



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

800 Independence Ave., S.W.  
Washington, D.C. 20591

May 4, 2015

Exemption No. 11451  
Regulatory Docket No. FAA-2015-0234

Mr. Michael A. Mang  
Vice President  
Butler, Fairman and Seufert, Inc.  
8450 Westfield Boulevard, Suite 300  
Indianapolis, IN 46240

Dear Mr. Mang:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

By letter dated January 29, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Butler, Fairman and Seufert, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial inspection, environmental monitoring, construction monitoring, and preliminary engineering report related imagery for civil engineering projects.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner.

#### **Airworthiness Certification**

The UAS proposed by the petitioner is a DJI Phantom 2.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112–95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21 and any associated noise certification and testing requirements of part 36, is not necessary.

### **The Basis for Our Decision**

You have requested to use a UAS for aerial data collection. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA–2014–0352), 11109 to Clayco, Inc. (*see* Docket No. FAA–2014–0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA–2014–0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA–2014–0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

### **Our Decision**

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Butler, Fairman and Seufert, Inc. is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

## Conditions and Limitations

In this grant of exemption, Butler, Fairman and Seufert, Inc. is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the DJI Phantom 2 when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.
2. Operations for the purpose of closed-set motion picture and television filming are not permitted.
3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.
4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.
5. The UA must 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, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.
6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. 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; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.
7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents,

the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.
9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.
10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. 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.
11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.
12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.
13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must 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.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.
15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.
17. The UA may 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.
18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.
19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.
20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.
21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must 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.
23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.
24. The UA must remain clear and give way to all manned aviation operations and activities at all times.
25. The UAS may not be operated by the PIC from any moving device or vehicle.
26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
  - a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
  - b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.
28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: [www.ntsb.gov](http://www.ntsb.gov).

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.
30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. 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 for the UAS aerial filming conducted under this grant of exemption;
  - c. Name and phone number of the person responsible for the on-scene operation of the UAS;
  - d. Make, model, and serial or N-Number of UAS to be used;
  - e. Name and certificate number of UAS PICs involved in the aerial filming;
  - f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
  - g. Signature of exemption holder or representative; and
  - h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.
31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on May 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan  
Director, Flight Standards Service

January 29, 2015

U.S. Department of Transportation  
Docket Operations  
West Building Ground Floor, Room W12-140 1200 New Jersey Ave., SE  
Washington, DC 20590

Electronically Submitted via [www.regulations.gov](http://www.regulations.gov)

Regarding:

The Butler, Fairman and Seufert Inc. Petition for Exemption pursuant To Section 333 of the FAA Modernization Reform Act of 2012 (FMRA) includes 14 C.F.R. 45.23(b); 14 C.F.R. Part 21; 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b)

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. as noted above, Butler, Fairman and Seufert Inc. ("BF&S" or "Petitioner") hereby submits this petition for exemption to authorize civil operations of small Unmanned Aircraft Systems ("SUAS") for the purposes of aerial inspection, environmental monitoring, construction monitoring and preliminary engineering report related imagery for civil engineering related projects. Including private properties and public properties owned by State or Local governments within the Continental United States. As a full-service civil engineering firm BF&S proposes to directly operate SUAS for commercial operation by employees and contractors as a value added benefit for civil engineering related projects.

This petition is, in most regards, similar to granted exemption No. 11138 both in operational approach (closer than 500') and equipment being utilized (DJI Phantom 2 ).

Applicant name and address is:

Butler, Fairman and Seufert Inc.  
Attn: Michael A. Mang, Vice President  
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Indianapolis, Indiana 46240  
Phone: (317)-713-4615  
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Email: mmang@bfsengr.com

**Public Interest**

BF&S was incorporated in 1961 and is a multi-faceted Civil Engineering firm with an emphasis on transportation and related infrastructure. BF&S has multiple offices in Indiana and works with communities throughout Indiana and surrounding states. Currently there are over 140 employees with various disciplines and professional licenses providing services in core areas including airport design and

inspection, asset management, bridges, construction inspection, environmental services, GIS, MS4, greenways/streetscapes, historic architecture, landscape architecture, land use planning, parks, right-of-way services, roadways/highways, site development, survey, trails, water & wastewater.

The granting of this exemption request would provide State and Local officials (our clients), engineers and environmental scientists with high-resolution imagery of infrastructure and equipment, including roadway, bridges, airports, elevated water tanks, water/wastewater treatment facilities and storm water management. Such sUAS operation will provide safety enhancements in and around surrounding areas and increase efficiency and reliability of inspections and investigations. The use of sUAS will reduce the risk of inspections by reducing the need for human inspection by personnel on permanent and temporary elevated structures currently being performed by bucket trucks, lifts, and ladders. Reduce needs for boating or on water activities. It would also reduce personnel time in vehicle traffic and reduce maintenance of traffic activities. sUAS operation will improve efficiency and reliability of inspections by allowing for higher quality inspections which serve the public interest and provide a new level of detail and transparency to public projects.

Additionally, BF&S uses for the sUAS have safety benefits that include reducing the danger and emissions associated with full size aircraft. sUAS have no fuel to ignite or explode, and no crew adds a greater degree of flexibility. The sUAS further minimizes ecological and ground safety issues to the general public and property owners.

#### **Proposed Location Areas**

BF&S has years of experience in working with the FAA on airport construction and rehabilitation projects and realizes that regulations are needed to protect the National Airspace System (NAS). We also do not wish to create any new burdens on existing FAA processes and facilities. Our sUAS area of use will be broad and that each project location has different requirements in terms of the NAS. The operation location areas have been designated as follows:

1. Airport property (limited basis)
2. Airport property to five miles out
3. Populated areas and Public Right-of-Way  
*(Populated areas are determined by yellow areas on VFR Sectional Aeronautical Charts or as determined by local public safety officials.)*
4. Uncontrolled Airspace/Private Property
5. Municipally/locally owned utilities and structures

With respect to operations on or near airports the following is offered for consideration:

- Unlike proposals by individuals or persons with no aviation knowledge, our firm is uniquely equipped to operate on/near airport property by virtue of our line of business. BF&S has advanced licensed pilots on staff, with trained individuals that routinely escort contractors in the AOA, as well as SIDA badged staff, at numerous airports, including commercial airports with Class C airspace. Collectively, this team knows airports intimately, and can make the call whether a certain sUAS flying scenario makes sense or not and would be able to synthesize with FAA on approaches to integrating sUAS into the NAS.
- In each case, a COA will be sought, and recommendations/restrictions will be followed.

- All possible coordination with airport management will take place prior to any operation on or near airport property.
- All necessary NOTAM's will be coordinated and issued per COA.
- Operations on airport property will not commence until such time that the PIC has established proficiency by accumulating and logging in a manner consistent with 14 CFR 61.51(b) [as applicable] at least 10 hours flight time as a sUAS pilot with a multi-rotor sUAS consistent with exemption No. 11062.
- sUAS operations will be limited to scenarios for which if attempted by normal aircraft, may endanger the pilot, persons, or property and which may create the potential of operating in a condition that may violate FAR's.
- On airport operations will be sequenced utilizing the N# (submitted for issuance) on the CTAF or with ATCT as appropriate, and shall always begin and terminate outside of any RSA. Communications will be transmitted using a handheld radio capable of operating in the same aviation frequency range and bandwidth as normally utilized by airport department staff during airport inspection projects.
- BF&S will utilize the strictest right-of-way rules and yield to any other manned aircraft that may potentially be in conflict.
- The pilot being utilized for this type of operation has 8 years airport management experience at a towered airport, is a CFI with Multi-Engine and Instrument ratings, and 6 years of experience as listed named responsible party on 7711-1 Certificates of Waiver or Authorization for annual airshow and R/C events at a FAR 139 airport, and has experience building and flying R/C aircraft. His knowledge and experience will ensure that any COA on or near airport property is executed with due diligence and within the confines of approval.

### **Proximity**

With regard to operating in close proximity, generally operations will be conducted no closer than 500'. In instances where, for the purposes of successful data acquisition, a flight closer than 500' is required, prior permission will be sought from any owner or oversight entity having jurisdiction. An example would be gathering data and imagery to augment inspection of a bridge, water tower, or other tall structure. Not only will the sUAS be able to capture images not possible in any other way, it removes the risk of an individual attempting to climb, or reach areas in need of inspection. The risks to life utilizing sUAS in this manner are far less than conventional methods.

All reasonable precautions will be considered and integrated into the flight plan to ensure the safety of persons and property, and shall immediately cease should any barrier to safe operations be encountered.

All reasonable precautions will be taken to ensure safety of non-participating persons. In cases where barriers or structures can be used, or operations conducted such that in a crash event, persons and property will be shielded from any debris, the operation will be approached in that manner.

Any flight that is compromised by an unauthorized person shall be immediately terminated until the breach is clear and precautions are taken to prevent further inadvertent entry.

### **Small Unmanned Aircraft System**

BF&S will utilize the DJI Phantom 2 Quadcopter for all locations, areas and operations specified herein. The Phantom 2 sUASs 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 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 sUAS does not carry any flammable propellant or fuel. The Phantom 2 sUAS also has an integrated GPS system that calculates the sUAS's position and height and relays that information via a secure connection back to ground control station. The on-board flight computer also can receive signals for flight controls from the ground control station. An on-board camera capable of capturing imagery in the form of full color, high definition still photos and video that will also be transmitted back to the ground control station. Additionally, the Phantom 2 sUAS contains gyro stabilized flight mode, GPS aided navigation, a compass, blinking LED's on the bottom, a failsafe mode if its connection to the remote control is lost, and the system permits the sUAS to return to a predetermined location and land without injury or damage. For additional safety, the Phantom 2 will be retrofitted with prop guards. The Phantom 2 will be identified by serial number, registered as a public aircraft and have identification (N-Number) markings with markings as large as practicable per guidance of UAS Integration Office, AFS-80, at minimum 1 inch tall on all four sides of the main body.

A transportable Ground Control Station will be utilized in the sUAS. The Ground Control Station will be a BF&S identifiable vehicle or trailer equipped with lighted beacons, strobes and horns capable of being seen and heard from 500 feet away. The vehicle or trailer will be stationary during all flight operations. The vehicle will carry temporary construction style signs for warning motorists of drone survey operations, ground wind speed indicators, as well as all OSHA required safety equipment relating to surveying and construction inspection related operations. All flight control equipment, documentation, the Pilot in Command (PIC) and Visual Observer (VO) will be incorporated into the Ground Control Station.

BF&S will carry out maintenance, inspections, and record keeping requirements, in accordance with the operator's manual. Maintenance, inspection, and alterations will be noted in the aircraft log, including total flight hours, description of work accomplished, and the signature of the authorized sUAS technician returning the sUAS to service.

### **Unmanned Aircraft Pilot in Command (PIC)**

For uncontrolled airspace or private property the PIC will possess a private pilot certificate and a current third-class medical certificate. For all other airspaces the PIC will possess a commercial pilot certificate and a current first or second class medical certificate. Additionally, all pilots will be assisted by a visual safety observer, who will communicate verbally with the PIC at all times.

The sUAS will be operated within visual line of sight (VLOS) of the PIC at all times. The PIC shall use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued medical certificate.

The PIC must have accumulated and logged, in a manner consistent with 14 CFR § 61.51 (b), a minimum of five hours as sUAS pilot operating the make and model of sUAS to be utilized for operations under the exemption and three take-offs and three landings in the preceding 90 days. Training will be conducted

per manufacturer's recommendations to ensure proficiency and experience-building, to include normal and emergency maneuvers, and take-off and landing.

