

October 14, 2014

**PH: (512) 925-9595**

**FAX: (512) 301-8382**

U.S. Dept. of Transportation, Docket Operations

West Building Ground Floor, Room w12-140

1200 New Jersey Avenue, SE.,

VIA FEDERAL EXPRESS

Washington, DC 20590

VIA FEDERAL DOCUMENT MANAGEMENT SYSTEM

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

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the “Reform Act”) and 14 C.F.R. Part 11, Capital Aerial Video, LLC (CAV) seeks an exemption from Federal Aviation Regulations (“FARs”) detailed below for the following described Unmanned Aerial System called in this application the CAV System, which includes an Unmanned Aircraft (UA) and ground station-based equipment and crew:

**THE UNMANNED AIRCRAFT (UA):**

- A lightweight (5.3 lb gross weight with all on-board equipment), battery operated 6-motor rotorcraft in the form of a hexacopter that takes off and lands vertically, manufactured by DJI, Model F550, modified by the applicant to carry the following equipment in flight;
- An on-board flight computer with GPS navigation and location ability that receives signals for flight controls from a ground-based transmitter/controller;
- An on-board camera capable of capturing imagery in the form of full color, high definition still photos and video;
- An on-board telemetry system that delivers flight data from the on-board flight computer to the on-board radio transmitter including altitude AGL, horizontal and vertical speed, compass direction of flight and direction back to its launch site;
- A 600mW, 5.8GHz on-board radio transmitter that transmits live video from the on-board camera plus all the flight data from the telemetry system described above;

**THE GROUND STATION-BASED PART OF THE SYSTEM:**

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

The requested exemption would support an application for a commercial Certificate of

Authorization to use the above described CAV System to support aerial photography and video primarily of real property, specifically individual properties of at least two acres in size (equivalent to a square 295 feet/side).

The UA, powered by batteries, is smaller, lighter and more maneuverable than larger aircraft running on combustible fuel, it operates at lower altitudes with no people on board and will thereby reduce current risk levels and thereby enhance safety and diminish the likelihood of death or serious bodily injury. With a small payload and maximum flight time of only 15 minutes, this offers little or no risk to national security.

Low level oblique photos and video from several angles are far more effective than ground-based imagery for displaying the characteristics of large, complex properties with several buildings and large trees. The applicants in the past have chartered 2-seat full-sized helicopters for this purpose, which has proven more costly than many potential clients have been able to afford. The benefits of reduced cost and improved quality of presentation from the UA will be valuable to and benefit many buyers and sellers of real property.

Additionally, we request that we be allowed to use our system to benefit first responders nearby who might require assistance, including fire fighters, the police, the sheriff, et al., while remaining subject to all limitations cited in this application as we do so.

The CAV System will be operated in the field with both a PIC and a VO in accordance with FAA Policy N 8900.227 Section 14 "Operational Requirements for UAS" and with the following Restrictions:

- (a) No flight will be made with a UA Gross weight exceeding 55 pounds;
- (b) All operations must occur in FAA Class G airspace at no more than 400 ft AGL, at an airspeed of no more than 25 knots and no further than 3/4 NM from the PIC;
- (c) All operations must utilize a visual observer (VO). The VO and PIC must be able to communicate by voice at all times during a flight operation;
- (d) Operations will be restricted to flights over private property with the permission of the property owner;
- (e) The PIC must have accumulated and logged, in a manner consistent with 14 CFR § 61.51 (b), a minimum of 100 flight cycles and 25 hours of total time as a UA rotorcraft pilot and at least ten hours logged as a UA pilot with a similar UA type;
- (f) All required permits will be obtained from state and local government prior to operation;
- (g) The CAV System will not be operated over densely populated areas;
- (h) The CAV System will not be operated at air shows;
- (i) The CAV System will not be operated over any open-air assembly of people;
- (j) The CAV System will not be operated over heavily trafficked roads;
- (k) The CAV System will not be operated within 5 NM of an airport or heliport;
- (l) The CAV System will not be operated over properties smaller than two acres in size;
- (m) Operations will be restricted to day only and weather conditions equivalent to VFR;
- (n) The PIC will brief the VO and property owner about the operation and risk before the first flight at each new location;
- (o) No flight may be made without a Pre-Flight Inspection by the PIC before each operation to ascertain that the UA is in a condition safe for flight (see Appendix A).

The PIC and VO will meet the requirements outlined in FAA Policy N 8900.227 Section 16 personnel Qualifications. Additionally, the PIC and VO will perform maintenance on the system and will complete a course of maintenance instruction as part of their initial training.

We submit that the combination of the UA's light weight, flight performance and ability, fully qualified flight crew and strict operation under the guidelines established in 8900.227, and under all of the Restrictions (a) through (o) listed above, the FAA can have full confidence that the operation will have an equivalent or greater level of safety than manned aircraft performing the same mission.

The name and contact information of the applicant are:

Capital Aerial Video, LLC

Attn: Alston Boyd

Ph: 512-925-9595

Fax: 512-301-8382

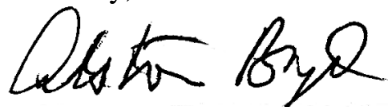
Email: alston@boyd2.com

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

- 14 CFR Part 21.....Addendum Page 1
- 14 CFR 91.203.....Addendum Page 1
- 14 CFR 45.23, 45.29.....Addendum Page 2
- 14 CFR 91.9.....Addendum Page 2
- 14 CFR 61.113, 61.133.....Addendum Page 2
- 14 CFR 91.109, 91.119, 91.121.....Addendum Page 3
- 14 CFR 91.151.....Addendum Page 4
- 14 CFR Subpart E (91.401 - 91.417) .....Addendum Page 4
- FAA Policy 8900.227 Paragraph 16(c)(4) and Paragraph 16(e)(1) ...Addendum Page 4

We are prepared to modify or amend any part of this request to satisfy the need for an equivalent level of safety. Please contact us at any time if you require additional information or clarification. We look forward to working with your office.

Sincerely,



Alston Boyd, Partner

Capital Aerial Video, LLC

Commercial Pilot Certif. No. 1689774

Addendum containing Exemption Requests and Equivalent Level of Safety

Appendix A – Flight Manual

Appendix B – Owner's Manual for UA

## **ADDENDUM**

### **EXEMPTION REQUESTS AND EQUIVALENT LEVEL OF SAFETY**

Capital Aerial Video, LLC, requests an exemption from the following regulations as well as any additional regulations that may technically apply to the operation of the CAV System:

#### **14 CFR Part 21, Subpart H: Airworthiness Certificates**

This part establishes the procedures for the issuance of an airworthiness certificate. While the FAA continues to work to develop airworthiness standards for Unmanned Aerial Systems, we request an experimental certificate be issued for the CAV System under either or both of the following provisions:

21.191 Experimental certificates.

Experimental certificates are issued for the following purposes:

**(a) *Research and development.*** Testing new aircraft design concepts, new aircraft equipment, new aircraft installations, new aircraft operating techniques, or new uses for aircraft.

**(b) *Showing compliance with regulations.*** Conducting flight tests and other operations to show compliance with the airworthiness regulations including flights to show compliance for issuance of type and supplemental type certificates, flights to substantiate major design changes, and flights to show compliance with the function and reliability requirements of the regulations.

Since the experimental certificate can be used for commercial purposes such as market surveys, sales demonstrations, and customer crew training, we would expect that an experimental certificate would permit our commercial purpose as well.

The aircraft will not carry persons or property, will not carry fuel, and will only fly under strict operational requirements. Combined with the UA's light weight, being constructed primarily of carbon fiber and plastic, we propose that the UA will be at least as safe, if not safer, than a conventionally certificated aircraft performing the same mission.

If an experimental airworthiness certificate is not appropriate for this application, then we request an exemption of 14 CFR Part 21, Subpart H, and the requirement for an airworthiness certificate in general, citing the equivalent level of safety outlined in the previous paragraph.

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

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

At a maximum gross weight of 5.3 pounds, the UA is too small to carry documentation, does not have an entrance, and is not capable of carrying passengers or crew. To obtain an equivalent level of safety and meet the intent of 91.203, we propose that documents deemed appropriate for this aircraft by the FAA will be co-located with the crew at the ground control station and available for inspection upon request. In order to identify the aircraft, we propose that the information found on airworthiness and registration certificates be permanently affixed to the aircraft via placard containing the following information plus the word "EXPERIMENTAL" to

satisfy the requirement of 14 CFR 45.23, which follows immediately after the proposed placard description below:

**EXPERIMENTAL**

Manufacturer: DJI Innovations, Inc.  
950 E Baseline Ave. Ste. 210  
Apache Junction AZ 85119  
Model: F550, Serial Number: DJ13-00937

If found please contact: (512) 925-9595

**14 CFR 45.23 Display of marks; general and 45.29 Size of marks.**

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 3 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station. The UA does not have an entrance in which the word "EXPERIMENTAL" can be placed, and may not have a registration number assigned to it by the FAA.

We propose to achieve an equivalent level of safety by including the word "EXPERIMENTAL" in the placard on the top of the aircraft, as shown above, where the PIC, VO and others in the vicinity of the aircraft while it is preparing for launch will be able to see the designation. Additionally, we feel that the permanent placard discussed in the previous paragraph will provide the aircraft's registration information at the ground station. Finally, we will display at the ground station a high contrast flag or banner that contains the words "Unmanned Aircraft Ground Station" in letters 3 inches high or greater. Since the aircraft will operate within 3/4 NM of the ground station, the banner should be visible to anyone that observes the aircraft and chooses to investigate its point of origin.

**14 CFR 91.9 Civil aircraft flight manual, marking, and placard requirements.**

This regulation provides that no person may operate an aircraft unless a current, approved flight manual is in the aircraft. We assume that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. We request an exemption to this requirement since the aircraft is not only too small to carry documentation, the documentation would not be available to the crew during flight operations.

To obtain an equivalent level of safety and meet the intent of 91.9, we propose that a current, approved UA Flight Manual (Appendix A) must be available to the crew at the ground station anytime the aircraft is in, or preparing for, flight.

**14 CFR 61.113 Private pilot privileges and limitations: Pilot in Command and 61.133 Commercial pilot privileges and limitations.**

The regulation provides that no person that holds a private pilot certificate may act as pilot in command of an aircraft for compensation or hire. Subparagraph (b) allows a private pilot to act as pilot in command of an aircraft in connection with any business or employment if: (1) The flight is only incidental to that business or employment; and (2) The aircraft does not carry passengers or property for compensation or hire.

Our proposed operations require that the PIC must either

1. Hold a Commercial Pilot Certificate issued by the FAA, and have logged 25 hours of flight experience in this type of UA, or
2. Meet the requirements of 8900.227 para 16(c)(2)(c) "Operations without a pilot certificate" in which the PIC is required to complete "FAA private pilot ground instruction" and pass "the FAA Private Pilot written examination." Since there are currently no means available for the pilot of a UAS to gain the experience in an equivalent category and class in order to apply for a commercial pilot's license, we propose to generate an equivalent level of safety by requiring our pilots to complete, at a minimum, FAA commercial pilot ground instruction and pass the FAA Commercial Pilot written examination in addition to completing the private pilot requirements. Since the aircraft cannot carry passengers or property, we feel we meet the intent of 61.113 Subparagraph (b) even though the intent of this application is to conduct a business.

#### **14 CFR 91.109 Flight Instruction; Simulated instrument flight and certain flight tests**

The regulation states that "No person may operate a civil aircraft that is being used for flight instruction unless that aircraft has fully functioning dual controls."

The CAV System ground-based control station consists of a small hand-held radio transmitter and while it does not offer a second set of "controls", both the student and instructor can, and will, operate the single set of controls simultaneously. With both student and instructor having "hands-on" the controls during flight, we feel that this technique meets the intent 91.109 and provides an equivalent level of safety.

#### **14 CFR 91.119 Minimum safe altitudes: General.**

The regulation states that over sparsely populated areas the aircraft cannot be operated closer than 500 feet to any person, vessel, vehicle, or structure. Since the aircraft will be operating at a maximum of 400 feet AGL, we cannot comply with this requirement.

In order to provide an equivalent level of safety we will only fly over private property with a size of at least two acres with the permission of the owner of the property flown over. The aircraft will not be operated over congested areas or over any open air assembly of persons. The property owner will be briefed on the expected route of flight and the associated risks to persons and property on the ground. The aircraft will be operated at a low altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface. Therefore we maintain that due to the small size of the UA, the hazard to persons, vehicles and structures is minimal compared to manned aircraft, which should be considered in granting the exemption.

#### **14 CFR 91.121 Altimeter settings.**

The regulation requires that aircraft shall maintain cruising altitudes by reference to an altimeter setting available within 100 NM of the aircraft.

The UA will always fly below 400 feet AGL and will not need to maintain cruising altitudes in order to prevent conflict with other aircraft. An Above Ground Level altimeter measurement above the takeoff point is transmitted via radio from the UA on-board computer to the display screen held by the PIC, providing a constantly updated AGL readout.

**14 CFR 91.151 Fuel requirements for flight in VFR conditions.**

The regulation provides that no person may begin a flight in an airplane under day-VFR conditions unless there is enough fuel to fly to the first point of intended landing and to fly after that for at least 30 minutes.

We feel the intention of this paragraph is to provide an energy reserve as a safety buffer for delays to landing. The UA is battery operated and the maximum duration of flight from a single battery charge is 12 minutes with a 20% reserve. Since the aircraft will never fly more than 3/4 NM from the point of intended landing, a full battery charge at launch will ensure that we meet the reserve energy requirement of this paragraph. We request an exemption to the word "fuel" and ask for an equivalent interpretation with the word "energy".

**14 CFR Subpart E (91.401 - 91.417) - Maintenance, Preventive Maintenance, Alterations**

The regulation provides that the operator is primarily responsible for maintaining the aircraft in an airworthy condition, including compliance with part 39 and 43. Paragraphs 91.407 and 91.409 require that the aircraft be "approved for return to service by a person authorized under 43.7" after maintenance and inspection.

It is our intention that the PIC perform maintenance and inspection of the aircraft and "be authorized to approve the aircraft for return to service." As provided in the Pre-Flight Checklist in Appendix A, the PIC will ensure that the aircraft is in an airworthy condition prior to every flight and in addition conduct detailed inspections after every two hours of flight. Maintenance performed by the PIC is limited to repairing small cracks, replacing a propeller, checking electrical connections and updating software and firmware for the on-board computer. All other maintenance will be performed by the manufacturer or their designated repair facility. The PIC will document work performed in accordance with 91.417. We feel that due to the size, construction, and simplicity of the aircraft, the PIC can ensure an equivalent level of safety.

**8900.227 Paragraph 16(c)(4) PIC Medical. and Paragraph 16(e)(1) Observer Medical.**

This policy provides that both the PIC and VO must have a valid FAA second-class medical certificate issued under part 67 in order to perform as a pilot or observer.

The UA maximum gross weight is 5.3 pounds, it is constructed of carbon fiber and plastic and the PIC is not on board. Both the PIC and the VO are required to be in VLOS. Given the unlikely event that both the PIC and VO become medically incapacitated while the aircraft is in flight, the UA will return autonomously to the site of launching and land without crew intervention. Therefore, requiring the PIC and VO to meet the same medical requirements as a commercial pilot carrying passengers in a large aircraft is an unnecessary burden.

We propose that the minimum medical requirements for the PIC and VO be vision corrected to 20/20 and a valid, state issued driver's license. The 20/20 vision requirement will ensure that the PIC and VO can see and avoid air traffic; a licensed driver is medically qualified to operate a much larger vehicle.

## **APPENDIX A – FLIGHT MANUAL**

### **FLIGHT RESTRICTIONS**

- (a) No flight will be made with a UA Gross weight exceeding 55 pounds;
- (b) All operations must occur in FAA Class G airspace at no more than 400' AGL, at an airspeed of no more than 25 knots and no further than 3/4 NM from the PIC;
- (c) All operations must utilize a visual observer (VO). The VO and PIC must be able to communicate verbally at all times during a flight operation;
- (d) Operations will be restricted to flights over private property with the permission of the property owner;
- (e) The PIC must have accumulated and logged, in a manner consistent with 14 CFR § 61.51 (b), a minimum of 100 flight cycles and 25 hours of total time as a UA rotorcraft pilot and at least ten hours logged as a UA pilot with a similar UA type;
- (f) All required permits will be obtained from state and local government prior to operation;
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- (h) The CAV System will not be operated at air shows;
- (i) The CAV System will not be operated over any open-air assembly of people;
- (j) The CAV System will not be operated over heavily trafficked roads;
- (k) The CAV System will not be operated within 5 NM of an airport or heliport;
- (l) The CAV System will not be operated over properties smaller than two acres in size;
- (m) Operations will be restricted to day only and weather conditions equivalent to VFR;
- (n) The PIC will brief the VO and property owner about the operation and risk before the first flight at each new location;
- (o) No flight may be made without a successful Pre-Flight Inspection by the PIC before each operation to ascertain that the UA is in a condition safe for flight.

### **PRE-FLIGHT CHECKLIST**

- (1) Use voltmeter to determine that UA battery is fully charged in order to prevent unexpected premature descent;
- (2) Check all wiring connections are tight;
- (3) Check all propellers are undamaged and no cracks exist in any structural members of the UA;
- (5) Turn on radio controller, check for adequate voltage, set it to connect to the UA, move all control switches to forward or down position and throttle control stick full back position;
- (6) Connect UA main battery, check for radio contact with UA's radio receiver;
- (7) At a location different from previous flight, re-set GPS and compass to current location;
- (8) Turn on transmitter, gimbal and camera.

### **TO REGAIN CONTROL AFTER LOST RADIO CONTACT**

- 1. Failsafe = ON**
- 2. Throttle = 50%**
- 3. Mode = ATTI**
- 4. Failsafe = OFF**
- 5. Mode = GPS**

If radio contact is not restored, the UA will automatically continue at 60 ft above its last elevation before losing contact toward its takeoff point, then descend and land there autonomously
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# DIAGRAM OF UA FLIGHT CONTROLS

(Excludes controls not used or not connected to UA)

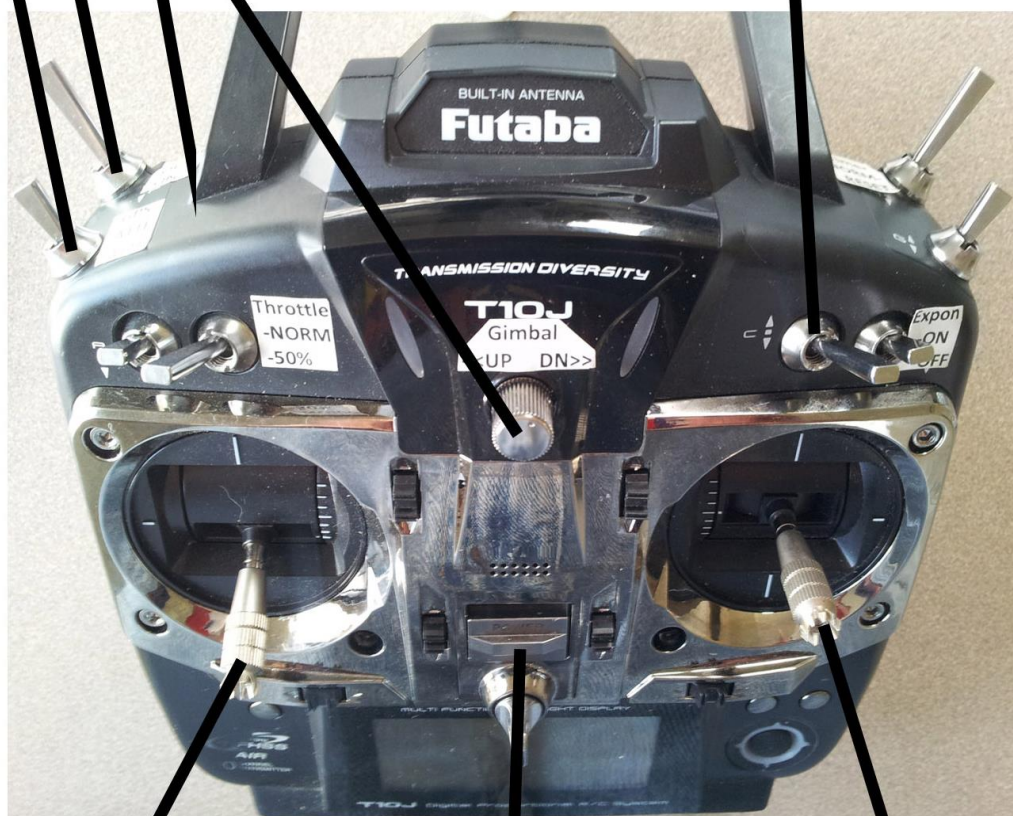
**Sw E:** Down=OPERATION WITH GPS LOCATOR ON  
 Middle=OPERATION WITHOUT GPS  
 Up=AEROBATIC-NOT USED

**Sw F:** Up=FAILSAFE=RETURN HOME AUTONOMOUSLY  
 Down=NORMAL OPERATION

**Sw B:** Forward=NORMAL OPERATION  
 Back=THROTTLE SET AT 50%=HOVER

**Sw C:** Forward=GEAR DOWN  
 Back=GEAR UP

VR-CAMERA GIMBAL CONTROL KNOB



**4-Way Stick-Left**  
 Forward=THROTTLE UP  
 Back=THROTTLE DOWN  
 Left=TURN LEFT  
 Right=TURN RIGHT

**Power Switch**  
 Up=ON  
 Down=OFF

**4-Way Stick-Right**  
 Forward=MOVE FORWARD  
 Back=MOVE BACKWARD  
 Left=MOVE LEFT  
 Right=MOVE RIGHT

# FlameWheel550

## User Manual

V 1.9

2013.03.13 Revision



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

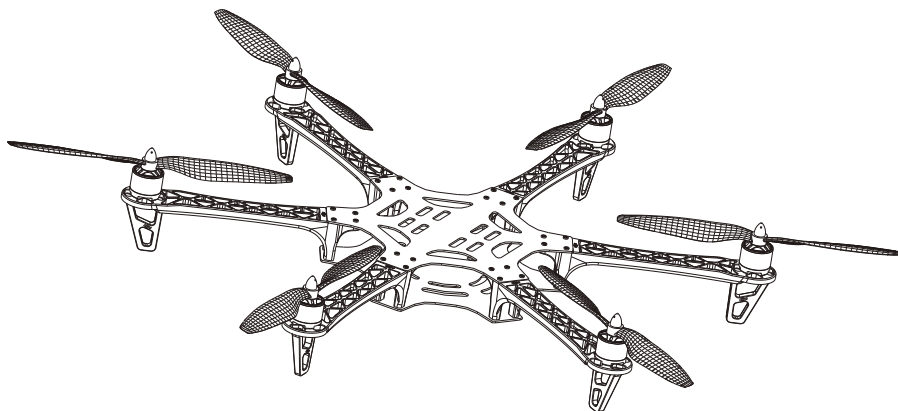
# Disclaimer

Read this disclaimer carefully before using FlameWheel550. By using this product, you hereby agree to this disclaimer and signify that you have read them fully. FlameWheel550 is an excellent multi-rotor. With a good autopilot, it will even offer tremendous flight features for low altitude flight working in restricted space. Despite the controller of autopilot operates in the safest manner when the main power battery is connected, we strongly recommend customers to remove all propellers, use power supply from R/C system or flight pack battery, and keep children away during system calibration and parameter setup. Please respect the AMA's National Model Aircraft Safety Code. DJI Innovations assumes no liability for damage(s) or injuries incurred directly or indirectly from the use of this product.

DJI FLAME WHEEL is registered trademark of DJI Innovations. Names of product, brand, etc., appearing in this manual are trademarks or registered trademarks of their respective owner companies. This product and manual are copyrighted by DJI Innovations with all rights reserved. No part of this product or manual shall be reproduced in any form without the prior written consent or authorization of DJI Innovations. No patent liability is assumed with respect to the use of the product or information contained herein.

## F550 Profile

FlameWheel550 (F550) is a multi-rotor designed for all pilots for fun or AP. With DJI WKM or NAZA autopilot system, it can achieve hovering, cruising, even rolling and other flight elements. It can be applied for entertainment, aerial photography, FPV and other aero-modeling activities.



# Contents

Disclaimer.....	2
F550 Profile .....	2
Contents .....	3
Product Usage Cautions.....	3
In Box .....	4
Tools Needed .....	5
ESC Wiring.....	5
Assembly.....	6
ESC Sound Introduction .....	7
Specifications .....	7

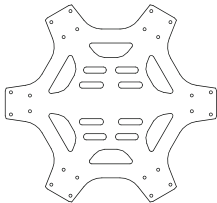
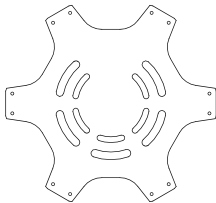
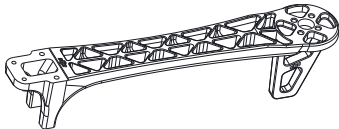
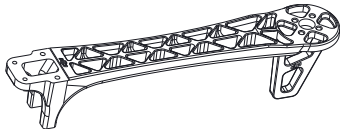
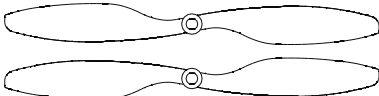
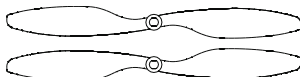

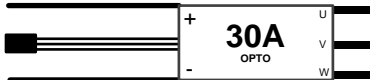
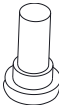
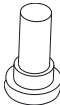
## Product Usage Cautions

When flying, the fast rotating propellers of FlameWheel550 will cause serious damage and injury. Therefore, please fly with a high safety consciousness.

- 1. Keep flying multi-rotor away from objects, such as obstacles, children, human beings, high-voltage lines and so on.**
- 2. Do not get close to or even touch the working motors and propellers, which will cause serious injury.**
- 3. Do not over load the multi-rotor.**
- 4. Check that the propellers and the motors are installed correctly and firmly before flight.**
- 5. Make sure the rotation direction of each propeller is correct**
- 6. Check whether all parts of multi-rotor are in good condition before flight. Do not fly with old or broken parts.**
- 7. Use DJI parts as much as possible.**

If you have any problem you cannot solve during installation, please contact our customer service.

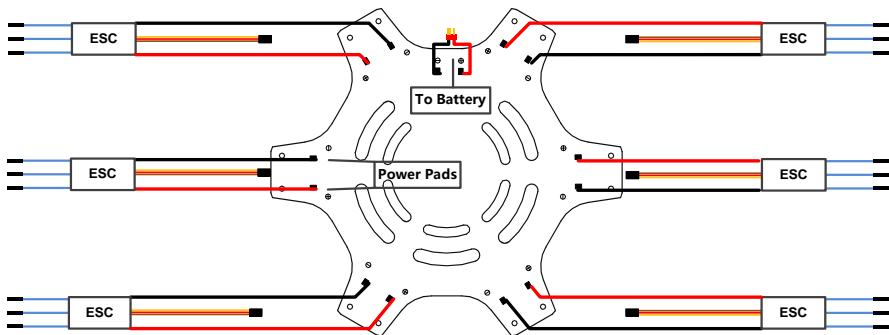
# In Box

Top Board <b>550FBT</b> x1	Bottom Board <b>550FBB</b> x1
	
Arms <b>550FAC</b> x4	<b>550FAW</b> x2
	
10in Propeller Pairs <b>550P10</b> x4	8in Propeller Pairs <b>550P08</b> x4
	
Motors <b>550MOT</b> x6	ESC <b>550ESC</b> x6
	
Screws <b>550-M3x8</b> x24	Screws <b>550-M2.5x6</b> x36
	
Magic Strap <b>550MSX</b> x1, Battery Band <b>550BBX</b> x1, Power Line Pair <b>550PLP</b> x1	

# Tools Needed

<b>2.0mm Hex Wrench</b>	For frame and motors installation.
<b>Screw Glue</b>	For fastening screws.
<b>Nylon Cable Tie</b>	
<b>Scissors</b>	For binding devices and wires.
<b>Diagonal Cutting Pliers</b>	
<b>Foam Double Sided Adhesive Tape</b>	For fixing receiver, controller and other modules.
<b>Soldering-iron &amp; Wires</b>	For connecting ESCs' power cables to bottom board.

