October 14, 2014

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

RE: Exemption Request Under Section 333 of the FAA Modernization and Reform Act of 2012 and 14 C.F.R. Part 11

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FAA Reform Act") and 14 C.F.R. Part 11, Unmanned Systems, Inc. ("USI") request exemptions from two provisions of the Federal Aviation Regulations ("FAR"), specifically portions of 14 C.F.R. Part § 91.119 and Part § 91.151(a) to allow, commercial operations of its Sandstorm unmanned aerial system ("Sandstorm") in the continental United States ("CONUS") by individuals who, at a minimum, maintain a FAA commercial pilot certification or FAA-recognized equivalents, and have successfully completed USI's FAA approved training plan for Sandstorm.

The Sandstorm is an all-environment, electric-powered, traditional fixed wing take-off and landing small unmanned aerial system ("UAS") that, is capable of transmitting live airborne location and video information to a Ground Control Station ("GCS"). Depending on payload configuration, Sandstorm will also be able of transmitting real-time high resolution video and photogrammetry collection to the ground based camera control station and stored on board for post flight production and forensics. The Sandstorm has a maximum weight of 70 pounds including payloads, a wingspan of 15 feet, and a length of 8 feet. The Sandstorm airplane weight without payload is a maximum of 40 pounds. The Sandstorm's normal cruising speed and maximum speed are 40-60 knots indicated airspeed and 80 knots indicated airspeed, respectively. It is battery powered that provides a flight endurance between one and one-half hours and three hours depending on battery configuration. Sandstorm is capable of operation in temperatures ranging from -15°F to 115°F. Launch and recovery of the aircraft is conducted via traditional fixed-wing take-off and landing procedures. The Sandstorm's 900 MHz datalink and 2.4 GHz control link has a range of five miles and provides all positional information and control capability required for safe operation of the aircraft.

The Sandstorm is unique among the various UASs applying for exemptions under Section 333 because it has received a Special Experimental Airworthiness Certificate from the FAA based on its operations near Columbia Falls, Montana. The Sandstorm has an unparalleled safety record based on our current and on-going flight operations in Montana with FAA certified aircraft. When this experience is considered in tandem with the remote areas in which it will operate, it becomes clear that the Sandstorm can operate safely in the National Airspace System ("NAS"), without posing a threat to national security, by operating in accordance with the requirements discussed herein.

The Sandstorm's capabilities, along with USI's experience to date, make it ideally suited to conduct commercial operations such as commercial film production, agriculture, aerial surveying, and patrolling in remote areas (i.e. non-congested or non-populated areas, private or controlled-access property) under Class E or Class G airspace and within Visual Line of Sight ("VLOS"). Use of the Sandstorm reduces the need to operate manned aircraft, decreasing the risk to the pilot, crew, and those on the ground as the Sandstorm will be transported to the

operational site for launch and recovery and will be not flown to the location with a load of flammable fuel.

As a result of the Sandstorm's size, weight, maximum speed, operational capability, and safety record; the distance at which it will operate from airports and populated areas; and its operation using visual observers to provide de-confliction from other air traffic, the Sandstorm does not create a hazard to users of the NAS or the public. Neither does it pose a threat to national security. Therefore, the FAA should grant USI the requested exemptions. Alternatively, if the FAA finds that modification of USI's application is required for safe operation of the Sandstorm in the NAS, USI requests that the FAA delineate the required modifications and either process USI's application as if the modifications were already made or allow USI to amend its application to incorporate the FAA's findings.

The name and address of the applicant are:

Unmanned Systems Inc.
Address: 2709 Cyrano Street, Henderson NV 89044

Attn: Don Bintz
Ph: (702) 324-9966
Fax: (702) 656-8782
Email: Don.Bintz@unmannedsystemsinc.com

Attn: William Reynolds
Ph: (702) 606-7539
Email: bill.reynolds@unmannedsystemsinc.com

USI's exemption request encompasses the following regulations:

14 C.F.R. § 21 subpart H
14 C.F.R. § 91.119
14 C.F.R. § 91.151(a)

Section 333's Mandate and the Federal Aviation Act

Grant of this exemption application for use of the Sandstorm in agriculture, precision aerial surveys, and patrols, pursuant to the exemption requested herein, will advance the Congressional mandate in Section 333 of the FAA Reform Act to accelerate the introduction of UASs into the NAS. Section 333 directs the Secretary of Transportation to consider whether certain UASs may operate safely in the NAS before completion of the rulemaking required under Section 332 of the FAA Reform Act. To make that determination, the Secretary must evaluate which types of UASs do not create a hazard to users of the NAS or the public or pose a threat to national security in light of several criteria:

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

FAA Reform Act § 333(b)(1). Once 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 Federal Aviation Act expressly grants the FAA the authority to issue exemptions. 49 U.S.C. § 44701(f). This statutory authority, by its terms, includes exempting civil aircraft, as the term is defined under §40101 of the Act, from the requirements that all civil aircraft must have a current airworthiness certificate, 49 U.S.C. § 44711(a), and those used in commercial service must be piloted by private and/or commercial pilots. 14 C.F.R. §§ 61.113(a) and (b), 61.133.