#### **Unmanned Aircraft Operation**

Prior to each flight the PIC will inspect the sUAS to ensure it is in a condition for safe flight. If the inspection reveals any issues that affect the safe operation of the sUAS, the aircraft will not be operated until the necessary maintenance has been performed and the sUAS is found to be safe for flight. The Ground Control Station, will be included in the preflight inspection. All maintenance and alterations will be properly documented in aircraft records. These documents will be kept at the ground control station, and project field office if available.

A Notice to Airman (NOTAM), coordination with local airport management, notices to private landowners and local law enforcement officials will be submitted not more than 72 hours in advance, but not less than 48 hours prior to all flights. A Plan of Activities will also be sent to the local FSDO with jurisdiction over the flight area. These documents will be kept at the Ground Control Station, and project field office if available.

Every effort will be made to keep flight operations from directly over any person or as far away as possible, and all flights will remain over the project or construction area. Construction style signs will be temporarily set up to warn vehicles of drone flight in roadway areas. Construction crews in the project area will be notified 30 minutes in advance of any flights. Drone flight awareness will also be incorporated into project safety meetings.

The Ground Control Station will not move during flight operations. Light beacons and strobes will remain on during all flight operations from takeoff to landing. Horns will be sounded during takeoff and landing.

Best safety practices shall be used to reduce public or non-project related personnel exposure in flight areas. Flights will be aborted in the event of unpredicted obstacles, emergencies within the flight area, or as directed by local law enforcement agencies.

Right of Way will be yielded to all other flight manned operations and activities at all times. Including but not limited to ultralight vehicles, hang gliders, or parachuting or parasailing activities.

Operations will only be conducted during daylight and under visual meteorological conditions. Ground wind speeds at the Ground Control Station shall not exceed UA manufacturer's recommendations.

Flights shall be operated at an altitude of no more than 400 feet above ground level (AGL).

The sUAS shall be operated within visual line of sight (VLOS) of the PIC.

Any accidents, or flight operation issues will be reported to the appropriate FAA office within 24 hours.

## **Summary**

The Butler, Fairman and Seufert Inc. Petition for Exemption pursuant to Section 333 of the FAA Modernization Reform Act of 2012 (FMRA) includes 14 C.F.R. Part 21; 14 C.F.R. Part 45.23(b); 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b) as found below:

Respecting 14 CFR Part 21 Subpart H, entitled Airworthiness Certificates, sets forth requirements for procurement of necessary airworthiness certificates in relation to FAR § 91.203(a)(1). The size, weight and restricted operational capabilities of the Phantom 2 permits exemption from Part 21 because it meets (and exceeds) an equivalent level of safety pursuant to Section 333 of the Reform Act. The FAA is authorized to exempt aircraft from the airworthiness certificate requirement under both the Act (49 U.S.C. § 44701 (f)) and Section 333 of the Reform Act. Both pieces of legislation permit the FAA to exempt UAS's from the airworthiness certificate requirement in consideration of the weight, size, speed, maneuverability and proximity to areas such as airports and dense populations.

Respecting 14 CFR Part 45.23(b) Title 14 of the Code of Federal Regulations 45.22(d), Exhibition, antique, and other aircraft: Special Rules, permits persons to apply to the Administrator for a different marking procedure if it is impossible to mark an aircraft per §§45.21 and 45.23 through 45.33. BF&S is requesting an alternate marking for the DJI Phantom 2 Quadcopter registration marks. The DJI Phantom 2 is a small Unmanned Aerial System (sUAS) Quadcopter that cannot comply with the aircraft marking standards per §§45.21 and 45.23 through 45.33. The achievement of equivalent level of safety for the Phantom 2 as that it will be identified by serial number, registered and have identification (N-Number) markings with markings as large as practicable per guidance of UAS Integration Office, AFS-80, minimum 1 inch tall on all four sides of the main body. The request was submitted on January 28, 2015.

Respecting 14 CFR Part 61.113(a)&(b) relief is requested since limitations state that a private pilot may, for compensation or hire, act as PIC of an aircraft in connection with any business or employment if (1) The flight is only incidental to that business or employment; and (2) The aircraft does not carry passengers or property for compensation or hire. BF&S proposes an equivalent level of safety in that a PIC with a private license will operate the sUAS for hire in the locations where a private license is sufficient (i.e. private property not in the vicinity of an airport) which may be the majority of the time, not just incidentally. The proficiency of the sUAS pilot with a private license versus a commercial license does not correlate with operating a sUAS in the NAS. BF&S contends an equivalent level of safety will be maintained because no PIC will be allowed to operate the Phantom 2 unless the PIC has demonstrated, through ongoing training and currency requirements that the PIC is able to safely operate in a manner consistent with applicable rules and operating criteria for that specific sUAS.

Respecting 14 CFR Part 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the FARs, this Regulation does not apply.

Respecting 14 CFR Part 91.9(b) (2) requires an aircraft flight manual in the aircraft. As there are no pilots on board, or passengers, and no cockpit, and given the size of the sUAS, this Regulation is not applicable.

Respecting 14 CFR Part 91.103(b) prescribes that a pilot shall for any flight, become familiar with runway lengths at airports of intended use, and takeoff and landing distance information. Reference Exemption No. 11138 for reason why exemption is not necessary.

Respecting 14 CFR Part 91.109 Flight instruction; Simulated instrument flight and certain flight tests. Reference Exemption No. 11138 for reason why exemption is not necessary.

Respecting 14 CFR Part 91.119 Minimum safe altitudes. With regard to operating in close proximity, generally operations will be conducted no closer than 500'. In instances where, for the purposes of successful data acquisition, a flight closer than 500' is required, prior permission will be sought from any owner or oversight entity having jurisdiction. An example would be gathering data and imagery to augment inspection of a bridge, water tower, or other tall structure. Not only will the sUAS be able to capture images not possible in any other way, it removes the risk of an individual or crew attempting to climb, or reach areas in need of inspection. The risks to life utilizing sUAS in this manner are far less than conventional methods. All reasonable precautions will be considered and integrated into the flight plan to ensure the safety of persons and property, and shall immediately cease should any barrier to safe operations be encountered. All reasonable precautions will be taken to ensure safety of non-participating persons. In cases where barriers or structures can be used, or operations conducted such that in a crash event, persons and property will be shielded from any debris, the operation will be approached in that manner.

Respecting 14 CFR Part 91.121 Altimeter Settings. BF&S will set the altimeter to zero feet AGL rather than local barometric pressure or field altitude before flight.

Respecting 14 CFR Part 91.151(a) Fuel requirements for flight in VFR conditions. Prior UAS-specific relief has been granted in Exemption Nos. 8811, 10808, and 10673 for daytime, VFR conditions. To achieve an equivalent level of safety, BF&S proposes flying the Phantom 2 per the operating manual leaving ample power to safely conclude the flight with power remaining, even auto land when a low battery is detected.

Respecting 14 CFR Part 91.203(a)&(b) Civil aircraft: Certifications required. BF&S requests relief from the requirement of Section 91.203(a) (i.e., that an appropriate and current airworthiness certificate and an effective U.S. registration certificate be carried within the aircraft), and further, BF&S requests relief from the requirement of Section 91.203(b) (i.e., that the airworthiness certificate be displayed at the cabin or cockpit entrance so that it is legible to passengers or crew). As the DJI Phantom 2 sUAS is unmanned, it has no cabin, cockpit, pilot station, or entrances thereto. Therefore, the aircrew member is located at a ground control station and no passengers are carried at any time. As such, BF&S proposes the following conditions and limitations to its request for exemption from Sections 91.203(a) and (b): The documents required by Sections 91.203(a) and (b) must be kept at the ground control station, where it is immediately available to the aircrew member (pilot in command) of the DJI Phantom 2 sUAS any time the unmanned aircraft is operating. The documents required by 91.203(a) and (b) will be made available within 10 days to any FAA, U.S. Department of Defense, or law enforcement official upon request.

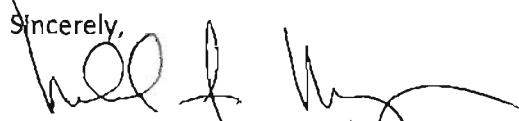
Respecting 14 CFR Part 91.405(a) Maintenance required, and Respecting 14 CFR Part 91.407(a) (1) Operation after maintenance, preventive maintenance, rebuilding, or alteration, and Respecting 14 CFR Part 91.409(a) (1) and (2) Inspections, and Respecting 14 CFR Part 91.417(a)&(b) Maintenance records. As noted previously, BF&S will carry out maintenance, inspections, and record keeping requirements, in

accordance with the operator's manual. Maintenance, inspection, and alterations will be noted in the aircraft maintenance and flight log, including flight hours, description of work accomplished, and the signature of the authorized sUAS technician returning the sUAS to service. Records will be kept in a place and in a manner that allows for inspection upon request.

**Conclusion**

As stated previously, we plan to utilize licensed pilots who understand the flight operations and can work within the existing system to achieve an equivalent level of safety. As project engineers we plan to make all local stakeholders aware of flight activities in efforts to keep our employees and the public safe in project areas. By granting this Petition, the FAA Administrator will be fulfilling the Congressional mandate of the FAA Modernization and Reform Act of 2012, while also advancing the interests of the public, by allowing BF&S to safely, efficiently, and economically operate the DJI Phantom 2 sUAS commercially within the NAS. If the FAA feels we should add more requirements to the exemption, we would be happy to do so.

Sincerely,



Michael A. Mang, Vice President  
Butler, Fairman and Seufert Inc.

Attachments

Maintenance and Flight Log  
Phantom 2 User Manual v1.2  
Letter requesting alternate markings

## DJI PHANTOM 2 - Maintenance and Flight Log

### GENERAL

PIC: \_\_\_\_\_

VO: \_\_\_\_\_

Date: \_\_\_\_\_ Location: \_\_\_\_\_

### AIRCRAFT

N \_\_\_\_\_

Pre-flight Inspection: Yes No      Aircraft Maintenance Status: \_\_\_\_\_

Return to Service by: \_\_\_\_\_

Comments: \_\_\_\_\_

### WEATHER

Ceiling: \_\_\_\_\_

Visibility: \_\_\_\_\_

Winds: \_\_\_\_\_

### FLIGHT DETAILS

Proximity to airport: \_\_\_\_\_ (reference attached map indicating approximate location of flight)      Airport notified: Yes No      Date: \_\_\_\_\_

Time: \_\_\_\_\_ Phone Number: \_\_\_\_\_

Contact Name: \_\_\_\_\_ COA Requested: \_\_\_\_\_

Nearest major intersection: \_\_\_\_\_

Proximity to local road: \_\_\_\_\_

Proximity to Structure: \_\_\_\_\_

Approx. Takeoff Time : \_\_\_\_\_

Approx. Landing Time: \_\_\_\_\_

Estimated Elevation: \_\_\_\_\_

Safety Concerns:

Additional Comments:

Initials of Preparer: \_\_\_\_\_

# 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.

DJI and PHANTOM 2 are registered trademarks of DJI. Names of product, brand, etc., appearing in this manual are trademarks or registered trademarks of their respective owner companies. This product and manual are copyrighted by DJI with all rights reserved.

