latest version 1.0.1.18
Gimbal CMU	1.0	200050605	No updates
Gimbal IMU	0.8	200050605	No updates
Battery	1.0.0.0	000000636	No updates

- (1) DO NOT power off until the upgrade is finished.



- (2) If the firmware upgrade failed, the main controller will enter a waiting for firmware upgrade status automatically. If this happens, repeat the above procedures.

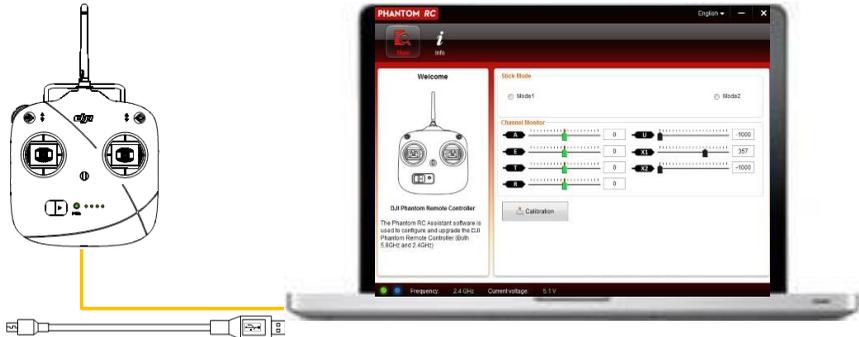


Firmware upgradable items: (1) Main Controller (2) P330CB(Main Board) (3) Receiver (4) Gimbal CMU (5) Gimbal IMU (6) Battery

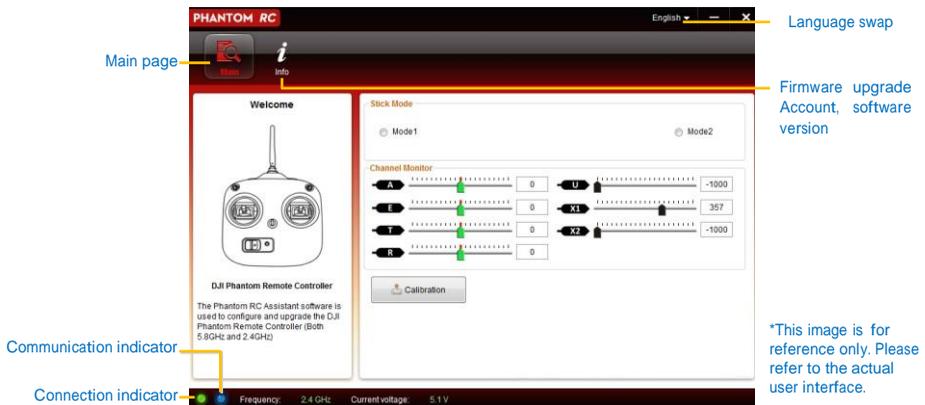
### 7.4 PHANTOM RC Assistant Description

Please follow the procedures to finish the configuration of the remote control.

1. Turn off the remote control and find the Micro-USB port on the bottom of it.
2. Start up the PC, power on the remote control, and then connect the remote control to the PC with a Micro-USB cable. DO NOT disconnect until the configuration is finished.
3. Run the PHANTOM RC Assistant and wait for the remote control to connect to the Assistant. Observe the indicators  on the bottom left of the screen. When connected successfully, the connection indicator is  and communication indicator is blinking .
4. Finish configuration in the [Main] page.
5. Finish upgrade in the [Info] page if necessary.



Main Page of the 2.4GHz Remote Control



## 8 Appendix

### 8.1 Specifications

Aircraft	
Operating environment temperature	-10°C to 50°C
Power consumption	5.6W
Supported Battery	DJI Intelligent battery
Weight (including the battery)	1000g
Take-off Weight	≤1300g
Hovering Accuracy (Ready to Fly)	Vertical: 0.8m; Horizontal: 2.5m
Max Yaw Angular Velocity	200°/s
Max Tilt Angle	35°
Max Ascent / Descent Speed	Ascent: 6m/s; Descent: 2m/s
Max Flight Speed	15m/s (Not Recommended)
Wheelbase	350mm
2.4GHz Remote Control	
Operating Frequency	2.4GHz ISM
Communication Distance (open area)	1000m
Receiver Sensitivity (1%PER)	-97dBm
Working Current/Voltage	120 mA@3.7V
Built-in LiPo Battery Working Current/Capacity	3.7V, 2000mAh
DJI Intelligent Battery	
Type	3S LiPo Battery
Capacity	5200mAh, 11.1V
Charging Environment Range	0°C to 40°C
Discharging Environment Range	-20°C to 50°C