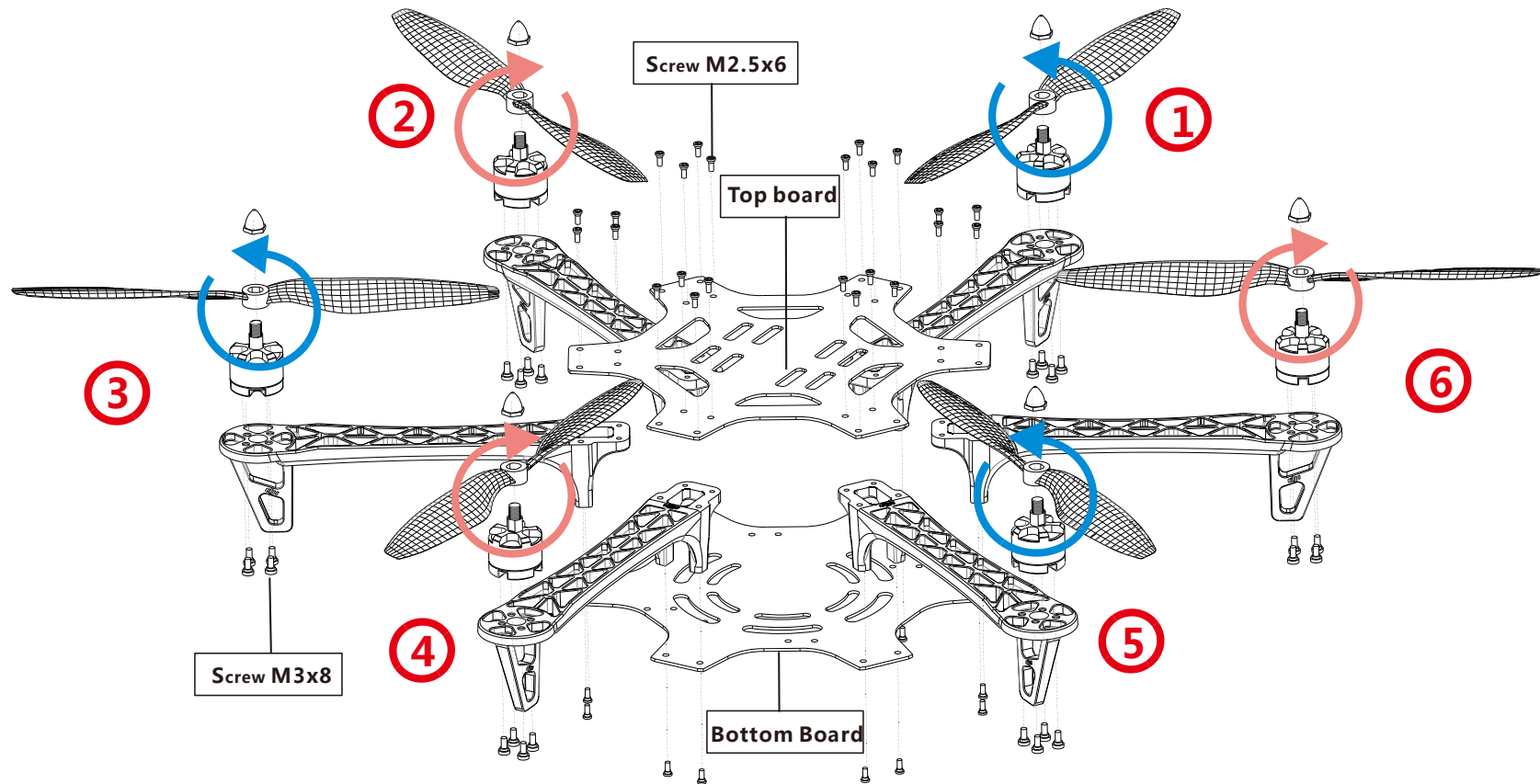
## ESC Wiring



### Important

- Please solder ESCs to power pads on bottom board as the figure shows.
- Use any insulating method at all soldering spots. Make sure there is no short or open circuit.
- Make sure the side of power pads is upward.
- Make sure the rotation direction of each motor is the same as the way in the figure of “**Assembly**” shows. If not, switch any of two wire connections of the incorrect motor to change its rotation direction.

# Assembly



- Install screws by appropriate force to prevent breaking threads.
- Use adequate screw glue for installing screws. 

- Please wire neatly. Make sure wires will not be cut by frame boards and propellers.
- Smooth out the boards edge if necessary.

- Please install propellers after autopilot system configuration procedure.
- Make sure the rotation direction of propellers are the same as the figure shows.
- When mounting the propellers, do not use any thread locker, just tighten the nuts to the end manually then use the wrench to tighten it about 50°.

In up figure, arms ③③ front of craft, arms ③⑤ are back of craft. See from top, motors on arms ③③⑤ rotate counter-clock wise, use propellers 1038; motors on arms ③④⑥ rotate clock wise, use propellers 1038R.

# ESC Sound Introduction

ESC State	Sound
Ready	J1234567
Throttle stick is not at bottom	BBBBBB...
Input signal abnormal	B-----B-----B...
Input voltage abnormal	BB---BB---BB---BB...

## Tips:

DJI ESCs are specially designed for multi-rotors. When use with DJI autopilot systems, you do not have to setup any parameters or calibrate travel range.

# Specifications

Frame	
Diagonal Wheelbase	550mm
Frame Weight	478g
Takeoff Weight	1200g ~ 2400g
ESC	
Current	30A OPTO
Signal Frequency	30Hz ~ 450Hz
Battery	3S ~ 4S LiPo
Motor	
Stator size	22×12mm
KV	920rpm/V
Propeller	10 × 3.8in (@3S); (Optional 8 × 4.5in (@4S))