



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

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, BOSH Precision Agriculture (dba "Digital Harvest"), the operator of the Super Swiper Unmanned Aircraft System ("UAS" or "Super Swiper"), seeks an exemption from the Federal Aviation Regulations ("FARs") listed below and discussed in Appendix A. Attached as Appendix B is a summary of this request.

The requested exemption would permit Digital Harvest to operate their Super Swipers, which weigh under 10 lbs and are produced by a sister company BOSH Technologies, for commercial precision agricultural surveys. With the landowner's permission, the Super Swiper uses onboard cameras to capture high quality digital images that are mosaicked into a digital map of the surveyed area. Use of the Super Swiper for aerial surveys reduces the need to operate conventional aircraft for the same purpose and provides very high quality imagery at a fraction of the cost. These savings result in enhanced efficiency and productivity for the affected activities, as well as environmental benefits.

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

As described more fully below, the requested exemption would authorize commercial operations of aerial surveys using the Super Swiper, which at 9.5 lbs, is small in size. The Super Swiper will be operated under controlled conditions at low altitude in airspace that is limited in scope, as described more fully herein; it will have automated control features, as described below. The Super Swiper also will be operated by an individual who has passed an FAA approved ground training exam and a required training program for the UAS. In an effort to reduce risk and retain operation quality control, Digital Harvest will not be selling the Super Swiper UAS, but will be offering their surveys as a service. Finally, the airspace in which the UAS will operate will be disclosed to the FAA in advance.

Digital Harvest respectfully submits that because this small, unmanned aerial vehicle will be used in lieu of comparatively hazardous operations now conducted with fixed wing and rotary conventional aircraft, the FAA can have confidence that the operations will achieve at least an

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equivalent level or greater level of safety. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities under Section 333(c) of the Reform Act to "establish requirements for the safe operation of such aircraft systems in the national airspace system."

The name and address of the applicant are:

Digital Harvest

Attn: Young Kim

Phone: 757-968-5462

Email: youngkim@digital-harvest.net

Address: 701 Flag Stone Way

Suite B

Newport News, VA 23608

The regulations from which the exemption is requested are as follows:

14 C.F.R. Part 21;

14 C.F.R. 45.23(b);

14 C.F.R. 61.113(a) & (b);

14 C.F.R. 61.133(a);

14 C.F.R. 91.7(b);

14 C.F.R. 91.9(b)(2);

14 C.F.R. 91.109(a);

14 C.F.R. 91.119;

14 C.F.R. 91.151(a);

14 C.F.R. 91.203(a) & (b);

14 C.F.R. 91.405(a);

14 C.F.R. 91.407(a)(1);

14 C.F.R. 91.409(a)(2);

14 C.F.R. 91.417(a).

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

THE APPLICABLE LEGAL STANDARD UNDER SECTION 333

Digital Harvest submits that grant of this exemption application for use of the Super Swiper in precision aerial surveys will advance the Congressional mandate in Section 333 of the Reform Act to accelerate the introduction of UASs into the national airspace system ("NAS") if it can be accomplished safely. This law 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 Reform Act. In making this determination, the Secretary is required to determine 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 the following:

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

Reform Act § 333(a)(1). If the Secretary determines that such vehicles “may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system.” *Id.* §333(c).

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

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

The grant of the requested exemption is in the public interest based on the clear direction in Section 333 of the Reform Act; the additional authority in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations; and the significant public benefit, including enhanced safety and cost savings associated with transitioning to UASs for aerial survey photography. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption without delay.

Airworthiness of the Super Swiper

A critical element of the exemption application involves evidence of the airworthiness of the Super Swiper. Digital Harvest believes that it has shown compliance with the requirements of Order 8130.34C, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, in the COA approval for the Super Swiper (See COA Certificate: 2013-ESA-79). Aside from the hours recorded under this COA, the aircraft has a rich history of successful flights within the military domain. It has over 20,000 hours of military operation without incident.

