U.S. Department
of Transportation
**Federal Aviation
Administration**

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

June 23, 2015

Exemption No. 11862
Regulatory Docket No. FAA–2015–0891

Mr. Kendrick Smith
1946 Twin Creeks Court
Napa, CA 94559

Dear Mr. Smith:

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 March 30, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Raven Aerial Imaging (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct market research, aerial surveys, mapping, data collection and inspections that consist of still photographs, video, thermal imaging and other data taken by onboard sensors.

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. The FAA received one individual comment in opposition to the petition and one in support from the petitioner. In granting this exemption, the FAA has determined that the proposed operations can safely be conducted under the conditions and limitations of this exemption. As with exemptions issued to Aeryon Lab, Astraeus Aerial, Clayco, Inc., and VDOS Global, LLC, failure to comply with the document's conditions and limitations is grounds for immediate suspension or rescission of the exemption.

Airworthiness Certification

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

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 relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates,* 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[1]. 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, Raven Aerial Imaging 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),

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

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, Raven Aerial Imaging 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 Vision+ 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.

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 June 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/
John S. Duncan
Director, Flight Standards Service

Enclosures

March 30, 2015

U.S. Department of Transportation
Docket Management System
1200 New Jersey Ave., SE
Washington, DC 20590

Re: Exemption Request Under Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations

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. Part 11, Raven Aerial Imaging, the owner and operator of the DJI Phantom 2 Vision+ a small Unmanned Aircraft Systems ("sUAS") seeks an exemption from the Federal Aviation Regulations ("FARs") listed below and discussed in Appendix A. Details of Raven Aerial Imagery and the DJI Phantom 2 Vision+ sUAS and described in Appendix B. Attached as Appendix C is a summary of this request.

The requested exemption would permit Raven Aerial Imaging commercial operation of DJI Phantom 2 Vision+ (see details in Appendix B), which weighs under 6 lbs. with imaging payload, to perform market research, aerial surveys, mapping, data collection and inspections that consist of still photographs, video, thermal imaging and other data taken by onboard sensors. The DJI Phantom 2 Vision+ produces high quality imagery and data that can be used independently or in the case of surveying and modelling, can be combined to produce precision digital point clouds, triangle models, and contour maps of the surveyed area. Application for this sUAS include inspection of sensitive infrastructure including oil and gas pipelines and flare stacks, powerlines and towers, wind turbines, and surveying tasks such as precision agriculture, mining, transportation, building inspection wildlife monitoring and forestry. Use of the DJI Phantom 2 Vision+ for these inspection and surveying applications reduces the need to operate conventional aircraft, providing data more quickly, accurately, economically, safely and with reduced environmental impact.

Operations under the exemption will be subject to strict operating requirements and conditions to ensure at least an equivalent level of safety to currently authorized operations using manned aircraft and under conditions as may be modified by the FAA as required by Section 333.

While Raven Aerial Imaging is filing this exemption request on its own behalf, it anticipates that its customers, in the future, will file exemption applications to allow them to operate the DJI Phantom 2 Vision+ in commercial operations at their own facilities, farms, mines, and other sites that require aerial data for inspections and surveys. Wherever possible, those filings will be substantially similar to this exemption application.

As described more fully below, the requested exemption would authorize Raven Aerial Imaging to

perform market research and commercial operations of aerial inspections, thermal imaging, photography, video and surveys using the DJI Phantom 2 Vision+[1] which under 6 lbs. is small in size and powered electrically by battery. The DJI Phantom 2 Vision+ will be operated under controlled conditions at low altitude (under 400ft. or 200ft. as determined by this exemption) in airspace that is limited in scope, as described more fully herein; It will have automated control features, as described below. The DJI Phantom 2 Vision+ is designed to be operated by one person but flight operations generally involve two people: an operator and an observer. The operator is responsible for flying the sUAS, monitoring its status and flight dynamics while maintaining visual line of sight and keeping the flight within the specified factory limits (in terms of wind, flight range, battery life, etc.) to ensure safe operation of the sUAS itself. The observer is responsible for monitoring the airspace for other aircraft and hazards and instructing the operator before and during flight as necessary to ensure safe separation/de - confliction with these aircraft and hazards. The operator also will be an individual who has passed authorized The DJI Phantom 2 Vision+ training program for the DJI Phantom 2 Vision+. Finally, the airspace in which the DJI Phantom 2 Vision+ will operate will be disclosed to and approved, as needed, by the FAA inadvance.

Raven Aerial Imaging respectfully submits that because this small, unmanned aerial system – the DJI Phantom 2 Vision+ will be used in lieu of comparatively hazardous operations now conducted with fixed wing and rotary conventional aircraft, the FAA can have confidence that the operations will achieve at least anequivalent level or greater level of safety. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities under Section 333(c) of the Reform Act to "establish requirements for the safe operation of such aircraft systems in thenational airspace system."

The name and address of the applicant are:

Raven Aerial Imaging
Attn: Kendrick Smith
Ph.707-333-0256
Email: kendrick@ravenaerialimagery.com
Address: 1946 Twin Creeks Ct
Napa, CA 94559 USA

The primary contact for this application is:
Kendrick Smith;
kendrick@ravenaerialimagery.com;
707-333-0256

The regulations from which the exemption is requested are as follows:
14 C.F.R. Part 21;
14 C.F.R. 45.23(b) ;
14 C.F.R. 61.113(a) & (b) ;
14 C.F.R. 61.133(a) ;
14 C.F.R. 91.7(a) ;
14 C.F.R. 91.9(b) (2) & (c) ;
14 C.F.R. 91.103;
14 C.F.R. 91.109(a) ;
14 C.F.R. 91.119;

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[1]DJI Phantom 2 Vision+ customers have been granted flight operation certificate to operate the DJI Phantom 2 Vision+, Certificates of Waiver or Authorization (COA) in the US for public agency use.

14 C.F.R. 91.151(a) ;
14 C.F.R. 91.203(a) & (b) ;
14 C.F.R. 91.405(a) ;
14 C.F.R. 91.407(a) (1) ;
14 C.F.R. 91.409(a) (2) ;
14 C.F.R. 91.417(a).

Appendix A discusses each rule listed above and explains why exemptions pursuant to the proposal set forth in this letter are appropriate, provide an equivalent level of safety, and are in the public interest.

THE APPLICABLE LEGAL STANDARD UNDER SECTION 333

Raven Aerial Imagery submits that grant of this exemption application for use of the DJI Phantom 2 Vision+ in market research,surveying, mapping and inspection operations will advance the Congressional mandate in Section 333of the Reform Act to accelerate the introduction of sUASs into the national airspace system ("NAS") if itcan be accomplished safely. This law directs the Secretary of Transportation to consider whethercertain sUASs may operate safely in the NAS before completion of the rulemaking required under Section 332 of the Reform Act. In making this determination, the Secretary is required to determinewhich types of sUASs do not create a hazard to users of the NAS or the public or pose a threat tonational security in light of the following:

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

Reform Act § 333(a) (1). If the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of suchaircraft in the national airspace system." *Id.* §333(c) (emphasis added).[2]

The Federal Aviation Act expressly grants the FAA the authority to issue exemptions. This statutoryauthority, by its terms, includes exempting civil aircraft, as the term is defined under §40101 of the Act,from the requirement that all civil aircraft must have a current airworthiness certificate and thoseregulations requiring commercial pilots to operate aircraft in commercial service:

> The Administrator may grant an exemption from a requirement of a regulation prescribed undersubsection (a) or (b) of this section or any of sections 44702-44716 of this title if the Administrator finds the exemption is in the public interest.

49 U.S.C. §44701(f). *See also* 49 USC §44711(a) ; 49 USC §44704; 14 CFR §91.203(a)(1).

The grant of the requested exemption is in the public interest based on the clear direction in Section 333 of the Reform Act; The additional authority in the Federal Aviation Act, as amended; The strong equivalent level of safety surrounding the proposed operations; And the

significant public benefit, including enhanced safety and cost savings associated with transitioning to sUASs for aerial surveying, mapping and inspection applications. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption without delay.

Airworthiness of the DJI Phantom 2 Vision+

A critical element of the exemption application involves evidence of the airworthiness of DJI Phantom 2 Vision+ sUAS including the DJI Phantom 2 Vision+. Raven Aerial Imagery believes that it has shown compliance through a history of granted flight operations and successful flights - including many operations with public agencies. The list of granted applicants includes:

[2]Applicant submits that this provision places a duty on the Administrator to not only process applications for exemptions under Section 333, but for the Administrator, if he deems the conditions proposed herein require modification in order to allow approval, to supply conditions for the safe operation of the sUAS. Raven Aerial Imagery welcomes the opportunity to consult with FAA staff in order to address any issues or concerns that this proposal may raise that they believe may require modification.

The criteria set forth in the Order specify the substantive showings of the device's safety and fitness for operation to ensure that the FAA has sufficient basis to evaluate the aircraft's safety[3]. The DJI Phantom 2 Vision+ also has a significant set of automated features to ensure safe takeoff, flight and landing in many conditions, further details of operation can be found in Appendix B.

Mandatory Operating Conditions

Grant of the exemption to Raven Aerial Imagery will be subject to the following mandatory conditions, which are based upon operating conditions set forth for operation of sUAS by public entities pursuant to Certificates of Authorization, with additional restrictions:

1. All operations to occur in Class G airspace.
2. Operations to avoid congested or populated areas, which are depicted in yellow on VFR charts.
3. Operations to be conducted over private or controlled access property.
4. Permission from land owner/controller required before commencing any flight.
5. Operations to occur during Visual Flight Rules Meteorological Conditions (VMC).
6. Aircraft to remain within Visual Line of Sight (VLOS).
    i. VLOS guaranteed with a cylinder of operation around operator of ½ nautical miles (NM).
    ii. Cylinder walls may be expanded by observer with ability to control aircraft.
7. Operations to occur during daylight hours.
8. Above Ground Level (AGL) altitude to be restricted to 400 feet.
9. All operations conducted in vicinity of airport to remain more than 2.5 NM from centerline azimuth of runway centerline measured from runway thresholds.
10. Operator will file a NOTAM for each flight.
11. All required permissions and permits will be obtained from territorial, state, county or city

jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies.

12. All operations will include one pilot for flight control and one observer for VLOS enhancement of surrounding area near the aircraft

Operator Requirements

Raven Aerial Imagery respectfully proposes that operator requirements should take into account the characteristics of the particular sUAS. Certain sUASs, such as the DJI Phantom 2 Vision+ are characterized by a high degree of pre-programmed control and various built-in technical capabilities that limit the potential for operation outside of the operating conditions set forth above. The DJI Phantom 2 Vision+ sUAS also provides many built-in functional and safety features to assist the operator in safe and reliable operation.[4]

[3]Raven Aerial Imagery can submit under confidentiality the following documents in support of this exemption application for the DJI Phantom 2 Vision+. DJI Phantom 2 Vision+ User Guide (Exhibit 1) which includes Safety and Preflight Checklists; and 2) Training Manual (Exhibit 2).

[4] As of July 2014, Raven Aerial Imagery staff have performed over 100 flights, logging more than 120 hours of flight time with the DJI Phantom 2 Vision+. This is a significant amount of flight time collected to understand and refine skills for the DJI Phantom 2 Vision+.

The DJI Phantom 2 Vision+ provides two semi-autonomous flight modes using a point-and-click map and video interface. The user clicks on a map to direct the DJI Phantom 2 Vision+ to fly to the point on the map where the operator is pointing, or programmed flight plans may be entered for a series of waypoints or grid based area. Additional navigation aids including landing zones and flight areas may be designated to ensure the DJI Phantom 2 Vision+ operates only within user specified flight parameters. All flight operations are GPS controlled making the system easy to navigate, and the flight control system also employs a variety of sensors including sonar, barometric pressure, temperature, wind speed and others to ensure the high stability and reliability in challenging weather conditions. At all times during flight operations, the operator can intervene a programmed flight and take immediate control.

Additional automated safety functions and safety enhancing features of the DJI Phantom 2 Vision+ include the following:

- Automated pre-flight system performance checks
- User pre-flight checklist
- Automated condition or fault detection, warnings, and pre-defined responses to a number of flight and system conditions.
  - High winds with system and user defined safety thresholds
  - Low battery with system and user defined safety thresholds
  - High temperature or other system safety thresholds
  - Lost link communication
- Pre-defined responses include behavior such as attempting to re-establish radio communication, return to home position and hover, return to home position and land, or land incurrent position
- In the case of lost GPS, a manual user flight mode is enabled which allows the operator to provide manual navigation inputs to assist in landing the vehicle.

Given these safety features, Raven Aerial Imagery proposes that operators of the DJI Phantom 2 Vision+ should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

1. Have successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA recognized equivalents including commercialor private license and ground school issued from an ICAO recognized country;
2. Have completed DJI Phantom 2 Vision+ authorized training program for operation and maintenance of the sUAS.

Raven Aerial Imagery notes that the FAA has found that safety factors permitted operation of sUASs by operatorswith these qualifications in the case of operations pursuant to public COAs when the mandatory operating conditions specified above were present. *See* Federal Aviation Administration, Notice N-8900.227, Unmanned Aircraft Systems (UAS) Operational Approval, at 20-21 (July 30, 2013). The FAA has the statutory authority to grant exemptions to the requirements for and privileges associatedwith the grant of airmen's certificates. 49 USC §44701 (f).

In summary, applicant seeks an exemption from the FARs set forth above and in Appendix C to allow market research and commercial operations of a small unmanned vehicle in surveying, mapping andinspection operations.

Approval of the exemption allowing commercial operations of the DJI Phantom 2 Vision+ for surveying, mapping, aerial photography, thermal imagery, data collection and inspection operations will enhance safety by reducing risk. Conventional aerial survey and inspection operations using manned aircraft involve very heavy aerial vehicles carrying significant quantities of combustible fuels, and a multi-person crew in piloting and observation roles. These operations require transit to and from the location of the activity, and will at times take place in congested environments including proximity to physical obstacles and/or presence of the general public. By contrast the DJI Phantom 2 Vision+ weighs under 6 lbs. including payloads and uses a battery for power, is carried to/from the area of activity, removes the need for airborne pilots/observers, and poses less risk to people and infrastructure on the ground.

Additionally, no national security issue is raised by the grant of the requested exemptions. Given thesize, load carrying capacity, speed at which it operates, and the fact that it carries no explosives orother dangerous materials, the DJI Phantom 2 Vision+ poses no threat to national security.

The operation of the DJI Phantom 2 Vision+ for market research, surveying, mapping, thermal imaging, data collection and inspection operations in accordance with the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting Raven Aerial Imagery from the requirements of Part 21.

The DJI Phantom 2 Vision+ satisfaction of the criteria set forth in Section 333 of the Reform Act—size, weight,speed, operating capabilities, lack of proximity to airports and populated areas, operation within visualline of sight, and national security – and its showing of an equivalent level of safety as it may relate tothe requirement for a pilot's license, provide more than adequate

justification for the grant of therequested exemptions allowing Raven Aerial Imagery commercial operation of the DJI Phantom 2 Vision+ in market research,surveying, mapping, thermal imaging, data collection and inspection operations.

Respectfully yours,

Kendrick F. Smith
Raven Aerial Imagery
1946 Twin Creeks Ct
Napa, CA 94559 USA
kendrick@ravenaerialimagery.com

Temporary Number: NT0048855

APPENDIX A

EXEMPTION REQUEST AND EQUIVALENT LEVEL OF SAFETY SHOWINGS UNDER APPLICABLE RULES SUBJECT TO EXEMPTION

Raven Aerial Imagery requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of the DJI Phantom 2 Vision+:

14 C.F.R. Part 21, Subpart H: Airworthiness Certificates
14 CFR § 91.203(a) (1)

Section 91.203(a) (1) requires all civil aircraft to have a certificate of airworthiness. Part 21, Subpart H, entitled Airworthiness Certificates, establishes the procedural requirements for the issuance of airworthiness certificates as required by FAR § 91.203(a)(1). Given the size of the aircraft (under 6 lbs.) and the limited operating area associated with its utilization, it is unnecessary to go through the certificate of airworthiness process under Part 21 Subpart H to achieve or exceed current safety levels.

Such an exemption meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the sUAS involved.

In this case, an analysis of these criteria demonstrates that the DJI Phantom 2 Vision+ operated without an airworthiness certificate, under the conditions proposed herein, will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) with an airworthiness certificate. The DJI Phantom 2 Vision+ weighs under 6 lbs. fully loaded. It will not carry a pilot or passenger, will not carry flammable fuel, and will operate exclusively within an area pre disclosed and in compliance with conditions set forth herein. Operations under this exemption will be tightly controlled and monitored by both the operator, pursuant to the conditions set forth above, and by local public safety requirements. The FAA will have advance notice of all operations through the filing of NOTAMs. Receipt of the prior permission of the land owner, thesize of the aircraft, the lack of flammable fuel, and the fact that the aircraft is carried to the location and not flown there all establish the equivalent level of safety. The DJI Phantom 2 Vision+ provides at least an equivalent, and most likely exceeds level of safety to that of such operations being conducted with conventional aircraft that would be orders-of-magnitude larger and would be carrying passengers, cargo and flammable fuel. The automated safety features including redundant sensor systems as described in Appendix B and throughout this document highlight the design intentions towards safety and reliability on DJI Phantom 2 Vision+.

14 C.F.R. § 45.23 & 91.9(c): Marking of the Aircraft

Regulation 45.23 provides:

> (a) Each operator of an aircraft must display on that aircraft marks consisting of the Roman capital letter “N” (denoting United States registration) followed by the registration number of the aircraft. Each suffix letter used in the marks displayed must also be a Roman capital letter.

> (b) When marks include only the Roman capital letter "N" and the registration number is displayed on limited, restricted or light sport category aircraft or experimental or provisionally certificated aircraft, the operator must also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches normore than 6 inches high, the words "limited," "restricted," "light sport," "experimental," or "provisional," as applicable.

Regulation 91.9(c) provides:

> No person may operate a U.S. registered civil aircraft unless that aircraft is identified in accordance with part 45 of this chapter.

The DJI Phantom 2 Vision+ has no entrance to the cabin, cockpit, or pilot station on which the markings can beplaced. Given the size of the sUAS, two inch lettering will be impossible. Official marking systems forsmall UAS have not yet been established for operations inside the NAS. The DJI Phantom 2 Vision+ is currently marked with a fixed label containing DJI Phantom 2 Vision+ measuring 1.5" x 0.5" as well as a serial number located under the removable camera payload. Raven Aerial Imagery is prepared to mark the inspection system with the name of the organization and location or origin and fulfill any other request by the FAAto this topic in accordance to § 45.29(f) where the pilot, observer, and others working with the sUAS will see the identification of the sUAS.

The FAA has issued the following exemptions to this regulation, see Exemption Nos. 8738, 10167, 10167A and 10700.

14 C.F.R. § 61.113(a) & (b); 61.133(a): Private Pilot Privileges and Limitations; Pilot in Command; Commercial Pilot Privileges and Limitations.

Section 61.113(a) & (b) limit private pilots to non-commercial operations. Unlike a conventional aircraft that carries a pilot, passengers, and cargo, the DJI Phantom 2 Vision+ in this case is remotely controlled with no passengers or property of others on board. Section 61.133(a) requires an individual with a commercial pilot's license to be pilot in command of an aircraft for compensation or hire. Raven Aerial Imagery respectfully proposes that operator requirements should take into account the characteristics of the particulars UAS. DJI Phantom 2 Vision+ has a high degree of pre-programmed control and various built-in technicalcapabilities that strictly limit the potential for operation outside of the operating conditions set forth in theexemption application.

The DJI Phantom 2 Vision+ has an all-digital software platform with advanced features previously restricted to full size unmanned aircraft. Automated features and advanced fly safe controls enable safe, reliableoperation, as well as advanced networking capabilities and system extensibility.

1. Plan your flight or fly ad hoc: The system can autonomously fly a programmed flight path or fly in manual mode
2. Smart batteries and charger: Flight time and battery minutes are displayed at all times. The system will return home and land automatically if user configurable limits are reached.

Flight safety is a priority, no matter the operating environment or project. The DJI Phantom 2 Vision+ offers superior safety over manned aircraft by removing the need for people to be onboard in potentially dangerous situations. With multiple built-in safety features, the DJI Phantom 2 Vision+ platform leads other sUAS with respect to safety.

1. Intelligent fault handling: The system automatically detects potential issues - with configurable automated response behavior such as a return-home-and-land routine
2. Automatic pre-flight checks: The system self-calibrates all of its sensors and performs self-tests prior to takeoff to check for errors
3. No fly zones: The system has the ability to set up visual no fly zones and installed no fly zones.
4. Self-monitoring: Monitoring battery levels, in-flight wind speeds, and other system and environmental conditions are automatically handled by the system
5. Battery communication: Battery minutes and flight time are displayed at all times. The system will return home and land automatically if user configurable limits are reached.

Additional automated safety functions and safety enhancing features of the DJI Phantom 2 Vision+ include the following:

1. Auto detection of lost GPS warns the pilot and initiates an immediate landing.
2. Low battery on the DJI Phantom 2 Vision+ triggers a Non- Fatal Warning alarm to return home, land and replace the battery
3. Very low battery on the DJI Phantom 2 Vision+ triggers a Fatal Error alarm and initiates an emergency high speed descent landing.
4. If the DJI Phantom 2 Vision+ detects a lost link to the base station the vehicle will perform its pre- defined Nonfatal Condition Response.

Given these safety features, Raven Aerial Imagery proposes that operators of the DJI Phantom 2 Vision+ should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

1. Have completed DJI Phantom 2 Vision+ training program for operation of the sUAS.
2. Completed Raven Aerial Imagery training and safety program.

Raven Aerial Imagery notes that the FAA has found that safety factors permitted operation of sUASs by operators with these qualifications in the case of operations pursuant to public COAs where the mandatory operating conditions specified above are present. *See* Federal Aviation Administration, Notice N-8900.227, Unmanned Aircraft Systems (UAS) Operational Approval, at 20-21 (July 30, 2013). TheFAA has the statutory authority, granted at 49 U.S.C §44701(f) to waive the pilot requirements forcommercial operations.

Given these conditions and restrictions, an equivalent level of safety will be provided by allowing operation of the DJI Phantom 2 Vision+ without a private pilot's certificate or a commercial pilot's certificate, underthe conditions set forth herein.

The risks associated with the operation of the DJI Phantom 2 Vision+ (given its size, speed, operational capabilities, and lack of combustible fuel) are so diminished from the level of risk associated with private pilot operations or commercial operations contemplated by Part 61 with conventional aircraft(fixed wing or rotorcraft), that allowing operations of the sUAS as set forth above meets or exceeds thepresent level of safety provided under 14 C.F.R. § 61.113(a) & (b) and does not rise to the level ofrequiring a commercial pilot to operate the aircraft under § 61.133(a).14 C.F.R. § 91.7(a): Civil aircraft airworthiness.

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. Should the exemption be granted allowing commercial operation of the DJI Phantom 2 Vision+ without an airworthiness certificate, no standard will exist for airworthiness of the DJI Phantom 2

Vision+. Given the size of the aircraft and the previous COAs issued for DJI Phantom 2 Vision+ equivalent level of safety will be achieved by ensuring compliance with the DJI Phantom 2 Vision+ manuals prior to each flight.

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

The regulation provides:

> No person may operate a U.S. registered civil aircraft configuration of the DJI Phantom 2 Vision+, it has no ability or place to carry such a flight manual on the aircraft, not only because there is no pilot on board, but because there is no room or capacity to carry such an item on the aircraft.

The equivalent level of safety will be achieved by keeping the flight manual (*see*, *e.g.*, User Guide, Exhibit 1) at the ground control point where the pilot flying the sUAS will have immediate access to it. The FAA has issued to others the following exemptions to this regulation: Exemption Nos. 8607, 8737,8738, 9299, 9299A, 9565, 9565B, 10167, 10167A, 10602, 32827, and 10700.

14 C.F.R. § 91.103: Preflight Action

This regulation requires each pilot in command to take certain actions before flight to insure the safety of flight. As FAA approved rotorcraft flight manuals will not be provided for the aircraft an exemption will be needed. An equivalent level of safety will be provided as set forth in the DJI Phantom 2 Vision+ User Manual (exhibit 1) under the 'Getting Ready to Fly' section. The PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff distances and aircraft performance data before initiation of flight.

14 C.F.R. § 91.109(a) & 91.319(a) (1): Flight Instruction

These regulations provide that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

The DJI Phantom 2 Vision+ is a remotely piloted aircraft and by design, does not have fully functional dual controls. Flight control is accomplished through the use of a control box that communicates with the aircraft via radio communications. The flight plan is either manually controlled through point-and-click touch screen navigation or pre-programmed as way points or an Auto Grid into the auto pilot before or during flight and only in unusual circumstances will the pilot input control functions to alter the pre-programmed flight. If instruction is accomplished through a training program, as set forth in Exhibit 2, an equivalent level of safety will be assured. The FAA has approved exemptions for flight training without fully functional dual controls for a number of aircraft and for flight instruction in experimental aircraft. *See* Exemption Nos. 5778K & 9862A. The equivalent level of safety will be achieved by the manufacturer providing the training as outlined, for example, in Exhibit 2 and through the use of experienced and qualified pilots familiar with the DJI Phantom 2 Vision+.

14 CFR § 91.119: Minimum Safe Altitudes

Section 91.119 establishes safe altitudes for operation of civil aircraft. Specifically, 91.119(c) limits aircraft flying over areas other than congested areas to an altitude of 500 feet above the surface,

except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

As set forth herein, the DJI Phantom 2 Vision+ will never operate at higher than 400 feet AGL. It will, however, be operated to avoid congested or populated areas that are depicted in yellow on VFR sectional charts. Because aerial survey, mapping and inspection work must be accomplished at relatively low altitudes and at altitudes less than 500 feet AGL, an exemption from Section 91.119(c) is needed.

The equivalent level of safety will be achieved given the size, weight, speed, and material with which the DJI Phantom 2 Vision+ is built. Also, no flight will be taken without the permission of the land owner or thosewho control the land. Because of the advance notice to the landowner, all affected individuals will beaware of the flights. Compared to aerial survey operations conducted with aircraft or rotorcraft weighing far more than 6 lbs. and carrying flammable fuel, any risk associated with these operationswill be far less than those currently allowed with conventional aircraft operating at or below 500 feet AGL Indeed, the low altitude operations of the sUAS will maintain separation between these sUAS operations and the operations of conventional aircraft that must comply with Section 91.119.

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

This regulation prohibits an individual from beginning "a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed;

1. During the day, to fly after that for at least30 minutes; Or
2. At night, to fly after that for at least 45 minutes.

The DJI Phantom 2 Vision+ batteries provide approximately 50 minutes of powered flight. Without an exemptionfrom § 14 CFR 91.151, the sUAS's flights would be limited to approximately 20 minutes in length. Given the limitations on its proposed operations and the location of those proposed operations, a longer timeframe for flight in daylight VFR conditions is reasonable.

Raven Aerial Imagery believes that an exemption from 14 CFR § 91.151(a) is safe and within the scope of a prior exemption. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate withoutcompliance with 91.151(a)). Operating the sUAS, without 30 minutes of reserve fuel does not engenderthe type of risks that Section 91.151(a) was meant to prevent given the size and speed at which the sUAS operates. The fact that it carries no pilot, passenger, or cargo also enhances its safety. Additionally, limiting DJI Phantom 2 Vision+ flights to 20 minutes would greatly reduce their utility. In the unlikely event that the DJI Phantom 2 Vision+ should run out of fuel, it would simply land. Given its weight and constructionmaterial, the risks are less than contemplated by the current regulation.

Raven Aerial Imagery believes that an equivalent level of safety can be achieved by maintaining 10 minutes of reserve fuel, which, allowing 40 minutes of flight time, would be more than adequate to return the sUAS to it planned landing zone from anywhere in its operating area.

The FAA has granted similar exemptions to others, including Exemptions 2689F, 5745, 10673 and 10808.

14 C.F.R. § 91.203 (a) & (b): Carrying Civil Aircraft Certification and Registration

This regulation provides as follows:

1. … No person may operate a civil aircraft unless it has … an appropriate and current airworthiness certificate.
2. No person may operate a civil aircraft unless the airworthiness certificate required by paragraph (a) of this section or a special flight authorization issued under §91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.
3. The DJI Phantom 2 Vision+ fully loaded weighs under 6 lbs. As such, there is no ability or place to carry certification and registration documents or to display them on the sUAS. In addition, there is no pilot onboard the aircraft.

An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the sUAS will have immediate access to them. The FAA has issued numerous exemptions to this regulation. A representative sample of other exceptions includes Exemption Nos. 9565, 9665, 9789, 9789A, 9797, 9797A, 9816A, and 10700.

14 C.F.R. § 91.405(a) ; 407(a) (1) ; 409(a) (2) ; 417(a): Maintenance Inspections

Section 91.405(a) requires that an aircraft operator or owner "shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter ..." Section 91.407 similarly makes reference to requirements in Part 43; Section 91.409(a) (2) requires an annual inspection for the issuance of an air worthiness certificate. Section 91.417(a) requires the owner or operator to keep records showing certain maintenance work that has been accomplished by certificated mechanics, under Part 43, or licensed pilots and records of approval of the aircraft for return to service.

The DJI Phantom 2 Vision+ is nearly maintenance free, it performs automatic pre-flight checks and the failure of any check will prevent take-off. Checks which cannot be done by the system will be performed by a qualified person prior to each flight and at predefined intervals as part of the Maintenance Schedule in the User Manual (see Exhibit 1).

Preflight checklist includes:

1. Visual inspection of the airframe
2. Visual inspections of rotor integrity
3. Check charge of all batteries (aerial vehicle, command station, radio repeater station)

An equivalent level of safety will be achieved because the sUAS is small in size, will carry no external payload, will operate only in restricted predetermined areas and is not a complex mechanical devise. As provided in the attached User Guide (System Maintenance section), the operator of Raven Aerial Imagery will ensure that the sUAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance that is performed. Moreover, the operator is the person most familiar with the aircraft and is best suited to maintain the aircraft in an airworthy condition and to ensure an equivalent level of safety.

The DJI Phantom 2 Vision+ Maintenance guidelines ensure an equivalent level of safety to the maintenance requirements in Part 91. In addition, any component failure detectable by the system will be reported tothe control station and will cause the UAV to perform a Fatal Condition Response (FCR) or Nonfatal Condition Response.

Appendix B:

The Phantom 2 Vision+ ushers in a new era of aerial cinematography with its brand new and incredibly stable 3-axis gimbal, combined with the sharp, powerful DJI-designed camera, making professional imaging tools easily accessible to everyone.

Phantom 2 Vision+	
	
Battery	5200mAh LiPo

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Phantom 2 Vision+ Weight	1242g (with battery & propellers)
Hover 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: 3m/s
Max Flight Speed	15m/s(Not Recommended)
Diagonal Length	350mm
Tilting Range of Gimbal	Pitch : -90°－0°

1. Ready to fly
2. 3-axis camera stabilization
3. Precision flight and stable hovering
4. Radar positioning & return home
5. Onscreen real-time flight parameters
6. High performance camera
7. Camera tilt control
8. Film straight down
9. Supports Adobe DNG RAW
10. Adobe lens profile support
11. Camera parameter settings
12. Album synchronization

TRANSMITTER

1. Operating Frequency:5.728 GHz – 5.85 GHz
2. Communication Distance（open area）: CE: 400m; FCC: 800m

3. Receiver Sensitivity（1%PER）:-93dBm</td></tr>
4. Transmitter Power: CE: 25mw; FCC: 100mw
5. Working Voltage:80 mA@6V
6. Battery:4 AA Batteries

CAMERA

1. Operating Environment Temperature： 0℃-40℃
2. Resolution:4384×3288
3. FOV:110°/ 85°
4. Sensor size:1/2.3"
5. HD Recording:1080p30 /720p60

RANGE EXTENDER

The Phantom 2 Vision+ Range Extender is a wireless communication device that operates within the 2.4 GHz frequency band. It is used to extending the effective range of communication between a Smartphone and the Phantom 2 Vision+. In an open, unobstructed area, the transmission distance can reach up to 700 meters. This can be reduced by trees, buildings and other sources of the same frequency. Before every flight, it is suggested that you ensure the Range Extender is functioning properly; otherwise communication issues between the mobile device and the Phantom 2 Vision+ may occur.

DJI VISION APP

System Requirement of Mobile Device: iPhone4s, iPhone5, iPhone5s, iPod Touch4, iPod Touch5;

Phantom 2 Vision+ Before Flight

Once pre-flight preparation is complete, it is recommended to carry out the tasks in the Phantom Pilot Training Guide to prepare for more complex flight maneuvers and learn to fly safely. Ensure that all flights are carried out in a suitable location.

Flight Environment Requirements

1. Do not use the aircraft in severe weather conditions. These include wind speed exceeding category 4, snow, rain and smog.
2. Fly in open fields as high buildings or steel structures may affect the accuracy of the onboard compass.
3. Keep the Phantom away from obstacles, crowds, high voltage power lines, trees or bodies of water when in flight.
4. Reduce the chance of electromagnetic interference by not flying in areas with high levels of electromagnetism, including base stations or radio transmission towers.
5. The Phantom cannot operate within the polar areas.
6. Do not fly the aircraft within no-fly zones specified by local laws and regulations.

Preflight Checklist

1. Remote Controller, smart battery, Range Extender and smartphone are fully charged.
2. Propellers are mounted correctly.
3. Gimbal clamp has been removed.
4. Damping absorbers are in good condition, not broken or worn.
5. Anti-drop kits have been mounted correctly.
6. Camera lens cap has been removed.
7. Micro-SD card has been inserted if necessary.
8. Gimbal is functioning as normal.
9. Motors can start and are functioning as normal.
10. DJI VISION App can connect to the camera.

DJI Vision App Usage

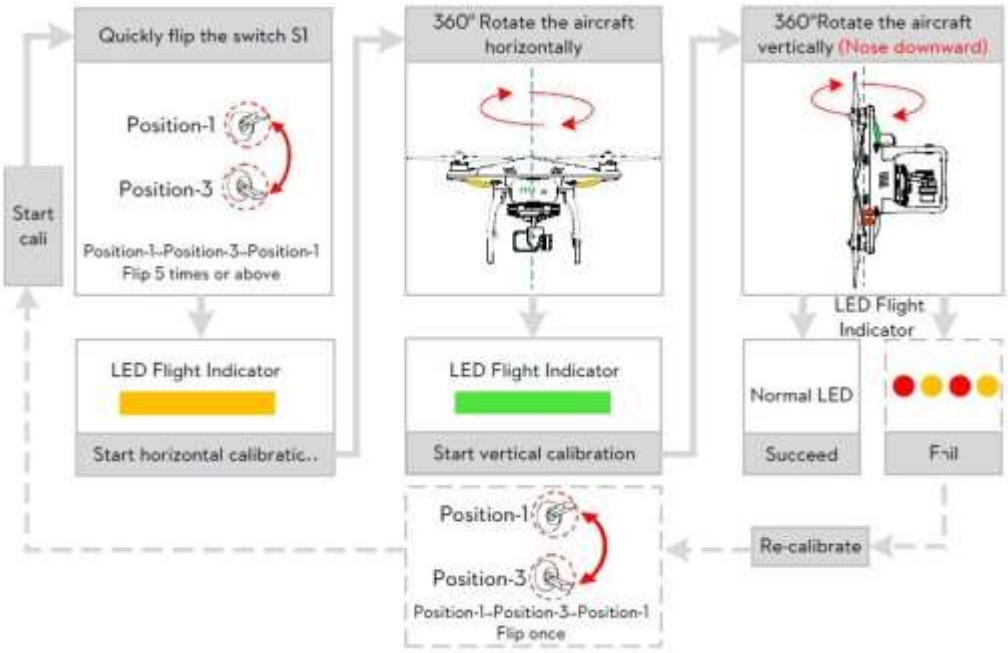
The DJI VISION App controls the Phantom 2 Vision+ camera including capture, recording, settings and pitch angle. It also displays essential flight information including flight parameters and battery.

Calibrating the Compass

IMPORTANT: Make sure to calibrate the compass in every new flight location. The compass is very sensitive to electromagnetic interference, which can cause abnormal compass data leading to poor flight performance or even flight failure. Regular calibration is required for optimum performance.

Calibration Procedures

Choose an open space to carry out the following procedures. Watch the Phantom 2 Vision+ quick start video for more details.



Hints and Tips:

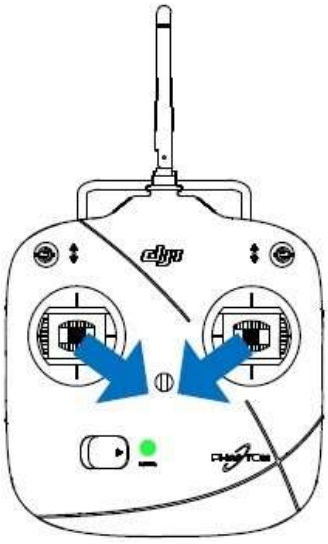
If compass calibration is needed before flight, a prompt will appear on the DJI VISON App's camera page. It will disappear after successful calibration.

When to Recalibrate

1. When compass data is abnormal, the rear LED flight indicator will blink red and yellow.
2. Flying in different location to last flight.
3. Mechanical structure of the Phantom has changed, i.e. changed mounting position of the compass.
4. Severe drifting occurs in flight, i.e. Phantom does not fly in straight lines.

Starting Motors

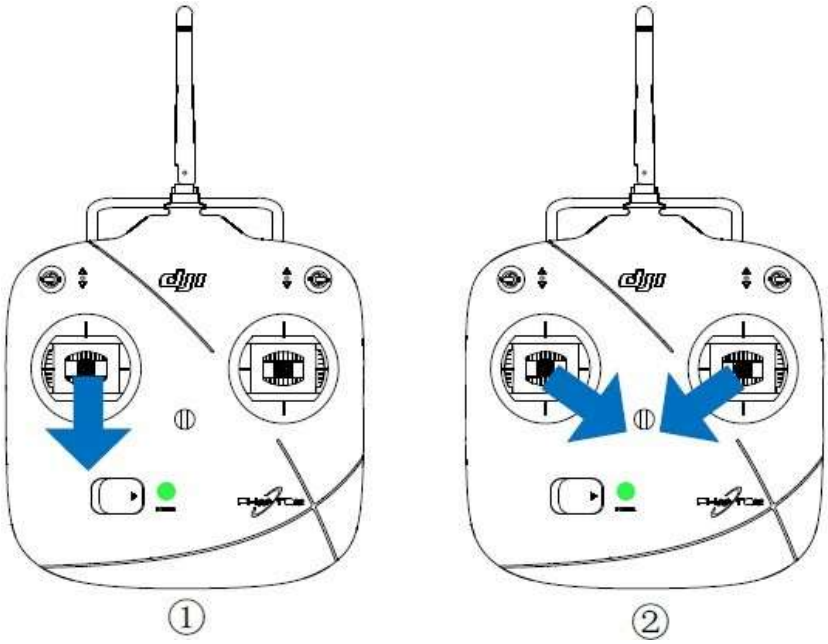
A Combination Stick Command (CSC) is used to start the motors instead of simply pushing the stick up. (Figure 50) Push both sticks to their bottom corners to start the motors. Once the motors have spun up, release both sticks simultaneously.



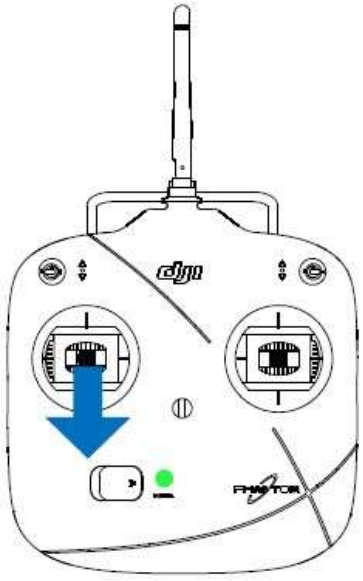
Stopping Motors

There are two methods to stop the motors.

Method 1: When the Phantom has landed, push the throttle down, then conduct CSC. Motors will stop immediately. Release both sticks once motors stop.



Method 2: When the aircraft has landed, push the throttle down and hold. Motors will stop after 3 seconds.



Warning: Do not execute CSC during normal flight. This will stop the motors and cause the aircraft to drop without control.

References: Conduct the CSC as neatly as you can. Release the sticks once motors start/stop.

Take off / Landing Procedures

1. Place the Phantom 2 Vision+ on open flat ground with battery indicators facing towards you.
2. Power on the Remote Controller and Range Extender, then the Smart Flight Battery.
3. Launch the DJI VISION App and start bind it with your smartphone then enter the camera preview page.
4. Wait until the Rear LED Flight Indicator blinks green. This means it has initialized and is Ready to Fly. If it flashes yellow, it is in Ready to Fly (non-GPS) mode and will require more careful flight. Execute the CSC command to start motors.
5. Push the throttle up slowly to take off. Refer to Remote Controller Operation for more details.
6. Shoot photos and videos using the DJI VISION App. Refer to DJI VISION App Usage for more details.
7. To land, hover over a level surface and gently pull down on the throttle gently to descend.
8. After landing, execute the CSC command or hold the throttle at its lowest position for 3 seconds or more until the motors stop.
9. Turn off the smart battery, Range Extender and Remote Controller.

Important:

1. When the Rear LED Flight Indicator blinks yellow rapidly during flight, the aircraft has entered Failsafe mode. Refer to Failsafe Function (Page 41) for details.
2. A low battery level warning is indicated by the Rear LED Flight Indicator blinking red slowly or rapidly during flight. Refer to the Low Battery Level Warning Function (Page) for details.
3. View tutorials about flight for more flight information: www.dji.com/phantom2visionplus/training.

Video Suggestions and Tips

1. Work through the check list before each flight.
2. Set the gimbal working mode to Stabilized.
3. Aim to shoot when flying in Ready to Fly only.
4. Always fly in good weather, such as sunny or windless days.
5. Change camera settings to suit you. These include FOV, photo format and exposure compensation.
6. Take flight tests to establish flight routes and scenes.
7. Push the sticks gently to make aircraft movements stable and smooth.

Failsafe Function

The Phantom will enter Failsafe mode when its connection to the Remote Controller is lost. The Flight Control System will automatically control the aircraft to return to home and land to prevent injury or damage.

Hints and Tips:

Home Point: When the Phantom enters 'Ready to Fly' from the 'Ready to Fly status (non-GPS)', the GPS coordinates will be recorded and set as the home point.

1. When Remote Controller signal is lost, the aircraft will return to the recorded home point coordinates and land.
2. Home point coordinates are used to calculate the horizontal distance of the aircraft (shown as "Distance" on the GUI of the DJI VISION App).
3. After successfully recording the home point, rear LED flight indicators blink fast green.

When will Failsafe Activate?

1. The Remote Controller is powered off.
2. The Phantom has flown out of effective communication range.
3. The signal between the Remote Controller and the Phantom has been blocked.
4. There is interference causing a signal problem with the Remote Controller.

Failsafe Procedure

Initiating the Failsafe mode from different flying statuses will results in different landing processes.

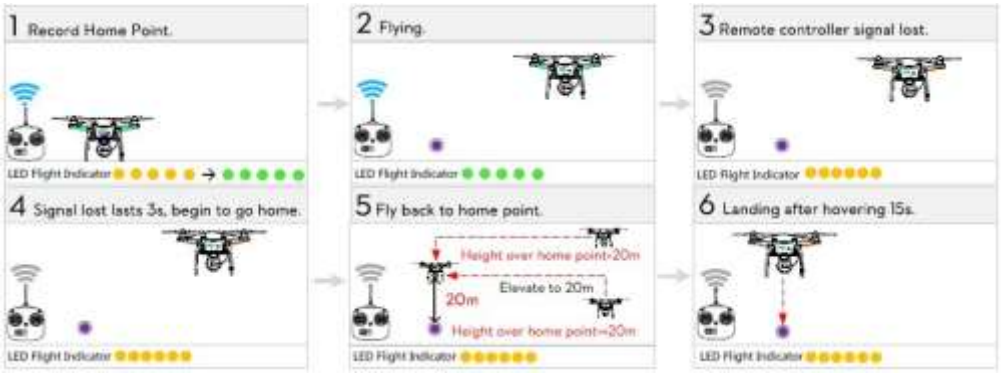
Ready to Fly (non-GPS) ---- Automatic landing

The Flight Control System will keep the aircraft level during descent and landing. It may be drift 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.

The below demonstrates the complete Ready to Fly Failsafe landing process.



Important:

1. To ensure the aircraft successful return to home after Failsafe activation, aim to only fly in Ready to Fly mode.

2. The Phantom will automatically descend during the Failsafe process if there are less than 6 GPS satellites detected for more than 20 seconds.
3. The aircraft cannot avoid obstacles during Failsafe.

Hints and Tips: Quickly flipping the S2 switch of the Remote Controller from top to bottom 5 times or more will reset the current aircraft position as a new home point. Rear LED flight indicators will blink green rapidly when successful.

Failsafe on the DJI VISION App

The DJI VISION App will provide information during Failsafe

Figure 54

Figure 55

Regaining Control During Failsafe Procedures

Position of Switch S1	Position-1	Position-2	Position-3
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 the Remote Controller signal is recovered, control is returned to the pilot.	Regain control as soon as signal is recovered.	

Low Battery Level Warning Function

The low battery level 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 Vision+ has two levels of low battery level warning. The default battery level warning thresholds are 30% (low battery level warning) and 15% (critical low battery level warning) respectively.

Battery Level Warning	Rest Battery Level	Rear LED Flight Indicator	DJI VISION App	Flight Instructions
Low battery level warning	≤threshold of low battery level warning	Slow red blinks	The battery level icon will become red (e.g. [redacted]), and a red rectangle will blink on the camera screen.	Fly the Phantom 2 Vision+ back and land it as soon as possible, stop motors and replace the battery.
Critical low battery level warning	≤threshold of critical low battery level warning	Fast red blinks	The battery level icon will become red (e.g. [redacted]), and a red rectangle will blink on the camera screen.	The Phantom 2 Vision+ will begin to descend and land automatically. After it has landed, stop motors and replace the battery.

Flight Limits

All unmanned aerial vehicle (UAV) operators should abide by all regulations from such organizations as the ICAO (International Civil Aviation Organization) and their own national 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 and No Fly Zones.

In Ready to Fly mode, height, distance limits and No Fly Zones work together to manage flight. In Ready to Fly (non-GPS) status, only height limits work and flights cannot go higher than 120m.

References : Default parameters in Assistant Software are 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 these parameters to comply with these rules before flying.

Max Height & Radius Limits

Max Height & Radius limits flying height and distance. Configuration can be done in the Phantom 2 Vision+ Assistant (Figure 57). Once complete, your Phantom will fly in a restricted cylinder (Figure 58).

Figure 57

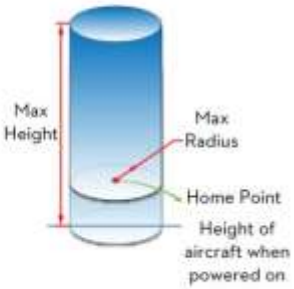


Figure 58

Ready to Fly	Limits	DJI VISION App	Rear LED flight indicator
Max Height	Flight height must be under the set height.	Warning: Height limit reached.	None.
Max Radius	Flight distance must be within the max radius.	Warning: Distance limit reached.	Rapid red flashing when close to the max radius limit.

Preparing the Remote Controller

The Phantom 2 Vision+ Remote Controller is a wireless communication device using the 5.8GHz frequency band. Remote Controller and Phantom are paired before delivery. The Remote Controller is set to Mode 2 by default. This can be adjusted in the PHANTOM RC Assistant Software. See Using the PHANTOM RC

Assistant Software for details. You can also adjust the power of your Remote Controller according to national regulations. Please refer to Compliance Version Configuration.

Definitions:

Compliance Version: The Phantom 2 Vision+ Remote Controller is compliant with CE and FCC (see the FCC ID) regulations.

Operating Mode: Mode 1 and Mode 2 refer to different channel mappings.

Mode 1: The right stick controls throttle.

Mode 2: The left stick controls throttle.

Hints and Tips:

The Range Extender and Phone Holder are already mounted on the Remote Controller. Twist the Phone Holder to face outwards and fix it in position for mobile device installation.

Warning: Large smartphones and tablets are not recommended for the Phone Holder as they do not fit.

The Remote Controller

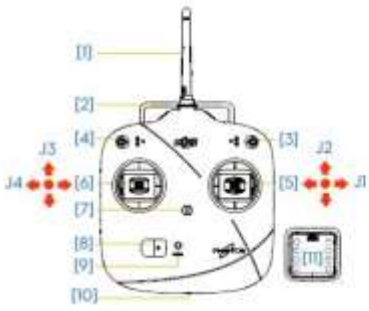


Figure 24

[1]	Antenna
[2]	Carrying Handle
[3]	Switch S1
[4]	Switch S2 (Reserved)
[5]	Right Stick (J1: Roll [left & right], J2: Pitch [front & back])
[6]	Left Stick (J3: Throttle [up & down], J4: Yaw [rotation])
[7]	Neck Strap Attachment
[8]	Power Switch
[9]	Power LED
[10]	RC Assistant Port(Micro-USB Port)
[11]	Battery Compartment (On the back)

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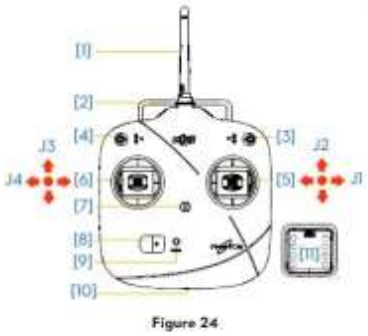

Figure 24

[1]	Antenna
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[8]	Power Switch
[9]	Power LED
[10]	RC Assistant Port(Micro-USB Port)
[11]	Battery Compartment (On the back)

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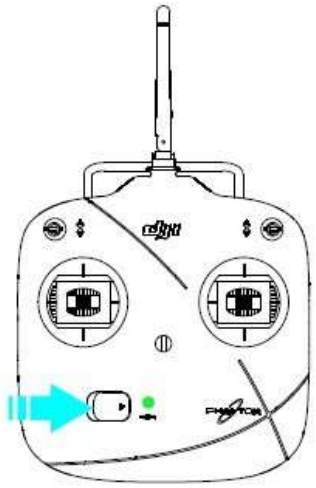
Power on the Remote Controller

Set S1 and S2 switches to the upper most position and place all sticks in the mid-point.
Toggle power switch to the right to switch on. The Remote Controller will then beep.
If it is set to CE compliance, then there will be one beep while the FCC compliant version will beep twice.
The Power LED will blink green quickly indicating that the solid green. Remote Controller and receiver are binding. Once binding is completed, the Power LED will change to a steady green.



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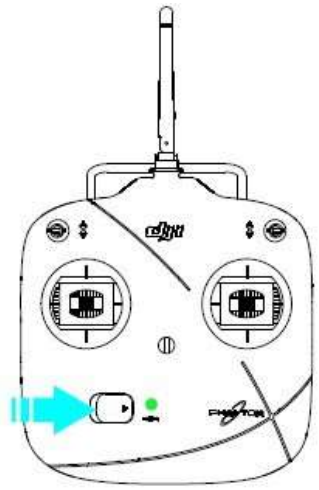

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Warning:

If the low voltage warning alert sounds

(refer to Remote Controller Power LED Status Information for details), charge batteries as soon as possible.
For long term storage, be sure to remove the batteries from Remote Controller.
Dispose of batteries properly.

Remote Controller Power LED Status Information

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Power LED	Sound	Remote Controller State
	None	Functioning normally.
	None	Establishing a link between the Remote Controller and the receiver.
	B-B-B.....	Low voltage (at 3.9V-4.5V). Replace batteries as soon as possible.
	BBBB	Low voltage (lower than 3.9V). Remote Controller will automatically power off. Replace batteries immediately.
	B--B--B.....	Remote Controller has not been operated for 15 minutes. Turn off or use the Remote Controller.

Power LED	Sound	Remote Controller State
	None	Functioning normally.
	None	Establishing a link between the Remote Controller and the receiver.
	B-B-B.....	Low voltage (at 3.9V-4.5V). Replace batteries as soon as possible.
	BBBB	Low voltage (lower than 3.9V). Remote Controller will automatically power off. Replace batteries immediately.
	B–B–B.....	Remote Controller has not been operated for 15 minutes. Turn off or use the Remote Controller.

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Warning:

The Remote Controller Power LED will blink red and sound an alert when the voltage drops below 3.9V and automatically power off after 3 seconds. This process will repeat even if you power cycle the Remote Controller.

If this low voltage warning occurs during flight, it will cause the Phantom to enter Failsafe mode which cannot be interrupted (refer to Failsafe Function for details).

Charging batteries immediately after the low voltage warning (3.9V-4.5V) is strongly recommended.

Antenna Orientation

Keep the antennas pointing skyward, perpendicular to the ground for maximum communication range during flight.

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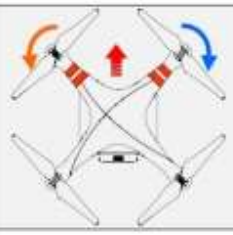
Remote Controller Operation

The Remote Controller default is set to Mode 2 by default.

Move the Stick: The control stick is pushed away from the central position.

Remote Controller (Mode 2)	Aircraft (◀ indicates nose direction)	Operation details
		Vertical movements on the left stick control elevation. Push the stick up to ascend and down to descend. When both sticks are centered the Phantom will hover in place. Push the throttle stick upward beyond the centered (neutral) position to take off. Push the throttle gently to prevent sudden and unexpected elevation.
		Horizontal movements on the left stick control the rudder. Push left to rotate counter clock-wise and right for clockwise. If the stick is centered, the Phantom will fly straight. The more the stick is moved, the faster the Phantom will rotate.
		Vertical movements on the right stick control forward and backward pitch. Push up to fly forward and down to fly backward. The Phantom will hover in place if the stick is centered. Push the stick further for a larger pitch angle (maximum 35°) and faster flight.

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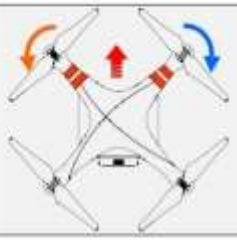
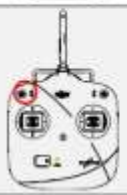
Remote Controller (Mode 2)	Aircraft (◀ indicates nose direction)	Operation details
		Vertical movements on the left stick control elevation. Push the stick up to ascend and down to descend. When both sticks are centered the Phantom will hover in place. Push the throttle stick upward beyond the centered (neutral) position to take off. Push the throttle gently to prevent sudden and unexpected elevation.
		Horizontal movements on the left stick control the rudder. Push left to rotate counter clock-wise and right for clockwise. If the stick is centered, the Phantom will fly straight. The more the stick is moved, the faster the Phantom will rotate.
		Vertical movements on the right stick control forward and backward pitch. Push up to fly forward and down to fly backward. The Phantom will hover in place if the stick is centered. Push the stick further for a larger pitch angle (maximum 35°) and faster flight.
		Horizontal movements on the right stick control left and right pitch. Push left to fly left and right to fly right. The Phantom will hover in place if the stick is centered. Push the stick further for a larger pitch angle (maximum 35°) and faster flight.
	 Position 1 Position 2 Position 3	The S1 switch is used for compass calibration. Toggle the S1 from position 1 to position 3 and back approximately 5 times to enter into compass calibration mode. In Naza-M mode, the S1 switch is used to switch between control modes and enter compass calibration.
	 Position 1 Position 2 Position 3	S2 is used to record a Home point manually. After a Home point has been recorded automatically, flipping S2 from position 1 to position 3 and back 5 times (or more) rapidly will move the Home point to the Phantom's current location. In Naza-M working mode, S2 is be used for IOC.

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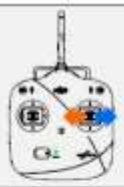
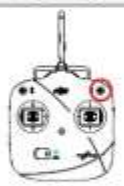
		Horizontal movements on the right stick control left and right pitch. Push left to fly left and right to fly right. The Phantom will hover in place if the stick is centered. Push the stick further for a larger pitch angle (maximum 35°) and faster flight.
	 Position 1 Position 2 Position 3	The S1 switch is used for compass calibration. Toggle the S1 from position 1 to position 3 and back approximately 5 times to enter into compass calibration mode. In Naza-M mode, the S1 switch is used to switch between control modes and enter compass calibration.
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1. Warning:

In 'Ready to Fly' mode, the Phantom will hover when all sticks are released.

In 'Ready to Fly (non-GPS)' the Phantom will lock its altitude but will not have horizontal positioning.

Linking the Remote Controller and Receiver

A 5.8G receiver is built in to the Phantom 2 Vision+. Its link button and indicator are located on the underside of the phantom, as shown in Figure 27.

The Remote Controller and the receiver are paired before delivery. Only use this button if you have replaced your Remote Controller or receiver.

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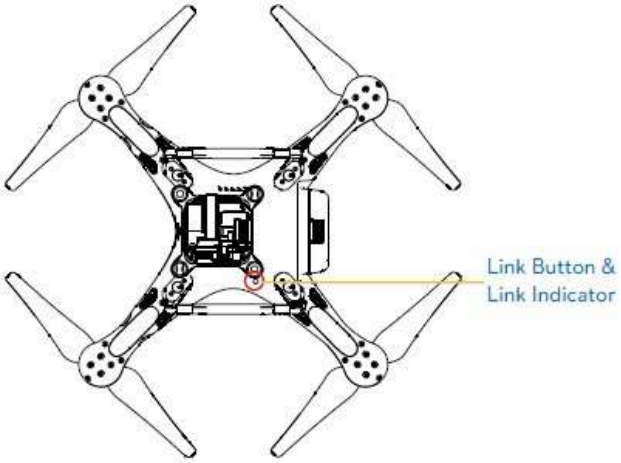

Figure 27

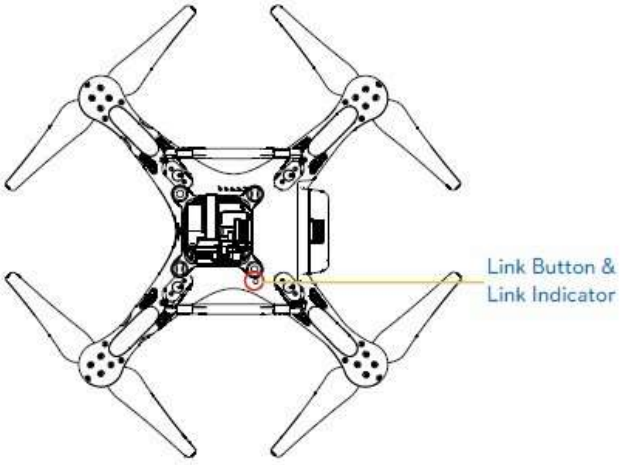

Figure 27

Linking Procedures:

Power off the Remote Controller, power on the aircraft.
You will see the link indicator blinking red.
Press the link button with a thin object and hold until the link indicator blinks yellow.
Release the link button.
Power on the Remote Controller. Link indicator will switch off,
showing that a link has been successfully established.

Link Indicator

Link Indicator	Description	Next Operation
	No signal received.	Switch on the Remote Controller or perform a link procedure.
	Ready to link.	Switch on the Remote Controller.

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Link Indicator	Description	Next Operation
	No signal received.	Switch on the Remote Controller or perform a link procedure.
	Ready to link.	Switch on the Remote Controller.

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Compliance Version Configuration

As power levels vary between regulators, the Phantom Remote Controller's power output can be adjusted by twisting the potentiometer knob (Figure 28) on the back of the Remote Controller using a flathead screwdriver.

For CE compliance, set the Remote Controller to CE with a full counterclockwise turn.

For FCC compliance, set the Remote Controller to FCC with a full clockwise turn. Be sure to follow relevant local regulations.

Compliance can be configured using the PHANTOM RC Assistant Software. Select CE compliance version in Assistant Software to set it, or do the same with FCC compliance version.

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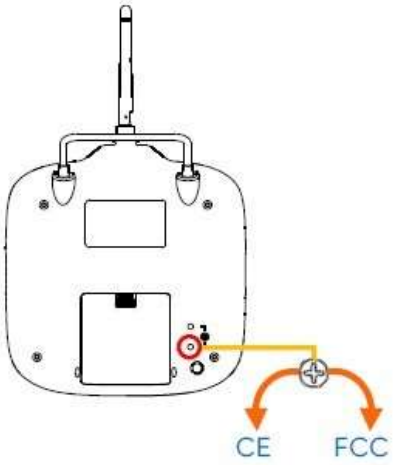

Figure 28

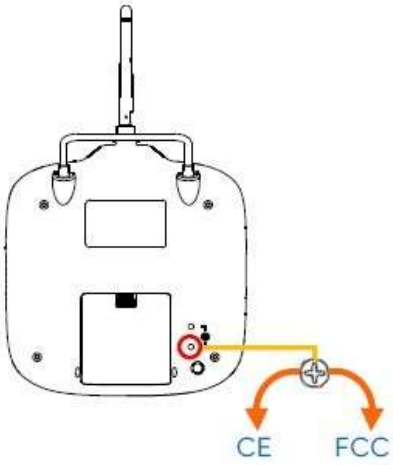

Figure 28

Important:

Turn the potentiometer knob gently to avoid damage.

CE compliant devices have an effective communication range of 400 meters in open spaces due to power limitations.