## Appendix C Operational Limitations

1. The unmanned aircraft system (UAS) will weigh less than 7 pounds, including energy source(s) and equipment.
2. The UAS will not be flown at a ground speed exceeding 35 MPH.
3. Flights will be operated at an altitude of no more than 400 feet above ground level (AGL), as indicated by the procedures specified in the operator's manual. All altitudes reported to ATC must be in feet AGL.
4. The UAS will be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses.
5. All operations will utilize a visual observer (VO). The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times.
6. Prior to each flight the PIC will inspect the UAS to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight. The Ground Control Station, if utilized, will be included in the preflight inspection. All maintenance and alterations will be properly documented in the aircraft records.
7. If the UAS has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, will undergo a functional test flight in accordance with the operator's manual. The PIC who conducts the functional test flight will make an entry in the UAS aircraft records of the flight. The requirements and procedures for a functional test flight and aircraft record entry will be added to the operator's manual.
8. The operator will follow the manufacturer's UAS aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements. When unavailable, aircraft maintenance/component/overhaul, replacement, and inspection/maintenance requirements will be established and identified in the operator's manual. At a minimum, requirements for the following will be included in the operator's manual:
  - a. Actuators / Servos;
  - b. Transmission (single rotor);

- c. Powerplant (motors);
  - d. Propellers;
  - e. Electronic speed controller;
  - f. Batteries;
  - g. Mechanical dynamic components (single rotor);
  - h. Remote command and control;
  - i. Ground control station (if used); and
  - j. Any other components as determined by the operator;
9. The Pilot In Command (PIC) will possess at least a private pilot certificate and at least a valid driver's license. The PIC will also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.
10. Prior to operations the PIC will have accumulated and logged, in a manner consistent with 14 CFR § 61.51(b), a minimum of 200 flight cycles and 25 hours of total time as a UAS rotorcraft pilot and at least ten hours logged as a UAS pilot with a similar UAS type (single blade or multirotor). Prior documented flight experience that was obtained in compliance with applicable regulations may satisfy this requirement. Training, proficiency, and experience-building flights can also be conducted to accomplish the required flight cycles and flight time.
11. Prior to operations the PIC will have accumulated and logged, in a manner consistent with 14 CFR § 61.51(b), a minimum of five hours as UAS pilot operating the make and model of UAS to be utilized for operations and three take-offs and three landings in the preceding 90 days. Training, proficiency, experience-building, and take-off and landing currency flights can be conducted to accomplish the required flight cycles and flight time.
12. The UAS may not be operated directly over any person, except authorized and consenting personnel, below an altitude that is hazardous to persons or property on the surface in the event of a UAS failure or emergency.
13. The operator will ensure that no persons are allowed within 500 feet of the area except those consenting. This provision may be reduced to no less than 200 feet if it would not adversely affect safety.
14. The UAS will abort the flight in the event of unpredicted obstacles or emergencies in

accordance with the operator's manual.

15. Each UAS operation will be completed within 30 minutes flight time or with 25% battery power remaining, whichever occurs first.
16. The operator will obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations. This COA will also require the operator to request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation.
17. All aircraft operated in accordance will be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N- Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.
18. Each UAS operated will comply with all manufacturer Safety Bulletins.
19. The radio frequency spectrum used for operation and control of the UA will comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.
20. At least three days before scheduled flight, the operator will submit a written Plan of Activities to the local FSDO with jurisdiction over the area of proposed flight area. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
  - a. Dates and times for all flights;
  - b. Name and phone number of the operator
  - c. Make, model, and serial or N-number of UAS to be used;
  - d. Name and certificate number of UAS PIC involved
  - e. A statement that the operator has obtained permission from property owners and/or local officials to conduct the flight operations; the list of those who gave permission must be made available to the inspector upon request;
  - f. Signature of exemption-holder or representative; and
  - g. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which flights will be conducted and the altitudes essential to accomplish the operation.
22. The documents required under 14 CFR §§ 91.9 and 91.203 will be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating.

23. The UA will remain clear and yield the right of way to all other manned operations and activities at all times (including, but not limited to, ultralight vehicles, parachute activities, parasailing activities, hang gliders, etc.).
24. UAS operations will not be conducted during night, as defined in 14 CFR § 1.1. All operations will be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
25. The UAS will not be operated by the PIC from any moving device or vehicle.
26. The UAS will not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.
27. The UAS will not operate in Class B, C, or D airspace without written approval from the FAA. The UAS may not operate within 5 nautical miles of the geographic center of a non-towered airport as denoted on a current FAA-published aeronautical chart unless a letter of agreement with that airport's management is obtained, and the operation is conducted in accordance with a NOTAM as required by the operator's COA. The letter of agreement with the airport management must be made available to the Administrator upon request.
28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA will be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours.