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

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

May 5, 2015

Exemption No. 11454
Regulatory Docket No. FAA–2015–0229

Mr. L. Michael Trenkle
CEO
Between the Peaks Aviation, Inc.
1660 Prominence Circle
Elizabeth, CO 80107

Dear Mr. Trenkle:

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

By letter dated January 28, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Between the Peaks Aviation, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct aerial data acquisition, photography, and film work in the areas of construction, agriculture, infrastructure, real estate, and other applicable areas.

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

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

Airworthiness Certification

The UAS proposed by the petitioner is a DJI Spreading Wings S1000.

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

The Basis for Our Decision

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

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

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

Our Decision

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

Conditions and Limitations

In this grant of exemption, Between the Peaks Aviation, Inc. is hereafter referred to as the operator.

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

1. Operations authorized by this grant of exemption are limited to the DJI Spreading Wings S1000 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 May 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC
Regulatory Docket No. _____

IN THE MATTER OF THE PETITION FOR EXEMPTION OF:
BETWEEN THE PEAKS AVIATION, INC.,
FOR AN EXEMPTION SEEKING RELIEF FROM THE REQUIREMENTS OF
TITLE 14 OF THE CODE OF FEDERAL REGULATIONS
14 C.F.R §§ 35 Part 21; and 91.7; 91.103(b); 91.109; 91.119; 91.121; 91.151; 91.405(a); 91.407(a)(1); 91.409(a)(1) & (a)(2); AND 91.417(a) &(b); 91.7(a)
CONCERNING COMMERCIAL OPERATION OF THE
DJI SREADING WINGS S1000 UNMANNED AIRCRAFT SYSTEM
PURSUANT TO SECTION 333 OF
THE FAA MODERNIZATION AND REFORM ACT OF 2012 (PUBLIC LAW 112-95)

Submitted on January 28, 2015
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CEO

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SUMMARY

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the "Reform Act") and 14 C.F.R. Part 11, Between the Peaks Aviation, Inc., seeks an exemption from Federal Aviation Regulations ("FARs"); C.F.R. 45.23(b); 14 C.F.R. Part 21; 14 C.F.R. 61.113(a)&(b); 91.7(a); 91.9(b) (2); 91.103(b); 91.105;(2) and (b) 91.109; 119.121; 91.151(a); 91.203(a)&(b); 91.405(a); 91.407(a) (1); 91.409(a) (2); 91.417(a)&(b). This exemption will permit Between the Peaks Aviation, Inc., (hereinafter referred to as "Between the Peaks Aviation") is an unmanned aircraft solutions provider with services for state, local, and commercial clients. Between the Peaks Aviation is focused on providing solutions for utilizing unmanned aircraft for aerial data acquisition, photography and film work in the areas of Construction, Agriculture, Infrastructure, Real Estate, and other applicable areas.

INTRODUCTION

L. Michael Trenkle, and The Company formed by him, Between the Peaks Aviation Inc, (both L. Michael Trenkle and Between the Peaks Aviation Inc., hereinafter known as Between the Peaks Aviation) seeks an exemption to operate the DJI Spreading Wings S1000, for compensation or hire within the national airspace system (NAS).

The DJI Spreading Wings S1000 UAS is a professional level flight platform manufactured by DJI, a multi-rotor manufacturer established in 2006 that has a history of producing leading edge UAS platforms and safety systems for the professional UAS operator around the world.

The DJI Spreading Wings S1000 UAS (hereinafter known as the UAS) is comprised of a Radio Controlled eight motor, multi-rotor unmanned aircraft system (UAS). The UAS has direct pilot intervention at all times. Redundant automated systems are in place to assist the pilot and ensure that at no time is safety compromised by a lost link situation. Between the Peaks Aviation has integrated a transportable ground control station as part of the UAS flight system. The DJI Spreading Wings S1000 UAS has a maximum gross weight of approximately twenty five (25) pounds, (typical net weight is in the eighteen pound range), while having a diameter of 41 inches. The UAS is equipped with eight propellers and eight motors driven by Lithium Polymer batteries. Maximum speed of approximately 40mph, maximum rate of climb: 1180fpm, and a maximum wind component of <8m/s (17.9mph / 28.8km/h). Maximum flight times of forty (40) minutes with the capability to hover, and move in the vertical and horizontal plane simultaneously. Maximum altitude is four hundred (400) feet limited by Between the Peaks Aviation, vertical line of sight (VLOS) requirements.

To maintain vertical line of sight (VLOS) requirements, the UAS is equipped with distance limiting programs to ensure that the UAS and /or the pilot do not operate the aircraft beyond a predetermined range. Between the Peaks Aviation will not operate in anything but Visual Meteorological Conditions (VMC), no less than five hundred (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.

The radio frequencies and equipment utilize either the 2.4mhz spectrum or the 900mhz spectrum. All equipment has the appropriate FCC authorization / approval to transmit on the radio frequencies used for

UAS uplink and downlink of control, telemetry, and payload information. (See attached FCC compliance statements submitted as part of this request).

BACKGROUND OF PETITIONER

I, L. Michael Trenkle, have been a licensed pilot for fourteen years and have been active in model aviation for over twenty five years. I have several thousand hours in combined full scale and model aviation, including scale air racing, aerobatic competition and over twenty years in model helicopter flight experience.

With the years of experience in flight attained, I recognize the importance of safety as the first and foremost consideration in aviation. There are many operators of small unmanned aircraft systems that are either unaware or unwilling to adhere to the strict safety guidelines that the FAA has instituted over the years to ensure the safety of the National Airspace System as well as persons and property on the ground. With these issues in mind, Between the Peaks Aviation Inc. seeks to offer safe and legal unmanned aerial options for data collection, mapping and surveying, photography, and agriculture services for state, local and commercial clients.

Between the Peaks Aviation is committed to safety in all of its operations, as such, Between the Peaks Aviation has developed multiple safety protocols, both in its operations and its flight platforms to ensure every level of safety and minimize the risk of damage to persons or property on the ground or in the air (NAS) and to comply with all state, local, and FAA regulations.

PUBLIC INTEREST

Currently, aircraft for aerial data acquisition, photography and film and other aerial operations, utilize manned aircraft, fixed wing or helicopters, that weigh thousands of pounds and can carry upwards of two hundred gallons of fuel. To perform aerial operations as described herein, these aircraft must fly at lower altitudes, increasing the risk to those on the ground and in the airspace, and contribute to a high level of noise pollution which can disturb citizens or animals while performing these operations. Between the Peaks Aviation is concerned with safety and the impact on the community and environment. Utilizing small unmanned aerial systems, minimizes the impact to the environment and to the community as a whole. Operating small electric powered UAS's, poses no risk of fuel spillage or contamination in the event of an accident. In the unlikely event of an accident, the small size of the UAS eliminates the risk to health and safety to onboard pilots and passengers and minimizes if not altogether removes the hazards to persons on the ground. Sound pollution is almost nonexistent, due to clean quiet electric operation.

Between the Peaks Aviation believes that responsible and safe UAS operations must be utilized to allow for UAS operations to continue.

SPECIFIC SECTIONS OF 14 CFR WHICH BETWEEN THE PEAKS AVIATION SEEKS EXEMPTION

Petitioner, Between the Peaks Aviation, pursuant to the provisions of the Federal Aviation Regulations (14 C.F.R. § 11.61) and the FAA Modernization and Reform Act of 2012, Section 333, *Special Rules for Certain Unmanned Aircraft Systems,* hereby petitions the Administrator to operate the S1000 UAS in the national airspace system, and for an exemption from the requirements of 14 C.F.R Part 21, §§ 91.103(b) 91.119, 91.121, 91.151, 91.109(a), 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), and 91.417(a) & (b).

Between the Peaks Aviation requests relief from 14 C.F.R. 91.7(a), *Airworthiness Certificate.*

In consideration of the limited size, weight, operating conditions, design safety features, and the imposed conditions and limitations by Between the Peaks Aviation, with the unmanned aircraft and its operation, Between the Peaks Aviation's operation of the S1000 UAS meets the conditions of Section 333 and should not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H.

14 C.F.R. 91.7(a) prohibits the operation of an aircraft without an airworthiness certificate. As no such certificate will be applicable in the form contemplated by the FARs, this Regulation is inapplicable. No standard exists for airworthiness of the S1000 at this time, an equivalent level of safety will be achieved by insuring compliance with the Between the Peaks Aviation's Flight Operations and Procedure Manual with Safety Checklists, and the S1000 User manual as well as inspection and / or maintenance, performed by an Airframe and Powerplant mechanic. Between the Peaks Aviation believes that compliance with the applicable manuals, the S1000 User Manual and Between the Peaks Aviation's Flight Operations and Procedure Manual, including checklists, and inspection and / or maintenance, performed by a Airframe and Powerplant mechanic, employed by Between the Peaks Aviation, that a very high level of safety can be achieved in assuring the airworthiness of Between the Peaks Aviation's S1000 UAS. The policies and procedures in place by Between the Peaks Aviation and the equipment utilized on the UAS for Risk Mitigation, provide an Acceptable Level of Safety (ALoS) that rivals full scale aircraft operations.

Therefore, Between the Peaks Aviation requests relief from 14 C.F.R. 91.7(a).

Between the Peaks Aviation requests relief from 91.103(b) *Pre-Flight Action,* specifically ***"For any flight, runway lengths at airports of intended use."***

Per the preflight section in Between the Peaks Aviation Flight Operations and Procedure Manual, certain preflight actions by the PIC are required including, but not limited to;

- Aircraft safety and flight worthiness inspection.
- Ground station inspection.
- Site assessment and inspection.
- The PIC will take all actions including reviewing weather, including visibility and standoff distances from clouds.
- Flight battery requirements.

Considering that operations will probably not occur at any airport, the requirement for knowledge of runway lengths at the airport of intended use, is not appropriate in this case.

Therefore, Between the Peaks Aviation requests relief from 91.103(b).

Between the Peaks Aviation requests relief from 91.105(2) and (b), *Flight crewmembers at stations.*

The UAS operated by Between the Peaks Aviation has no cockpit, the requirement for seatbelts is not applicable.

Therefore, Between the Peaks Aviation requests relief from 91.105(2) and (b).

Between the Peaks Aviation requests relief from 91.109(a), *Flight Instruction*.

Although there is the ability to utilize dual controls on the UAS operated by Between the Peaks Aviation, the dual control is only utilized during a limited time during flight instruction activities. The second set of controls are removable and not practical for all phases of the time building or flight instruction process in place as referenced by Between the Peaks Aviation Flight Operations and Procedure Manual.

Therefore, Between the Peaks Aviation requests relief from 91.109(a)

Between the Peaks Aviation requests relief from 91.119, *Minimum safe altitudes.* Section 91.119 establishes safe altitudes for operation of civil aircraft.

Between the Peaks Aviation's S1000 UAS has multiple safety systems integrated within the airframe to minimize the risk of damage to persons or property and has been assembled with the additional features to mimic as closely as possible (considering the limitations in size and capability) the requirements of full scale aircraft and the regulations such aircraft are required to comply with.

- With eight motors, Between the Peaks Aviation's S1000 UAS has the ability to stay aloft and make a safe controlled landing, even with the loss of one motor.
- Between the Peaks Aviation's S1000 UAS is electric is there is no risk of fuel spillage or a fire from leaking fuel after an emergency, where as the typical aircraft utilized in the proposed operations of Between the Peaks Aviation can weigh thousands of pounds and carry up to 200 gallons of fuel.
- Equipped with altitude and distance limiting features that inhibit the UAS from flying above certain altitudes or beyond specified ranges.
- In the unlikely event of a GPS and / or radio control Lost link, the UAS automatically enters into a hover, if GPS and / or radio control link cannot be re-established, the UAS will return back to its departure point (Fail Safe).
- Between the Peaks Aviation's S1000 UAS is also equipped with a rapid deployment ballistic recovery parachute that is automatically activated in the event of any catastrophic event.
    (a) The flight controller determines an emergency (catastrophic event) as a rate of decent greater than 10 m/s (1978 fpm / 22.36 mph) or a critical battery (10%) level while still at altitude.

(b) Typical loaded weight of the S1000 UAS will be less than 20 lbs (approximately 18lbs). At a weight of 18lbs, the emergency recovery parachute allows a decent rate of 6 m/s (1181 FPM / 13.4 MPH), a very slow decent rate.

(c) The emergency recovery parachute is a Co2 driven device that is fully deployed in one half (1/2) second with full parachute deployment and effectiveness after a drop of only 16.5 feet.

(d) Minimum altitude for safe deployment is 6m / 19.7 feet.

- ADS-B transponder equipped (Dual band 978 and 1090)
- ADS-B receiver equipped
- COMM Radio equipped at Ground Station
- Navigation and anti-collision lights
- AHRS with telemetry link to Ground Station, equipped with Synthetic Vision, Terrain Detection, Air to Air Traffic Detection, GPS, NEXRAD Radar, Weather, NOTAM's, etc. (TISB / FISB)
- Flight operations will not take place unless all non-participating persons are more than 500 feet and 200 feet from property measured from the flight operation area or in an appropriate shelter/ building that can shield them from the aircraft in case of any unrecoverable situation.
- Flight operations will only commence with permission of the land owner / controller
- Flight operations will only take place in VMC and VLOS.
- Flight operations will always have a Visual Observer (VO) to assist the pilot in any and all sense and avoid concerns regarding airspace as well as any other hazards that may exist within the flight operation envelope.
- Flight operations in Class A or B airspace will not be performed.

Certain areas along the front range of Colorado as well as the western slope are considered congested areas. Although the area may be congested, per sectional charts, there are many areas within these zones that are very wide open and comply with the self imposed 200 foot standoff from hazards (busy roads, buildings, towers, power lines, open air gatherings of people, etc.) or a much greater range as proposed by the petitioner, and 500 foot distance from any non participating individuals. This is mainly due to the relatively rural and spread out nature of Colorado that is not as common in other states. The ability to comply with airspace rules, sense and avoid other aircraft, yielding the right of way to all full scale operations, Anti-Collision and Navigation Lights, Air Traffic Control Communications, VO to assist in ground and air hazard recognition (buildings, towers, full scale flight operations, etc.), as well as extensive pre-flight site analysis combined, create a scenario that minimizes the risk to persons or property, and allows for flight operations to be safely conducted and create an operation that is as safe or safer than any operation with an aircraft typically employed in the proposed operations.

The FAA has stated that there is no precise definition of a "congested area" and official U.S. Government aeronautical charts and NOTAMs provide general guidance for developing a proposed route that complies with § 91.119. (Trimble, Waiver 11110). The FAA states in 8900.1 V16, C1, S2, "H. Congested Area. A congested area is determined on a case-by-case basis. The determination must take into consideration all circumstances, not only the size of an area and the number of homes or structures (e.g., whether the buildings are occupied or people are otherwise present, such as on roads). Furthermore, aeronautical charts would not be expected to reflect all required local information." As such, Between the Peaks Aviation utilizes all aforementioned safety procedures and guidelines to be able to operate safely, even in areas that are "generally" designated as congested. With the use of appropriate standoff distances from structures and hazards, large, heavily trafficked roads, non production persons, working with appropriate airports and ATC's, filing of a NOTAM, as well as the integrated safety features on the UAS operated by Between the Peaks Aviation, the safety of the public and property can be

ensured, especially when compared to the risks of traditional aircraft utilized in similar activities to those proposed here (See also submitted Supplemental Summary Adherence to 8900.1).

Considering the sense and avoid and other safety considerations factored in to Between the Peaks Aviation's operational procedures, and the installed features on the S1000 UAS including but not limited to, ADS-B transponder, ADS-B receiver, synthetic vision, integrated lost link procedures (Fail Safe), the ability of the UAS to operate even with the failure of one motor, emergency ballistic parachute, the exceptionally fast rate of parachute deployment, the very short distance of drop prior to effective parachute deployment, the minimum safe altitude for deployment, the very short distance of drop prior to emergency parachute deployment, light weight of the S1000 UAS, elimination of the risk of carrying up to 200 gallons of fuel as a typical aircraft would carry minimal risk of damage to persons or property in the NAS or on the ground, especially as flight operations will not be conducted within 500 feet of any non participating persons, well within the safety margin for emergency procedures to be implemented and effective, standoff distances of at least 200 feet for any natural or man-made hazards, and filing of NOTAM's for flight operations, Between the Peaks Aviation believes that the S1000 UAS meets the requirements of the FAA to be able to perform an emergency landing without undue hazard to persons or property on the surface if a power unit fails, as specified 91.119, or in the case of a loss of link, or any other catastrophic event.

Therefore, Between the Peaks Aviation requests relief from 91.119(a), 91.119(b), 91.119(c) 91.119 (d)(1) and 91.119(d)(2).

Between the Peaks Aviation requests relief from 91.121 *Altimeter Settings.*

Between the Peaks Aviation S1000 UAS is equipped with redundant pressure and GPS altimeters that provide altitude readings AGL and as well as an ADS-B receiver, coupled with synthetic vision AHRS that provides GPS indicated altitude MSL and AGL to the UAS pilot via a digitally encoded telemetric data feed, which downlinks from the aircraft to a ground-based on-screen display.

Between the Peaks Aviation will only conduct flight operations within Visual Line of Sight (VLOS).

In the Astraeus-Aerial Waiver 11062, and Snaproll Waiver 11063, the FAA determined that this method to be a sufficient method for ensuring the UAS operations do not adversely affect safety.

Therefore, Between the Peaks Aviation requests relief from 91.121.

Between the Peaks Aviation requests relief from 91.151 *Fuel Requirements in VFR Conditions.*

Between the Peaks Aviation operates an electric powered UAS and ground station equipped with a digitally encoded telemetric data feed that includes feedback data on remaining battery life.

Between the Peaks Aviation S1000 can be configured for multiple battery options that can provide up to forty (40) minutes of flight time. As the battery options and loads can vary, depending on net weight, so can maximum flight times. Considering the limited flight times possible, to require a reserve of thirty minutes daytime and forty minutes nighttime would not be possible in all situations.

The FAA recognized these limitations with small UAS's and in 2689, 5745, 10650, 8811, 10808, and 10673.

Between the Peaks Aviation S1000 UAS is equipped with multiple fail safe items that minimize the risk of the UAS completely exhausting the battery supply. Should the battery level fall below thirty (30) percent capacity, (programmed by Between the Peaks Aviation) the S1000 UAS will automatically initiate the fail safe mode and return to home. Should the capacity fall to twenty (20) percent capacity, the UAS will immediately descend and land. If battery levels were to drop below ten (10) percent capacity, the emergency ballistic parachute will deploy, safely bringing the UAS to the ground.

Therefore, Between the Peaks Aviation requests relief from 91.151.

Between the Peaks Aviation requests relief from 14 CFR 91.405(a), *Maintenance required*, 91.407(a)(1), *Operation after maintenance, preventive maintenance, rebuilding, or alteration,* 91.409(a)(2), *Inspections,* and 91.417(a) and (b), *Maintenance records.*

Between the Peaks Aviation believes that these sections only apply to aircraft with an airworthiness certificate.

Between the Peaks Aviation submits that the requested relief is proper since an equivalent level of safety will be ensured. Between the Peaks, will use its Airframe and Powerplant (A&P) mechanic to perform and /or inspect maintenance, alterations, and preventive maintenance on the unmanned aircraft system using the methods, techniques, and practices prescribed in Between the Peaks Aviation's Flight Operations and Procedure Manual. Furthermore, Between the Peaks Aviation will document and maintain all maintenance records for the S1000 UAS.

Therefore, Between the Peaks Aviation requests relief from 14 CFR 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) and (b).

Between the Peaks Aviation requests permission to operate at night per 14 CFR 1.1.

UAS operations by Between the Peaks Aviation will only be conducted by certificated pilots.

Between the Peaks Aviation has installed on its UAS navigation lights required under 14 CFR 91.209, including wingtip lights, anti-collision strobe lights and a flashing beacon at the tail end of the UAS. The lighting system can be seen from a minimum of three (3) statute miles per 91.209.

In addition to the standard navigation and anti-collision lights installed, the UAS is also equipped with lower intensity lighting to aid the VO and the PIC with maintaining the requirement for VLOS.

The installed lighting coupled with the ADS-B transponder would alert any other air traffic and / or air traffic control operating in the area to the presence of the UAS, (as well as required NOTAM's).

The onboard telemetry downlink system has dual redundant primary instruments, providing an artificial horizon, altimeter, vertical speed and airspeed, (AHRS), as well as battery life and other warning messages, that are viewable at the ground station. To operate in nighttime VFR conditions, the PIC and the VO will arrive at least thirty (30) minutes prior to nighttime to ensure dark adaptation (8900.1 V16, C5, S3 I).

The PIC, VO, and any other participating persons will examine and pre-flight the area prior to nighttime, to assess risks and hazards present. For all nighttime operations, standoff distances from hazards will be increased to three hundred feet (300) minimums and mandatory battery life remaining prior to required landing would be increased to 40% life remaining. Only when it can be determined that there are no hazards or risks to flight operations, non-participating persons, and full scale flight operations, would a nighttime VFR flight be approved.

Therefore, Between the Peaks Aviation requests permission to operate at night per 14 CFR 1.1.

REASONS BETWEEN THE PEAKS AVIATION EXEMPTION WILL NOT AFFECT PUBLIC SAFETY

The flight system that Between the Peaks Aviation has constructed is based on the DJI Spreading Wings S1000 platform. The aircraft is constructed primarily of carbon fiber intended to lift a range of cameras including still, video and multispectral cameras.

The components installed by Between the Peaks Aviation to enhance the safety include;

- Direct Pilot Intervention via remote control.
- FAA Compliant ADS-B transponder per 91.215 certified per 91.413
- Altitude Heading Reference System (AHRS).
- ADS-B receiver
- 3D Synthetic Vision app. at mobile ground station, including GPS, Wi-Fi and In-flight NEXRAD Radar, Weather, NOTAM's etc. (FIS-B).
- Navigation and Anti-Collision lighting.
- GPS Based altitude and position sensors and flight stabilization systems.
- Redundant Pressure and GPS Altimeters
- Equipped with altitude and distance limiting features that inhibit the UAS from flying above certain altitudes or beyond a specified range.
- Lost link integration providing for automatic return to home system ensuring that in the unlikely event of a lost link occurrence (Fail Safe), the S1000 UAS will safely return to the departure point.
- Emergency recovery parachute. In the event of a loss of link, a critical loss of power, or any other catastrophic failure, the S1000 UAS will automatically deploy a parachute returning the UAS safely to the ground minimizing any potential damage to persons or property.
- Emergency recovery parachute is also manually deployable by the pilot in case of any other emergency situation.
- Remote instrumentation at the mobile ground station relaying data back to the pilot, including, altitude, heading, airspeed (relative ground speed), artificial horizon, rate of climb, GPS position, other aircraft in the area and battery power levels, as well as warning messages of critical onboard systems.
- Dual redundant flight controls. The mobile ground station has a 2nd set of integrated controls that in the unlikely event of a lost link situation, a completely separate set of controls, operating on a different frequency can be utilized to control the aircraft.
- Dual on board cameras to assist in detect and avoid.
- Dual Flight Data Recorders. In the event of any situation, all logs and recordings of the flight can be reviewed.

- Hobbs Meter to accurately monitor flight times for maintenance purposes.
- Ground Station equipped with COMM radio for communication with airport control and weather services.

Between the Peaks Aviation will also employ a Visual Observer (per FAA 8900.1 V16, Ch5, S3) at all flight operation sites, who has either a current pilot certificate, or has completed a private pilot ground school, to ensure there are always, at a minimum, two individuals familiar with airspace and FAA rules and regulations and that can assess any proposed flight operations site and determine the safety and compliance of such site.

Between the Peaks, will use its Airframe and Powerplant (A&P) mechanic to perform and /or inspect maintenance, alterations, or preventive maintenance on the unmanned aircraft system using the methods, techniques, and practices prescribed in Between the Peaks Aviation's Proprietary Flight Operations and Procedure Manual. Furthermore, Between the Peaks Aviation will document and maintain all maintenance, overhaul and modification records for its UAS.

Between the Peaks Aviation has mitigated risks to the public and property in the NAS and on the ground in the design and operations of its UAS. As such, Between the Peaks Aviation has considered that risk of injury to persons or property and has established protocols to mitigate and / or eliminate such risk. Between the Peaks Aviation has implemented procedures to ensure that the proposed UAS and its operation will not impede or divert other NAS operations.

The policies and procedures in place by Between the Peaks Aviation and the equipment utilized on the UAS for Risk Mitigation and interference with the NAS, provide an Acceptable Level of Safety (ALoS) that rivals full scale aircraft operations.

Between the Peaks Aviation submits that the requested relief under Section 333 is proper in consideration of the limited size, weight, operating conditions, design safety features, and the imposed conditions and limitations by Between the Peaks Aviation, that an equivalent level of safety will be ensured.

Between the Peaks Aviation in all flight operations will comply with airspace rules. Flight operations will not impede, delay or divert any other aircraft as the Between the Peaks Aviation flight operations will be conducted below 400 feet AGL. Any operations in airspace controlled by a control tower, will be coordinated with the tower to ensure there are no hazards to the NAS. A Letter of Authorization will be procured from appropriate airport managers to ensure compliance with airspace and ATC operations. Between the Peaks Aviation will adhere to all airspace rules.

Class A No Operations Allowed
Class B No Operations Allowed
Class C per 91.130
Class D per 91.219
Class E per 91.127
Class G per 91.126

Between the Peaks Aviation has implemented procedures to address flight termination plans in the unlikely event of an unrecoverable system failure. As flight operation locations will vary considerably, Flight Termination Points (FTP's) will vary for each location (typically FTP's will be the point of departure). Each flight operations site will be assessed for acceptable risk FTP's (in order as follows);

- Airspace classification
- Risk to NAS operations
- Risk impedance, delay or diversion of other aircraft due to flight operations
- Risk to persons or property on the ground
- Site assessment to determine hazards that could cause an unrecoverable system failure

Lost Link Points (LLP's) will be established at each flight operations site. The flight control systems integrated into Between the Peaks Aviation's UAS has redundant lost link or Fail Safe procedures that in the event of a lost link, the UAS will return to the origination point. This origination point is the point at which the UAS departs the takeoff position and is recorded automatically as soon as the UAS leaves the ground.

All flight operations sites will be assessed for Divert / Contingency Points (DCP's). Typically, most flight operations sites will have the same DCP as LLP as operations will be conducted in very close proximity to the departure point. For a flight operations sites that are much larger, a DCP will be assessed on the salient features of each site.

A graphic representation on a sectional chart for LLP's and/or DCP's is not feasible due to the wide areas of operations. As such, other contingencies to mitigate risk have been implemented by Between the Peaks Aviation and integrated into its UAS.

Redundant and separate flight controls for direct pilot intervention have been incorporated. The primary flight control system, made up of a traditional radio control transmitter for direct pilot intervention and a redundant independent and separate set of full flight controls operating on a different frequency located at the Ground Station. Should a lost link incident occur with the primary flight control system, the PIC can immediately transfer to the ground station to resume flight control. The ground station is considered part of the "cockpit" and the PIC will be conducting all flight operations in very close proximity to the Ground Station as this is where the secondary set of telemetry flight data is received. (The PIC also has flight data transmitted directly to the primary control transmitter).

In all operations, Risk Mitigation plans have been implemented to mitigate the risk of collision with other aircraft. 14 CFR 91.113 will be adhered to at all times. Flight separation distances of at least one thousand (1000) feet will always be maintained per 91.111 and 91.13. With direction of appropriate air traffic control authorities and the interaction of the PIC and the VO as well as a transponder, telemetry feedback from the AHRS and synthetic vision, to sense and avoid other aircraft and other hazards that may exist or appear, the risk level has been eliminated to any other aircraft operating in the NAS.

To mitigate the risk to persons and or property on the ground, an emergency recovery parachute system (ballistic parachute) has also been incorporated into the UAS that allows the UAS to safely return to

ground in the event of a loss of link, or any other unrecoverable system failure. The ballistic parachute recovery system allows for the UAS to descend at a very slow rate to minimize and / or eliminate any damage to persons and / or property on the ground. There have been many incidences recently of ballistic parachutes in full scale aircraft being deployed and being credited with saving lives and reducing if not eliminating the damage on the ground. The UAS operated by Between the Peaks Aviation, being a much smaller and lighter aircraft, all but eliminates the risk of damage to persons and property.

In the air, Between the Peaks Aviation's UAS has integrated an ADS-B transponder on the UAS to ensure that flight operations are compliant with airspace rules. Communication with ATC will be used per all regulations and agreements reached with appropriate airport authorities. Flight Service Stations (FSS) will be contacted to ensure that NOTAM's are in place prior to flight operations. The UAS is also equipped with anti-collision lights and navigation lights to assist other aircraft in observing the UAS operating in the airspace. As the UAS will be flying below four hundred (400) feet AGL, there should never be a situation that requires an avoidance maneuver. Should an avoidance maneuver become necessary adherence to 91.113 will be primary as to maintain consistency in airspace operations.

All phases of flight with the UAS are critical, as such 14 CFR 135.100 *Flight crewmember duties* will be strictly enforced. The areas surrounding where the PIC and the VO are working, including the ground station will be segregated from any non-participating individuals to ensure that distractions are kept at a minimum during all critical phases of flight.

The S1000 UAS that will be operated by Between the Peaks Aviation will be registered in accordance with 49 U.S.C. 44103, *Registration of Aircraft*, as well as 14 C.F.R Part 47, *Aircraft Registration*, and marked in accordance with 14 C.F.R. Part 45, *Identification and Registration Marking*.

Conclusion

As set forth herein, Between the Peaks Aviation seeks an exemption pursuant to 14 C.F.R. §§ 11.61 and Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA), which will permit the safe operation of its S1000 UAS commercially, without an airworthiness certificate, for the limited purpose of conducting aerial acquisitions over certain areas of the United States. By granting this Petition, the FAA Administrator will be fulfilling the Congressional mandate of the FAA Modernization and Reform Act of 2012, while also advancing the interests of the public.

WHEREFORE, in accordance with the Federal Aviation Regulations and the FAA Modernization and Reform Act of 2012, Section 333, Between the Peaks Aviation respectfully requests that the Administrator grant this Petition for an exemption from the requirements of 14 C.F.R §§ 35 Part 21; and 91.7; 91.103(b); 91.109; 91.119; 91.121; 91.151; 91.405(a); 91.407(a)(1); 91.409(a)(1) & (a)(2); AND 91.417(a) &(b); 91.7(a) to permit Between the Peaks Aviation to operate its S1000 UAS in the NAS for the purpose of safely, efficiently, and economically utilizing unmanned aircraft for aerial data acquisition, photography and film work in the areas of Construction, Agriculture, Infrastructure, Real Estate, and other applicable areas.