FCC compliant devices have an effective range of 800 meters in open spaces.

Watch your flight distance as the Phantom 2 Vision+ will enter Failsafe Mo
de (auto-landing or go home and land) if it flies beyond the relevant range limits.

Always follow local laws and regulations.

Hints and Tips:

1. It is recommended to use a Φ2.4mm flathead screwdriver for adjustments.
2. There is another potentiometer for reserved use.

Preparing the Range Extender

The Phantom 2 Vision+ Range Extender is a wireless communication device that operates within the 2.4 GHz frequency band. It is used to extending the effective range of communication between a Smartphone and the Phantom 2 Vision+.
In an open, unobstructed area, the transmission distance can reach up to 700 meters. This can be reduced by trees, buildings and other sources of the same frequency.

Before every flight, it is suggested that you ensure the Range Extender is functioning properly; otherwise communication issues between the mobile device and the Phantom 2 Vision+ may occur.

Each Range Extender has a unique MAC address and network name (SSID), details of which are printed on the label as 'Phantom_XXXXXX'. The 'XXXXXX' represents the last 6 letters or numbers of the MAC address for the Range Extender.
This can be renamed in the DJI VISION App.

Introduction

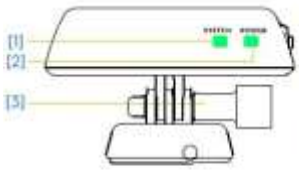

Figure 29

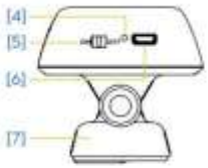

Figure 30

[1]	SYSTEM Indicator
[2]	POWER Indicator
[3]	Lock-screw
[4]	Binding Reset Button
[5]	Power Switch
[6]	Charging Port(Micro-USB port)
[7]	Mounting Bracket

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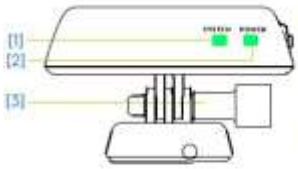

Figure 29

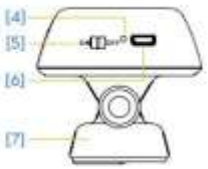

Figure 30

[1]	SYSTEM Indicator
[2]	POWER Indicator
[3]	Lock-screw
[4]	Binding Reset Button
[5]	Power Switch
[6]	Charging Port(Micro-USB port)
[7]	Mounting Bracket

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SYSTEM Indicator

Shows Wi-Fi status of the Range Extender.

SYSTEM Indicator	Description
● ● ● ●	The Wi-Fi network is functioning normally.
Off	The Wi-Fi network is functioning abnormally.

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SYSTEM Indicator	Description
● ● ● ●	The Wi-Fi network is functioning normally.
Off	The Wi-Fi network is functioning abnormally.

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POWER Indicator

Shows power levels of the Range Extender.

POWER Indicator	Description
▬	Fully charged.
▬	Low voltage alert, re-charge required.
▬	Charging.

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POWER Indicator	Description
▬	Fully charged.
▬	Low voltage alert, re-charge required.
▬	Charging.

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Warning:

If the power indicator is a solid red light, the Ranger Extender may stop working at any moment. Land and recharge as soon as possible.

Binding Reset Button

When the Binding Reset Button is pressed, it will reset and restart the Range Extender. You will need to bind it with the Phantom 2 Vision+ again to recreate its Wi-Fi network. Failure to do so will cause the DJI VISION App to fail to connect with the camera.

Charging the Range Extender

Charge the Range Extender by connecting the charging port to a power supply device such as a PC or a USB charger using a Micro-USB cable. Make sure to charge the Range Extender completely before using it for the first time. This takes 3~4 hours depending on USB power output.

Hints and Tips:

Make sure the Range Extender has enough power before each use.

Powering on the Range Extender

Flick the power switch to the ON position.
Wait for approximately 30 seconds. The Wi-Fi signal indicator will blink green indicating the Range Extender is communicating properly.
Keep the Range Extender facing the aircraft during flight for the best communication link.

Warning: Power off the Range Extender after every flight to avoid discharging the battery.

Checking the Battery Level

The battery level of the Range Extender can be checked in the camera page of the DJI VISION App as shown below. When the battery level drops to 20% or lower, the battery level icon will go red as a charging reminder.

Renaming the Range Extender SSID

Make your Range Extender SSID easier to remember by changing its name.

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1. Tap “Rename SSID of Range Extender” in the Settings page. Enter a new name SSID name (e.g. Phantom_Tom) in the textbox.
2. Tap Blue Check you will be asked to enter the last six characters of your MAC address on the Range Extender to confirm the change. The MAC address can be found on the sticker on your Range Extender. If your MAC address is 60:60:1F:60:41:E7, then enter 6041E7.
3. Tap “OK” to confirm the change. The Range Extender will automatically restart and the App will return to the settings page. Approximately 30 seconds later, the new network name can be found in the Wi-Fi list of your mobile device. Select and connect the renamed network to use the DJI VISION App.

Binding the Phantom 2 Vision+ and Range Extender

If the connection between the Phantom 2 Vision+ and the Range Extender fails,

or one of them needs to be repaired or replaced, a camera and

Range Extender binding will need to be performed through the DJI VISION App.

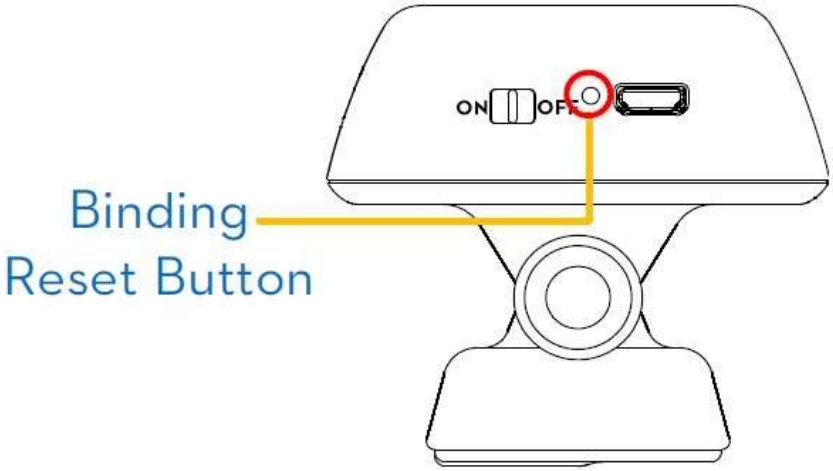

Figure 36

Procedures :

Power on the camera and Range Extender.
Approximately 30 seconds later, press the Binding Reset Button
on the Range Extender with a thin object until the SYSTEM Indicator turns off.
The Range Extender will then restart automatically.
Approximately 30 seconds later, the SYSTEM Indicator will start to blink green,
indicating that the Range Extender is ready for binding.
Enable Wi-Fi on your mobile device then select “Phantom_XXXXXX”
the (SSID of your Range Extender) from the Wi-Fi network list.
Figure 37) Run the DJI VISION App then tap -> Settings -> General -> Binding.
(Figure 38) Select ’Scan QR Code’ to scan the camera QR code on the product
packaging. (Figure 39) Get the camera SSID (E.g. FC200_xxxxxx) and the MAC
address. You can also skip the scan and enter the camera MAC address directly
(Figure 38, Figure 40). The MAC address can be found on the camera label.
Tap the blue check the top right corner. The Range Extender should automatically
restart. Binding is now complete.

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Figure 37

Figure 38

Figure 39

Figure 40

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Figure 37

Figure 38

Figure 39

Figure 40

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Warning:

DO NOT push the Binding Reset Button of the Range Extender unless you are ready to rebind the Range Extender and the camera. This will unbind your camera so you must follow the steps above for rebinding.

Important:

If both the Phantom 2 Vision+ and the Range Extender are powered on and working normally, you will be able to find the SSID on the Wi-Fi list of your mobile device.

APPENDIX C

SUMMARY OF RAVEN AERIAL IMAGERY SECTION 333 EXEMPTION REQUEST

Raven Aerial Imagery hereby provides pursuant to Part 11 a summary of its exemption application to allow commercial operation of the DJI Phantom 2 Vision+ small unmanned system in market research, precision aerial survey work, mapping, thermal imaging, photography, video and inspections. An exemption is requested from the following regulations:

14 C.F.R. Part 21;
14 C.F.R. 45.23(b) ;
14 C.F.R. 61.113(a) & (b) ;
14 C.F.R. 61.133(a) ;
14 C.F.R. 91.7(a) ;
14 C.F.R. 91.9(b) (2) & (c) ;
14 C.F.R. 91.103;
14 C.F.R. 91.109(a) ;
14 C.F.R. 91.119;
14 C.F.R. 91.151(a) ;
14 C.F.R. 91.203(a) & (b) ;
14 C.F.R. 91.405(a) ;
14 C.F.R. 91.407(a) (1) ;
14 C.F.R. 91.409(a) (2) ;
14 C.F.R. 91.417(a).