The grant of the requested exemption is in the public interest based on (i) the clear direction in Section 333 of the FAA Reform Act; (ii) additional authority in the Federal Aviation Act, as amended; (iii) the strong equivalent level of safety surrounding the proposed operations; and (iv) the significant public benefit, including enhanced safety and cost savings associated with utilizing UASs for commercial film production, agriculture, aerial survey photography, and patrolling. Accordingly, USI respectfully requests that the FAA grant the requested exemption without delay.

Airworthiness

The Sandstorm is safe and fit for operation in the NAS under the conditions listed herein. The FAA has deemed the Sandstorm safe by initially issuing a Special FAA Experimental Airworthiness Certificate for flight on September 14, 2011. USI has flown the Sandstorm since this date in 2011 and currently continues to operate near Columbia Falls, Montana under the FAA issued Experimental Airworthiness Certificate for Unmanned Aircraft with an assigned Registration Mark N441KS, being the first tail USI got certified.

In support of this application, USI can provide with a request for confidentiality, the following documents: the Combined Sandstorm S3™ Aircrew Operating Handbook ("AOH"); the USI Local Pilot Initial Qualification Syllabus; the USI Observer Initial Qualification Syllabus; and the USI Safety Pilot Initial Qualification Syllabus.

Mandatory Operating Conditions

USI proposes that the grant of the exemption be subject to the following mandatory conditions, which are based upon operating conditions set forth for operation of UAS by public entities pursuant to Certificates of Waiver or Authorization, with additional restrictions:

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- Operations to avoid congested or populated areas to the maximum extent possible.
- Operations to be conducted over private or controlled-access property.
- Permission from land owner/controller required before commencing any flight.
- Operations to occur during Visual Flight Rules Meteorological Conditions (VMC).
- Aircraft to remain within Visual Line of Sight (VLOS).
- Operations to occur during daylight hours.
- Above Ground Level (AGL) altitude to be restricted to 400 feet and below.
- All operations conducted in vicinity of airport to remain more than 2.5 NM from centerline azimuth of runway centerline measured from runway thresholds.
- Operator will file a NOTAM for each flight.
- All required authorizations and permits will be obtained from territorial, state, county, or city jurisdictions, including local law enforcement, fire, or other governmental agencies.

Operator Requirements

USI respectfully proposes that operator requirements should take into account the characteristics of the particular UAS. The Sandstorm is an inherently stable, light-weight aircraft that weighs less than 40 pounds without payload, has a proven safety flight safety record and will be operated in remote areas.

Sandstorm is configured to give the Local Pilot ("LP") or Remote Pilot ("RP") full control of the aircraft during all phases of flight. It is equipped with an advanced autopilot that can be used to fly the aircraft in one of four modes: Stabilized, Return to Home ("RTH"), Circle or Nav. Stabilized mode commands the aircraft to fly straight and level with no input from the pilot. RTH mode commands the aircraft to fly to a "return to home point" designated by the pilot and then circle until transitioned to manual control by the pilot. Circle mode commands the aircraft to circle around its current position until the pilot takes control manually or activates another autopilot mode. Engaging Nav mode commands the aircraft to fly to pre-programmed waypoints designated by the pilot on the GCS Map screen. Each of these autopilot modes creates a predictable aircraft flight pattern that allows Sandstorm to operate within the intended flight envelope with minimal input from the pilot. Flight limits are coded into the autopilot and define the aircraft's normal flight operating envelope. Manual flight modes that do not use the autopilot require the operator to provide control input to maintain heading, altitude and airspeed. Pitch, roll and throttle inputs are accomplished by the LP using the handheld radio controller/transmitter (JR-12X) or by the RP using GCS RP Control Stick station via the 900 MHz or 2.4 GHz link respectively.

The GCS is the primary control station; providing the RP situational awareness and command and control interface for the UA. The S³™ GCS is a environment consisting of three monitor displays including a Map screen, a Head-up Display (HUD) screen, and a Standby Instrument Panel screen. Flight controls consist of a control stick, throttle, and rudder pedals. Additional system controls utilize touchscreen "push buttons" on the three displays to control gear position, flap position, barometric altimeter setting, transponder settings, autopilot modes, and active control link selections. The LP will always have the capability to take control of the aircraft with the handheld JR-12X if necessary for safety of flight in all phases of flight while maintaining VLOS.

In the event of a Total Lost-Link ("TLL") the autopilot shall navigate the UAS back to a designated Return to Home ("RTH") point. Standard operating procedures will have a designated RTH point prior to every flight. While in circle mode around the RTH point, recovery of control should be possible. In the event that recovery of control link is not possible, the UAS will spiral down to a controlled landing around the designated RTH point. If the motor batteries have been depleted, the avionics and flight control surfaces are powered independently to allow for continued control by the LP to conduct a pilot controlled landing of the aircraft.

Specific Exemption Requests and Equivalent Level of Safety Showings

14 C.F.R. Part 21, Subpart H: Airworthiness Certificates

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 aircraft to be utilized by the Applicant, an exemption from Part 21 Subpart H meets the requirements of an equivalent level of safety under Part 11 and Section 333 of the Reform Act. The Federal Aviation Act (49 U.S.C.§44701 (f)) and Section 333 of the Reform Act both authorize the FAA to exempt aircraft from the requirement for an airworthiness certificate, upon consideration of the size, weight, speed, operational capability, and proximity to airports and populated areas of the particular UAS. 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.

Sandstorm has already been certified as airworthy via a Special Airworthiness certificate of the Experimental class and has been recertified as such on four separate occasions. The exemption USI seeks at this time is to be able to conduct commercial operations while only having an Experimental certification.

14 C.F.R. § 91.119: Minimum Safe Altitudes

Section 91.119 establishes safe altitudes for operation of civil aircraft. Specifically, Section 91.119(c) limits aircraft flying over areas other than congested areas to an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

As set forth herein, the Sandstorm will never operate at higher than 400 feet AGL. It will, however, be operated in a manner that avoids congested or populated areas that are depicted in yellow on VFR sectional charts. Because commercial film flights, agriculture, aerial survey work, and patrolling must be accomplished at relatively low altitudes, *i.e.*, less than 500 feet AGL, an exemption from Section 91.119(c) is required.

The equivalent level of safety will be achieved given the size, weight, speed, and material with which the Sandstorm is built. Also, no flight will be taken without the permission of the land owner or the party controlling the operating area. With advance notice to the landowner, all affected individuals will be aware of the agriculture, survey, and patrolling flights. Compared to similar operations conducted with conventional aircraft or rotorcraft, which weigh thousands of pounds and carry flammable fuel, any risk associated with these operations will be significantly reduced from those currently allowed for conventional aircraft operating at or below 500 feet AGL. Waivers have been granted to other UAS operators for such operations in Alaska. USI believes such operations can be conducted within the CONUS in Class E and Class G airspace for the same reasons justifying like operations under the existing waiver in Alaska.

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.” 14 C.F.R. § 91.151(a).

The Sandstorm's batteries provide between one and three hours of powered flight. Without an exemption from 14 C.F.R. § 91.151, the Sandstorm's flights could be limited to approximately thirty minutes in length. Given the limitations on its proposed operations and the location of those proposed operations, a longer duration for flight in daylight VFR conditions is reasonable.

USI believes that an exemption from 14 C.F.R. § 91.151(a) is safe and consistent with the scope of a prior exemption. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with 91.151(a)). Operating the Sandstorm, a small UAS, without 30 minutes of reserve fuel does not engender the type of risks that Section 91.151(a) was meant to prevent. The fact that the Sandstorm carries neither pilot, passenger, nor cargo also enhances the reduced risk to overall safety. Additionally, limiting Sandstorm flights to thirty minutes would greatly reduce the operational utility of the platform. In the unlikely event that the Sandstorm should run out of fuel, it would glide under pilot control for landing. Given its weight and construction material, the risk is significantly less than contemplated by the current regulation.

USI believes that an equivalent level of safety can be achieved by maintaining 10 minutes of reserve fuel, which, allowing at least fifty minutes of flight time, would be more than adequate to return the UAS to its planned landing zone from anywhere in its planned operating area.

Similar exemptions have been granted to others, including Exemptions 2689F, 5745, 10673, and 10808.

Federal Register Summary

Pursuant to 14 C.F.R. § 11.81(f), the following summary is provided for publication in the Federal Register, should the FAA determine that publication is needed:

Petitioner: Unmanned Systems Inc.
Section of 14 C.F.R.: 14 C.F.R. § 21(h), 14 C.F.R. § 91.119, 14 C.F.R. § 91.151(a).

Approval of exemptions allowing commercial operations of UASs in the film industry will enhance safety by reducing risk. Conventional film operations, using jet or piston power aircraft, operate at extremely low altitudes in close proximity to people and structures and present the risks associated with vehicles that weigh in the neighborhood of 4,000 pounds, carrying large amounts of jet A or other fuel (140 gallons for jet helicopter) Such aircraft must fly to and from the film location. In contrast, a battery powered UAS weighing fewer than 70 pounds eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The UAS will carry no passengers or crew and, therefore, will not expose them to the risks associated with manned aircraft flights.

The operation of small UASs, weighing less than 70 pounds, conducted in the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting the applicant from the requirements of Part 21 and allowing commercial operations. These lightweight aircraft operate at slow speeds, close to the ground, and in a sterile environment and, as a result, are far safer than conventional operations conducted with turbine helicopters operating in close proximity to the ground and people.

Privacy

All flights will occur over private or controlled access property 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.

Satisfaction of the criteria provided in Section 333 of the Reform Act of 2012 - size, weight, speed, operating capabilities, proximity to airports and populated areas and operation with is VLOS and national security. Provided in the above documentation is adequate justification for the grant of the requested exemptions allowing commercial operation of applicant's UAS in the motion picture and television industry pursuant to the manual appended hereto.

Sincerely,

William E. Reynolds
Unmanned Systems, Inc.