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

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## 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

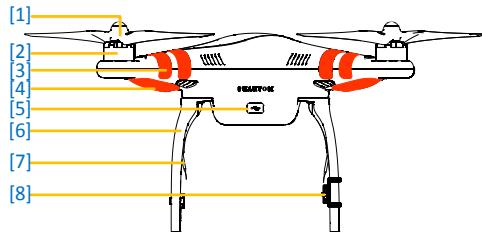


Figure 1-1

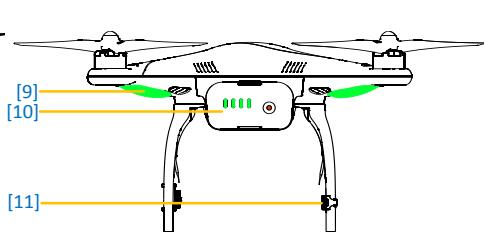


Figure 1-2

[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 aircraft's 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.

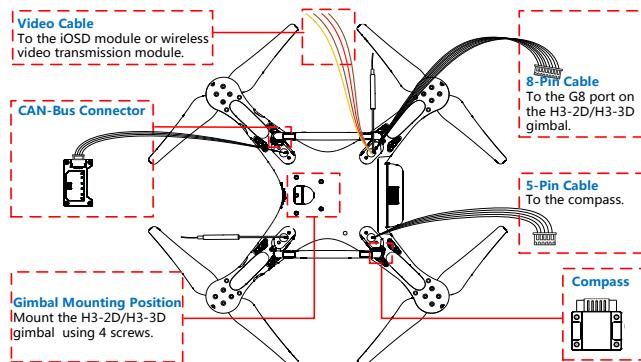


Figure 1-3

## 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.

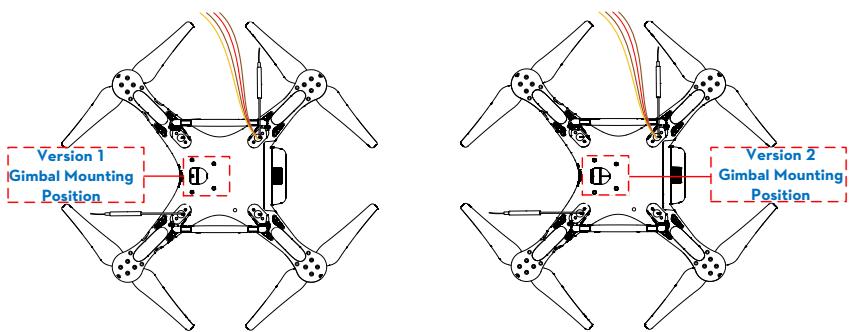


Figure 1-4

- (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.

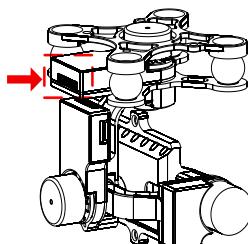


Figure 1-5

## 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.

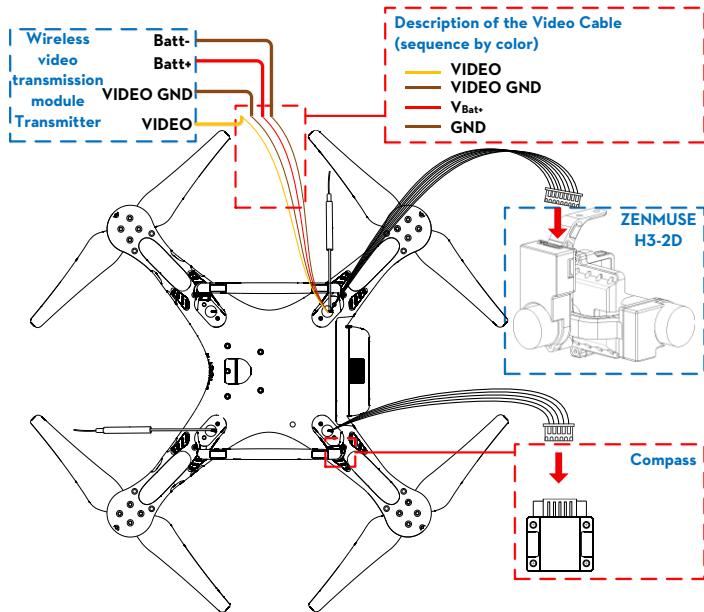


Figure 1-6

- (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.

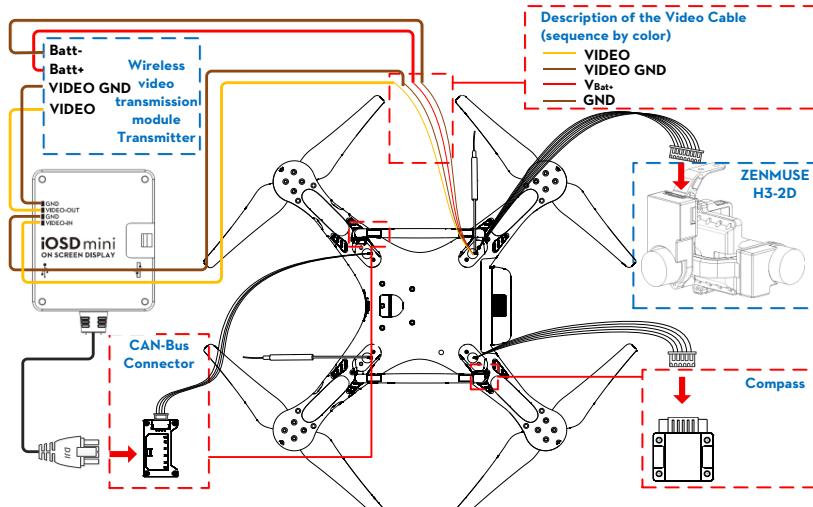


Figure 1-7

( 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.

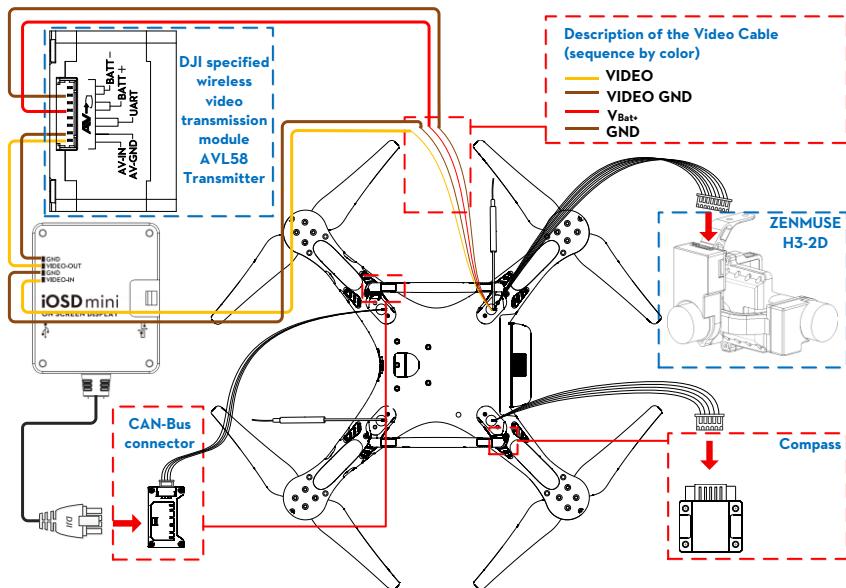


Figure 1-8



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.

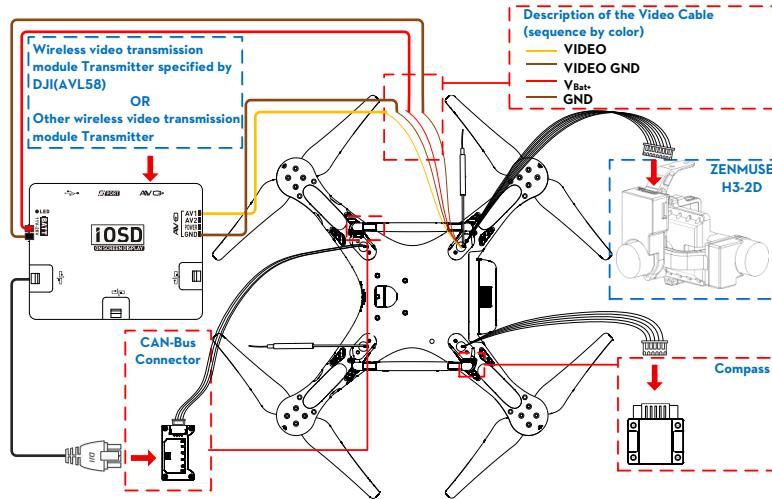
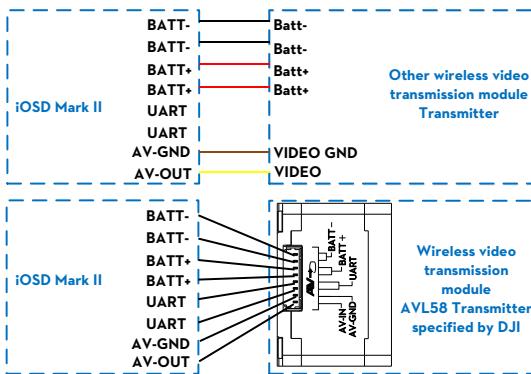


Figure 1-9

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



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

## ( 5 ) Using the iPad Ground Station

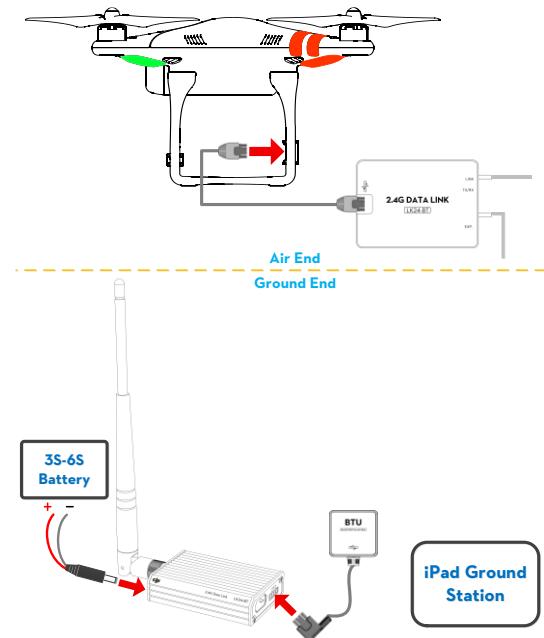


Figure 1-10



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

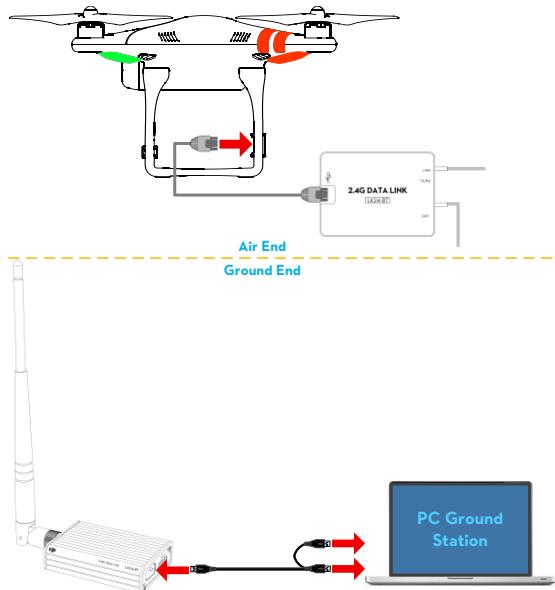
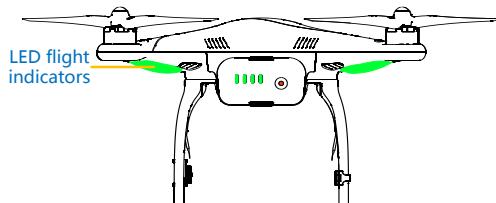


Figure 1-11

### 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.

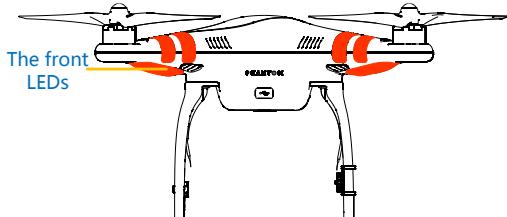
(1) The LED indicators diagram above are for Phantom 2 mode. In Naza-M mode, LED indicators



will work according to the Naza-M flight control system.

(2) 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 connect 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)	V1.0.1.19 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 <b>does not have a black dot</b> .	Attach to the motor thread that <b>has a black dot</b> .
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.

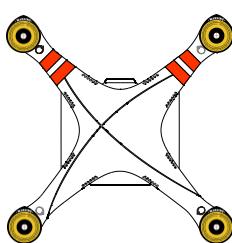


Figure 2-1

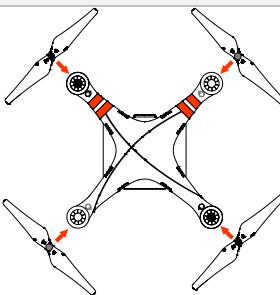


Figure 2-2

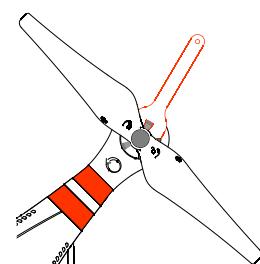


Figure 2-3

### 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.

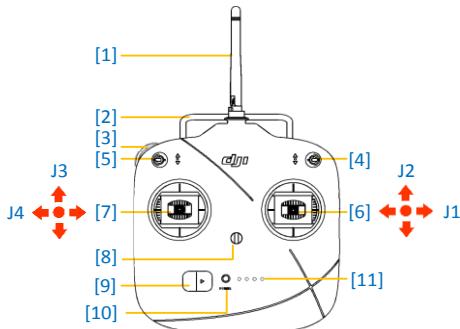


Figure 3-1

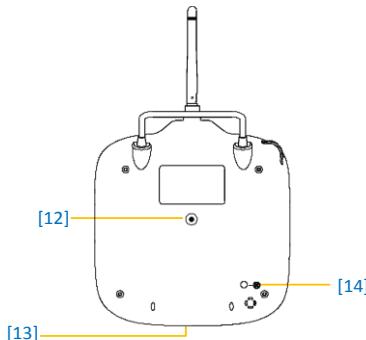
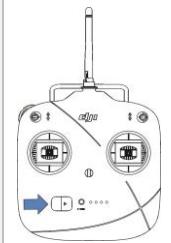


Figure 3-2

- [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.

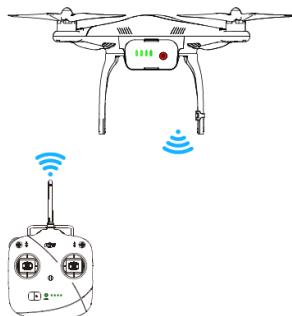


Figure 3-3

### 3.4 Remote Control Operation

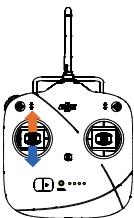
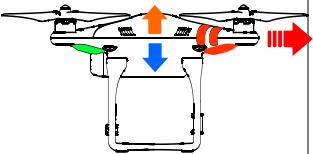
The operations of remote control are based on mode 2 stick configuration.

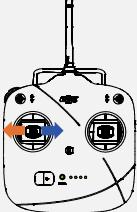
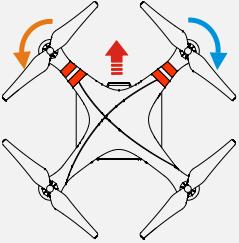
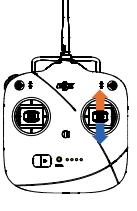
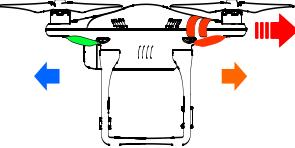
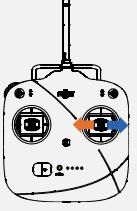
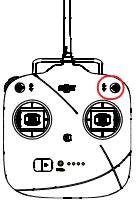
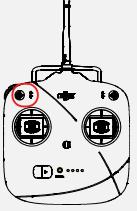
#### Definitions

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. Push the stick left and the aircraft will rotate counter clock-wise. Push the stick right and the aircraft will rotate clock-wise. If the stick is centered, the aircraft will remain facing the same direction. 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. Push the stick up and the aircraft will tilt and fly forward. Pull the stick down and the aircraft will tilt and fly backward. The aircraft will keep level and straight if the stick is centered. 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. Push the stick left and the aircraft will tilt and fly left. Push the stick right and the aircraft will tilt and fly right. The aircraft will keep level and straight if the stick is centered. Pushing the stick further away from center will result in a larger tilt angle (maximum of 35°) and faster flight velocity.</p>
	 Position-1      Position-2      Position-3	<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. Users can configure position 3(bottom position) of the S1 switch to trigger the Failsafe in the Assistant.</p>
	 OFF      Course Lock      Home point Lock	<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.

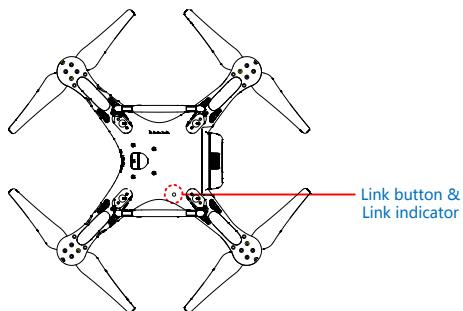


Figure 3-4

#### Linking procedures

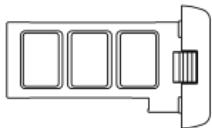
1. Power on the PHANTOM 2.
2. Turn on the remote control and place it 0.5m~1m away from the aircraft.
3. Push the link button with a thin object and hold it until the Link indicator blinks red, then release it.
4. When the Link indicator turns solid green, the link between the remote control and the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

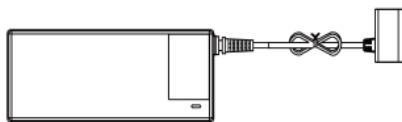
	please carry out the linking procedures.
	The remote control is linked with the receiver successfully.

## 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 10mA 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.

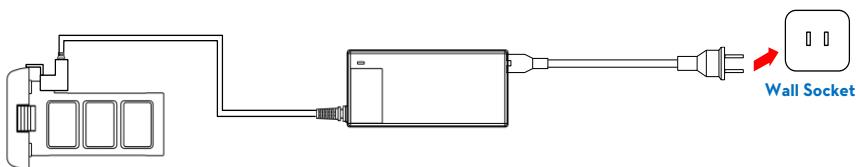
- ( 2 ) The battery should only be charged with the charger provided by DJI. DJI does not take any responsibility for operation of any charger from a third party.

### 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.

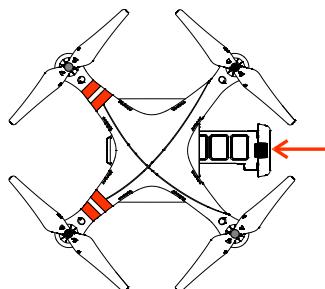


Figure 4-1



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

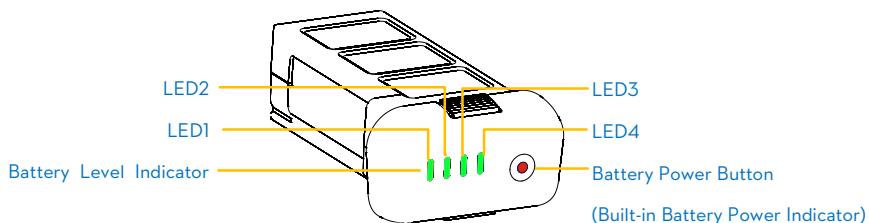


Figure 4-2

**(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.

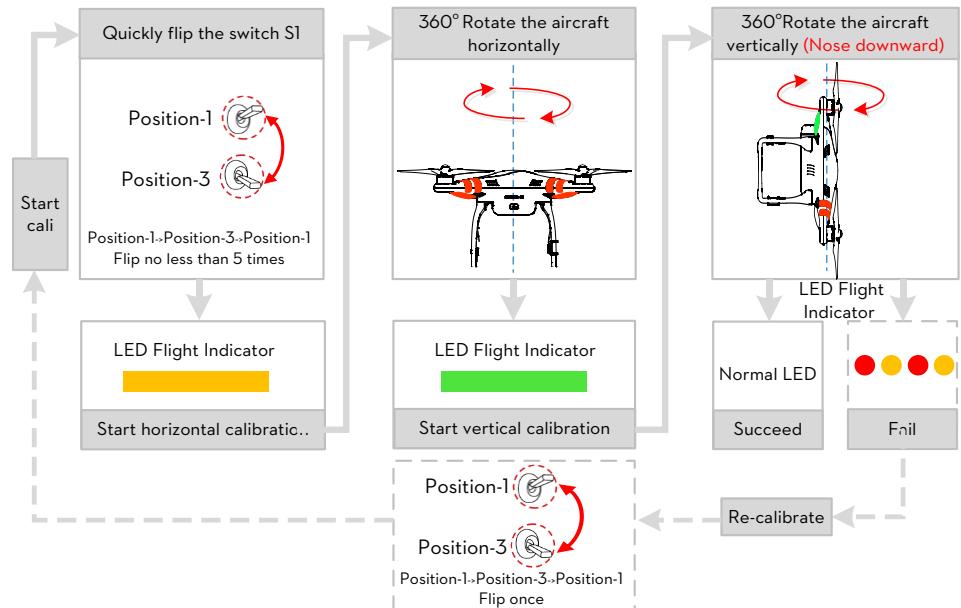
The compass is very sensitive to electromagnetic interference which causes abnormal compass data and leads to poor flight performance or even flight failure. Regular calibration of the compass enables the compass to perform at its optimal level.