Mandatory Operating Conditions

Grant of the exemption to Digital Harvest will 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 Authorization, with additional restrictions:

- All operations to occur in Class G airspace
- Operations to avoid congested or populated areas, which are depicted in yellow on VFR charts
- 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)
 - o VLOS guaranteed with a cylinder of operation around operator of ½ nautical miles (NM)
 - o Cylinder walls may be expanded by additional observer’s ability to deconflict airspace
- Operations to occur during daylight hours
- Above Ground Level (AGL) altitude to be restricted to 400 feet

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- 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 permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies

Operator Requirements

Digital Harvest respectfully proposes that operator requirements should take into account the characteristics of the particular UAS. Certain UASs, such as the Digital Harvest Super Swiper, are characterized by a high degree of pre-programmed control and various built-in technical capabilities that limit the potential for operation outside of the operating conditions set forth above.

The Super Swiper has a semi-autonomous navigation and control system comprised of a Ground Control Station (GCS) and auto-pilot system. Flights can be pre-programmed with precision GPS guidance and do not require human intervention. In the case of unplanned events, the operator can allow the aircraft to follow the pre-programmed evasive maneuvers from the control unit or enable assisted steering for direct control. Pre-programmed maneuvers include diversion to the right; initiation of holding at present position; suspension of mission; fly back to launch point; fly to point and hold; abort mission and land; and emergency power cut off and land (Flight Termination System).

Additional automated safety functions and safety enhancing features of the Super Swiper include the following:

- Detection of lost GPS for 2 seconds will initiate a right hand orbit, allowing the operator time to enter "Altitude" control mode. After 20 seconds, if the operator elects to do nothing, the aircraft will begin an auto land.
- If the auto-pilot detects a lost-link to the GCS for longer than 5 seconds, the aircraft will orbit return to the designated "HOME" point and await reconnection. If link is not established within 60 seconds, the aircraft will enter a pre-programmed auto land.
- Auto-pilot failure will result in the aircraft entering into an aerodynamically induced spiral landing for minimal impact speed
- Low power on the aircraft triggers an alarm on GCS at 12% (15 minutes left)
- On-board failsafe limits aircraft descent speed to a maximum of approximately 5 m/s
- The aircraft, weighing less than 10 lbs, fully loaded, is constructed of EPP foam, or similar material which is intended to absorb impact energy.
- The motor is driven by a pulse width modulated signal, not an analog signal.

Given these safety features, Digital Harvest proposes that operators of the Super Swiper should not be required to hold a commercial or private pilot certification. Instead, operators should be required to:

- have successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA Private Pilot written examination or FAA-recognized equivalents;
- have completed a training program for operation of the UAS.

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

In summary, applicant seeks an exemption from the FARs set forth above and in Appendix A to allow commercial operations of a small unmanned vehicle conducting precision aerial surveys.

Approval of the exemption allowing commercial operations of the Super Swiper for precision survey work will enhance safety by reducing risk. Conventional aerial survey operations, using jet or piston-powered aircraft present risks associated with vehicles that weigh in the neighborhood of 5,000 to 7,000 lbs, carry large quantities of fuel, passengers, and, in some cases, cargo. Such aircraft must fly to and from the survey location. In contrast, a Super Swiper weighing less than 10 lbs and powered by batteries eliminates a portion of that risk given the reduced mass and lack of combustible fuel carried on board. The Super Swiper is carried to the survey location, not flown there. The Super Swiper will carry no passengers or crew and, therefore, will not expose any individuals to the risks associated with manned aircraft flights.

Additionally, no national security issue is raised by the grant of the requested exemptions. Given the size, load carrying capacity, speed at which it operates, and the fact that it carries no explosives or other dangerous materials, the Super Swiper poses no threat to national security.

The operation of the Super Swiper, weighing less than 10 lbs, for precision surveys in accordance with the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein, including exempting Digital Harvest from the requirements of Part 21.

The Super Swiper's satisfaction of the criteria set forth in Section 333 of the Reform Act—size, weight, speed, operating capabilities, lack of proximity to airports and populated areas, operation within visual line of sight, and national security—and its showing of an equivalent level of safety as it may relate to the requirement for a pilot's license, provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of the Super Swiper in the commercial precision agriculture business.

Very truly yours,

Young Kim

Chief Executive Officer at Digital Harvest
701 Flag Stone Way, Suite B
Newport News, VA 23608
757-968-5462