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

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

August 10, 2015

Exemption No. 12381
Regulatory Docket No. FAA–2015–1823

Mr. Michael D. Curran
Curran and Curran Law
Counsel for PaleoWest Archeology
90 North Coast Highway 101
Encinitas, CA 92024

Dear Mr. Curran:

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 May 11, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of PaleoWest Archeology (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial photography, videography, mapping, and inspections.

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

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

Airworthiness Certification

The UAS proposed by the petitioner are the Event 38 E384 and the DJI Phantom 2.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in

consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *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, PaleoWest Archeology is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

[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.

Conditions and Limitations

In this grant of exemption, PaleoWest Archeology 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 Event 38 E384 and DJI Phantom 2 when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents,

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

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g., replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g., inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N−Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

24. The UA must remain clear and give way to all manned aviation operations and activities at all times.

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

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

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

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 August 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

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MICHAEL D. CURRAN, ESQ., ATP
SUSAN M. CURRAN, ESQ.

May 11, 2015

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

Re: Exemption Request; Section 333 of the FAA Modernization & Reform Act and Part 11 of the Federal Aviation Regulations from 14 C.F.R. 45.23(b);14 CFR Part 21;14 CFR 61.113 (a) & (b); 91.7 (a); 91.9 (b) (2); 91.103(b); 91.109; 91.119; 91.121; 91.151 (a); 91.203(a) & (b); 91.405 (a); 91.407(a) (1); 91.409 (a) (2); 91.417 (a) & (b).

Dear Sir or Madam:

Petitioner PaleoWest Archeology hereby petitions the Secretary of Transportation and Federal Aviation Administration ("FAA") for exemption to the above referenced and below more fully described Federal Aviation Regulations, ("FARs") that currently may, or may not apply to the recreational/commercial operations of model aircraft/small unmanned aerial vehicles/ systems ("SUAV").

1. Prefatory Statement to Petition

In June, 1981, the FAA published an advisory circular, AC 91-57, (an advisory publication giving non-regulatory information/guidance. Advisory circulars do not create or change regulations and are not binding on the public.) AC 91-57 was entitled "Model Aircraft Operating Standards" and gave non-regulatory suggestions to model aircraft operators on suggested procedures for operating their models. This was the sole publication by the FAA which addressed SUAV for the next nearly 25 years.

In September 2005, the FAA appeared to turn its' attention toward unprecedented attempts at regulating model aircraft specifically the more modern SUAV. The FAA, for the first time in history now termed these devises as Unmanned Aerial Systems ("UAS") seemingly to align with their attempts at enforcement. The FAA published "AFS-400 UAS POLICY 05-01 - Unmanned Aircraft Systems Operations in the U. S. National Airspace System - Interim Operational Approval Guidance." This interim internal FAA memo expressly confirms that "[t]his policy is not meant as a substitute for any regulatory process." Still, it purported to "require" a Certificate of Authorization ("COA") or Waiver to use SUAVS. The new FAA policy relied for legal/regulatory "authority" on the non-regulatory, AC 91-57.

In February, 2007 the FAA, published a 2007 "policy statement" in the Federal Register. The 2007 Policy Statement started by defining "unmanned aircraft" as "a device that is used or intended to be used, for flight in the air with no onboard pilot" and it purported to include "a remotely controlled model airplane used for recreational purposes." The FAA termed these devices "UAS" and then purported to articulate the new FAA "policy" for "UAS" operations was that "no person may operate a "UAS" in the National Airspace System without specific authority." For the first time ever, the 2007 Notice purported to articulate two new alleged "rules": (1) Model aircraft can no longer be operated for a "business" purpose; and (2) a Model aircraft operated for a business purpose requires a COA, or special Certificate of Operating Authority and therefore is subject to the FAR's.

Thereafter beginning in 2007 and continuing to present based on these two new FAA internal "policies" and without citing to any actual federal law, or FARs, the FAA then sent various cease and desist notices to model aircraft/SUAVS operators indicating their activity was not authorized and describing the COA process and threatening to impose a $10,000 fine if they did not comply with the new FAA policies which the FAA indicated created a "ban" on using SUAVS for a "business/commercial purpose." The FAA's current position is the business/commercial use of SUAVS is "not authorized."

In 2012, following the FAA's attempts to regulate using internal policy memos, Congress enacted the Federal Aviation Administration Reform and Modernization Act, ["FRMA"]. The FRMA allows the Secretary of Transportation to "exempt" SUAVS from existing Federal Law, FARs to the extent any federal law or FAR actually currently apply to SUAVS.

Recently, on February 15, 2015 in Washington, D.C. at just after 10 a.m. EST, the FAA released their proposed rules for small SUAVS incorporating them into the National Airspace System ["NAS"]. These are proposed rules that have yet to go through the statutory Federal Rule making process to actually become law, but at present they are instructive for current model aircraft/SUAV recreational and commercial operators. They include staying below 500 ft. AGL, below 100 mph, staying out navigable airspace, staying away from airspace surrounding airports, seeing and avoiding other aircraft, taking a FAA knowledge test and a number of other common sense proposed rules, that this firm believes will ultimately govern SUAVS operations. See, http://www.faa.gov/regulations_policies/rulemaking/media/021515_sUAS_Summary.pdf

Most recently, Petitioner is aware the FAA has granted similar exemptions across the country for aerial photography and other uses that benefit the public and enhance aviation safety.

Petitioner at all times has and currently operates their SUAVS following the safety guidelines of AC 91-57.

Petitioner respectfully makes this request as suggested by the FMRA and the FAA.

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2. Petition for Exemption

With the above preface, pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FMRA") and 14 C.F.R. Part 11, Petitioner PaleoWest Archeology operator of actual manned aircraft as well as SUAV, requests exemption to conduct aerial photography/inspection/mapping including but not limited to the following; aerial photography/inspection/mapping services for Archaeological sites as well as aerial photography/inspection/mapping for roads, pipelines and pipeline corridors, cell towers, wind farms, and for general land management all in non-navigable airspace, using non-intrusive recording devices, operation in otherwise unrestricted US States/Territories; to allow commercial operation of its SUAVS, so long as such operations are conducted within and under the conditions outlined herein, or as may be established by the FAA, or as required by Section 333.

3. Name and Address of the Petitioner

PaleoWest Archeology is a large, professional archaeological, ethnographic, paleontological, and historical consulting service that operates in compliance with the National Historic Preservation Act and other regulations. They have offices in Denver, CO, Farmington, NM, New York, NY and Pasadena, CA. Their headquarters are located at:

PaleoWest Archeology
319 East Palm Lane
Phoenix, AZ 85004
602.261.7253
http://www.paleowest.com

Contact person:

Chester P. Walker, PhD, Senior Technologist
PaleoWest Archaeology
cwalker@paleowest.com
512.577.2438 cell

4. Public Interest

As described more fully below, the requested exemption would permit the operation of SUAV under controlled conditions in airspace that is 1) limited 2) predetermined; and 3) controlled as to access. The exemption would also provide safety enhancements to the already safe operations within the aerial photography industry presently using conventional aircraft by using small, unmanned and relatively inexpensive SUAV.

Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities to "...establish requirements for the safe operation of such aircraft systems in the national airspace system." Section 333(c) of the FMRA. By authorizing E384/Phantom operations, the FAA would advance the public interest by reducing the number of manned aircraft in the NAS; reducing air and noise

pollution; reducing the risk to life and property on the ground; and increasing agricultural economic growth.

Petitioner asserts that allowing E384/Phantom operations would reduce the burden on air traffic controllers; would reduce air and noise pollution from the manned aircraft that would otherwise be used; would reduce fuel use, as the E384/Phantom is battery-powered unlike the manned aircraft it would replace; and would reduce the risk to life and property on the ground, as the E384/Phantom contains no pilot and is constructed of a small, lightweight foam airframe.

Finally, the petitioner asserts that the high-resolution image data generated from E384/Phantom would provide scientists with important information that would assist efforts in aerial photography/inspection/mapping including but not limited to the following; aerial photography/inspection/mapping services for Archaeological sites as well as aerial photography/inspection/mapping for roads, pipelines and pipeline corridors, cell towers, wind farms, and for general land management all in non-navigable airspace, using non-intrusive recording devices.

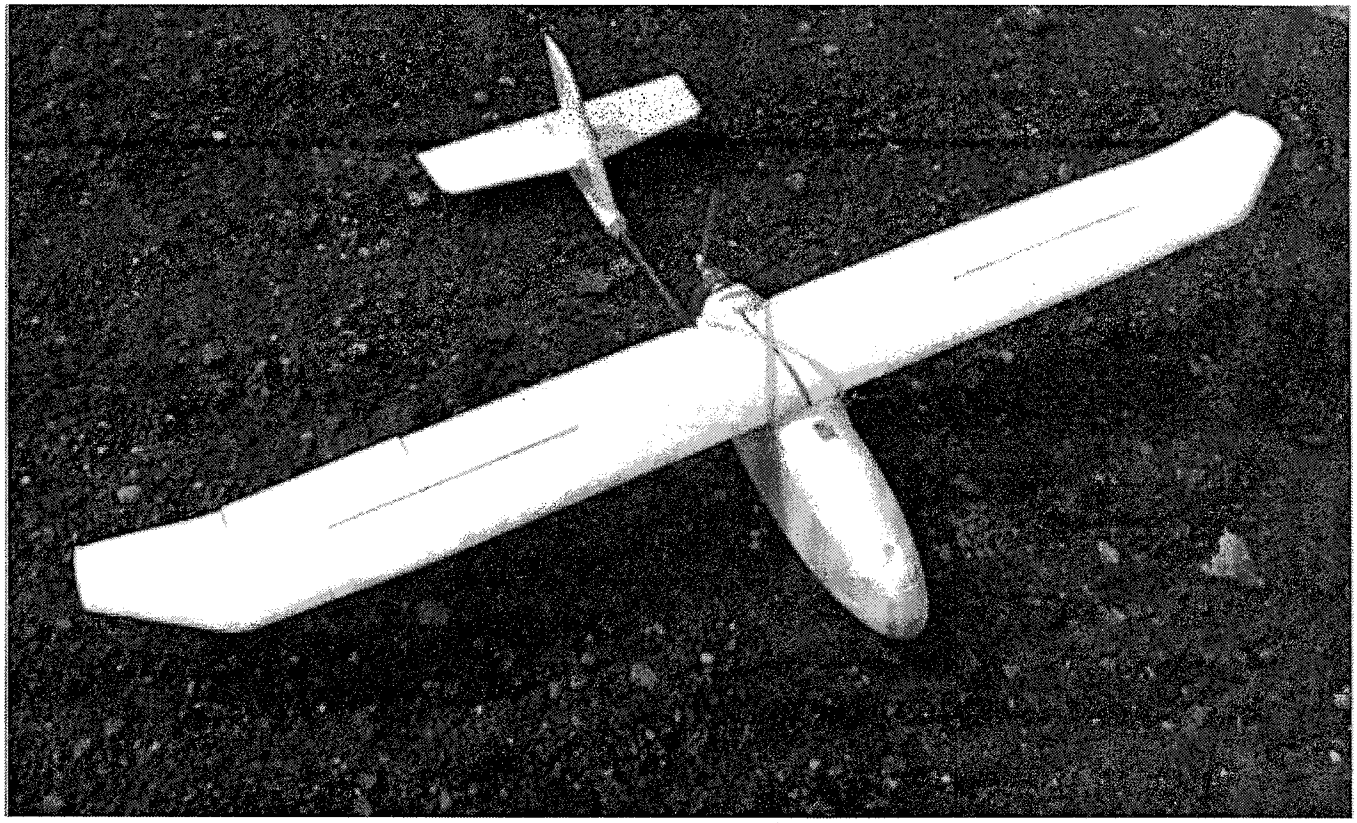
The petitioner asserts that all of this would result in a major increase in economic growth, which would be in the public interest.

5. Precedent for Granting Exemption for E384/Phantom

There is a precedent for the requested exemption using the same SUAV, the E384 in the matter of the petition of PRAVIA, LLC On January 29, 2015 the FAA granted/issued Exemption No. 11166, Regulatory Docket No. FAA–2014–0790. There are numerous grants across the country using the DJI Phantom 2 series of SUAV.

The E384 SUAV is manufactured by Event 38 located in Akron, Ohio. The system consists of a lightweight battery operated aircraft, ground control station, and associated data link equipment. The E384 airframe is constructed of EPO foam with a carbon fiber tail and weighs 5.9 lbs. with a wingspan of 6.2 ft. and total length of 4.3 ft. The E384 is powered by two lithium polymer batteries that drive an electric propeller. It is hand launched, has maximum flight time of 100 minutes, and operates at a cruising speed of 27 mph. The ground control station consist of a Turnigy 9XR remote and PC computer which have a maximum data link range of 5.4 NM. If the E384 loses link with the ground control station or detects a low battery state at any time it will initiate a return-to-launch sequence.

The E384 has extensive flight experience and a history of operational success overseas, including flights by over one hundred professional operators on 6 continents. It has been used in Uganda to survey potential land for the construction of a hydroelectric power plant. It has also been used in Greece by the National Technical University of Athens to study open-pit mining. In Belize the Fishery Department started routine flights with the E384 to track illegal fishing in protected waters. More recently in the United States the E384 was flown over three days at the Cleveland Airshow, demonstrating its ability to safely integrate and operate in the NAS.



For PaleoWest checklists please see Ex. 1 Attached. For additional information on the E384, reference Ex. 2 (E384 Operations Manual) and Ex. 3, E384 Maintenance Manual, which specify manufacturing information, aircraft performance, operating limits, normal and emergency procedures, fail-safe features, and maintenance and inspection procedures.

Petitioner also requests exemption to operate the DJI Phantom group of SUAVS a class and category of SUAV well known to the FAA. The Phantom Operations Manual is available upon request.

6. Regulations Petitioner Petitions for Exemption, If Such Regulations Apply to SUAVS

14 CFR Part 21 14 C.F.R. 45.23(b) 14 CFR 61.113 (a) & (b) 14 C.F.R. 91.7 (a) 14 CFR 91.9 (b) (2) 14 C.F.R. 91.103	14 C.F.R. 91.109 14 C.F. R. 91.119 14 C.F.R. 91.121 14 CFR 91.151 (a) 14 CFR 91.203 (a) & (b)	14 CFR 91.405 (a) 14 CFR 407 (a) (1) 14 CFR 409 (a) (2) 14 CFR 417 (a) & (b)

This exemption application is expressly submitted to fulfill Congress' goal in passing Section 333 (a) through (c) of the Reform Act. This law directs the Secretary of Transportation

to consider whether certain unmanned aircraft systems may operate safely in the national airspace system ("NAS") before completion of the rulemaking required under Section 333 of the FMRA. In making this determination, the Secretary is required to determine which types of SUAVS/UAS do not create a hazard to users of the NAS, or the public, or pose a threat to national security in light of the following:

A. The SUAV size, weight, speed, and operational capability;
B. Operation of the SUAVS in close proximity to airports and populated areas; and
C. Operation of the SUAVS within visual line of sight of the operator. FMRA § 333 (a).

Lastly, 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 such aircraft in the national airspace system." *Id.* §333(c) (emphasis added). The Petitioner interprets this provision to place the duty on the Secretary/FAA Administrator to not only process applications for exemptions under section 333, but for the Secretary/Administrator to affirmatively craft conditions for the safe operation of the SUAVS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.

The Federal Aviation Act expressly grants the Secretary/FAA Administrator the authority to issue exemptions. This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined under §40101 of the Act, which currently may or hereafter may include SUAVs, from the requirement that all civil aircraft must have a current airworthiness certificate.

The Secretary/FAA Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of this title if the Secretary/FAA Administrator finds the exemption 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 PaleoWest Archeology SUAV described hereinabove are both fixed wing electric motor type configuration as well as multi-rotorcraft equipped with an on board NAZA computer stabilization controller and GPS, return to home and other safety features, weighting 55 lbs or less and most typically less than 10 lbs., including camera/payload. They operate, under normal conditions, at speeds of 5-40 KIAS and at speed of no more than 50 KIAS and have the capability to hover and move in the vertical and horizontal plane independently/ simultaneously. They will operate in line of sight and will operate only within the areas described herein. Such operations will insure that the SUAVS will "not create a hazard to users of the NAS or the "public" as described in the FMRA §333(b).

Given the small size of the SUAV involved, and the limited environment within which they will operate, the Petitioner falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of SUAV to commence immediately. Also, due to the size of the SUAVS and the restricted areas in which the relevant SUAV will operate, approval of the application presents no national security issue.

Given the clear direction in FMRA §333, the authority contained 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, reduction in environmental impacts (including reduced emissions associated with allowing SUAV for filming operations rather than full-sized aircraft, the grant of the requested exemptions is in the public interest. Accordingly, the Petitioner respectfully requests that the FAA grant the requested exemption without delay.

7. Limitations and Conditions

The Petitioner proposes that the exemption requested herein be issued pursuant the limitations and conditions listed herein. These conditions/limitations provide for an even higher level of safety to operations under the current regulatory structure which apply to actual certificated aircraft because the proposed operations represent a safety enhancement to the already very safe SUAV filming operations conducted by recreational SUAVS and conventional aircraft.

Petitioner's primary missions include but are not limited to aerial photography/inspection/mapping services for Archaeological sites as well as aerial photography/inspection/mapping for roads, pipelines and pipeline corridors, cell towers, wind farms, and for general land management all in non-navigable airspace, using non-intrusive recording devices, operation in otherwise unrestricted US States/Territories; hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its SUAVs, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333.

Petitioner's primary operational locations shall be in the continental United States.

These limitations and conditions to which PaleoWest Archeology agrees to be bound when conducting business/commercial operations under this FAA issued exemption are consistent with the Administrators previous grant of Exemption include:

1) Operations authorized by this grant of exemption are limited to the following aircraft described in the operating documents which are both a fixed wing E384 and DJI Phantom 2 quad-rotor aircraft weighing about 5 pounds any other aircraft will require a new petition or a petition to amend this grant.

2) UAS operations under this exemption are limited to conducting operations for the purpose of aerial photography and inspection for various industries.

3) The UA may not be flown at an indicated airspeed exceeding 50 knots.

4) The UA must be operated at an altitude of no more than 400 feet above ground level (AGL), as indicated by the procedures specified in the operating documents. All altitudes reported to ATC must be in feet AGL.

5) The UA must be operated within visual line of sight (VLOS) of the pilot in command (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.

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 functions prescribed in the operating documents.

7) The VO must not perform any other duties beyond assisting the PIC with seeing and avoiding other air traffic and other ground based obstacles/obstructions, and is not permitted to operate the camera or other instruments.

8) The operating documents and this grant of exemption 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 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.

9) Prior to each flight, the PIC must inspect the UAS to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the UAS is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight. The Ground Control Station must be included in the preflight inspection. All maintenance and alterations must be properly documented in the aircraft records.

10) 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. The PIC who conducts the functional test flight must make an entry in the aircraft records.

11) The pre-flight inspection section in the operating documents must account for all potential discrepancies (e.g., inoperable components, items, or equipment, not already covered in the relevant sections of the operating documents).

12) The operator must follow the UAS manufacturer's aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.

13) The operator must carry out its maintenance, inspections, and record keeping requirements, in accordance with the operating documents. Maintenance, inspection, alterations, and status of replacement/overhaul component parts must be noted in the aircraft records, including total time in service, description of work accomplished, and the signature of the authorized person returning the UAS to service.

14) Each UAS operated under this exemption must comply with all manufacturer Safety Bulletins.

15) The authorized person must make an entry in the aircraft record of the corrective action taken against discrepancies discovered between inspections.

16) The PIC must possess at least a recreational pilot airman certificate and at least a current third class medical certificate. 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.

17) The operator may not permit any PIC to operate unless the PIC meets the operator's qualification criteria and 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). The PIC must ensure that the VO is trained appropriately in order to fulfill her or her duties. A record of training must be documented and made available upon request by the Administrator. Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) are permitted under the terms of this exemption. However, training 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.

18) 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.

19) The UA may not operate within 5 nautical miles of an airport reference point as denoted on a current FAA-published aeronautical chart unless a letter of agreement with that airport's management is obtained, and the operation is conducted in accordance with a Notice to Airmen (NOTAM), as required by the operator's Certificate of Waiver or Authorization (COA). The letter of agreement with the airport management must be made available to the Administrator upon request.

20) 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.

21) If the UA loses communications or loses its GPS signal, it must return to a predetermined location within the planned operating area and land or be recovered in accordance with the operating documents.

22) The PIC must abort the flight in the event of unpredicted obstacles or emergencies in accordance with the operating documents.

23) The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 25% battery power remaining.

24) The operator must obtain an Air Traffic Organization (ATO) issued COA prior to conducting any operations under this grant of exemption. This COA will require the operator to request a NOTAM not more than 72 hours in advance, but not less than 48 hours prior to the operation. All operations shall be conducted in accordance with airspace requirements in the ATO issued COA including class of airspace, altitude level and potential transponder requirements.

25) 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.

26) Before conducting operations, the radio frequency spectrum used for operation and control of the UA must comply with the Federal Communications Commission (FCC) or other appropriate government oversight agency requirements.

27) The operator is required to keep a copy of the UAS manufacturer's operating/flight manual and all other operating documents in a location accessible to the PIC, during flight operations. These documents must be made available to the Administrator or any law enforcement official upon request.

28) The UA must remain clear and yield the right of way to all other aviation operations and activities at all times.

29) The UAS may not be operated by the PIC from any moving device or vehicle.

30) The UA may not be operated over congested or densely populated areas.

31) 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 and/or; b. The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles or structures has granted permission 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, and; c. Operations nearer to the PIC, VO, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).

32) 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 prior to the beginning of every flight.

33) 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.

8. Description of Regulations Which May Apply From Which Petitioner Requests Exception 14 C.F.R. Part 21, Subpart H: Airworthiness Certificates 14 C.F.R. §91.203 (a) (1)

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 and limited operating area associated with the SUAVS to be utilized by the Petitioner, an exemption from Part 21 Subpart H meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the FMRA. The Federal Aviation Act (49 U.S.C.§44701 (f)) and Section 333 of the FMRA 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 particular SUAVS. In all cases, an analysis of these criteria demonstrates that the UAS operated without an airworthiness certificate, in the restricted environment and under the conditions proposed will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate without the restrictions and conditions proposed.

The SUAV's to be operated hereunder is less than 55 lbs. fully loaded, is by definition unmanned and carries neither a pilot nor passenger, carries no explosive materials or flammable liquid fuels, and operates exclusively within a limited flight area. Unlike other civil aircraft, operations under this exemption will be tightly controlled and monitored by the PIC/Operator and will also remain within the requirements of, and in compliance with, local public safety requirements. These safety enhancements, which already apply to civil aircraft provide a greater degree of safety to the public and property owners than conventional operations conducted with airworthiness certificates issued under 14 C.F.R. Part 21, Subpart H. Lastly, application of these same criteria demonstrates that there is no credible threat to national security posed by the UAS due to its size, speed of operation, location of operation,

lack of explosive materials or flammable liquid fuels, and inability to carry a substantial external load.

14 C.F.R. § 45.23 (b). Marking of the Aircraft

The regulation requires; 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 nor more than 6 inches high, the words "limited," "restricted," "light-sport," "experimental," or "provisional," as applicable.

Even though the SUAV will have no airworthiness certificate, an exemption may be needed as the SUAV will have no entrance to the cabin, cockpit or pilot station on which the word "Experimental" can be placed. Given the size of the SUAVS, two-inch lettering will be impossible. The word "Experimental" will be placed on the fuselage in compliance with §45.29 (f). The equivalent level of safety will be provided by having the SUAVS marked on its fuselage as required by §45.29 (f) where the pilot, observer and others working with the SUAVS will see the identification of the SUAV as "Experimental." The FAA has issued the following exemptions to this regulation to Exemptions Nos. 10700, 8738, 10167 and 10167A.

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

Sections 61.113 (a) & (b) limit private pilots to non-commercial operations. Because the SUAVS is unmanned and will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring the PIC operating the aircraft to have a FAA ground school rather than a commercial pilot's license to operate this small SUAVS. Unlike a conventional aircraft that carries the pilot and passengers, the SUAVS is remotely controlled with no living thing on board. The area of operation is controlled and restricted, and all flights are planned and coordinated in advance. The level of safety provided by the requirements included herein exceed that provided by a single individual holding a commercial pilot's certificate operating a conventional aircraft. The risks associated with the operation of the SUAVS are so diminished from the level of risk associated with commercial operations contemplated by Part 61 when drafted, that allowing operations of the SUAVS as requested with a private pilot as the PIC exceeds the present level of safety achieved by 14 C.F.R. §61.113 (a) & (b).

14 C.F.R. §91.7(a): Civil aircraft airworthiness.

The regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. As there will be no airworthiness certificate issued for the aircraft, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness. Given the size of the aircraft and the requirements contained herein for the use of safety check lists prior to each flight, an equivalent level of safety will be provided.

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

Section 91.9 (b) (2) provides: No person may operate a U.S.-registered civil aircraft ...

(2) For which an Airplane or Rotorcraft Flight Manual is not required by §21.5 of this chapter, unless there is available in the aircraft a current approved airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

The SUAVS, given its size and configuration 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 maintained by keeping the SUAVS operation manual and appropriate checklists at the ground control point where the pilot flying the SUAVS will have immediate access to it. The FAA has issued 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: Pre-flight 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 hereinabove. The PIC will take all actions including reviewing weather, flight battery requirements, landing and takeoff distances and aircraft performance data before initiation of flight using appropriate checklists.

14 C.F.R. §91.109: Flight instruction:

Section 91.103 provides that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

SUAV's and remotely piloted aircraft, by their design do not have fully functional dual controls. Flight control is accomplished through the use of a radio transmitter that communicates with the aircraft via a receiver in the SUAVS. 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 provided by the fact that neither a pilot nor passengers will be carried in the aircraft and by the size and speed of the aircraft.

14 C.F.R. §91.119: Minimum safe altitudes

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, provided the person operating the helicopter complies with any route or altitudes prescribed for helicopters

by the FAA. This exemption is for a SUAVS and the exemption requests authority to operate at altitudes up to 400 AGL underneath navigable airspace and in class E and G airspace maintaining safe separation from actual aircraft, an exemption may be needed to allow such operations.

The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner or local officials. Because of the advance notice to the property owner and participants in the filming activity, attempts will be made to contact all affected individuals regarding the planned flight operations. Compared to flight operations with aircraft or rotorcraft weighting far more than the maximum 55lbs. proposed herein, and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented with conventional aircraft. In addition, the low-altitude operations of the SUAVS will ensure separation between these SUAVS operations and the operations of conventional aircraft that must comply with Section 91.119.

14 C.F.R. §91.121 Altimeter Settings

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "...to the elevation of the departure airport or an appropriate altimeter setting available before departure." As the SUAVS may not have a barometric altimeter, but instead a GPS altitude read out, an exemption may be needed. An equivalent level of safety will be achieved by the operator, pursuant to the Manual and Safety Check list, confirming the altitude of the launch site shown on the GPS altitude indicator before flight.

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

Section 91.151 (a) 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 least 30 minutes; or (2) At night, to fly after that for at least 45 minutes."

The battery powering the E384 SUAV provides approximately between 80-100 minutes of powered flight. The Phantom 2 provides approximately 25 minutes of flight time. To meet the 30 minute reserve requirement in 14 CFR §91.151, SUAV in the E352 flights would be limited to approximately 70 minutes in length and unable in the Phantom. Given the limitations on the SUAV proposed flight area and the location of its proposed operations within a predetermined area, a longer time frame for flight in daylight or night VFR conditions is reasonable.

Petitioner believes that an exemption from 14 CFR §91.151(a) falls within the scope of prior exemptions. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with FAR 91.151 (a)). Operating the SUAVS in controlled area where only people and property owners or official representatives who have signed waivers will be

allowed, with less than 30 minutes of flight operation time, does not give rise to the type of risks that Section 91.151(a) was intended to alleviate particularly given the size and speed of the SUAVS. Additionally, limiting SUAV flights would greatly reduce the utility for which the exemption will be granted.

Petitioner believes that an equivalent level of safety can be achieved by limiting flights to landing with no less than 25% of battery power remaining. This restriction would be more than adequate to return the SUAVS to its planned landing zone from anywhere within its limited operating area. Similar exemptions have been granted to numerous other operations.

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

The regulation provides in pertinent part:

(a) Except as provided in § 91.715, no person may operate a civil aircraft unless it has within it the following:

(1) An appropriate and current airworthiness certificate. . . .

(b) 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.

The SUAV fully loaded weighs no more than 55 lbs and typically less than 20 lbs. And is operated without an onboard pilot. As such, there is no ability or place to carry certification and registration documents or to display them on the SUAV.

An equivalent level of safety will be achieved by keeping these documents at the ground control point where the pilot flying the SUAV will have immediate access to them, to the extent they are applicable to the SUAV. 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) & (b): Maintenance Inspections

These regulations require 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...," and others shall inspect or maintain the aircraft in compliance with Part 43.

Given that these section and Part 43 apply only to aircraft with an airworthiness certificate, and the requirements of pre-flight inspection required herein, these sections will not apply to the applicant. Routine and pre-flight maintenance will be accomplished by the operator. An equivalent level of safety will be achieved because these SUAVS are very limited in size and will carry a very small payload and operate only in restricted areas for limited

periods of time. If mechanical issues arise the SUAV can land immediately and given its small size poses very little risk to persona or property. The operator will ensure that the SUAV is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, the operator is the person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety.

9. Publication Summary

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

Petitioner seeks an exemption from the following rules:

14 C.F.R. §21, subpart H; 14 C.F.R 45.23(b);14 C.F.R. §§ 61.113(a) & (b);91.7 (a); 91.9 (b) (2);91.103(b);91.109; 91.119; 91.121; 91.151(a);91.203(a) and (b); 91.405 (a); 91.407 (a) (1); 91.409 (a) (2); 91.409 (a) (2) and 91.417 (a) & (b) to operate commercially a SUAVS vehicle (55lbs or less) for Aerial Photography Operations.

Approval of exemptions allowing commercial operations of SUAV for aerial photography/Inspection for the following; Business Operations: over land, water-ways, and oceans; operation over/in non restricted National Parks, National Forests, flight in non-navigable airspace, using non-intrusive recording devices, operation in otherwise unrestricted US States/Territories will enhance safety by reducing risk. Conventional film operations, using jet or piston power aircraft, operate at extremely low altitudes, just feet from the subject being filmed, and in extreme proximity to people and structures; and present the risks associated with vehicles that weigh in the neighborhood of 4,000lbs, carrying large amounts of jet A or other fuel. In addition such actual certificated aircraft must fly to and from the film location. In contrast, a SUAV weighing fewer than 55 lbs., and powered by batteries rather than fuel, eliminates virtually all of that risk. The SUAV is driven/carried to the film set, not flown. The SUAV will carry no passengers or crew and, therefore, will not expose any crew to the risks associated with manned aircraft flights.

The operation of SUAV, weighing less than 55 lbs., conducted in the strict conditions outlined above, will provide at least an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting the Petitioner from the requirements of Part 21 and allowing commercial operations. These lightweight aircraft operate at slow speeds, close to the ground, and in a line of sight, relatively sterile environment and are, as a result, far safer than conventional operations conducted with actual aircraft/helicopters operating in close proximity to the ground and people.

10. Privacy

All business/commercial flights which occur over private or controlled access property will be with the property owner's prior consent and knowledge. Filming will be of people who

have also consented to being filmed or otherwise have agreed to be in the area where filming will take place. Petitioner will not infringe on any individual or landowner privacy rights.

Limited nighttime operations may be conducted. Nighttime as defined FAR's in Section is as follows 1.1. "Night means the time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time." Night operations may be conducted by the SUAVS following the guidelines above and provided such operations have sufficient lighting so that Petitioner/Operator maintains visual line of sight. Allowing SUAVS this exemption will provide a far safer nighttime filming alternative to the current full size aircraft operations.

11. Conclusion

The FAA's purported "ban" on business/commercial SUAV operations has actually had the current effect of causing American skies to be less safe. There are many actual certificated pilots who are exceptionally qualified to fly SUAV with their SUAV experience, private, commercial or ATP pilot training, licenses and instructor ratings. However, these experienced operators and licensed pilots familiar with the FARs, airspace and safe operating procedures are currently reluctant to commercially operate model aircraft/SUAVS or be involved, for fear of the FAA seeking an enforcement action against them or their actual pilot's licenses.

Presently, during the pendency of these issues, it defies safety or regulatory logic that according to the FAA's current alleged "ban" on business operations of SUAVS, your average enthusiastic 12 year old, who's well meaning Father bought him a quadcopter SUAV equipped with a camera, can operate his SUAVS wherever he wants and take whatever recreational video/pictures subject only to the suggestions of FAA AC 91-57 and yet an FAA certificated private/commercial/ATP pilot cannot be paid to use a far higher quality and equipped SUAVS to take an aerial photo or aerially inspect a farmers field, despite the significant improvement in safety over non-pilots operating SUAVS recreationally and real aircraft used for aerial photography.

Satisfaction of the criteria provided in Section 333 of the FMRA of 2012, and requiring the SUAV PIC to have or obtain medical certificate and a actual pilots license and considering the small size, weight, speed, operating capabilities, limited operations in proximity to airports and populated areas and operation within visual line of sight and national security – all of which provide more than adequate justification for the grant of the requested exemptions allowing business /commercial operation of applicant's SUAVS for aerial photography/ Inspection as requested herein.

If this firm can be of any further assistance in processing this request, or you have any other questions or concerns, please do not hesitate to contact me directly, in writing.

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CURRAN & CURRAN LAW

Michael D. Curran, Esq./ATP/CFII/MEI

cc: James Williams, FAA
Les Dorr, FAA, Allison Duquette, FAA

Ex. 1.

PaleoWest Checklists

Preflight Checklists

Inspect Vehicle

1. Check props
2. Check screws
3. Check Radio
4. Check body/arms for cracks
5. Prepare log book
6. Review mission/Check review weather
7. Check/test batteries record voltages
8. Prepare nav/gps system
9. Radio RX/TX distance test/Check timers
10. Satellite localization/lock

Narrative Descriptions. Inspect the vehicle for previous damage like cracked chassis, loose props, motors and wires, this will ensure the safe operation of the vehicle and not a catastrophic failure of parts. Tighten all screws and record which ones are becoming loose over time. This will indicate problems with the vehicle structure and you should use more CA or thread locking liquid to keep this problem to a minimal. If you are repeatedly tightening the screws in the same spot then there is a problem with the screw hole and should be tapped or corrected. Prepare a logbook, this will ensure that you are recording the proper flight times and will indicate battery health, saving you from a failure and possible loss of vehicle. Pull out the document you use for logging your flight fill out the information that is most important: date, time, and mission information. Weather affects the performance of a vehicle and should be calculated to ensure proper weights given to your flight and battery time totals. Weather information to include as follows: Temperature, wind speed, maximum gusts, ambient temperature, humidity, dew point, barometric pressure, and any solar information that can effect your GPS. Review your mission so that you know exactly what you plan to do and what data you will gather. Check and test your batteries so that you have sufficient power for your mission. If you followed this checklist your batteries should have been charged the last time you put your vehicle away. Turn on the navigation system if applicable and verify the appropriate settings to localize the satellite signal. Check for solar flare information and gps outages in your area connected to your mission.

II. Before Flight

1. Turn on transmitter; Check set flight mode
2. Set throttle down
3. Clear flight area
4. Connect battery on the vehicle
5. Verify indicator lights for proper indications/GPS locks

6. Start motors
7. Throttle up slowly
8. Maintain visual separation from all obstructions

Narrative Descriptions: You should always be near your transmitter so that in the case of a failure you can control the vehicle to the best of your abilities and get the vehicle safely to the ground. First turn the transmitter on, with the throttle turned all the way down. Next walk over to the vehicle that you plan to fly clear area and connect the battery. You should connect the battery in a way that does not disturb the vehicle from sitting on the ground, when you plug the vehicle up it is calibrating the flight system and powering up safely. When the lights give proper indications it is safe to either pick up the vehicle safely and move it or walk away from it with your controller in your hand. To begin your flight move the sticks up slowly until the vehicle leaves the ground maintain visual separations from people, buildings, obstructions, other UAV/aircraft.

III. Post Flight/After Landing

1. Unplug battery on vehicle while near the controller
2. After battery is unplugged turn off the controller
3. Fill out log books

Narrative Descriptions: Once the vehicle has returned to the ground, walk over with your controller and disconnect the wire to the vehicle battery, this will essentially kill the power and render the vehicle in the safe to transport mode. Next you can power the controller off to save the battery life. Return the vehicle to a safe place and then locate your logbooks and recover your data.

IV. Debrief

1. Fill out logs
2. Complete calculations for batteries and flight times
3. Put away gear, vehicle and log books

E384 Operations Manual

See http://event38.wikispaces.com for latest revision

Ex. 2

Table of Contents....

E384 Specifications and Operating Limitations

Includes –

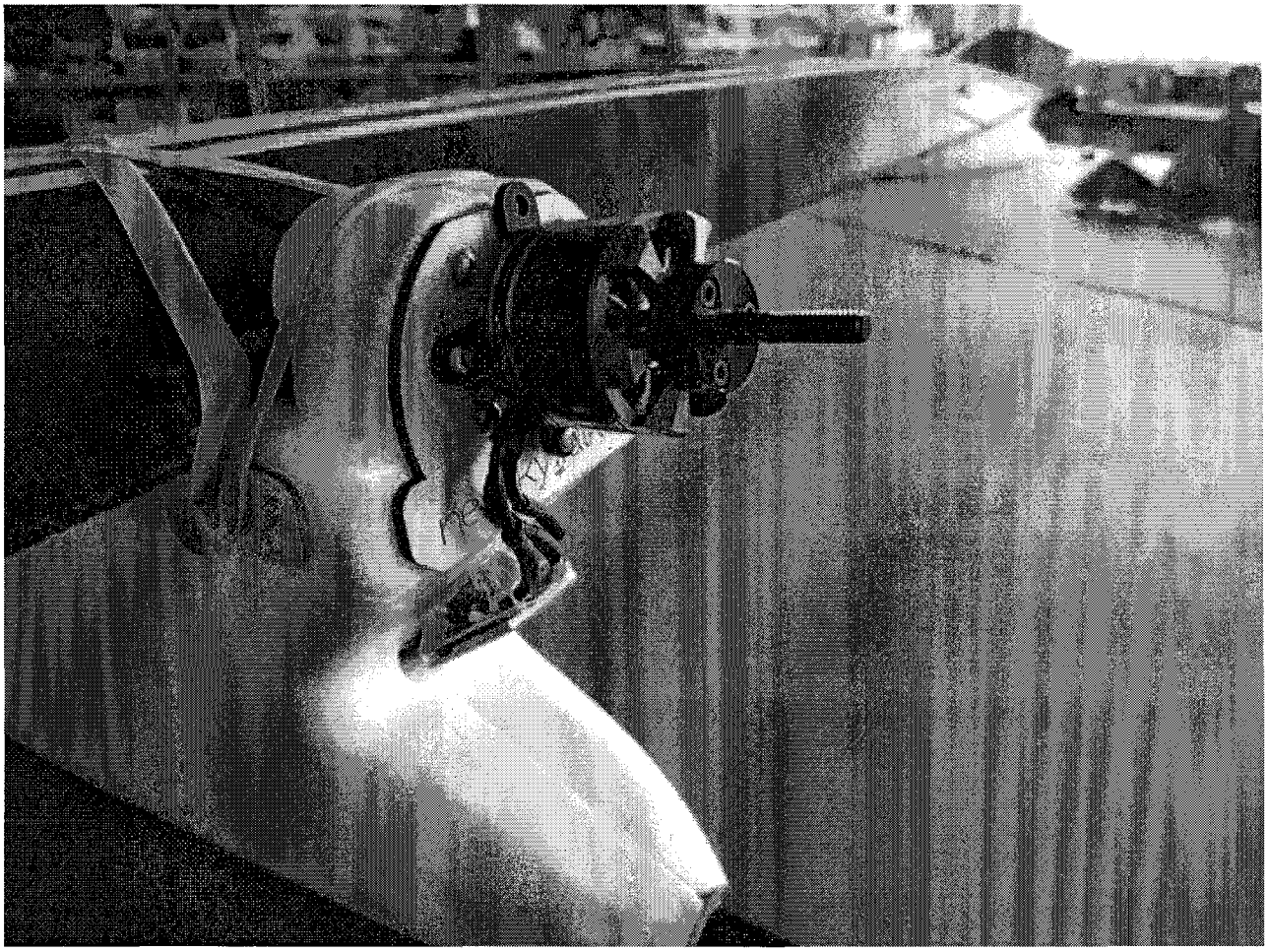
- Pixhawk Autopilot with GPS, IMU, Pressure Sensor and Flight Data Log
- Telemetry Radios (3DR or RFD900)
- Spektrum DX5E and Battery
- 2 Flight Batteries – 4 Cell, 5.0 Ah LiPo

Specs and Limits-

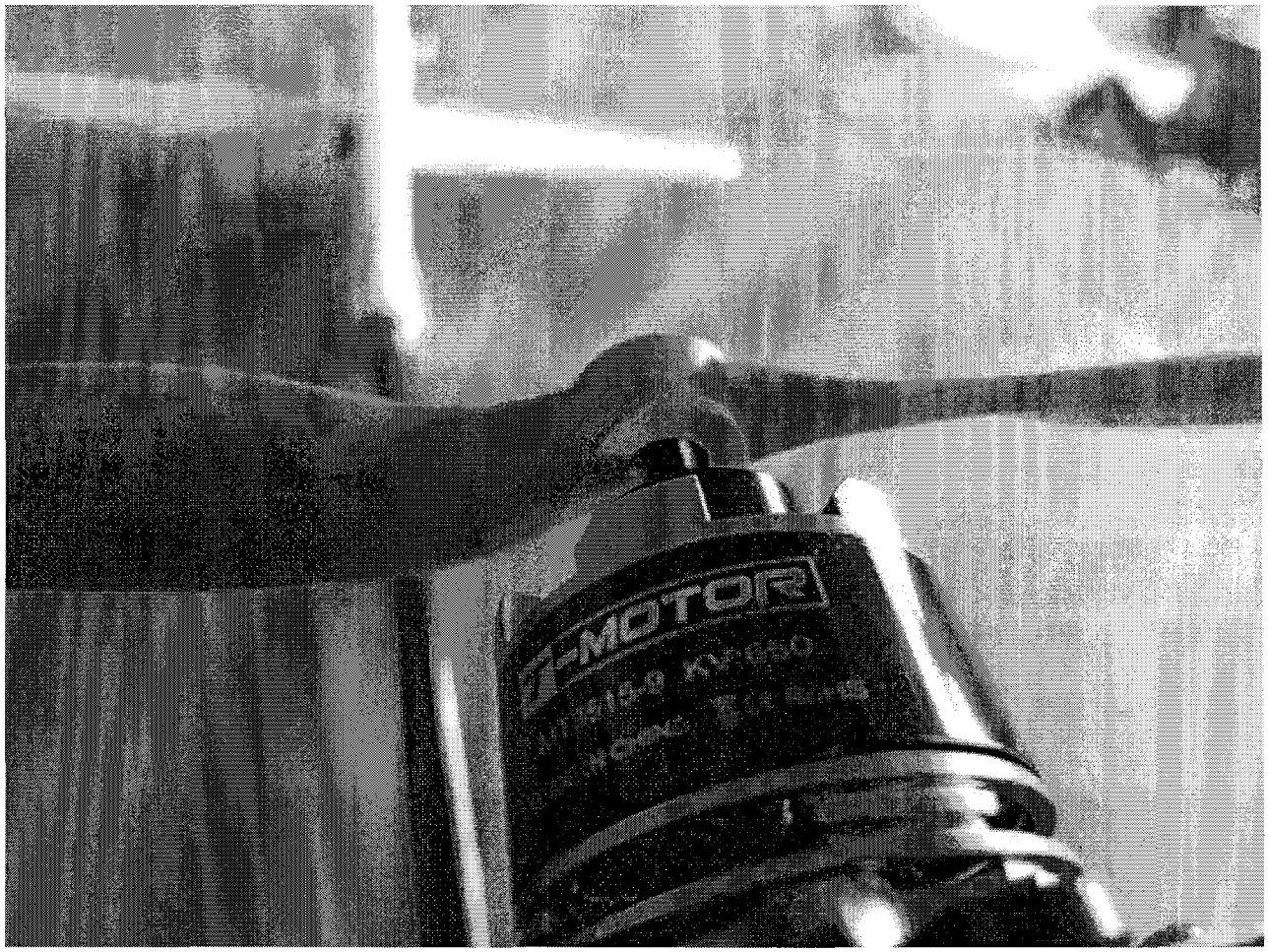
- Cruise Speed: 13 m/s
- Endurance 100 minutes
- Range 44 miles / 70km
- Up to 10 m/s windspeed for autonomous operation
- 14,000 Feet MSL Ceiling, Take-off Tested to 10,000'
- Live Data Telemetry to Ground Station Software on your Laptop (One km (3DR) , 10km (RFD900))
- Fly-by-Wire mode, Return-to-Launch and Autonomous Flight Modes Pre-Configured
- 190cm Wingspan, 130cm Length
- Weight- 5.9 lbs (Fully equipped with a Canon S100)
- Airframe is built usinf flexible EPO foam, with a carbon fiber booml.

Attaching E384 Propeller

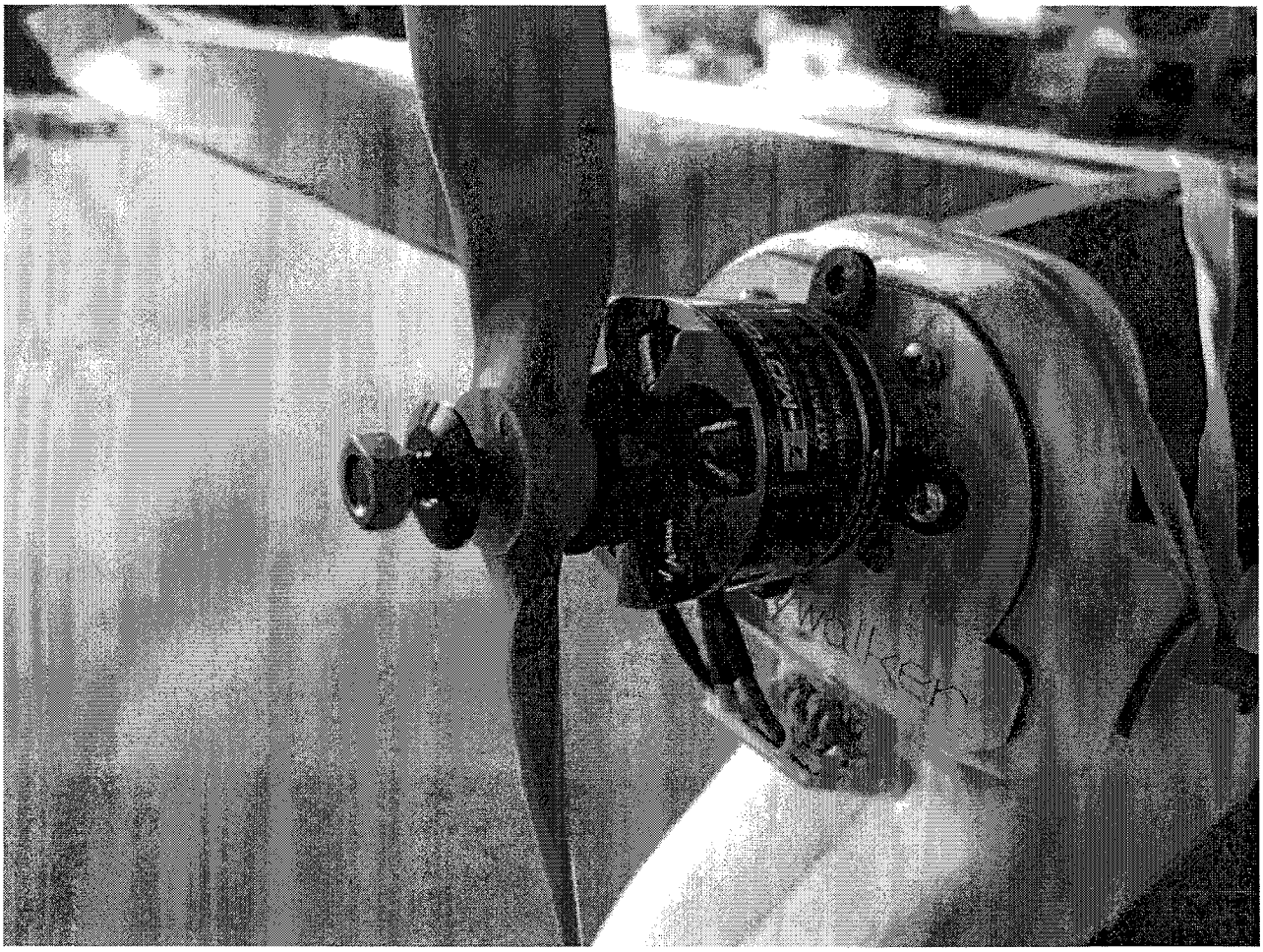
In this page we will see how the propeller securely connects to the motor.



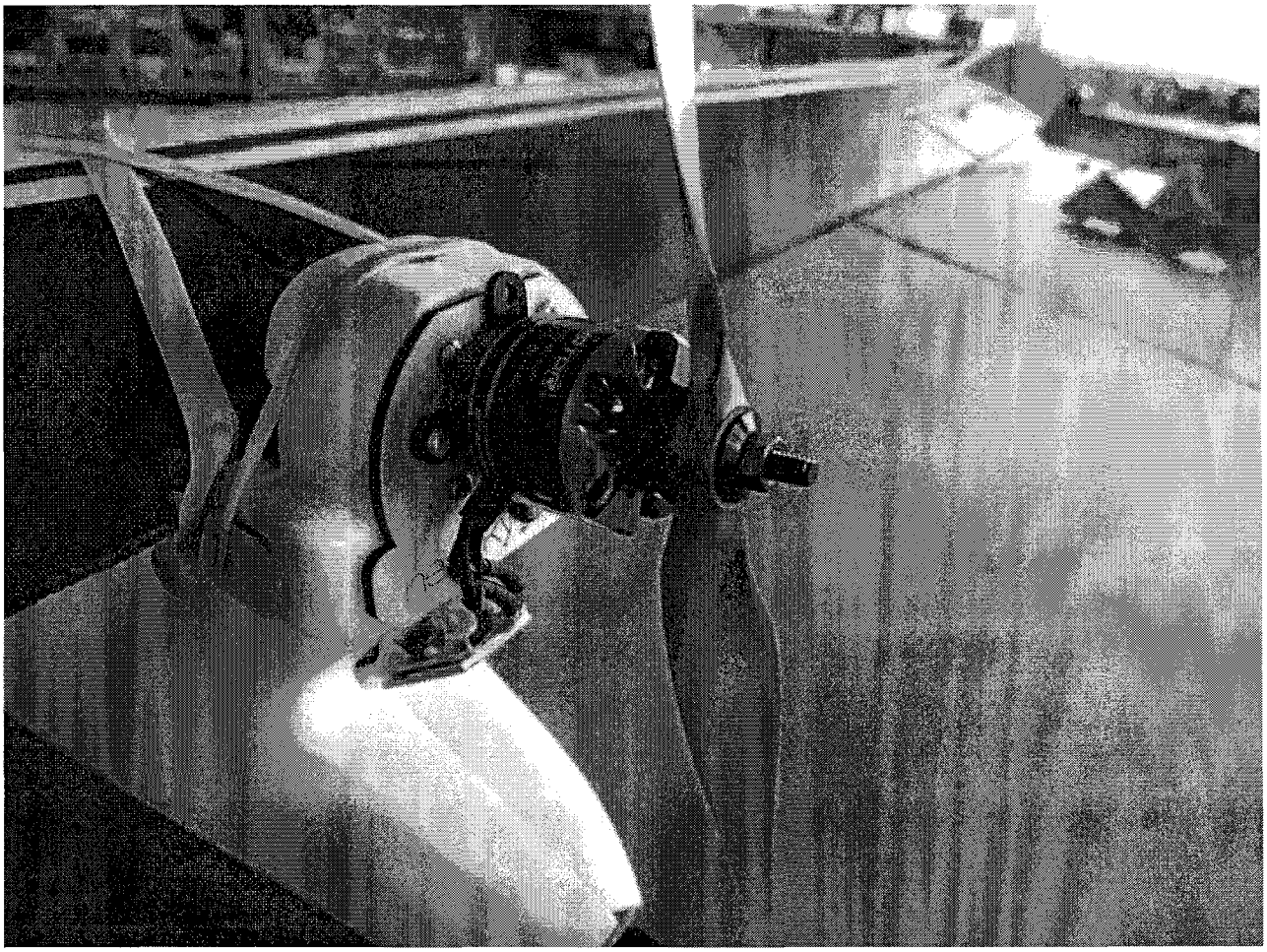
First, place the propeller on to the bolt with the lettering on the propeller facing the motor.

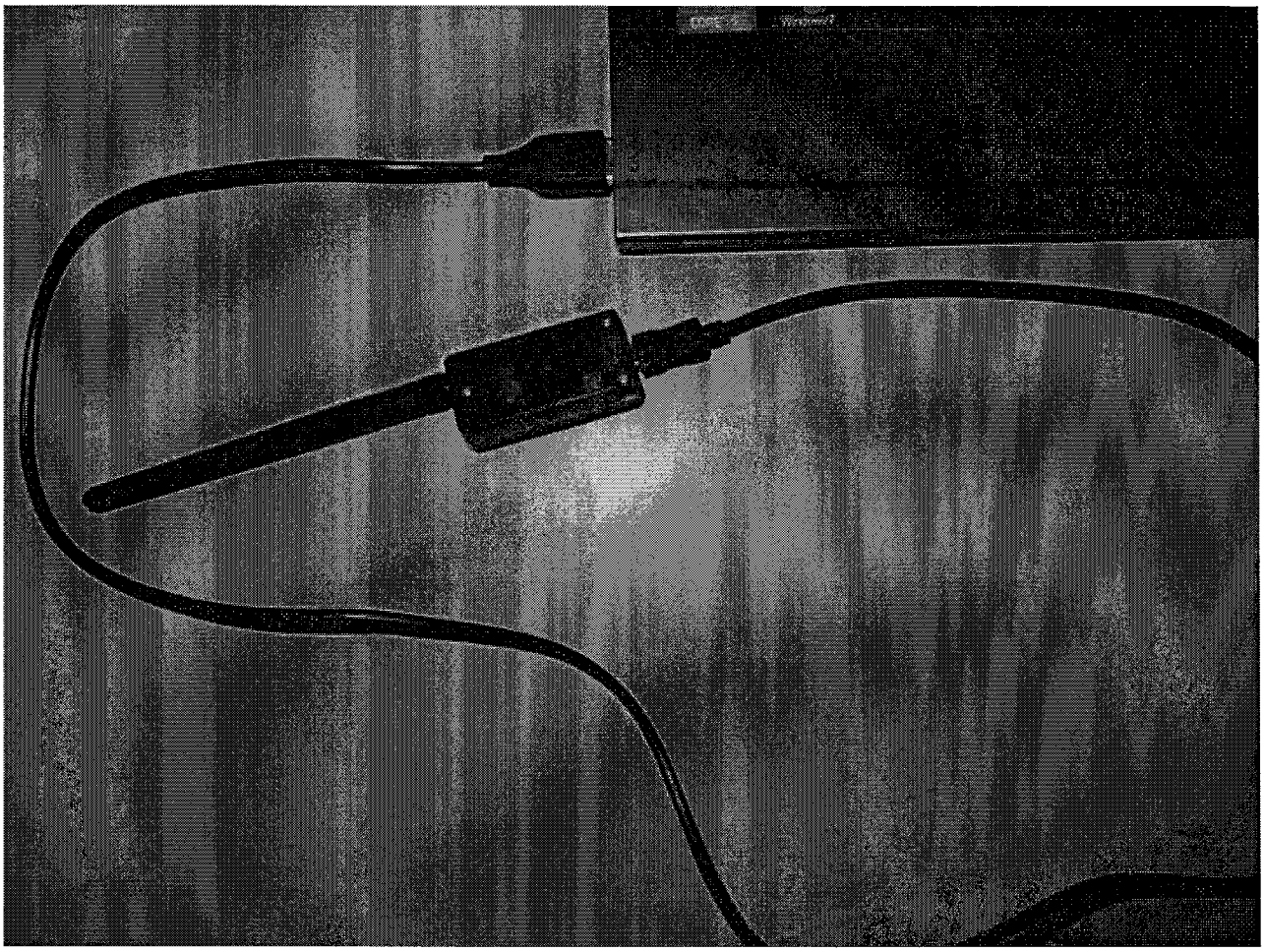


After the propeller is on the bolt facing the correct direction, place the washer on the bolt. Make sure the side of the washer with the larger face is against the propeller. Then, tighten the nut to bolt very tightly securing the propeller and washer. If this bolt is too loose the propeller may fall off during a flight.

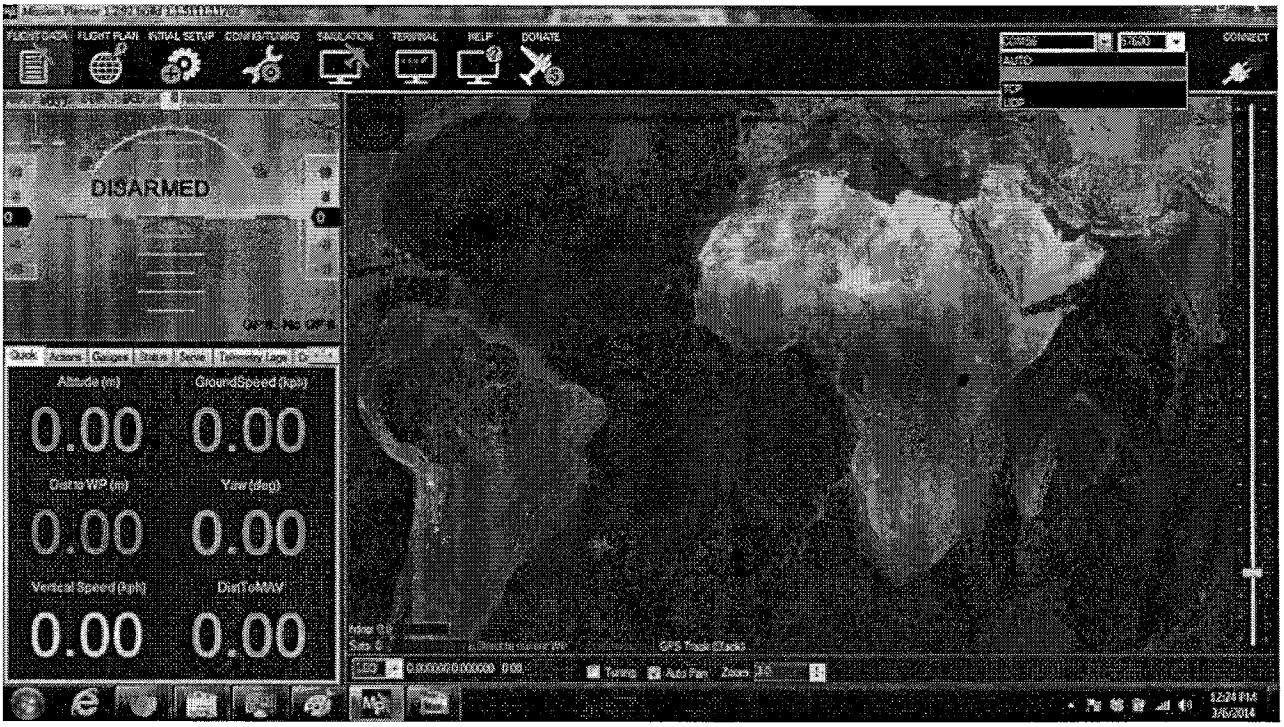


When all of these steps are done the propeller will be properly secured to the motor.





Open Mission Planner and choose the Com Port that comes up when plugging in the telemetry (it may take a few minutes for the Com Port to show up). Set baud rate to 57600.



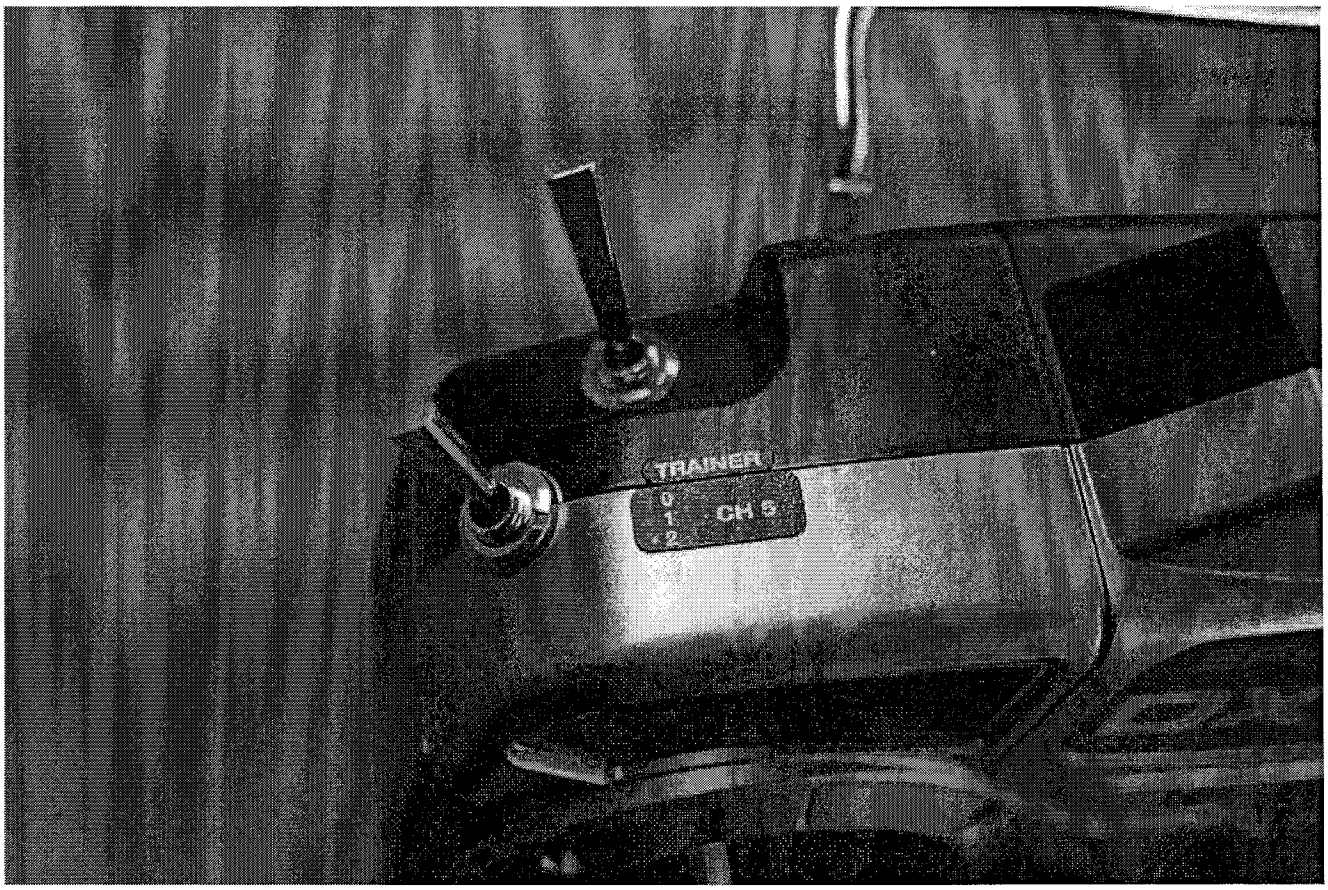
Now press Connect and you should have your wireless connection established.

Transmitter Modes (Spektrum DX5E)

If you order any transmitter from Event 38 it will arrive set up with three independently selectable modes on Channel 8. The three position switch labeled "Gear" is used to select FBWA, RTL and Auto.

The modes will be selected using the CH 5 three position switch.

The position pushed furthest away from the operator (0) is FBWA mode.



The middle position (1) is RTL.

The position pulled closest to the operator (2) is Auto.

Verify your modes;
Power on your transmitter. Remove propeller. Power on your E384. Connect to Mission Planner. Cycle through the modes. In Flight Plan, the bottom right corner of the heads up display will show which mode is currently engaged.

Transmitter Operation (Spektrum DX5E)

We will look at the Spekrtum DX5e pictured here.

There are two sticks that can be moved in all all directions. We will refer to the stick on the left side of the transmitter as the left stick, and the stick on the right side of the transmitter as the right stick

We will go through the movements in FBW-A mode first. In the "Transmitter Modes" link you will find the steps to get into FBW-A mode. This is the only mode where the stick movement will have an effect on the E384.

In FBW-A, the autopilot limits the amount of pitch and bank possible while also automatically stabilizing the aircraft.

In FBW-A, holding the right stick all the way to the right will cause a sharp right turn. By contrast, doing the same in manual mode would result in a continuous barrel roll.

Left Stick:

Moving the left stick up and down will turn your motor on. When the stick is at the very bottom there should be no movement. As you move the left stick upward it will increase the speed of the motor.

Moving the left stick to the right will cause the rudder to move to its right, so that the plane will turn right. Moving the left stick to the left will move the rudder to the left.

Right Stick:

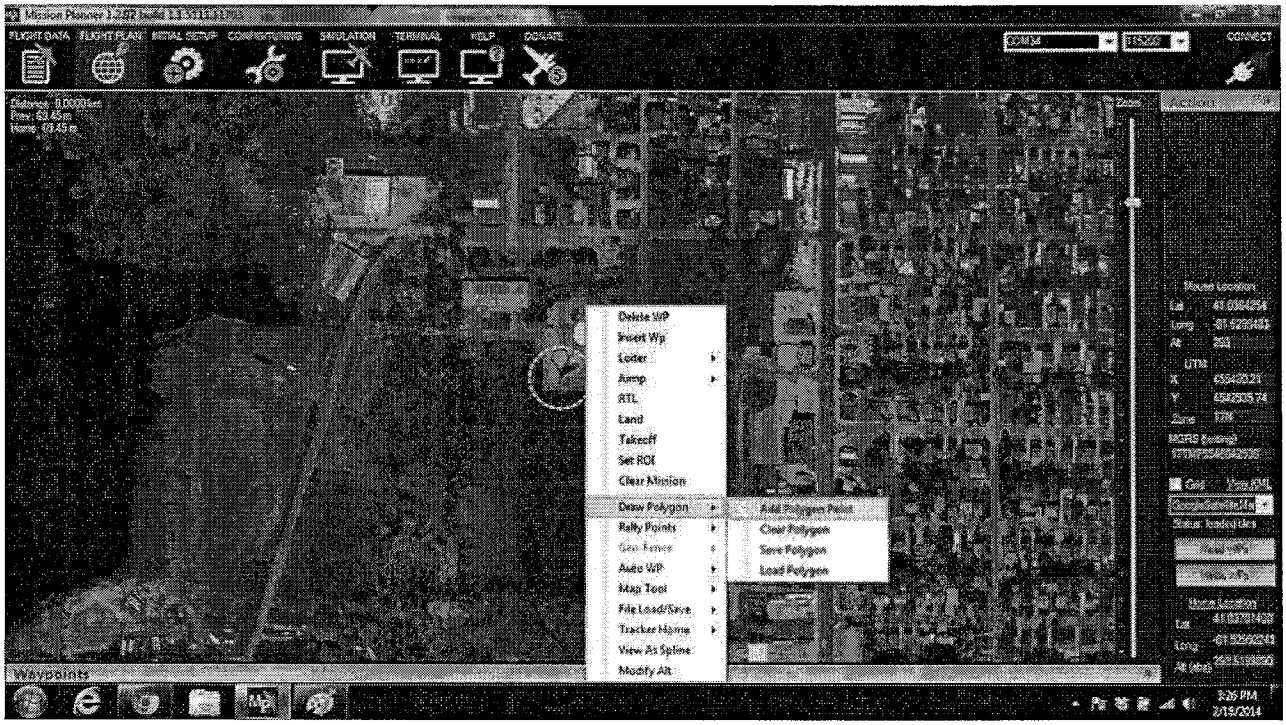
Moving the right stick up and down controls the movement of the elevator. To increase altitude you will move it in the downward direction, while descending will require you to move the stick upwards.

Moving the right stick to the left will cause the ailerons on the wings and the rudder to move into position to turn the plane to the left while moving the right stick to the right will perform a right turn.

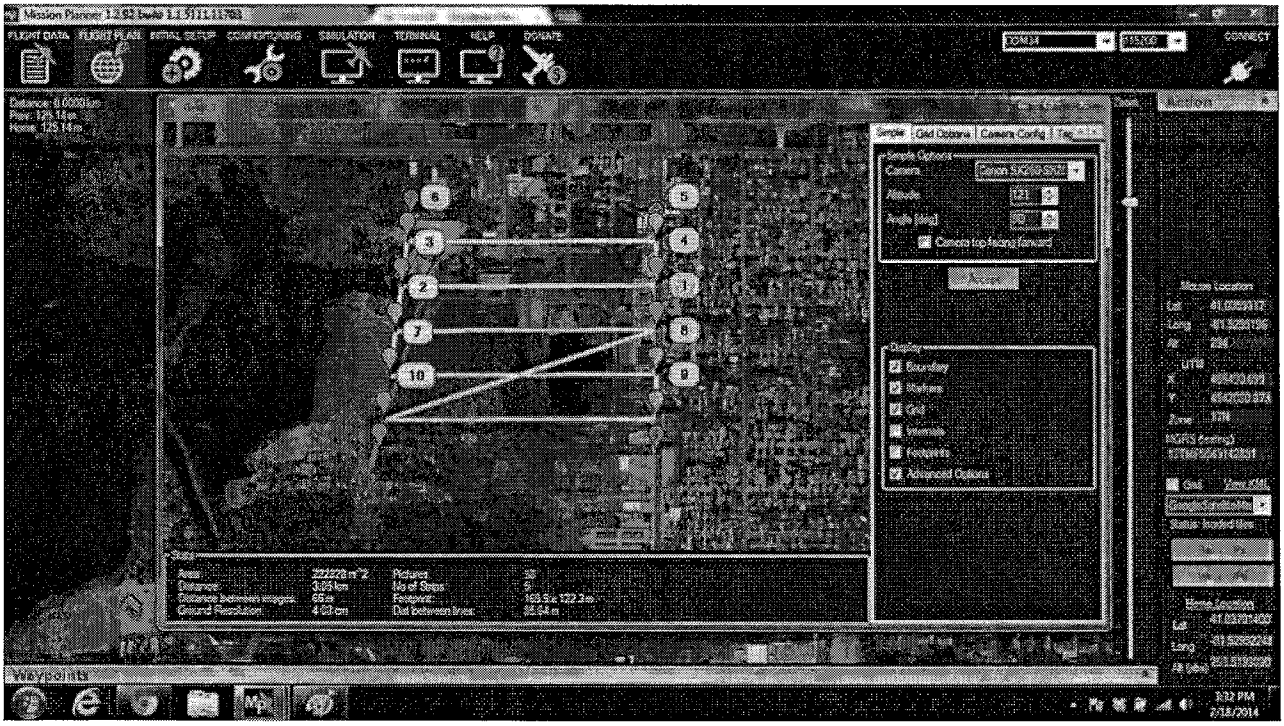
Planning a Mapping Mission

On this page we are going to see how a mission can be easily designed. In this scenario we will be using a simple and effective method. This is the "Survey (Grid)" method. We will outline the area we intend to survey. We will tell Mission Planner what type of camera we are using and the overlap that we desire. We will also specify flight direction, keeping the wind in mind. Lets get started.

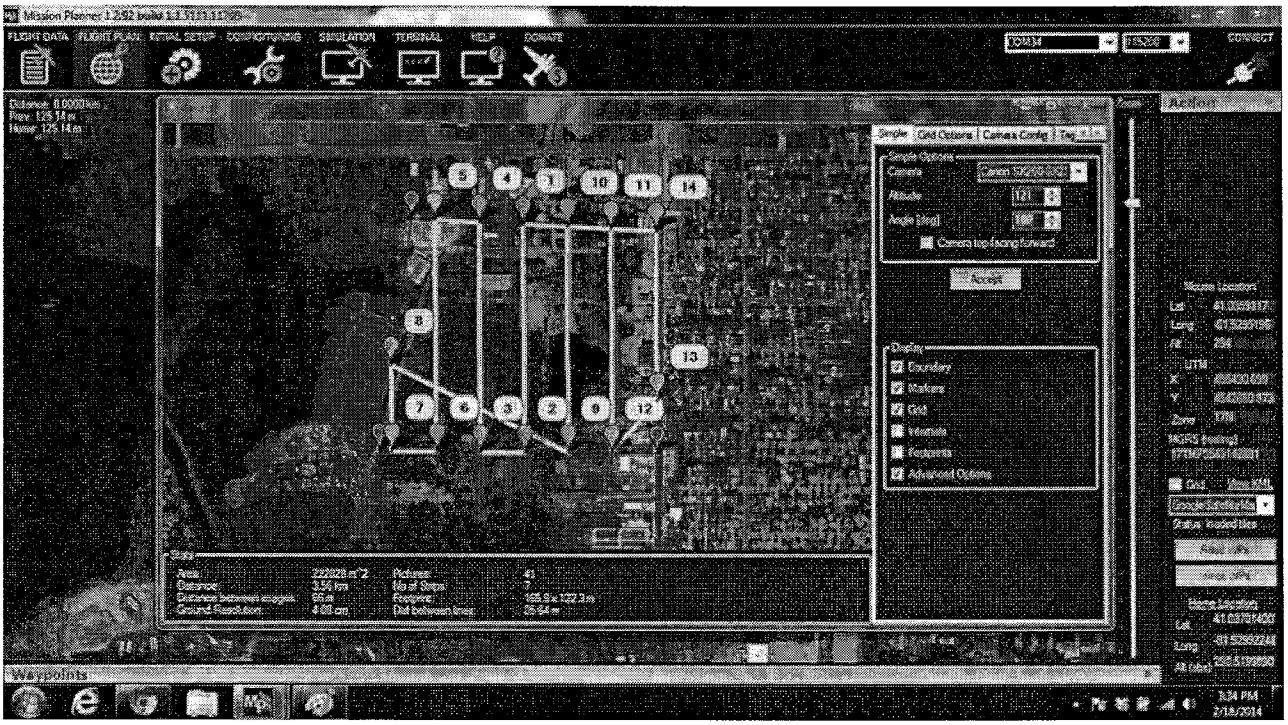
Go to the Flight Plan tab and find the area you intend to survey.
Next we are going to "Add Polygon". This polygon that you create will be the outline for the way points we will be generating. When in "Add Polygon" mode simply left click to add as many points as you desire. If you left click and hold a polygon point you can drag it (likewise with way points). If you need to delete a polygon point you can simply right click on the point and click on "Delete WP" (likewise with way points).



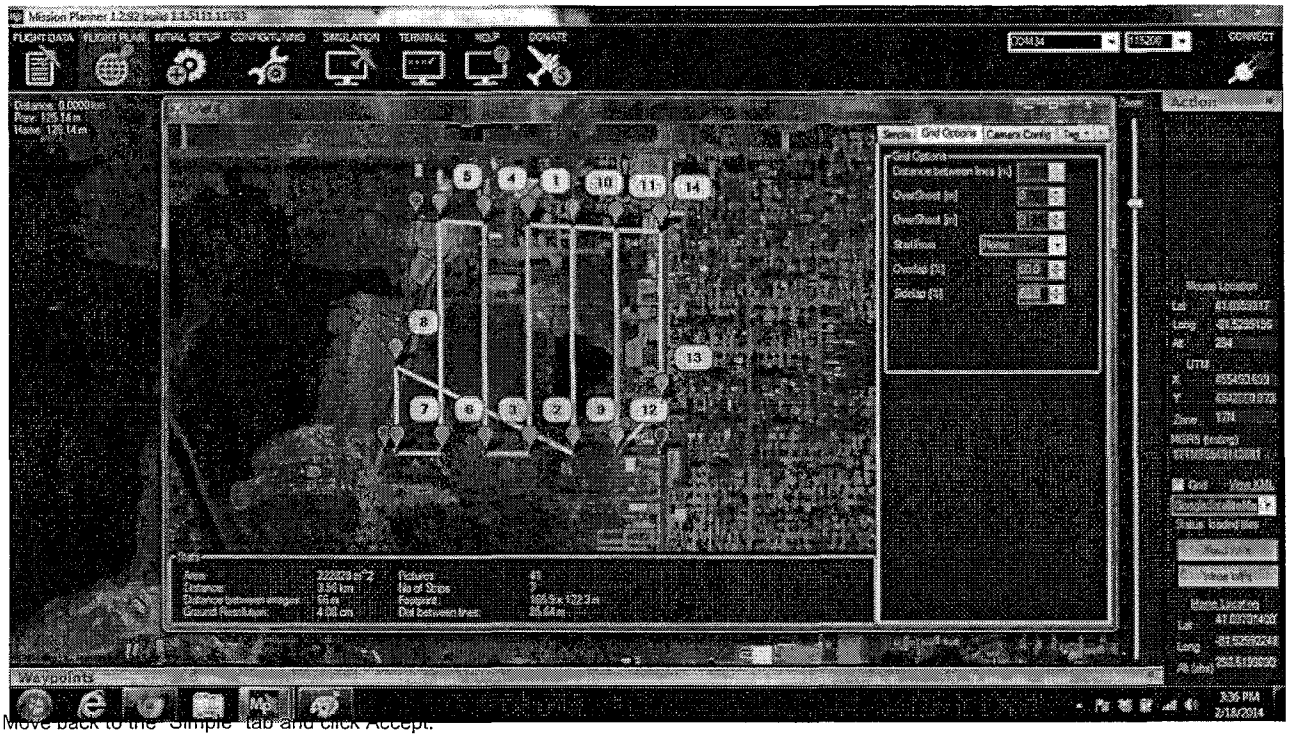
After selecting the area we desire, and moving the polygon points as necessary, we are ready to generate way points



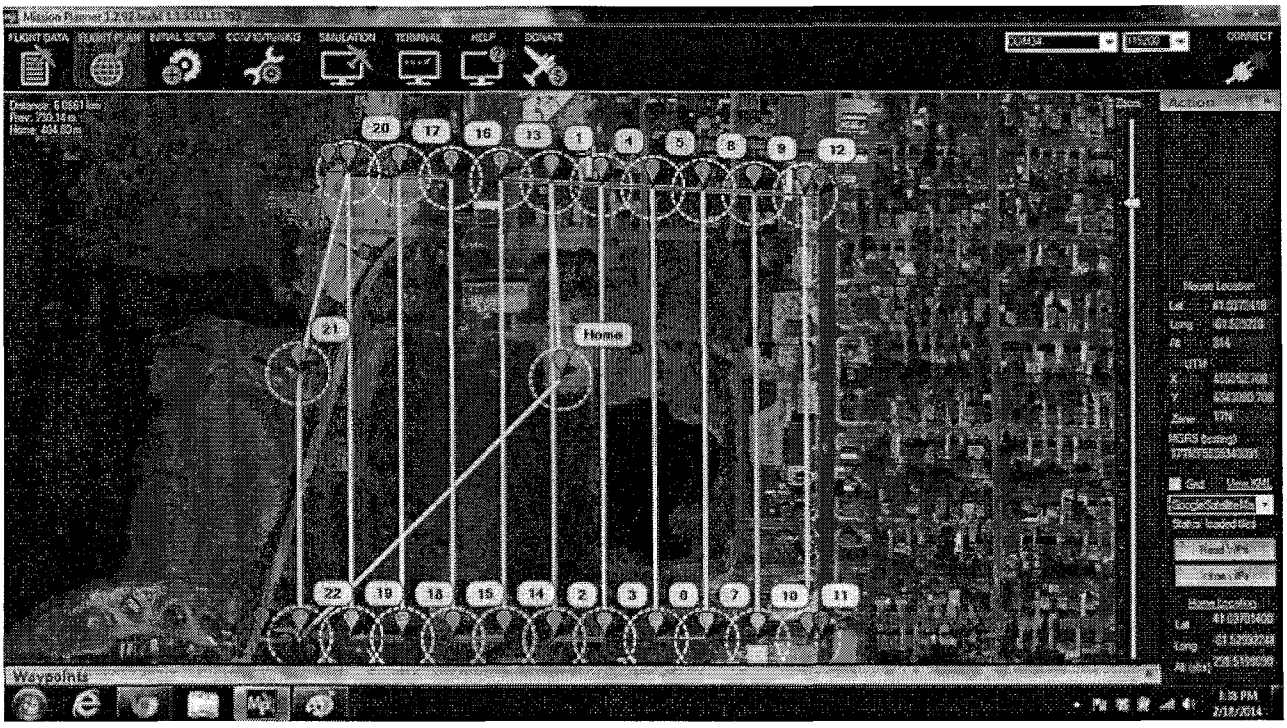
We have generated some way points, but we are not finished yet. For this example I anticipate a wind moving from west to east. So I will need to alter my flight path so that I am primarily traveling North and South, while traveling against the wind on the small instances that I am traveling East to West. So we will change the angle to 180. Also note that in the "Simple Options" we have selected the Canon SX260 (if that is not applicable, find your camera and select it).



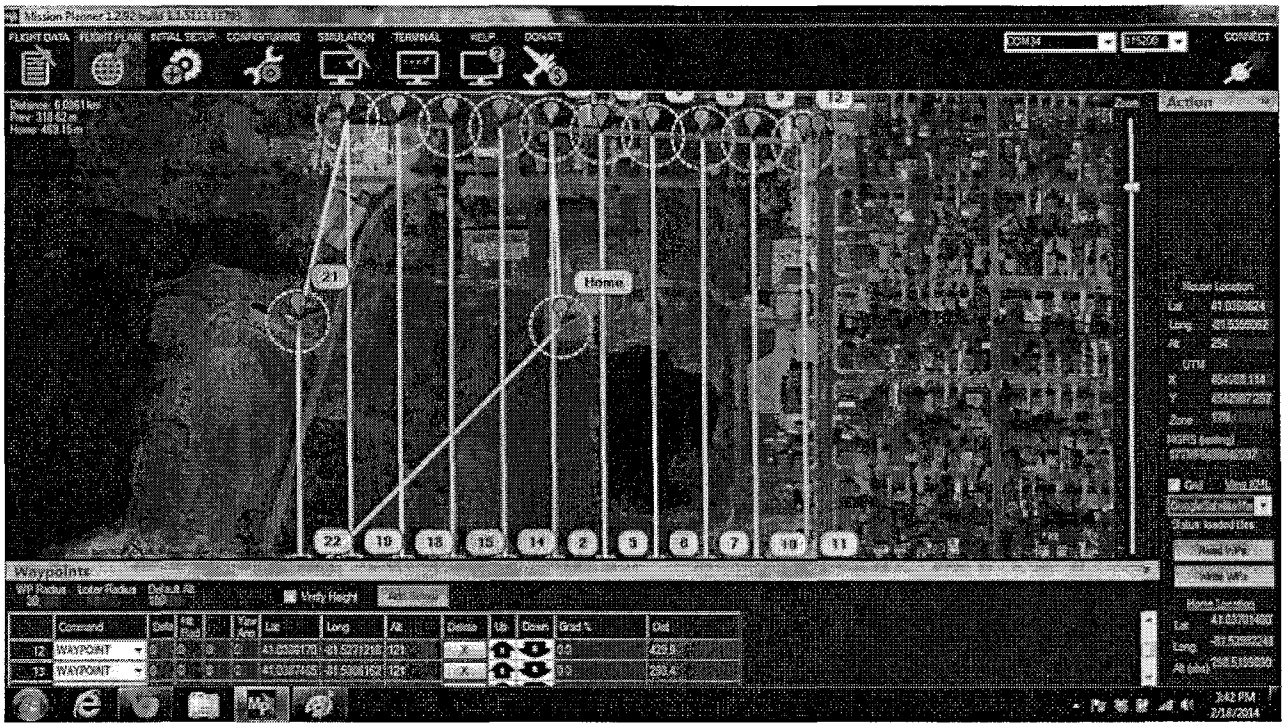
Next we will go to the "Grid Options" tab and change the sidelap to 60%. This will add or reduce the amount of way points generated to reach the 60% sidelap with the Canon SX260.



Move back to the "Simple" tab and click Accept.

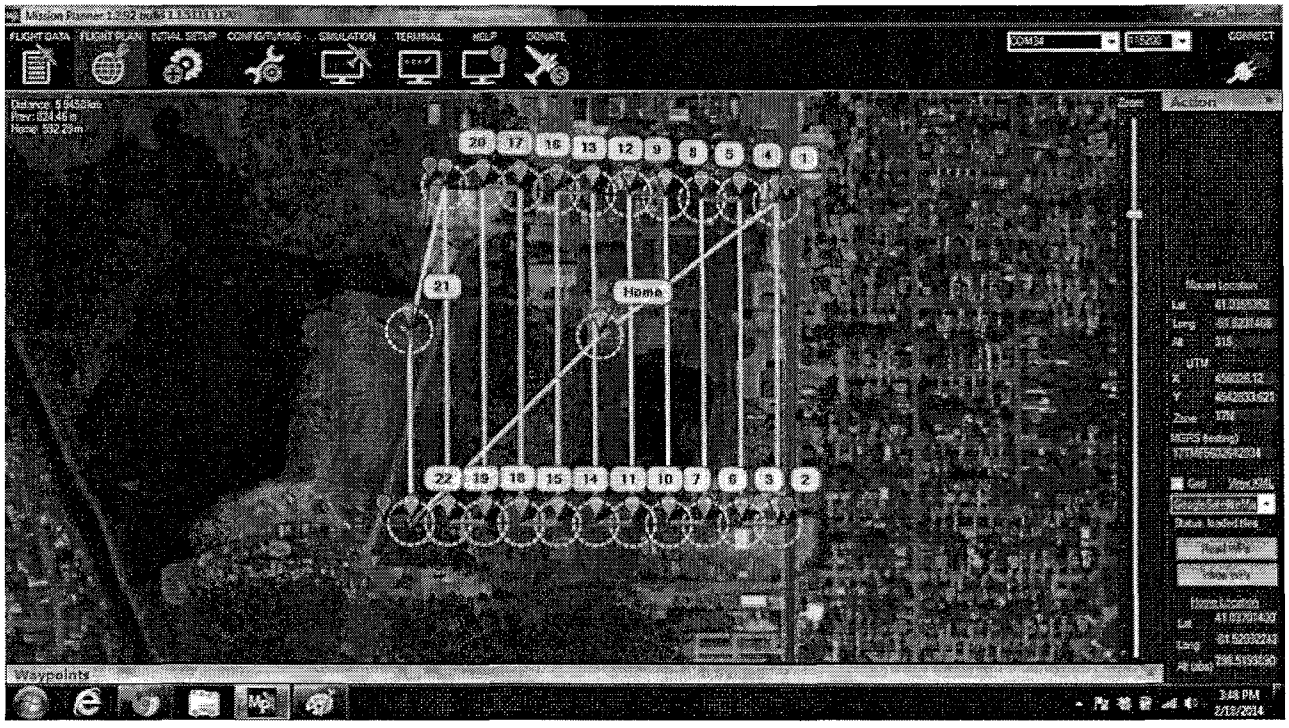


As you can see, often times the way points are not automatically placed in the optimum positions. If you click on the green "Waypoints" bar toward the bottom of the screen you will see the way points pop up. From there the "UP" and "DOWN" arrows will allow you to change the assigned number of any way point. You may also drag way points.

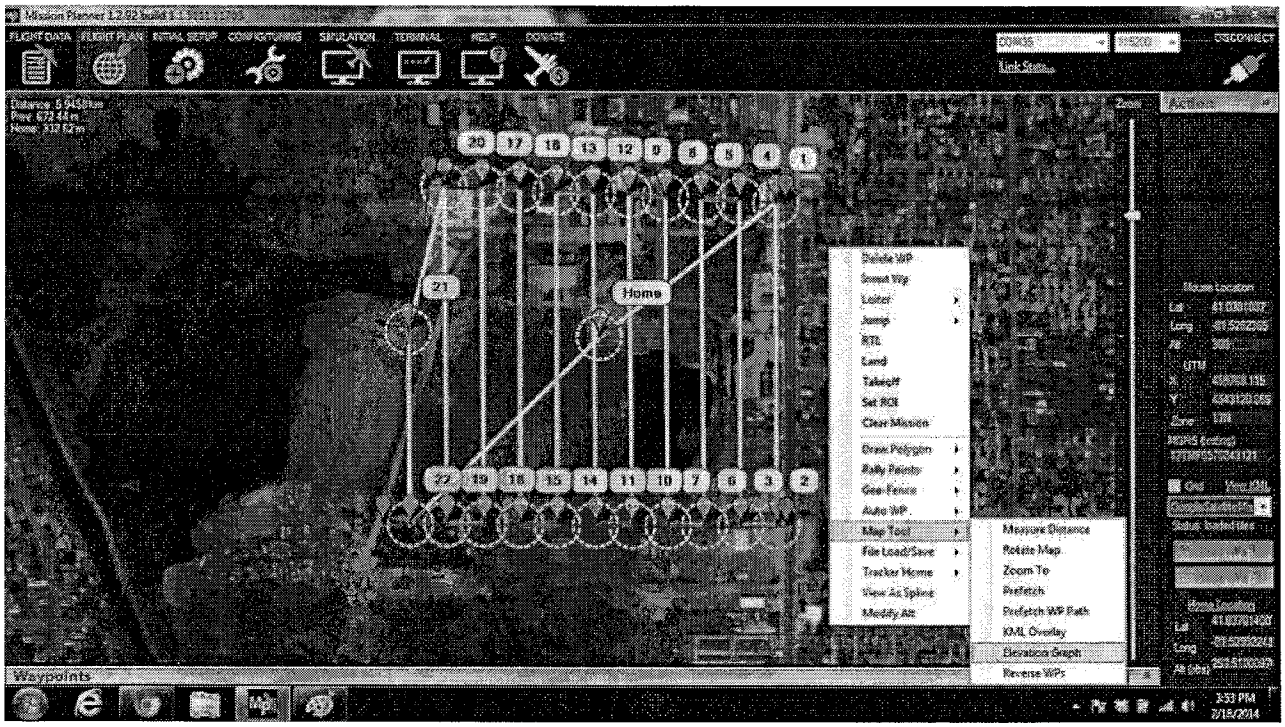


r

After arranging our way points we will have a more desirable flight plan.



Before finalizing the plan and sending the plane out, we are going to look at the elevation graph. We must make sure that the plane is no going to crash into any buildings or hills.



The graph will show the altitude the plane is projected to maintain, and it will show the google earth estimated elevation of the terrain.

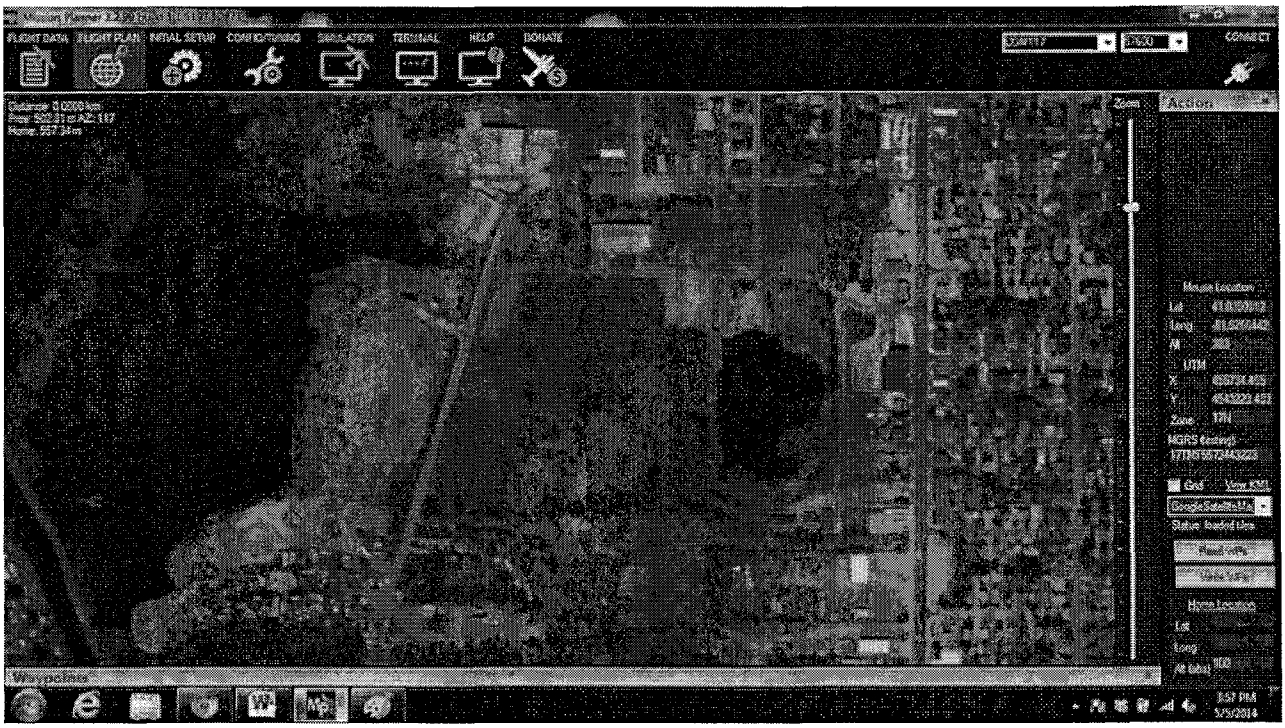
If everything looks good, connect to your APM, write the WP's.

This is a good opportunity to do some calcuations, and alter camera settings as necessary.

While in the Flight Plan screen it is a good idea to look at the "Distance" in the upper left of the screen. Using this distance we can estimate how many pictures we need to take to cover the area. Using our distance of 5.945km or 5945m , we will assume speed of the plane to be 12 m/s and the default time in between each picture is three seconds. Dividing distance by speed will give us our estimated time in the mission (about 500 seconds). 500 seconds divided by the 3 second shot interval gives us 167 shots. We are going to give an extra 10% to compensate for any error and to make sure we have the images we want. So we will set "Total Shots" on the camera to 184. Multiplying "Total Shots" by the three second "Shot Interval" gives 552 seconds. Adding that to the "Delay Time" of 240 seconds and you get 792 seconds. Keep a stop watch nearby. When you start the script, start the stopwatch. When the stopwatch reaches 792 seconds the lens will be closed and it is safe to land. For more details on everything camera related, check out our walkthrough.

Auto Takeoff

In this page we will take a look at the Auto Takeoff Way Point. We will see how to set the way point, and where to go from there. Enter the Flight Plan screen of Mission Planner. Left click anywhere on the screen as if you were entering a normal way point.



Now change the Command column so it reads Takeoff.

Change the Pitch Angle to 35 for a clean takeoff. Change the Alt to either the RTL altitude or the altitude of the

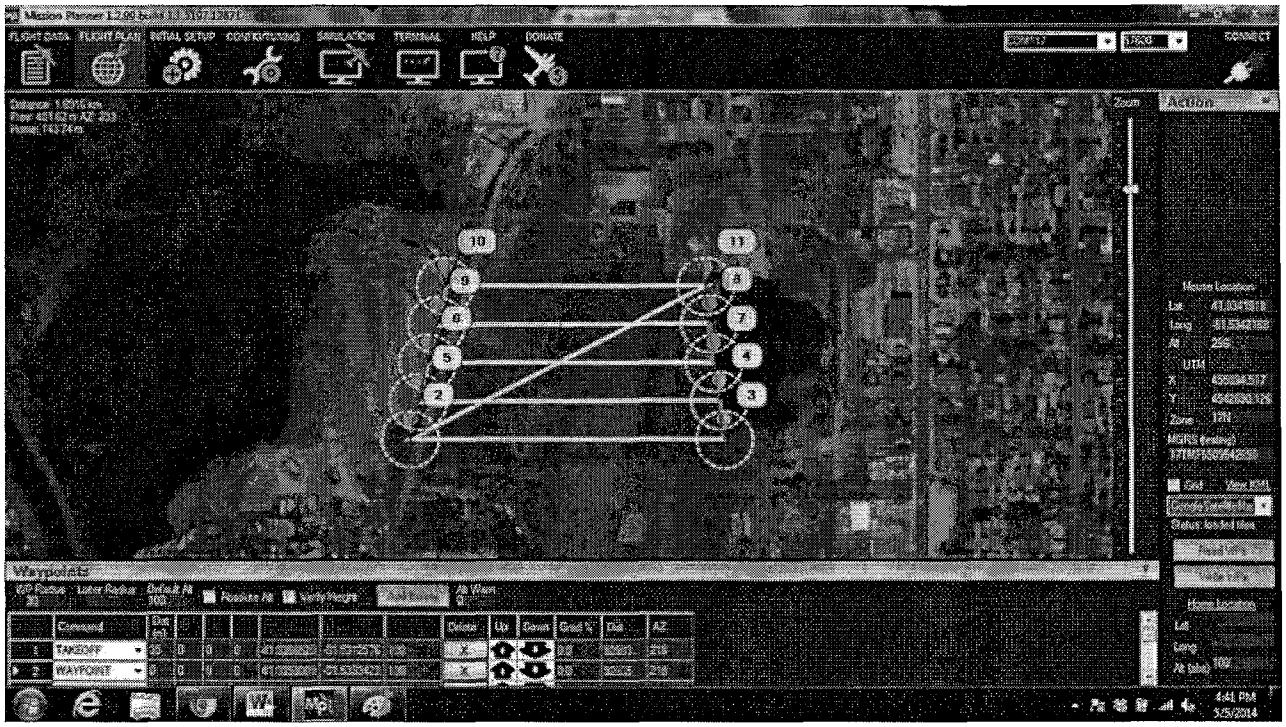
next WP. Notice that WP 1 disappears. Do not be alarmed, it is normal.

Now that you have your takeoff WP, write the WP to your E384, then read the WP to verify it has been written properly. Put the plane into Auto. When the plane reads as moving 2 m/s it will turn the propeller on and start climbing. Never put body parts near the propeller when the battery is plugged in!

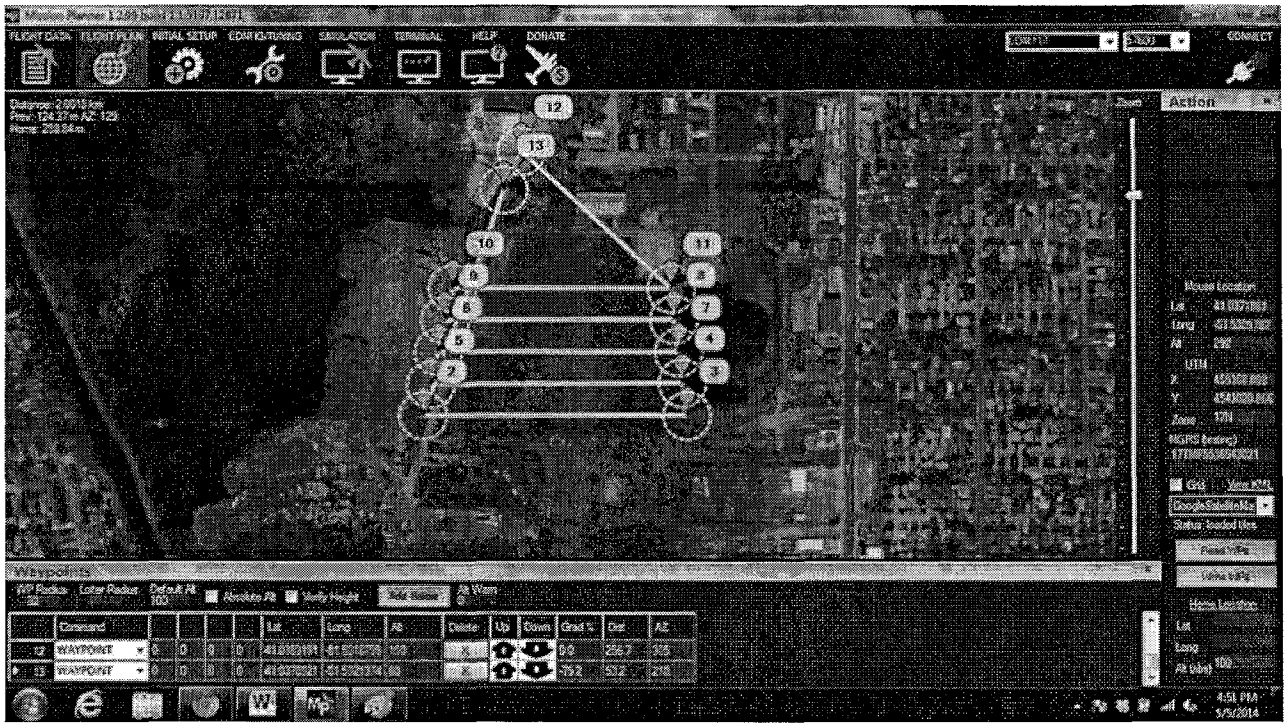
So, you have your take WP written and you set your plane into Auto. Do not make sudden movements at this point to avoid the plane wanting to take off. Throw the plane firmly at a 15 degree angle. The motor will kick on and the plane will begin to climb. It may drift slightly left or right, so be sure to give it some distance away from obstacles. The plane will continue to climb until it reaches its altitude for the Takeoff WP. If you have set up additional WPs it will travel to the second WP as soon as it reaches the takeoff altitude. If you have no additional WPs it will go into RTL.

Auto Land

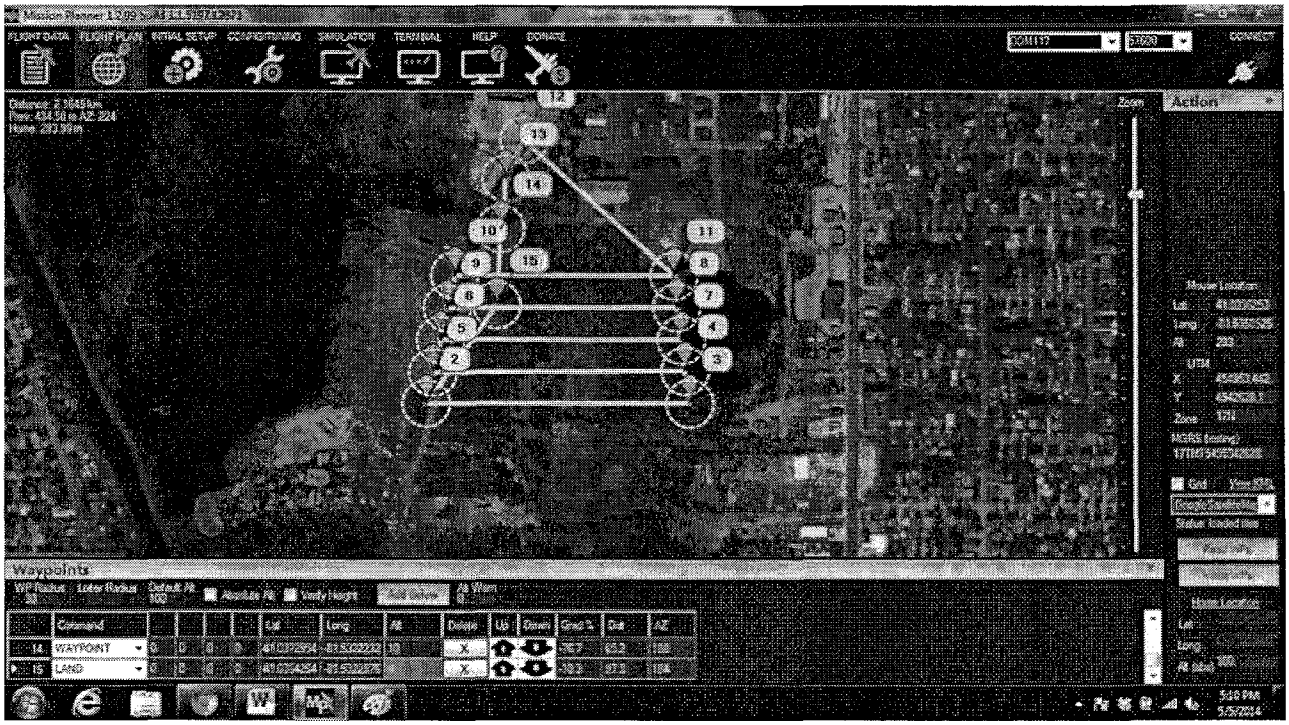
In this page we will see Autonomous flight from start to finish. Brief mentions will be made of Auto Takeoff and Mapping a Mission. Check out those pages to fill in the details.
The mission has been planned by first setting the Auto WP, then adding a polygon and using the auto WP function. Because the Takeoff WP disappears we see that the first visible WP is WP 2.



Now two WP will be added to get us on the proper landing path. We see that the second WP will be a reduced altitude but still high enough to clear obstacles by a safe distance.



After clearing obstacles we will substantially decrease altitude. It is important to note that the altitude can be off by 5 meters, so to be safe we go to 10 meters first. Also Google Maps can be off 10 meters horizontally, so be aware if you have a tight space to fly between. Be ready to switch to FBWA and manually avoid danger.
The last WP is at 0 meters. We have changed it to LAND and given plenty of distance to slow down before touch down.



After writing the WP, and reading them back for verification we are ready for an automatic flight from start to finish.

Adjusting Declination

The Earth's magnetic field varies significantly depending on your location relative to the poles. To adjust for the offset in your location, we'll change the magnetic declination parameter until the heading shown on Mission Planner matches the heading of your plane. To start, power on the R/C transmitter, then power on the E384 - we'll want to do this with the battery installed as it would be for flight and with the wings plugged in and installed. Be sure not to set it near any large metallic objects as the compass is very sensitive and can be affected by local magnetic disturbances. Once it has initialized, set it on the ground at a known heading.. it can be any direction as long as it's known. If no directions are known for certain, you can use visual cues that would be visible on Google Earth. For example, you can point the nose to be perpendicular to your street or parallel with the edge of your house. Once that's decided, connect to the E384 by telemetry in Mission Planner.

Once connected, you'll see an airplane icon at roughly your current location. If you're inside, you may need to go near a window or put the E384 outside in order to get a GPS fix. There will be a red line emerging straight forward from the icon, that is the direction the autopilot thinks it's facing. Knowing the real direction, we can now adjust and iterate the magnetic declination until the red line is pointing in the same direction we know the E384 to be pointing. To start, take a mental note of approximately how many degrees off the true direction the red line is pointing. Now click on Initial Setup -> Mandatory Hardware -> Compass. If the red line was counterclockwise of the true direction, add the approximate number of degrees you noted before to the current value, type that in and then switch back to Flight Data. Wait at least 30 seconds between iterations, it takes some time for the direction to update. If the red line was spun clockwise relative to the true direction, subtract. Negative values are ok but they should not exceed 180 degrees in either direction.

Initial setting, I've set the E384 down lining up with the edge of my building.

Now after adding 45 degrees to the declination value, it's very close to parallel with the edge. I'll make one more adjustment for another 2-3 degrees but this is close enough already. Aim to be within 5 degrees of the true heading.

Once the heading in Mission Planner lines up with the E384's true heading, you can move on to the next step.

Preflight Checklist

Before leaving for flight location

- Prefetch base map imagery in Mission Planner (Flight Planner tab, right-click Map Tool >Prefetch). Note that this may take up to a few hours depending on area prefetched and internet access speed
  - Leave enough time to complete this step.
- Optional – create flight plan (waypoint list) based on desired imaging ground resolution (altitude), using Mission Planner camera tool (Flight Planner tab, right-click Map Tool >Camera) to estimate flight line spacing and camera timing interval to achieve desired image overlap. Use dummy Home point – it will get reset in the field when GPS lock is achieved.