### 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.

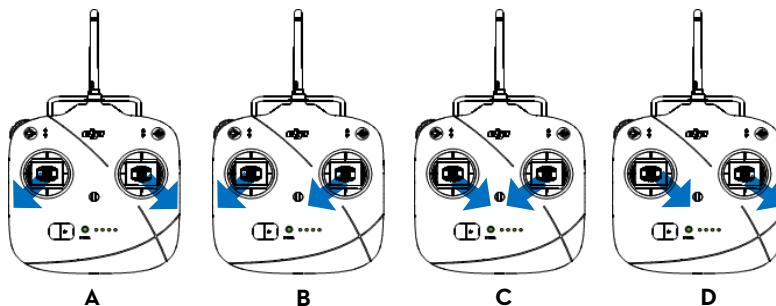


Figure 6-1

### 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

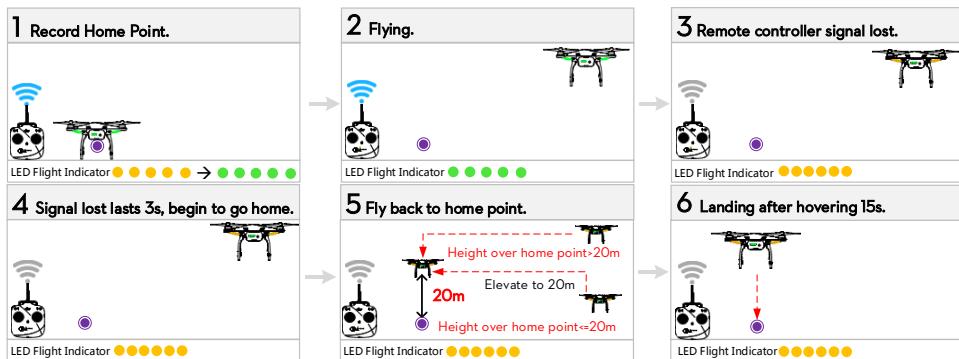


Figure 6-2



- (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 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.
- (2) Users in Mainland China can refer to [民用航空空域使用办法](#).

### 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

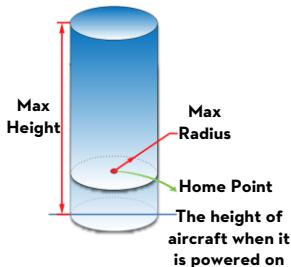


Figure 6-4

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

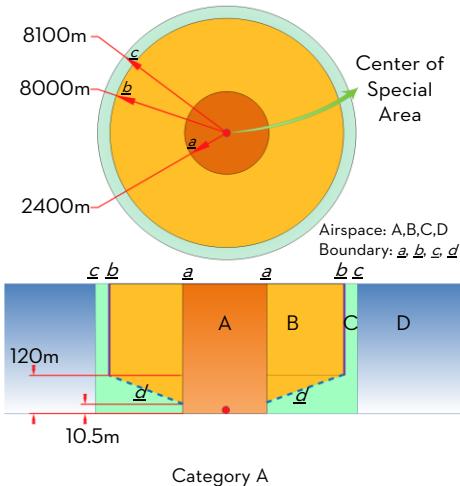
Ready to Fly(non-GPS)			
	Flight Limits	Ground Station	Rear LED flight indicator
<b>Max Height</b>	The flight height is restricted to fly under the minor height between the Max height and 120m.	Warning: Height limit reached.	None.
<b>Max Radius</b>	Not limited, no warnings or LED indicators.		



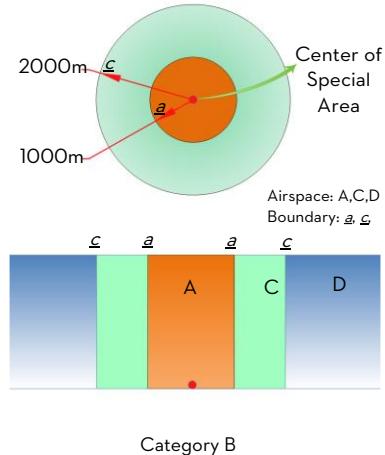
- (1) If the aircraft flies out of the limits, you can still control your aircraft except to fly it further away.
- (2) If the aircraft is flying out of the max radius in Ready to Fly (non-GPS) status, it will fly back within the limits range automatically if 6 or more GPS satellites have been found.

## 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

Airspace	Limits	Rear LED Flight Indicator
<b>A</b> <b>Orange</b>	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>B</b> <b>Yellow</b>	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>a</u> .	
<b>C</b> <b>Green</b>	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> .	
<b>D</b> <b>Blue</b>	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 \(Page23\)](#).

- (1) 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.
- (2) 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

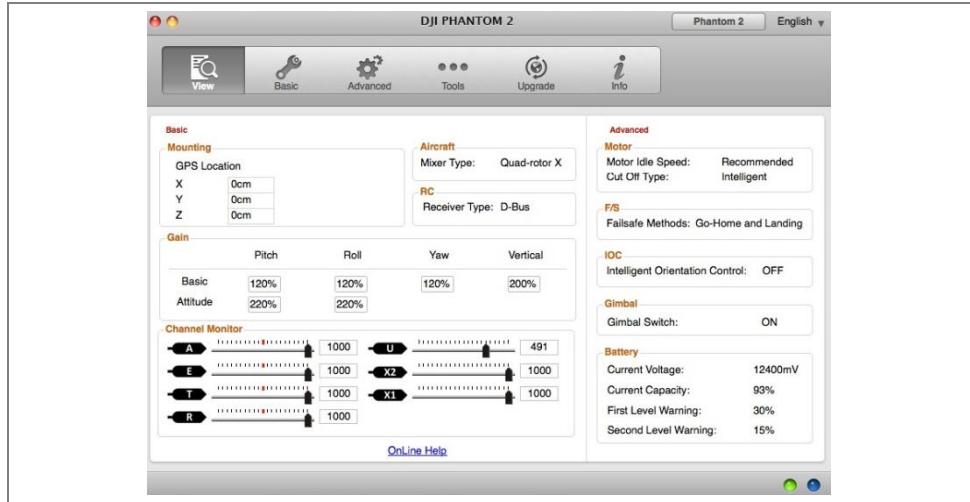
1. Download the Assistant installer in **DMG** format from the download page of PHANTOM 2 on the DJI website.
2. Run the installer and follow the prompts to finish installation.



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.



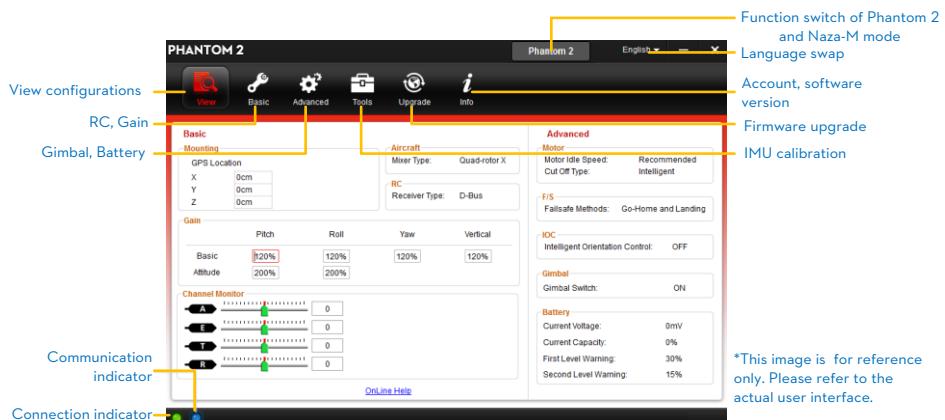
Installer in DMG format supports only Mac OS X 10.6 or above.



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.

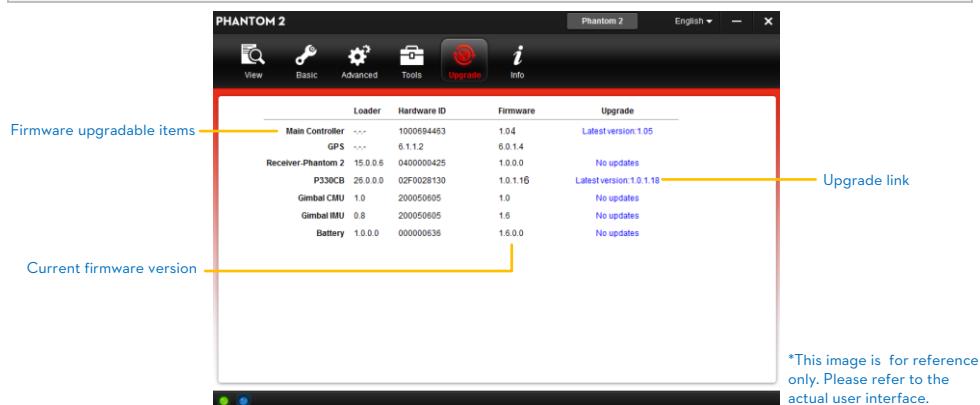


- (1) Users should not enable the Naza-M function before finishing Advanced Flight Maneuvers procedure in the "PHANTOM Pilot Training Guide". If the Naza-M mode is enabled, users can switch the control mode between ATTI. Mode, GPS Mode or Manual Mode, and access the advanced settings (e.g. IOC). In addition,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



- (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.

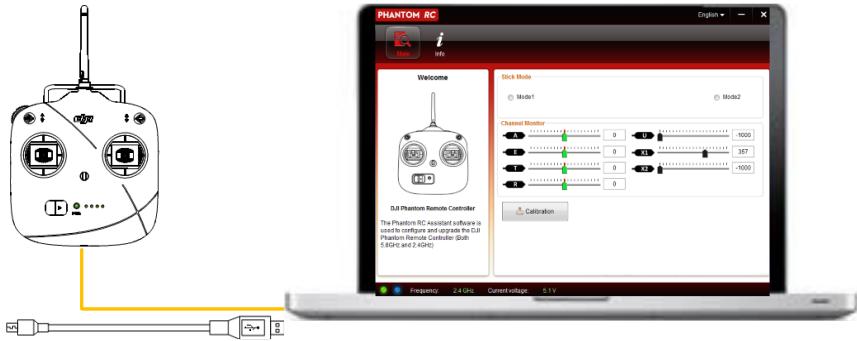


Firmware upgradable items: (1) Main Controller (2) P330CB(Main Board) (3) Receiver (4) Gimbal CMU (5) Gimbal IMU (6) Battery

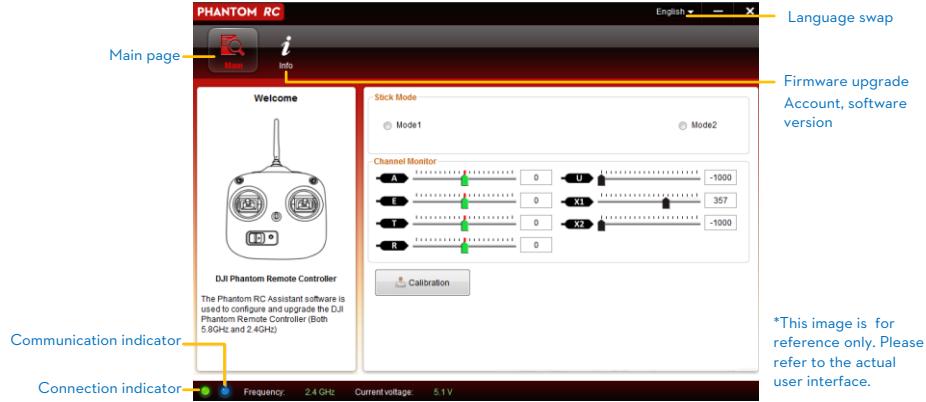
### 7.4 PHANTOM RC Assistant Description

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

### 8.2 LED Flight Indicators Description

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.

\* Users can connect to the PHANTOM 2 Assistant to get detailed information about warnings and errors.



# **PHANTOM PILOT TRAINING GUIDE**

## Earning Your Stripes V1.1

Learn More: [www.dji.com](http://www.dji.com)



# CAUTION

AGES

18+



## WARNING!

Rotating parts may cause injury

This product is not suitable for people under the age of 18. Please carefully read the "Quick Start Guide", "User Manual", "Disclaimer", and fully watch the tutorial videos before using the PHANTOM. Users should make every effort to fly regularly in order to improve their flight skills as an advanced level pilot (★★★). Please fly safely and responsibly.

### Please follow these guidelines prior to flying your Phantom:

- ① Always turn on the Remote Controller prior to turning on the Phantom.
- ② Toggle S1, S2 to the top.
- ③ Be sure there are no distractions when you're flying.
- ④ When starting your training, be sure you are in a very large open area. Be aware of your surroundings. Always fly in areas void of obstacles and away from traffic and people.
- ⑤ Before actually taking off, be sure you have calibrated the compass and you have full GPS satellite reception (Slow Continuous Green Flashing).
- ⑥ Never fly higher than 400 feet.
- ⑦ During training, stay behind your imaginary barrier and never fly behind yourself.
- ⑧ When in doubt, gently pull down on the throttle stick and land.
- ⑨ DO NOT PANIC.

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The aircraft nose should face AWAY from the pilot before takeoff.



CAUTION

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DO NOT fly the Phantom within a radius of 2 meters.



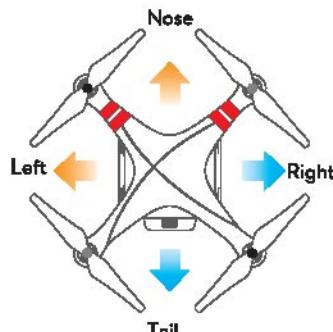
FORBIDDEN

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DO NOT touch the propellers after the Phantom has been started.

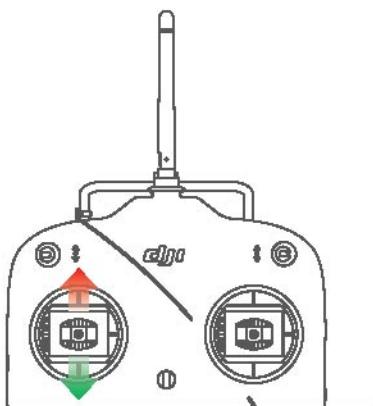
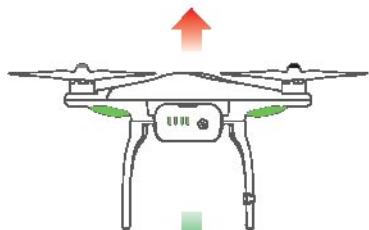


NO TOUCH

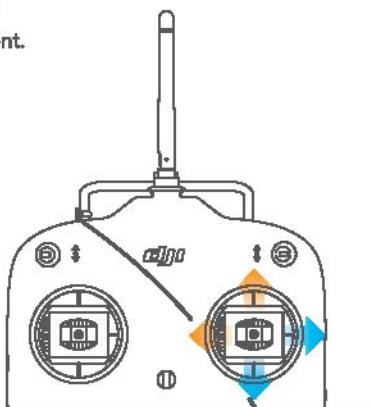


# Basic Flight Maneuvers (★)

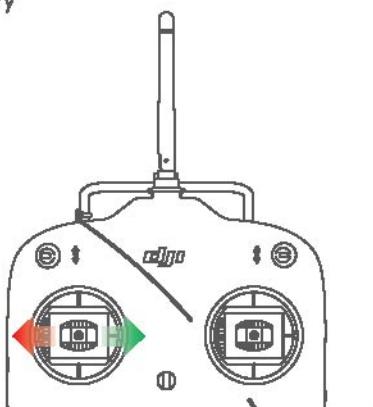
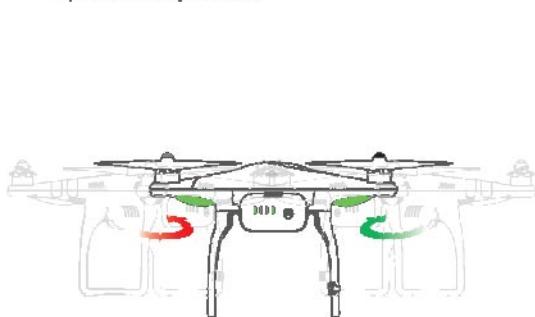
- 1** Take off and land with battery facing you.



- 2** Hover in one spot keeping battery facing you, make sure to control Left/Right/Forward/Back movement.

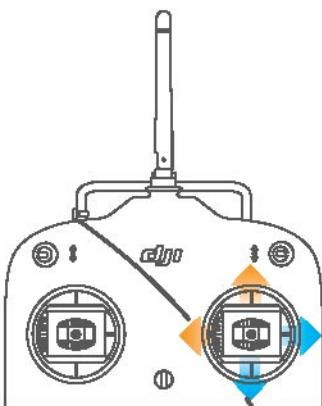


- 3** Rotate left, rotate right but try to keep the battery pointed at yourself.

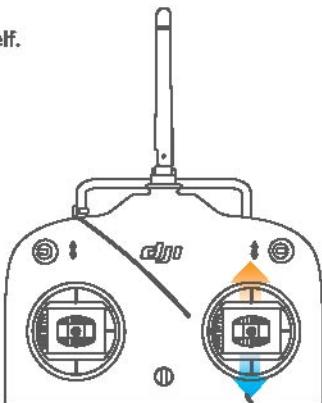


## Basic Flight Maneuvers (★)

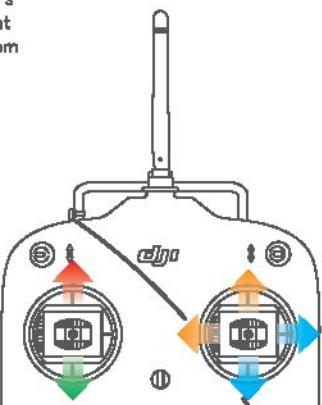
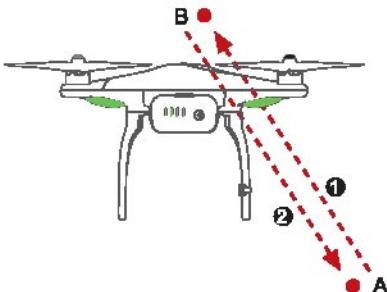
- 4** Slowly fly forward/back/left/right with back of Phantom pointed at yourself.



- 5** Fly forward to a spot 20-30 feet away.  
Then fly back keeping the battery pointed at yourself.

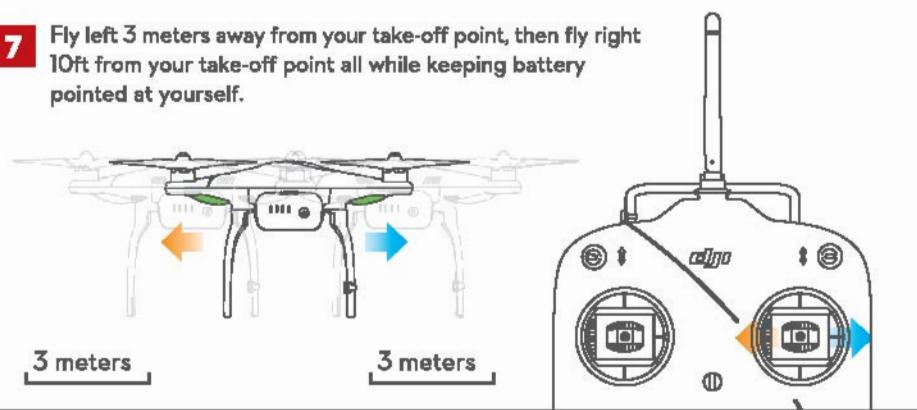


- 6** Mark a spot (B) on the ground 10ft away from the Phantom's take off point. Hover and fly towards that spot and land at the spot (B). Then go back into a hover and bring the Phantom back to its original position (A) and land again.

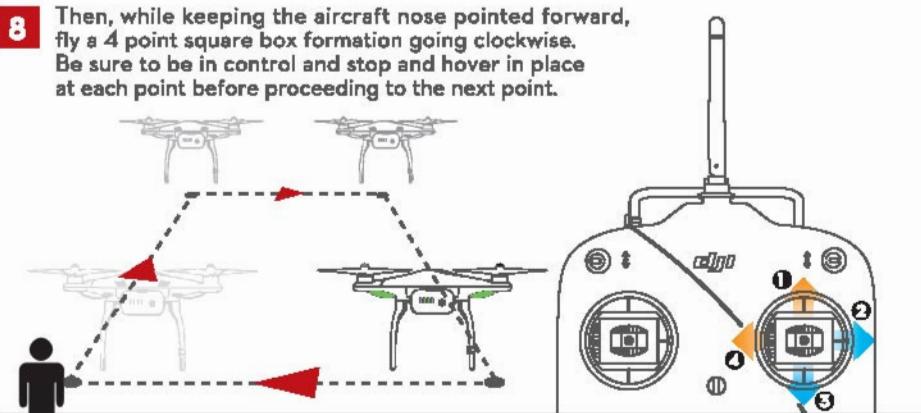


# Basic Flight Maneuvers (★)

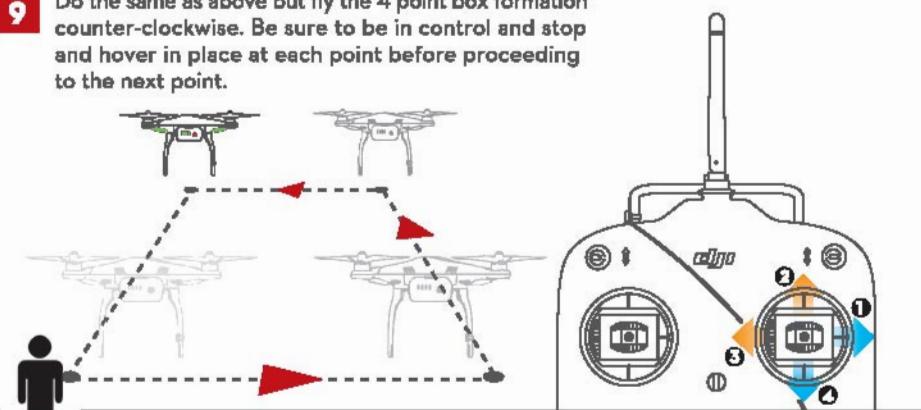
- 7** Fly left 3 meters away from your take-off point, then fly right 10ft from your take-off point all while keeping battery pointed at yourself.



- 8** Then, while keeping the aircraft nose pointed forward, fly a 4 point square box formation going clockwise. Be sure to be in control and stop and hover in place at each point before proceeding to the next point.

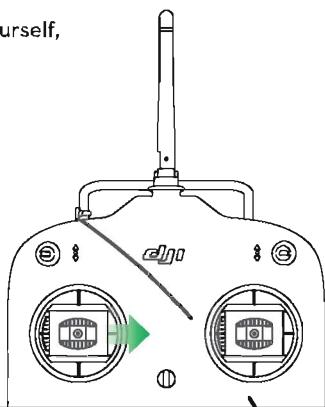
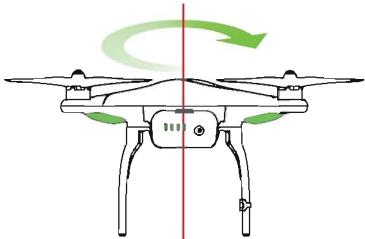


- 9** Do the same as above but fly the 4 point box formation counter-clockwise. Be sure to be in control and stop and hover in place at each point before proceeding to the next point.

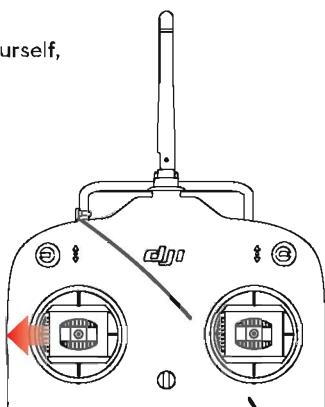
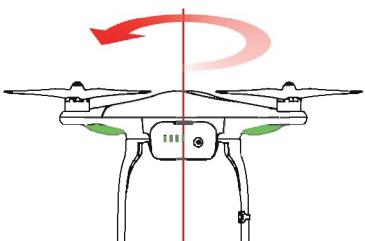


# Skilled Flight Maneuvers (★★★)

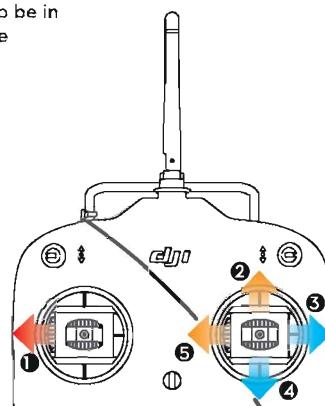
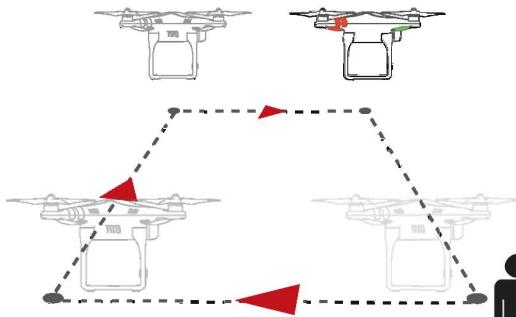
- 1** In a hover, starting with the battery pointed at yourself, rotate 360 degrees clockwise.



- 2** In a hover, starting with the battery pointed at yourself, rotate 360 degrees counter-clockwise.

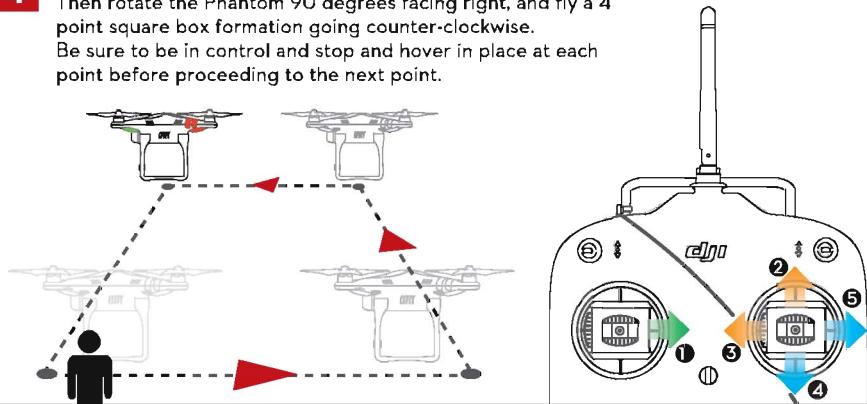


- 3** Starting with the battery pointed at yourself, go into a hover. Then rotate the Phantom 90 degrees facing left, and fly a 4 point square box formation going clockwise. Be sure to be in control and stop and hover in place at each point before proceeding to the next point.

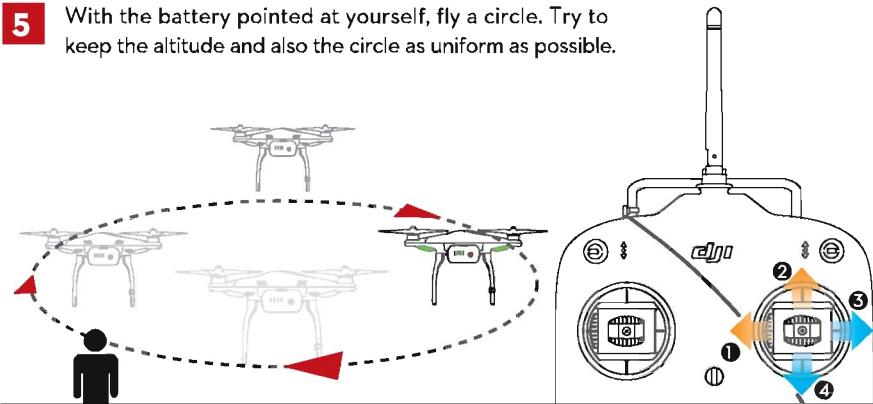


# Skilled Flight Maneuvers (★★★)

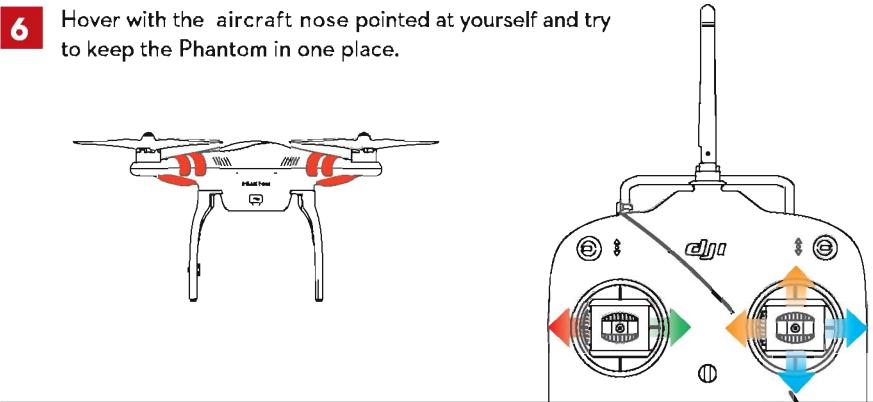
- 4** Starting with the battery pointed at yourself, go into a hover. Then rotate the Phantom 90 degrees facing right, and fly a 4 point square box formation going counter-clockwise. Be sure to be in control and stop and hover in place at each point before proceeding to the next point.



- 5** With the battery pointed at yourself, fly a circle. Try to keep the altitude and also the circle as uniform as possible.

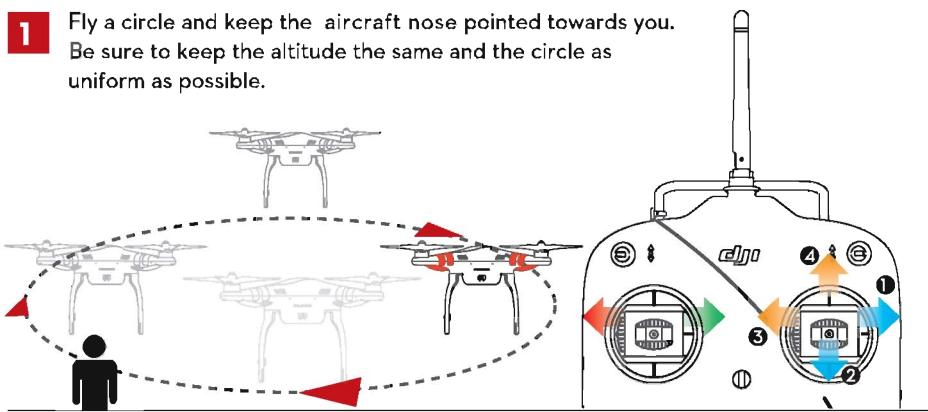


- 6** Hover with the aircraft nose pointed at yourself and try to keep the Phantom in one place.

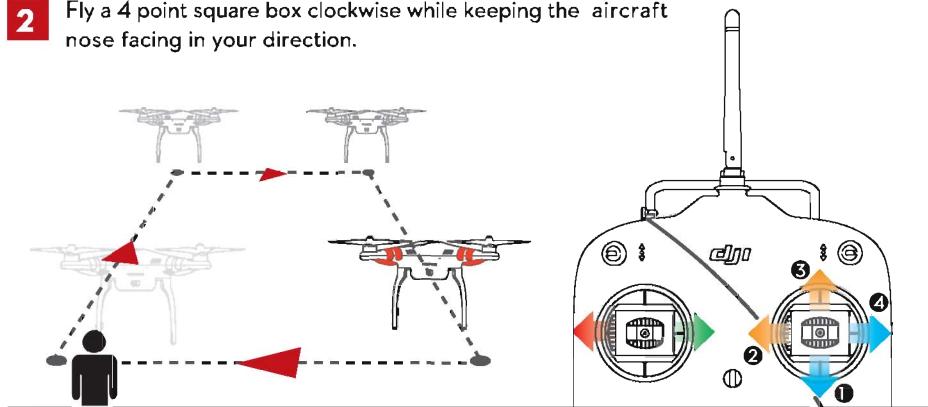


# Advanced Flight Maneuvers ( ★★★ )

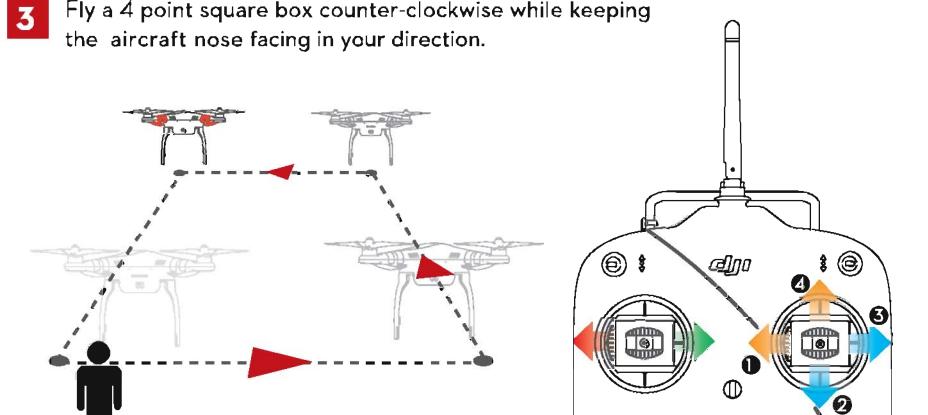
- 1** Fly a circle and keep the aircraft nose pointed towards you.  
Be sure to keep the altitude the same and the circle as uniform as possible.



- 2** Fly a 4 point square box clockwise while keeping the aircraft nose facing in your direction.

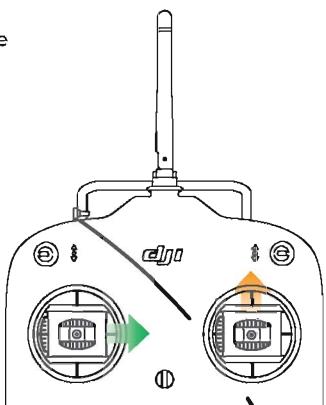
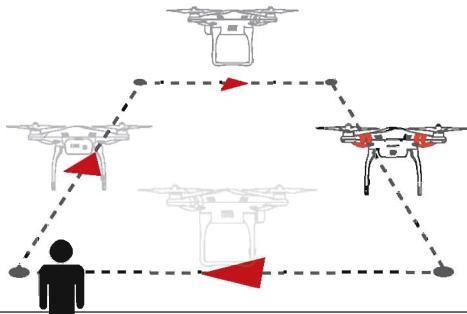


- 3** Fly a 4 point square box counter-clockwise while keeping the aircraft nose facing in your direction.

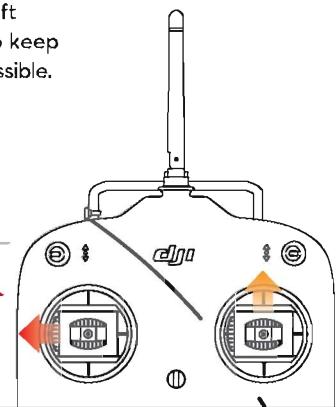
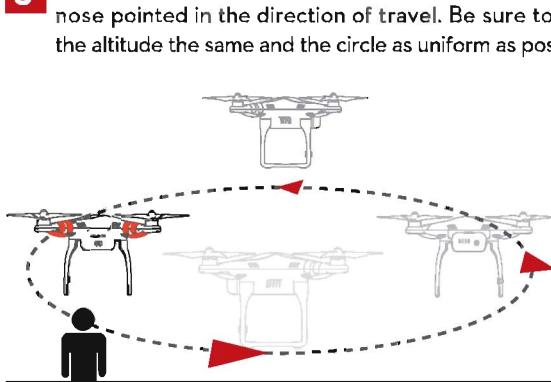


# Advanced Flight Maneuvers (★★★)

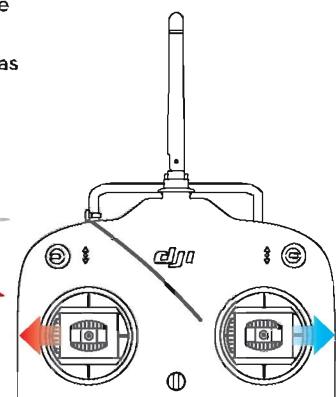
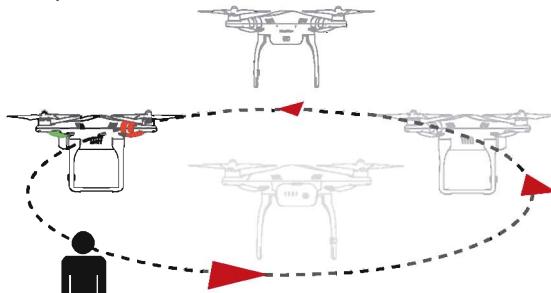
- 4** Fly a 4 point square box clockwise and rotate the phantom in the direction of travel.



- 5** Fly a circle counter-clockwise and keep the aircraft nose pointed in the direction of travel. Be sure to keep the altitude the same and the circle as uniform as possible.

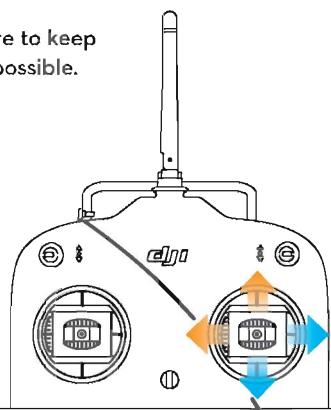
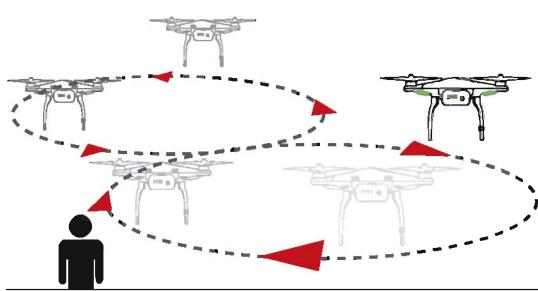


- 6** Fly a circle counter-clockwise with the aircraft nose pointed at the center of the circle. Be sure to keep the altitude the same and the circle as uniform as possible.

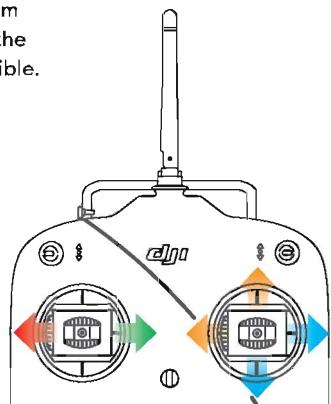
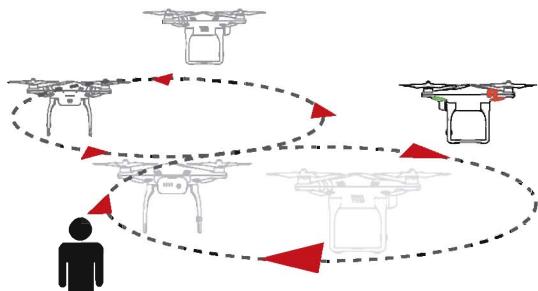


# Advanced Flight Maneuvers (★★★)

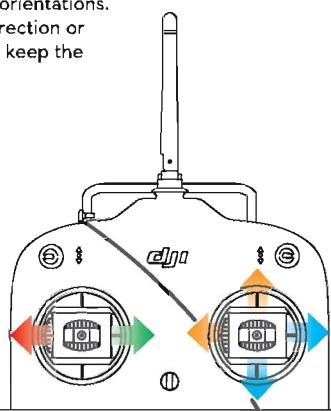
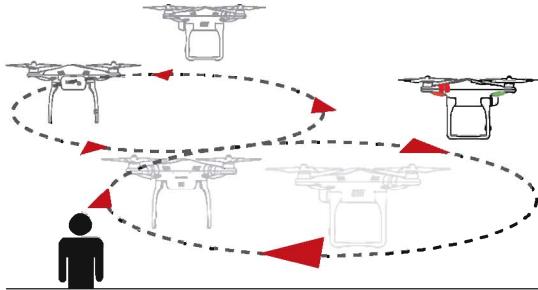
- 7** Fly a figure 8 without rotating the Phantom. Be sure to keep the altitude the same and the circle as uniform as possible.



- 8** Fly a Figure 8 with the aircraft nose of the Phantom pointed in the direction of travel. Be sure to keep the altitude the same and the circle as uniform as possible.



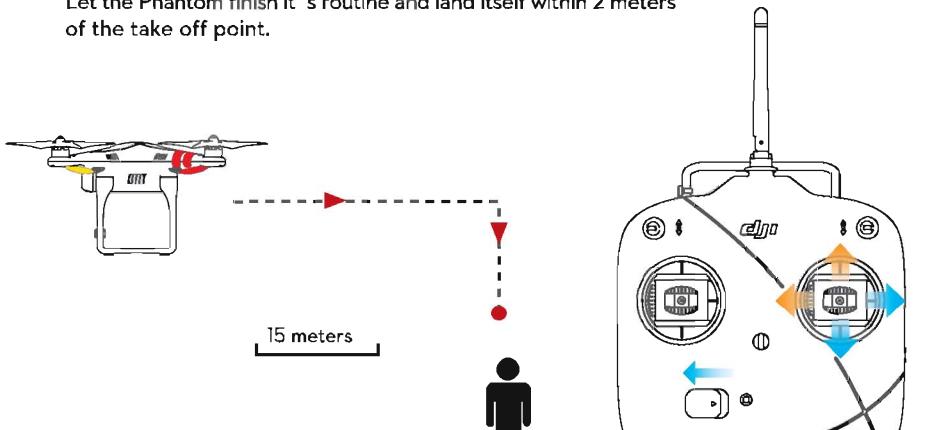
- 9** Fly Figure 8 patterns while experimenting with different orientations. For example, aircraft nose always pointed in a given direction or opposite/left/right the direction of travel, etc. Be sure to keep the altitude the same and the circle as uniform as possible.



# Emergency Situations

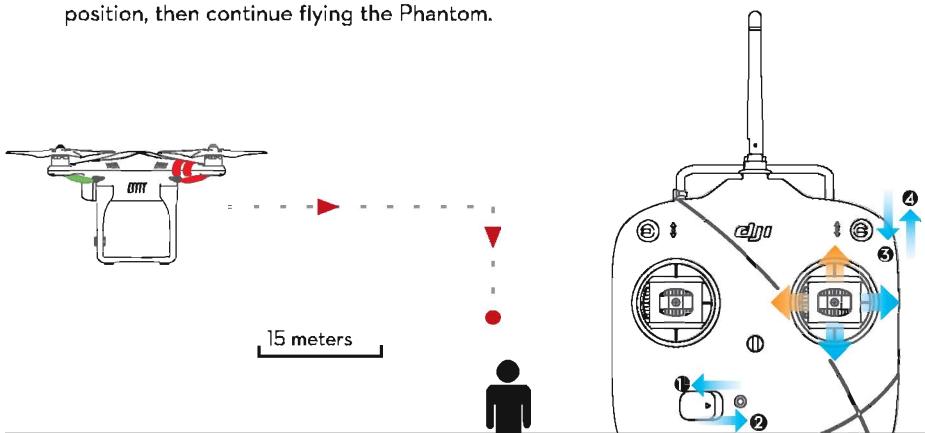
## 1 Return Home & Land Mode

Be sure you are in a large open area. Before you take off, make sure you have a good GPS lock by ensuring your LED indicators are flashing Green. Fly the Phantom at least 50ft away from your take off point. Turn off the Remote Controller. The Phantom will enter it's failsafe Return-To-Home Mode. Let the Phantom finish it's routine and land itself within 2 meters of the take off point.



## 2 Intercepting Return Home & Land Mode

Be sure you are in a large open area. Before you take off, make sure you have a good GPS lock by ensuring your LED indicators are flashing Green. Fly the Phantom 50ft away from your take off point. Turn off the Remote Controller. The Phantom will enter it's failsafe Return-To-Home Mode. When the Phantom is returning home, you can intercept RTH Mode by switching the S1 Switch from the top position to the middle or lower position, then continue flying the Phantom.



[www.dji.com](http://www.dji.com)



January 28, 2015

Mr. Kenneth Fugate  
UAS Integration Office, AFS-80  
UAS Airworthiness Section, AFS-86  
470 L'Enfant Plaza, Suite 3200  
Washington, DC 20024

RE: UAS Registration Marking (Replaces Letter dated January 22, 2015)

Dear Mr. Fugate:

**Headquarters:**  
8450 Westfield Blvd., Suite 300  
Indianapolis, IN 46240-5920  
t 317.713.4615  
f 317.713.4616  
e bfs@BFSEngr.com  
www.BFSEngr.com

**Branch Locations:**  
Ft. Wayne  
Jeffersonville  
Lafayette  
Merrillville  
Plainfield

Founded 1961



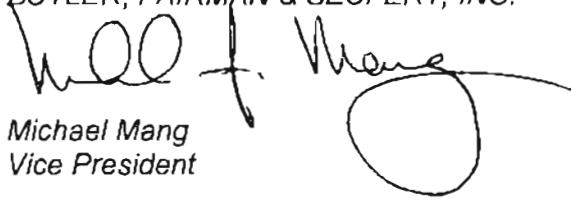
Title 14 of the Code of Federal Regulations 45.22(d), *Exhibition, antique, and other aircraft: Special Rules*, permits persons to apply to the Administrator for a different marking procedure if it is impossible to mark an aircraft per §§45.21 and 45.23 through 45.33. Michael Mang is requesting an alternate marking for the DJI Phantom 2 Quadcopter registration marks.

The DJI Phantom 2 is a small Unmanned Aircraft System (sUAS) Quadcopter that cannot comply with the aircraft marking standards per §§45.21 and 45.23 through 45.33. Michael Mang is proposing marking the DJI Phantom 2 using minimum 1 inch lettering by placing the assigned N# on all four sides of the main body so that it is visible to the operator or anyone assisting in its operation.

If you have any questions, please contact Michael Mang at 317-713-4615 or [mmang@bfsengr.com](mailto:mmang@bfsengr.com).

Sincerely,

BUTLER, FAIRMAN & SEUFERT, INC.

  
Michael Mang  
Vice President

MM:lm