Pre-flight Operations at Flight Location

1. Assemble airframe (wings, tail, etc.).
2. Start computer and open Mission Planner software.
3. Load or create flight plan as described above. If not using telemetry, use USB cable to connect computer to APM to load flight plan. Disconnect USB cable when finished.
4. If using telemetry, connect ground station modem to computer's USB port.
5. Turn on RC transmitter, set mode channel(s) to Manual, and SET THROTTLE POSITION TO IDLE.
6. Make sure UAV is motionless.
7. Install battery in UAV and connect, taking care not to disturb UAV.
8. In Mission Planner software, select correct port ID and baud rate (default is 57600) for telemetry modem, and hit "Connect" button. Wait for APM to switch from Disarmed to Armed.
9. Check for 3D Fix on GPS (map display should show current location).
10. Check that battery voltage and compass heading are correct in Mission Planner HUD.
11. In lower left corner of Mission Planner, select Actions tab and press "Set Home Alt" button. Current altitude display in HUD should change to zero.
12. In Mission Planner Flight Planner tab, load or create flight plan. Check that all altitude values are nonzero and sufficiently high to clear any terrain or obstacles in flight path. Press "Write WPs" to transfer flight plan to UAV.
13. Check that all flight controls surfaces have appropriate neutrals, and that they move in correct direction when RC transmitter sticks are moved, first in Manual mode, then in FBW mode.
14. Lift UAV from ground or holder and check that Center of Gravity is OK.
15. Set mode to FBW. Move UAV in both pitch and roll axes, and check that ailerons, rudder, and elevator move in appropriate direction to return UAV to level flight.
16. Install propeller if not already installed. (Install propeller while the plane is powered off)
17. Set script parameters in camera and install camera into UAV. Close hatch cover.

Launch and Flight

1. Set mode channel on RC transmitter to Manual or FBW-A.
2. Grasp UAV near camera hole in one hand, and RC transmitter in other hand.
3. Apply take-off throttle (60%) and hand-launch UAV straight away with good authority into the wind. UAV needs to be flying when it leaves your launch hand.
4. Manually pilot UAV in a straight upwind climb until all ground-based obstacles are cleared by at least 30m. At that point continue climbing upwind, climb circling, or point UAV toward location of first waypoint. Avoid switching to Auto or RTL mode with the UAV pointed directly away from its first target.

5. Switch to Auto mode and observe that UAV seeks location and altitude of first waypoint. Maintain visual contact with UAV at all times and be prepared to take over manual control if UAV exhibits odd behavior, or if another aircraft of any type enters the UAV's airspace.

Mission Completion and Landing

1. If flight plan included a landing sequence, observe landing and be prepared to take over manual control of UAV to avoid crash or hard landing.
2. If flight plan did not include landing sequence, when mission is complete (or if mission is aborted) switch flight mode to RTL using either RC transmitter or GCS. Observe that UAV returns to home position and orbits. When desired, take over manual control and land UAV straight into any wind.
3. Disconnect Mission Planner from APM upon landing, and physically disconnect or power down UAV upon retrieval.

E384 Flight Procedure

In this section we will discuss the procedure used to collect imagery, beginning with preparations for flight. Before heading out to

the field to collect imagery we must cache the Google Maps imagery of our area of interest in Mission Planner. Download Mission Planner. Mission Planner will allow you to plan, monitor, and replay your flights. Find your area of interest using the Google Maps interface within Mission Planner. This step requires internet connection. Cache any area you may fly over to give yourself a reference during flight, and to help with mission planning. Simply find the area you want to see during flight and it will be cached.

The first time you wish to connect a computer to your E384 you will need to download the drivers for the telemetry modem. This step requires internet connection. After Mission Planner has been downloaded, plug your telemetry radio into the computer. It will automatically download the drivers you need and should be complete within a minute or two.

Before making your way to the field, charge your batteries, make sure you have a Phillips screwdriver and a wrench to attach the propeller.

When you arrive at the field, take a note of the wind direction and speed. Avoid flying in winds above 25 mph. When we plan a mission we want to fly crosswinds and make all our turns into the wind. At this time plan your mission.

Now we will turn our attention to the assembly of the E384.
Attach the propeller. Attach the tail. Attach the wings. Place the batteries (but do not plug them in) and camera into the E384 and check the balance.

Turn your transmitter on in manual mode. Make sure to clear any alerts that may be shown on the transmitter. At this point forward, keep all body parts away from the propeller. One battery at a time, plug them into the Y-Splitter in the E384. Hold the E384 still until you see small movements on the elevator, signaling the E384 has been initialized. This usually takes 5-15 seconds after power has been plugged in.

Check that all the surfaces respond in manual mode. Move the right stick to the right and left to see the ailerons move. Move the right stick up and down to move the elevator. Move the left stick left and right for the rudder. Moving the left stick up will start the motor.

Check that all surfaces respond in FBW-A. Moving the right stick to the right and left will not only move the ailerons, but also the rudder. Move the E384 so that it is level. Check that the ailerons are flush with the wings. Now, move the E384 to a bank left and right to make sure the ailerons and rudder are moving in response. Pitch up and down should see the elevator respond.

Plug your telemetry modem into your computer. Connect to your E384 in Mission Planner. Check to see that you have a 3D Fix and at least 5 satellites, see image below (GPS circled in blue, number of satellites circled in green).

hdop should be below 5 (circled in white).

Your telemetry strength should be above 95% when near to the E384 (circled in red above).

A full battery pack will show your voltage near 16.8 (circled in orange). Always keep battery voltage in mind. If the battery voltage falls below 14V the E384 will no longer be able to climb.

Altitude should be below 10 (circled in yellow).

Adjust Declination as needed.

When everything checks out properly go to the Fight Plan screen and press Write WP. After the WP have been written to the E384 press Read WP. This will read whatever WP the E384 has stored. Verify all the WP are correct.

Customize the camera settings to your mission (SX260 and S100 Camera Walkthrough). Start the script and place the camera back into the plane. Attach the top of the nose.

In FBW-A hold the E384 up with two hands, keeping the propeller as far away as possible. At this time the pilot should have the transmitter in hand. Throttle up to 60%. Throw the E384 firmly and level with the wind at the nose of the plane. After the release, increase throttle and pull up on the elevator to climb. Climb to

about 100m. When you are in FBW-A with AUX3 at the bottom position flip the THR CUT switch and the E384 will go into RTL.

Watch the E384 circle at least twice to make sure that it is flying properly. Wait for the delay time to be up on the camera before you start the mission. Now go to your computer and press Auto. This will start the mission.

During the mission keep an eye on the battery voltage. If it drops below 14.5V it is time to bring it in for a landing. During the mission pay attention to the flight path and the altitude as well.

When the E384 has reached the last WP it will go into RTL. When the E384 is circling wait for the camera to reach total shots, if it has not already. When it has the camera lens will be shut and ready for landing.

Flip the THR CUT back to gain control in FBWA. During descent keep throttle very low, and no throttle at all if speed is maintained. Always land with the wind at the nose of the E384 to slow it down. Bring the E384 down and land on its belly. Go to the E384 and unplug both batteries. When you are sure there are no batteries plugged in you may disassemble.

Emergency Procedures

The Spektrum DX5E transmitter and AR610 receiver can communicate up to 1km. If communication is lost with the transmitter the E384 will switch to Return-to-Launch and fly safely above the home point at 100m.

The 3DR telemetry radio is rated at 1km range. The RFD900 telemetry range is 10km. If the E384 loses telemetry communication with the ground station for an extended period (30 seconds) the plane will switch to Return-to-Launch.

If the battery on the E384 reaches 14.3V the E38 will switch to Return-to-Launch. If the battery is below 14V the E384 will no longer be able to increase altitude.

During flight it is imperative to have both a Spektrum DX5E communicating with the E384 as well as the telemetry connection. If the Spektrum DX5E becomes unusable during flight (usually due to a low battery) communicate using the telemetry connection and set up a land way point to bring the E384 in safely. During flight if there are connectivity issues with the telemetry radios manually land the E384 with the Spektrum DX5E and resolve the telemetry connection issues.

If there is a GPS failure when the E384 is an automatic mode the E384 will proceed by setting the throttle to cruise, 42%, and enter a bank right at a 15 degree angle. If this occurs the Pilot will take control in FBWA with the Spektrum DX5E transmitter and land the E384.

Post-Flight Checklist

Immediately following landing check that all servos are working properly.

Verify the motor is still working properly.

Disconnect both batteries from the E384.

It is now safe to power off the transmitter and ground station laptop.

Check the fuselage and wings for damage.

If there is small amounts of damage (small cracks) take care to reinforce the cracks with CA glue.

If the fuselage or wings have major damage, replace them.

Store LiPo batteries at room temperature.

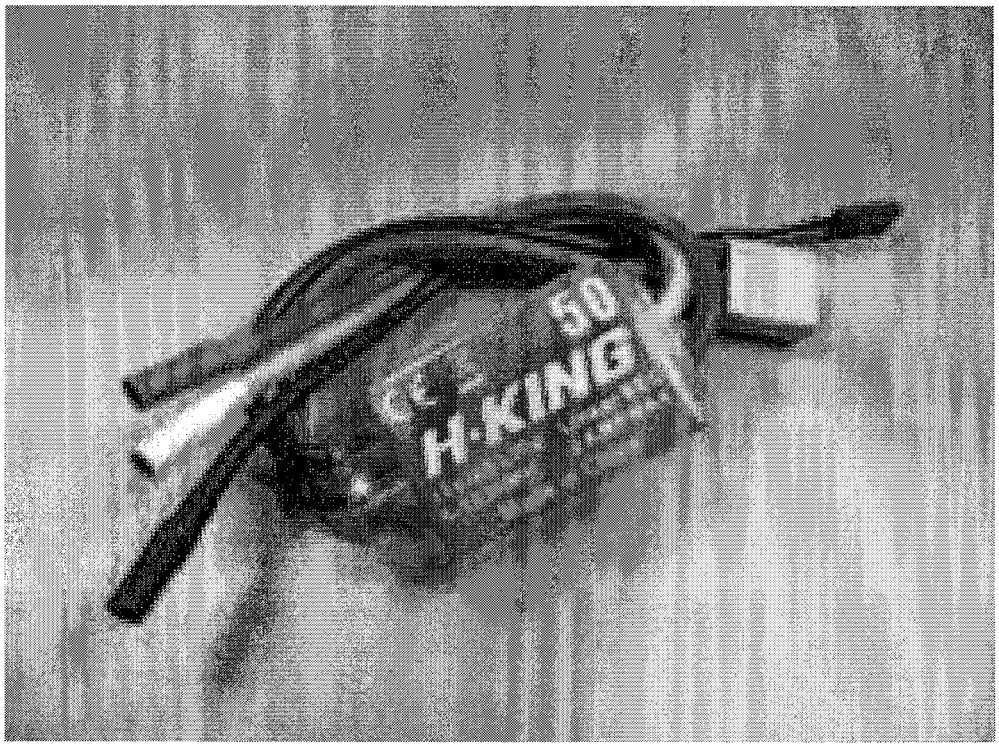
Refer to the Maintenance Manual for the regular replacement schedule.

E384 Maintenance Manual

Ex. #3

Table of Contents....

H-King ESC



After each flight check the heat of the ESC. If it is too hot to touch wait until it has cooled down to begin your following flight.

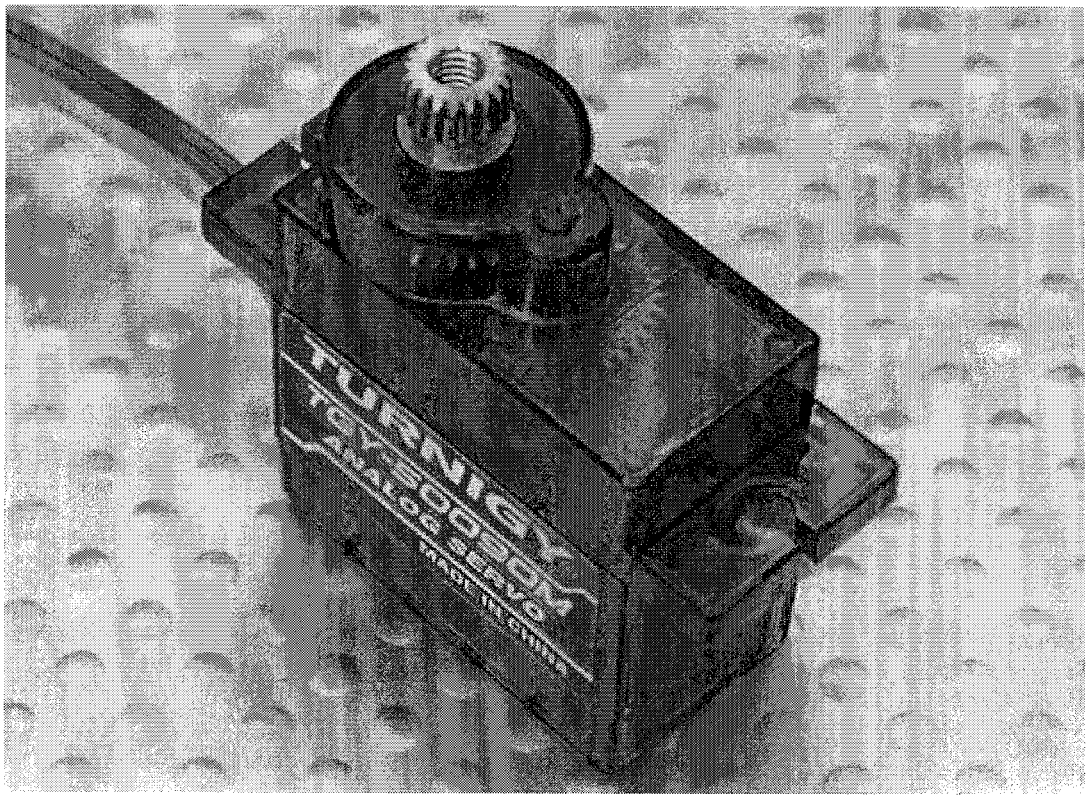
The ESC should be replaced every 200 hours of use.

Tiger T-Motor 3515-9

The motor should be monitored before each flight to monitor the fluidity of the motor. If any binding is seen replace the motor.

The motor should be replaced every 200 hours of use.

Turnigy 5009 Metal Gear Servo



The servos should be tested before each flight to make sure they are still operational.

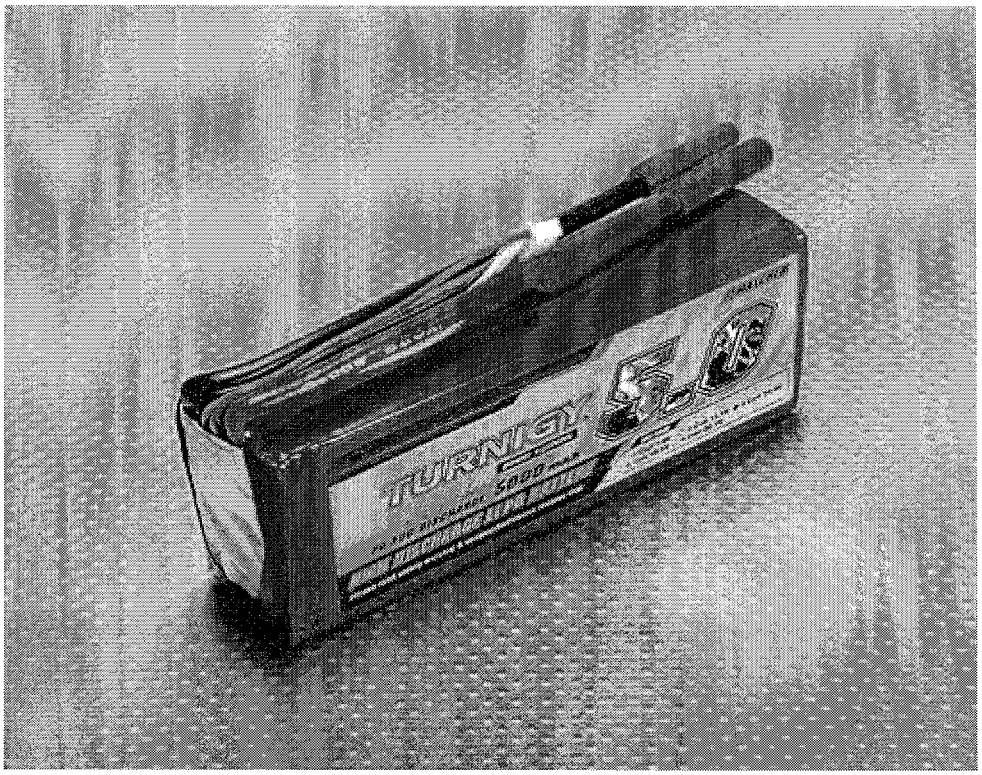
Replace the servos every 100 hours of use.

Skywalker 2014 AirFrame

After each flight observe the wear on the frame. Use CA glue on any small cracks or tares. If there are large tares replace the frame.

Replace the frame every 300 hours of use.

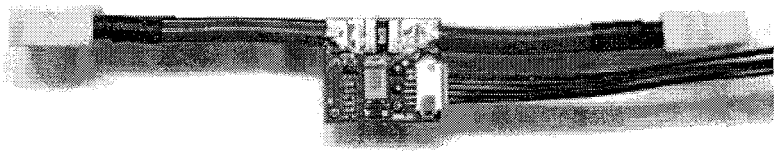
Turnigy 5000mAh Batteries



After each flight monitor the physical condition of the batteries. If a battery begins to expand, replace the battery.

Batteries should be replaced every 200 cycles.

3DR Power Module



No regular observations needed.

Replace the 3DR Power Module every 2000 hours.

PHANTOM 2 VISION+

User Manual

2015.01

Ex 4

Phantom 2 Vision + User Manual

2015.01

Important Safety Notice

Maintenance

Battery

Using This Manual

Key

Important

Before Flight

Watch the Tutorial Videos

Download DJI VISION App

Search "DJI VISION" on the App Store then follow instructions for iOS version.
Search "DJI VISION" on Google Play then follow instructions for Android version.

Contents

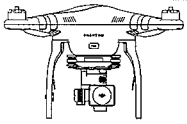
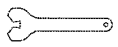
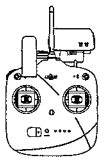
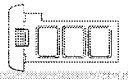
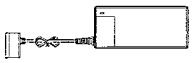
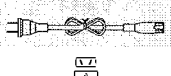
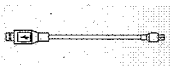
DJI VISION App Usage

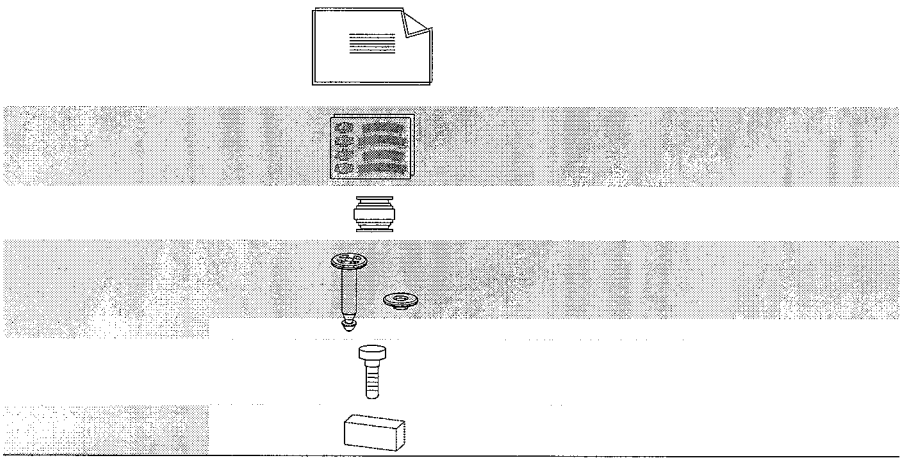
PC / MAC Assistant

Appendix

Overview

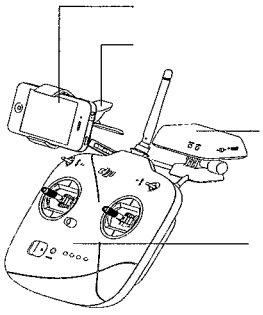
1 In the Box

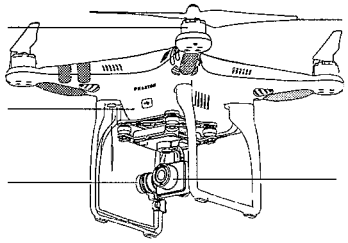
NO.	Name	Picture	Qty.	Remarks
				
				
				
				
				
				
				
				
				
				
				
				
				



2 Introduction

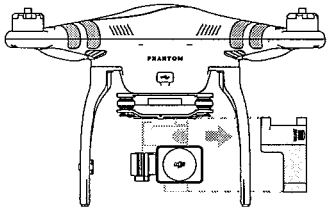
Remote Controller Outside Working Modes Inside





Assembly and Use

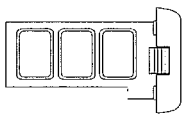
1 Removing Gimbal Clamp

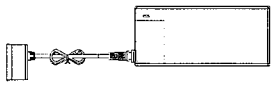


2 Preparing the Battery

Device	Power supply

2.1 DJI Smart Flight Battery



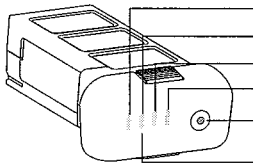


Battery Specifications

2.2 Usages

Powering on:

Powering off:

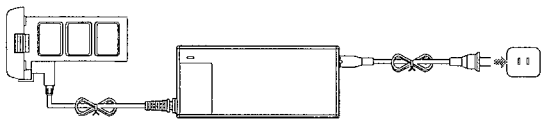


Discharging process				
LED1	LED2	LED3	LED4	Current battery level

Battery life				
LED1	LED2	LED3	LED4	Current battery life

⚠

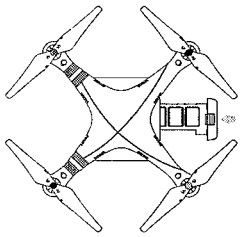
2.3 Charging the Flight Battery



Charging process				
LED1	LED2	LED3	LED4	Current battery level

- •
- •

2.4 Battery Installation



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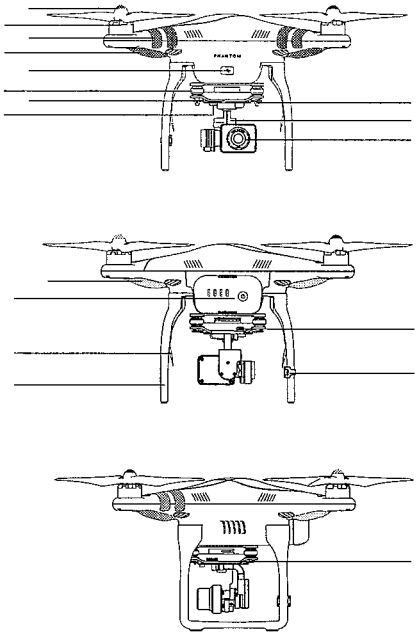
2.5 Correct Battery Usage Notes

Slow

Fast

3 Preparing the Phantom 2 Vision+

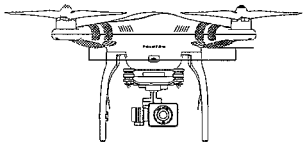
3.1 Introduction

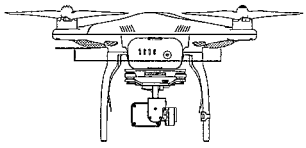


3.2 Built-in Flight Control System

Modules	Functions

3.3 LED Flight Indicator Descriptions





Rear LED Flight Indicators	Normal	Notes
R G Y ·····		
Y G ·····		
G ·····		
Y ·····		

Rear LED Flight Indicators	Abnormal	Notes
Y ·····		
R ·····		
R ·····		
R ·····		
R		
R Y ·····		

⚠ R

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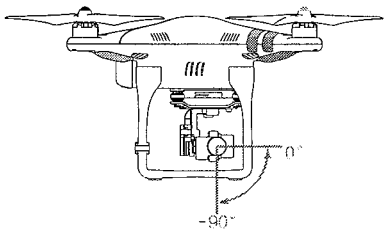
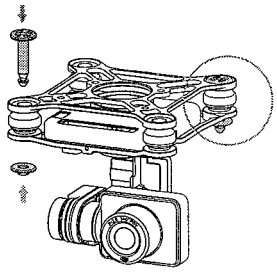
-
-
-

3.4 3-axial Stabilized Gimbal



Gimbal specifications	

• Non-FPV Mode:
• FPV Mode (First Person View Mode):



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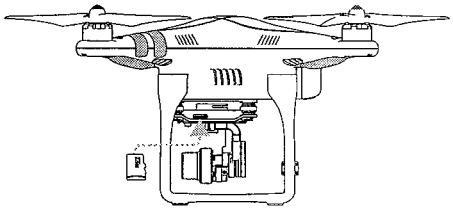

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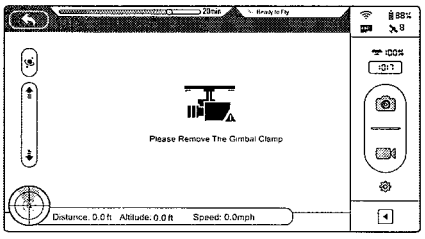

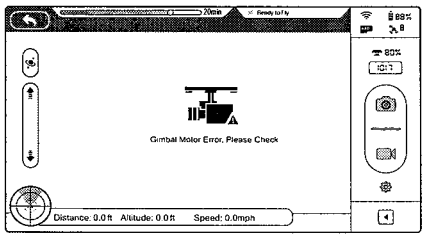

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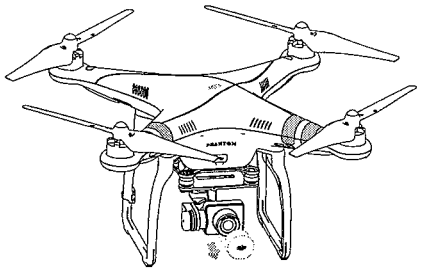
3.5 Camera

Camera specifications

Lens cap removal

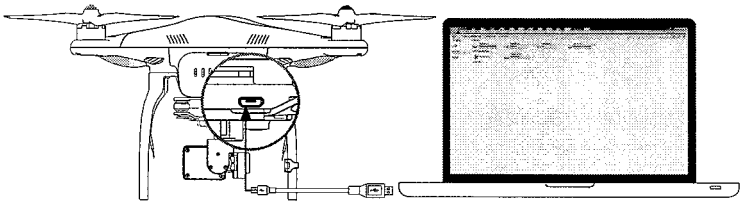


Camera Function Buttons

Capture:

Record:

Camera Data Port



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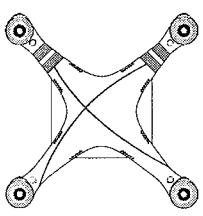
Camera LED Indicator	Wi-Fi status	Camera status
G		
G		
G		
G		
O		
O		
O		
O		
G O		
R		
R		
R		
R		
R		
G O R		

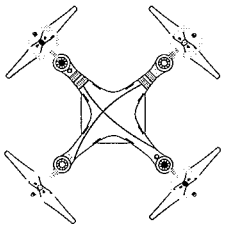
4 Attaching the Propellers

4.1 Introduction

Propellers	Grey Nut (9450)	Black Nut (9450 R)
		

4.2 Assembly





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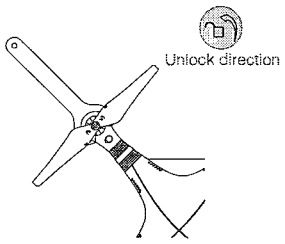
4.3 Removing the Propellers



4.4 Notes

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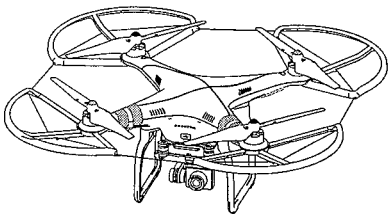

5 Preparing the Remote Controller

• Compliance Version:

• Operating Mode:
• Mode 1:
• Mode 2:

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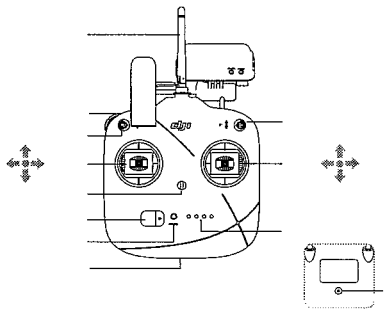
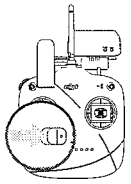
5.1 The Remote Controller



5.2 Power on the Remote Controller



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5.3 Remote Controller Power LED Status Information

Power LED Indicator	Sound	Remote Controller Status
G		
R		
Y		
R		
R		
G		

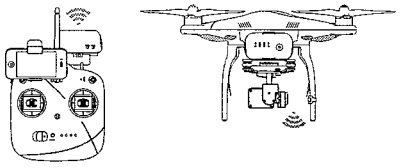
5.4 Battery Level Indicator

Battery Level Indicator

25% 50% 75% 100%

⚠

5.5 Antenna Orientation



5.6 Remote Controller Operation

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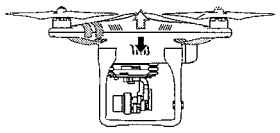
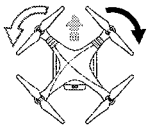
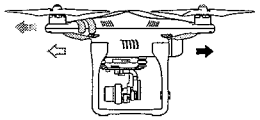
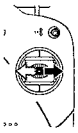
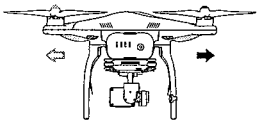
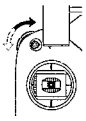
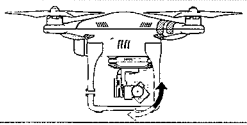
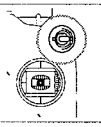
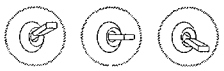
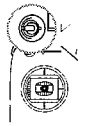
Remote Controller (Mode 2)	Aircraft (indicates nose direction)	Operation details
		
		
		
		
		
		
		

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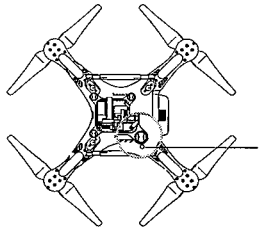
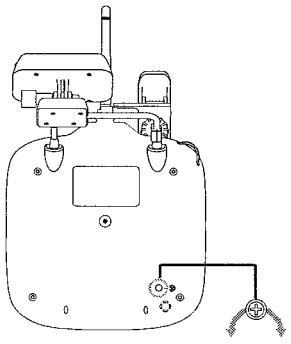
5.7 Linking the Remote Controller and Receiver



Link Indicator	Description	Next Operation
R		
Y		

5.8 Compliance Version Configuration



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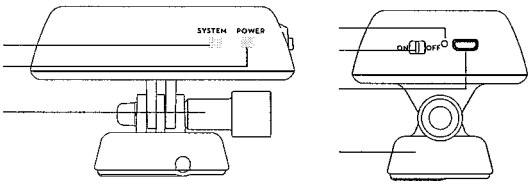
6 Preparing the Range Extender

6.1 Introduction



SYSTEM Indicator	Description
G ·····	

POWER Indicator	Description
G	
R	
Y	

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6.2 Using Range Extender

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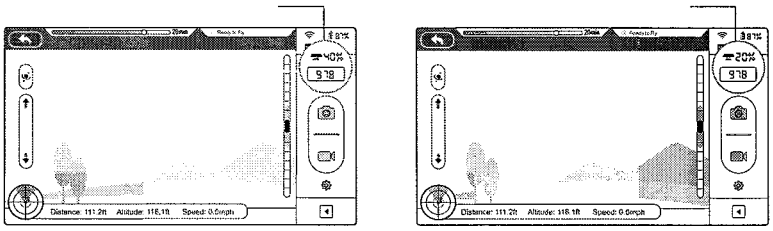
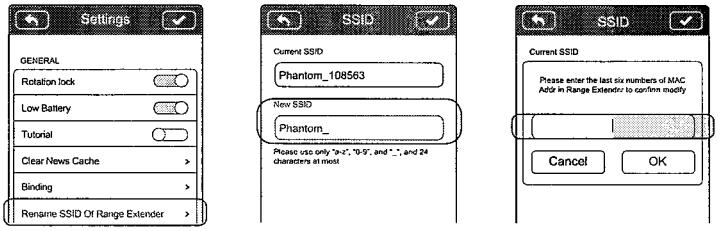
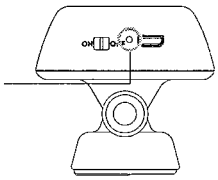
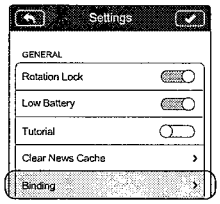


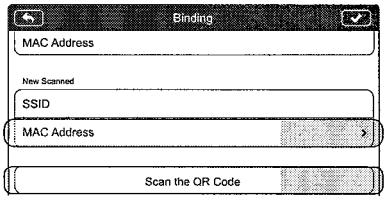
6.3 Rename Range Extender SSID

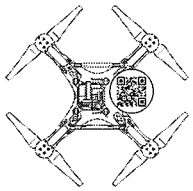


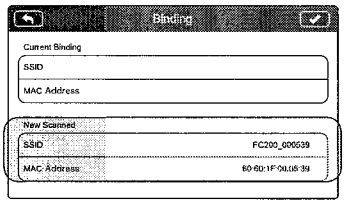
6.4 Binding the Phantom 2 Vision+ and Range Extender











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7 Downloading and Installing the DJI VISION App

7.1 Download and Install

Download DJI VISION App

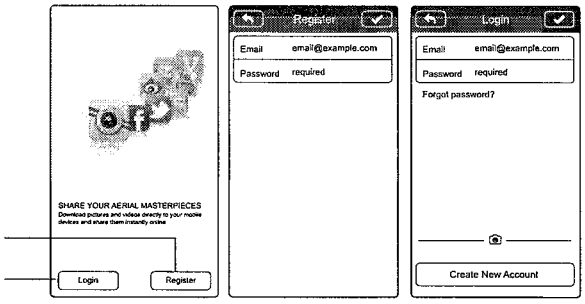
Search "DJI VISION" on the App Store then follow instructions for iOS version.
Search "DJI VISION" on Google Play then follow instructions for Android version.

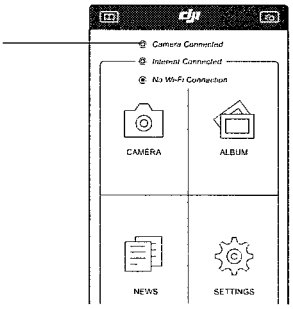
Available on the iPhone App Store

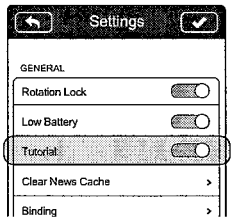
Get it on Google play

Supported mobile devices

7.2 Register and Login



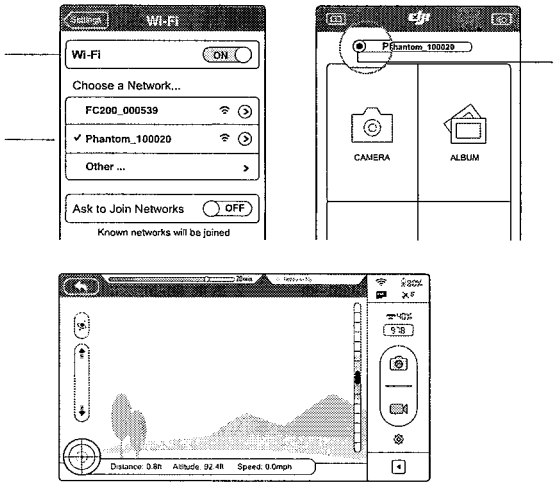




8 Connecting the Camera

8.1 Connecting Procedures

Follow these instructions to connect a mobile device to the Phantom 2 Vision+ camera.



Icon	Description
G	
B	

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Flight

Flight Environment Requirements

Preflight Checklist

1 Calibrating the Compass

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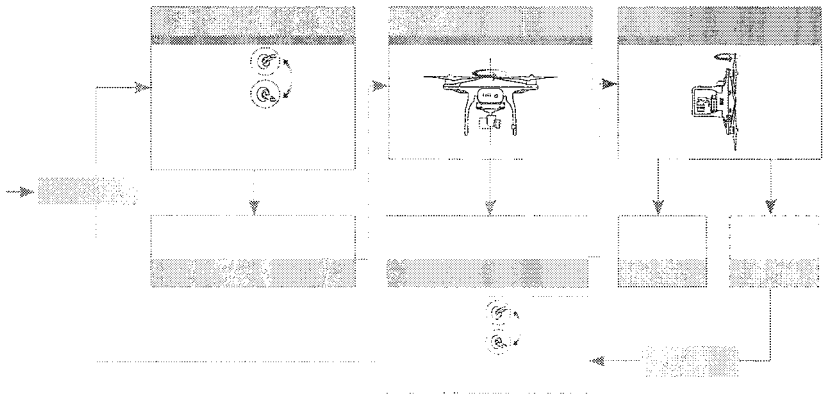
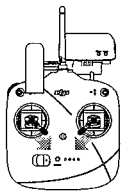
1.1Calibration Procedures



1.2 When to Recalibrate

2 Starting/Stopping the Motors

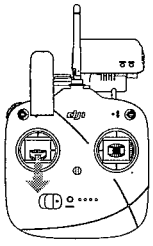
2.1 Starting Motors

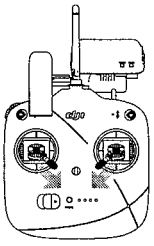


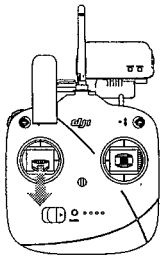
2.2 Stopping Motors

Method 1:

Method 2:







3 Flight Test

3.1Take off/Landing Procedures

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3.2 Video Suggestions and Tips

4 Failsafe Function

Home Point:

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Dynamic Home Point: The Home point will be reset to position of the mobile device at specific time intervals.

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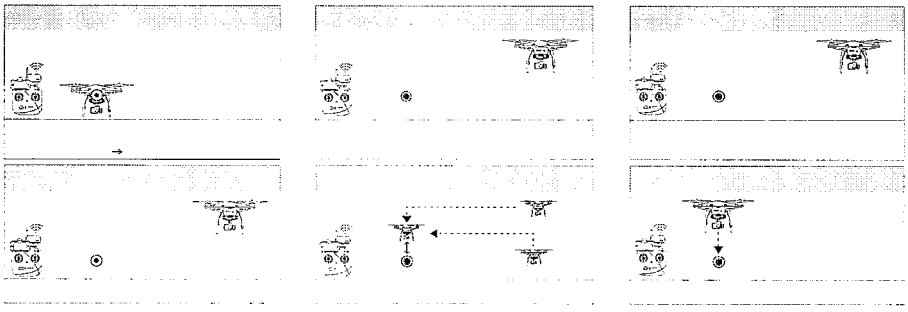
4.1 When Will Failsafe Activate?

4.2 Failsafe Procedure

Ready to Fly(non-GPS)— Automatic landing

Ready to Fly— Automatic go home and land



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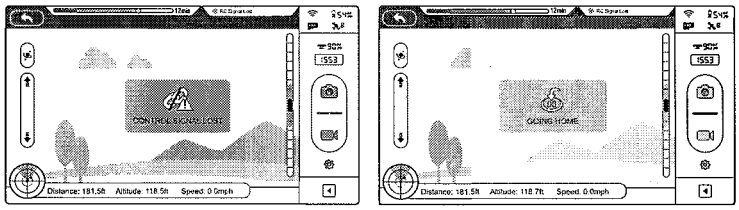
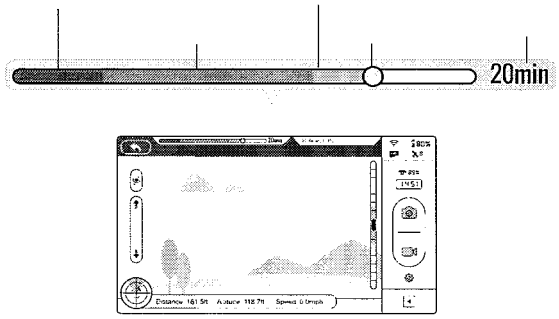
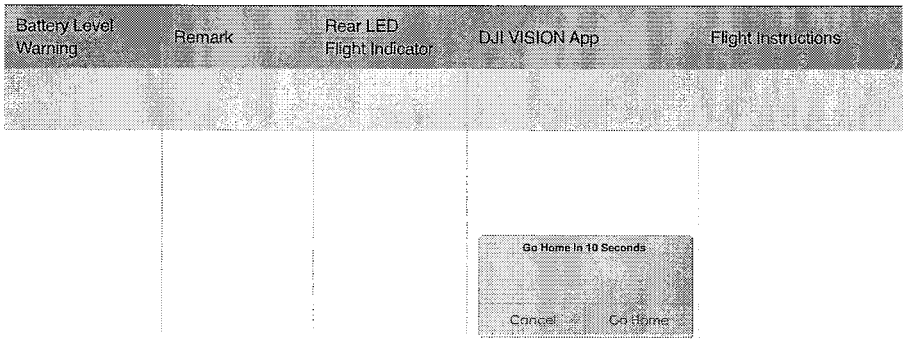


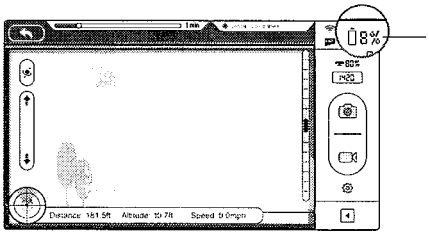
4.3 Regaining Control During Failsafe Procedures

5 Low Battery Level Warning Function



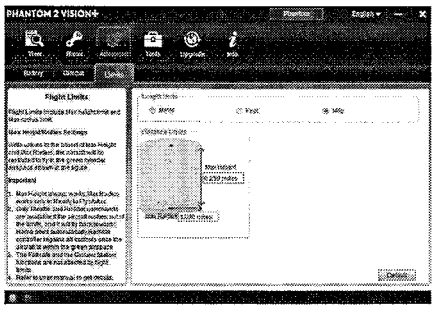


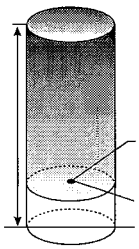
Low Battery Level Warning on the DJI VISION App



6 Flight Limits

6.1 Max Height & Radius Limits





Ready to Fly G ····· Green flashing

Limits DJI VISION App Rear LED flight indicator

R ·····

Ready to Fly(non-GPS) Y ····· Yellow flashing

Flight Limits DJI VISION App Rear LED flight indicator

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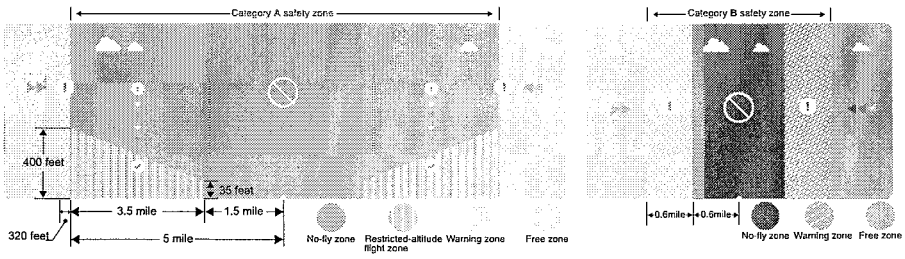
6.2 Flight Restriction of Restricted Areas

Category A Safety Zone

Category B Safety Zone



Ready to Fly G ····· Green flashing			
			R ·····

- R ·····

6.3 Conditions of Flight Limits

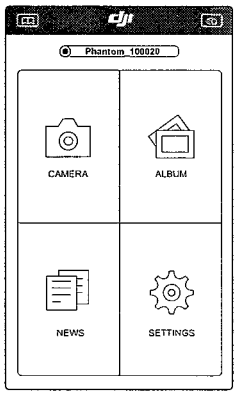
Phantom mode			

Naza-M mode				

6.4 Disclaimer

DJI VISION App Usage

1 DJI VISION App Main Menu



Icons	Description

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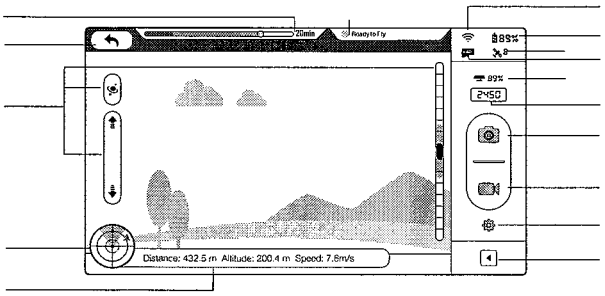
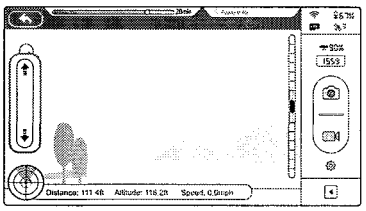
2 Camera Page



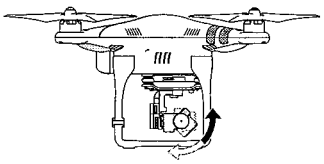
[1] Return

[2] Camera Pitch Control

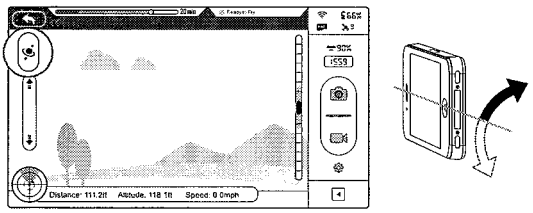
Gimbal pitch control (Normal Mode)



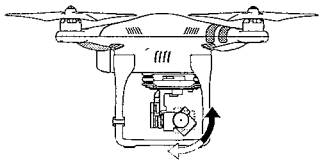
Gimbal pitch movement



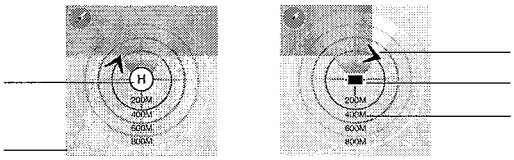
Gimbal pitch control (Accelerometer Sensor Mode)



Gimbal pitch movement



[3] Flight Attitude and Radar Function



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[4] Flight Parameters

[5] Wi-Fi Signal Strength

[6] Flight Battery Level

[7] Aircraft GPS Status

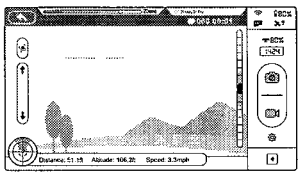
[8] Micro-SD Card Status

[9] Range Extender Battery Level

[10] Remaining Shots

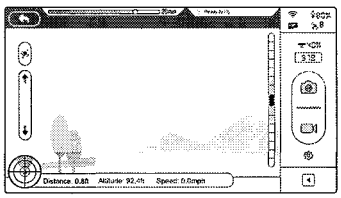
[11] Shutter Button

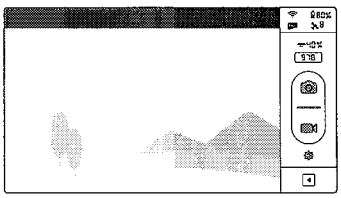
[12] Video Recording Button



[13] Camera Settings

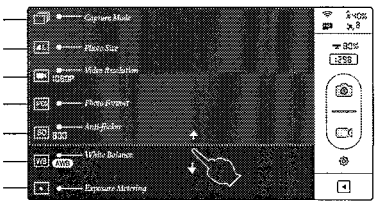
[14] Hide or Show Flight Parameters

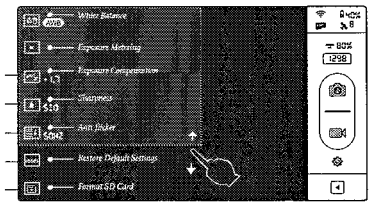




[15] Rear LED Flight Indicator Status

3 Camera Settings

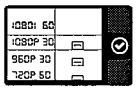




[1] Capture Mode

[2] Photo Size

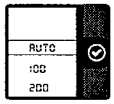
[3] Video Resolution



[4] Photo Format

JPEG	JPEG
RAW	

[5] Selectable ISO

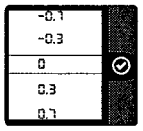


[6] White Balance

AWB	

[7] Exposure Metering

[8] Exposure Compensation



[9] Sharpness

STD	
HARD	
SOFT	

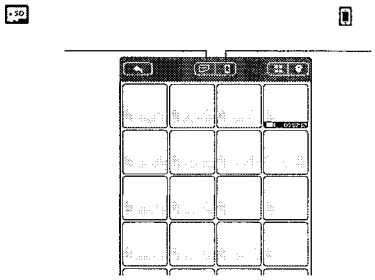
[10] Anti-flicker

AUTO	
50HZ	
60HZ	

[11] Restore Defaults

[12] Format Micro-SD Card

4 Album Page



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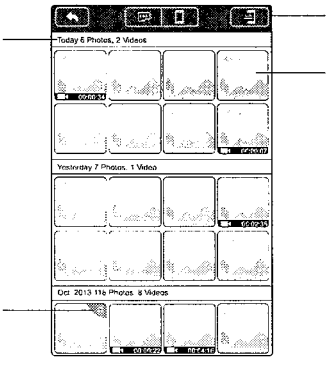
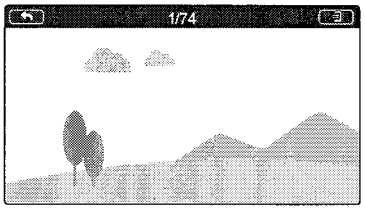
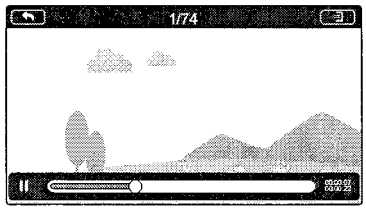
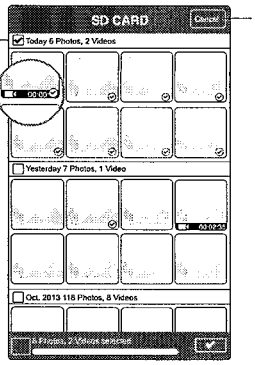
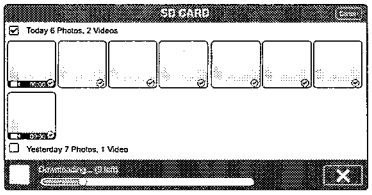
4.1 SD Card Album



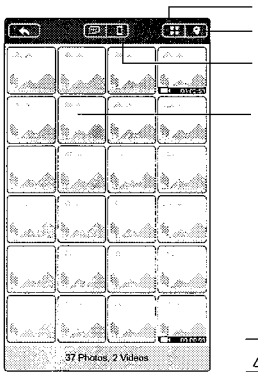


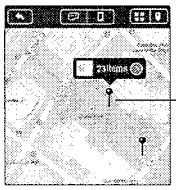


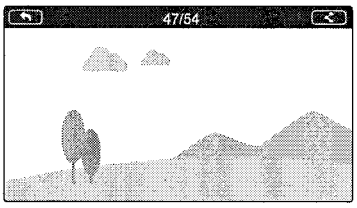


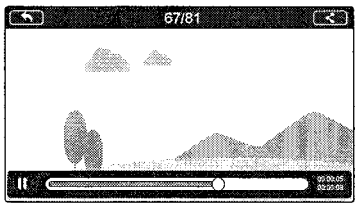


4.2 Mobile Device Photo Album

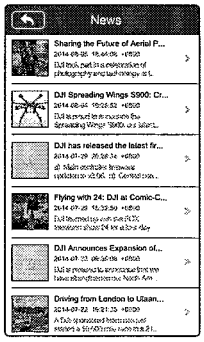


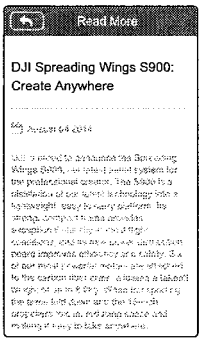




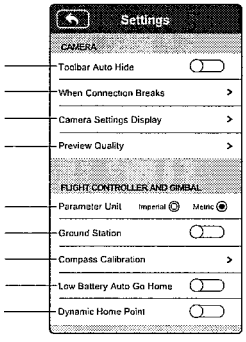


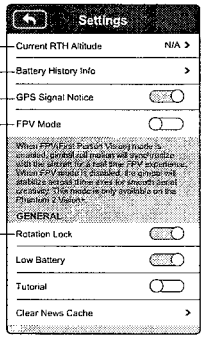
5 News Page

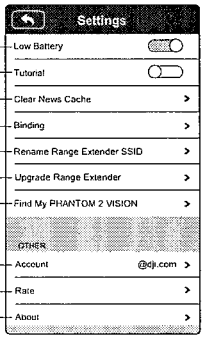




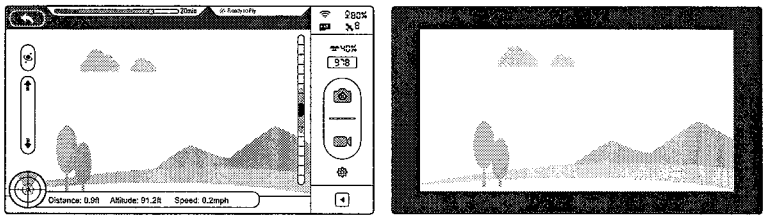
6 Settings Page



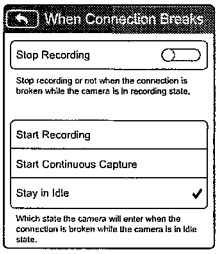




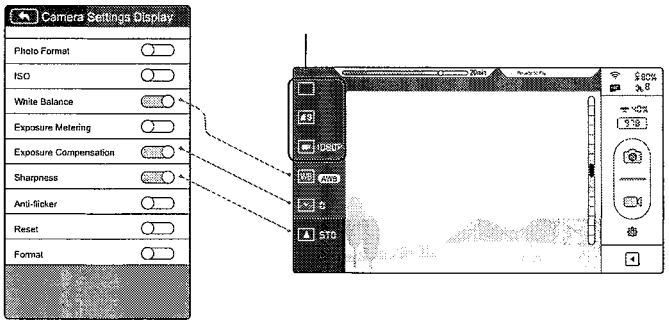
[1] Toolbar Auto Hide



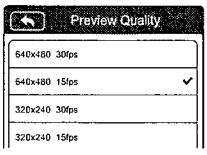
[2] When Connection Breaks



[3] Camera Settings Display



[4] Preview Quality



[5] Parameter Unit

[6] Ground Station

[7] Compass Calibration

[8] Low Battery Auto Go Home

[9] Dynamic Home Point

[10] Current RTH Altitude

[11] Battery History Info

[12] GPS Signal Notice

[13] FPV Mode

[14] Rotation Lock

[15] Low Battery Warning

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[16] Tutorial

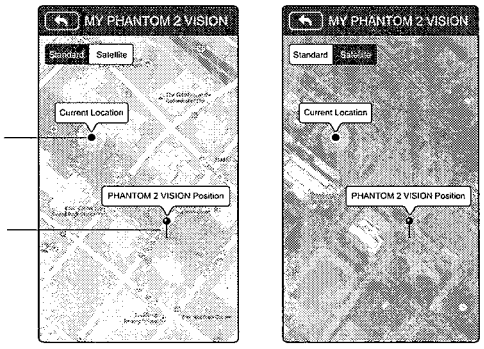
[17] Clear News Cache

[18] Binding

[19]

[20] Upgrade Range Extender

[21] Find My PHANTOM 2 VISION



[22] Account

[23] Rate

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[24] About

7 Ground Station

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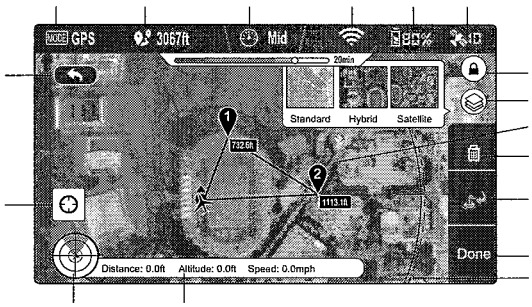
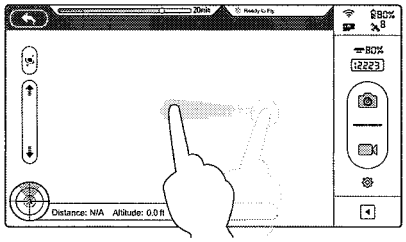
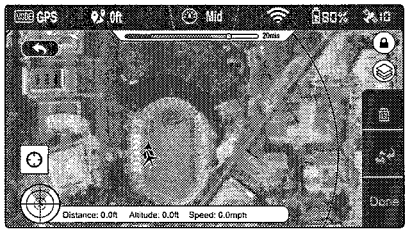
7.1 Ground Station GUI



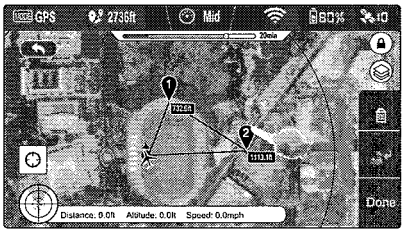
7.2 Using Ground Station

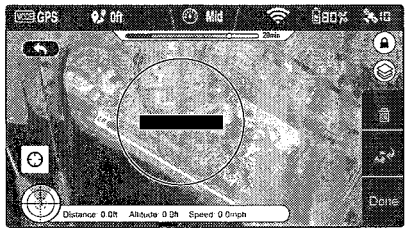
Step 1 Launching Ground Station:





Step 2 Setting a Waypoint:





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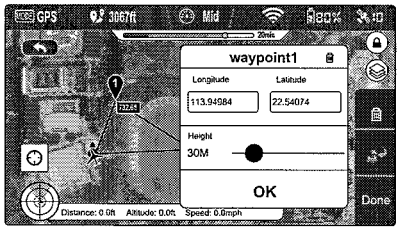

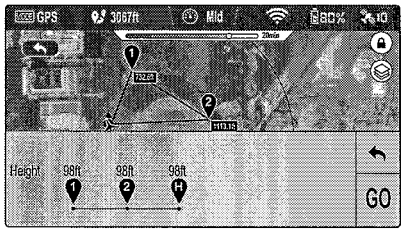

Step 3 Preview a Mission:

⚠ Aircraft reacts differently to the "GO" command:

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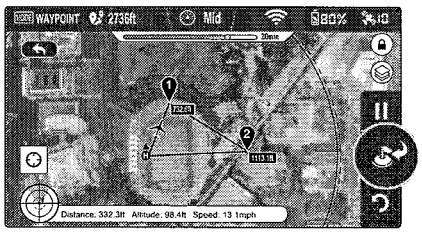
Step 4 Executing Flight Mission

Step 5 Landing



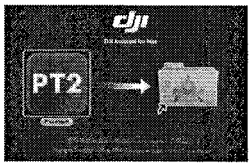
PC / MAC Assistant

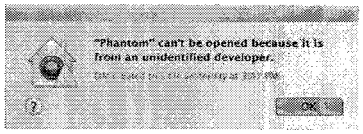
1 Installing Driver and Phantom 2 Vision+ Assistant

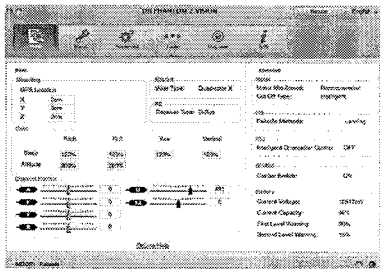
1.1 Installing and Running on Windows

⚠

1.2 Installing and Running on Mac OS X







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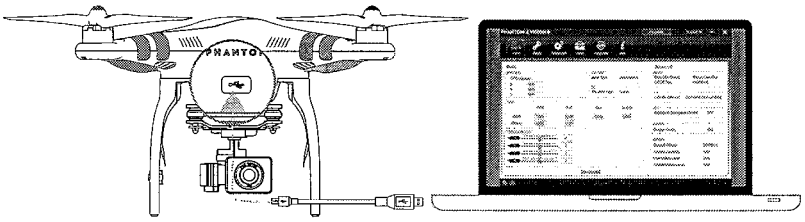
2 Using Assistant

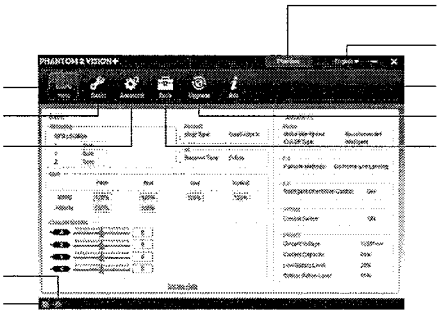
2.1 Using the Phantom 2 Vision+ Assistant



R B

G

B



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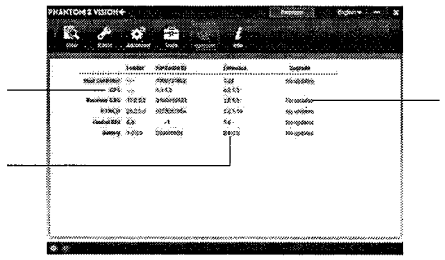
2.2 Firmware Upgrade of the Phantom 2 Vision+



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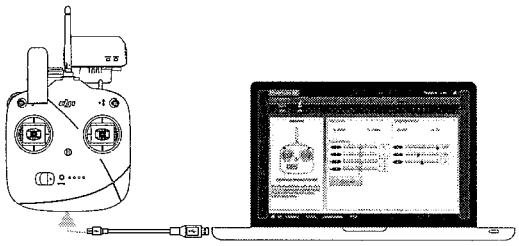
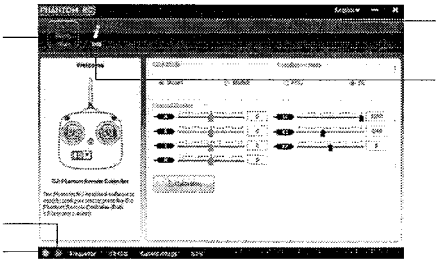
2.3 Using the Phantom RC Assistant



R B G

B



Appendix

1 Rear LED Flight Indicator Status

Rear LED Flight Indicators	Normal status
R G Y ·····	
Y G ·····	
G ·····	
Y ·····	
Rear LED Flight Indicators	**Abnormal status**
Y ·····	
R ·····	
R ·····	
R ·····	
R	
R Y ·····	

2 Specifications

Aircraft	
3-axial stabilized Gimbal	
Camera	

Remote Controller

Range Extender

3 Troubleshooting (FAQ)

3.1 How to solve large margin(s) mid-point error?

3.2 How to restore a video file if power is turned off during a recording session?

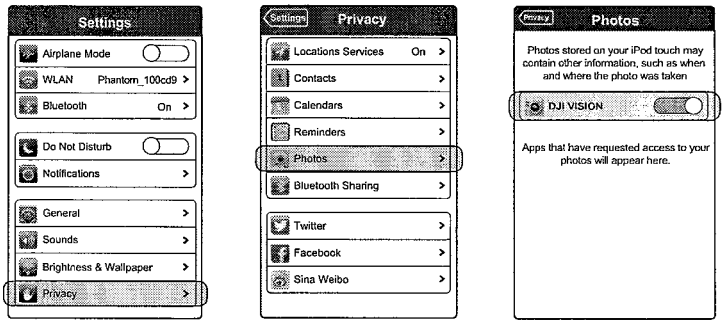
3.3 Failure to acquire the SSID.

3.4 What to do if Phantom 2 Vision+ is out of sight and the Wi-Fi connections is lost?

3.5 Wi-Fi connection fails all the time.

3.6 Files fail to synchronize.

3.7 iOS Albums fail to synchronize.



3.8 Failure to share.

3.9 Some Android devices have a problem connecting to the Phantom 2 Vision+ Wi-Fi Extender.

3.10 App tips for mobile devices.

3.11 How to land the aircraft more smoothly?

3.12 Why is the discharge time of a battery not zero when unused?

3.13 Do I need extra hardware to utilize ground station?

3.14 Does ground station support caching map data offline?

3.15 What if I accidently exit DJI Vision App in ground station mode?

http://www.dji.com/product/phantom-2-vision-plus

DECLARATION OF SERVICE

I am employed in the County of San Diego, State of California. I am over the age of 18 and not a party to the within action. My business address is 662 Encinitas Boulevard, Suite 260, Encinitas, CA 92024. On May 11, 2015, I served the foregoing documents, described as:

1. Exemption Request Section 333 FMRA (PaleoWest Archeology)

on the parties of interest as follows:

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

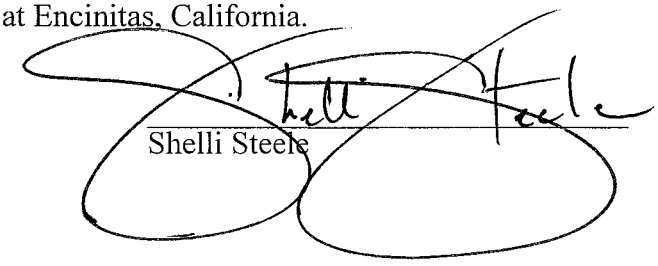
(X) **BY U.S. MAIL**
I placed a true and correct copy of said document(s) in sealed a envelope(s) addressed according to the above listed parties and deposited such envelope(s) in the mail at Encinitas, California. The envelope(s) was/were mailed with postage thereon fully prepaid.

I am "readily familiar" with the firm's practice of collection and processing correspondence for mailing. It is deposited with U.S. postal service on that same day in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

( ) STATE I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

(X) FEDERAL I declare that I am employed in the office of a member of the bar of this Court at whose direction the service was made.

Executed on May 11, 2015, 2015 at Encinitas, California.



Shelli Steele