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

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

June 19, 2015

Exemption No. 11857
Regulatory Docket No. FAA–2015–0513

Mr. Jonathan B. Hill
Counsel for Liberty Mutual LLC
Cooley LLP
1299 Pennsylvania Avenue, NW., Suite 700
Washington, DC 20004−2400

Dear Mr. Hill:

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 letters posted to the public docket on March 2, 2015 and May 15, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Liberty Mutual Insurance Company (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct aerial photography for home and business roof inspection, and large structure/fire site inspection.

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

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

Airworthiness Certification

The UAS proposed by the petitioner are the Liberty 1, Liberty 2, Liberty 3, and Liberty 4.

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 relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection. 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, Liberty Mutual Insurance Company 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, Liberty Mutual Insurance Company 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 Liberty 1, Liberty 2, Liberty 3, and Liberty 4 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 5 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 June 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/

John S. Duncan
Director, Flight Standards Service

Enclosures

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

Re: Exemption Request Section 333 of the FAA Reform Act and Part 11 of the Federal Aviation Regulations from14 C.F.R. §§ 61.113 (a) & (b); 91.7(a); 91.119 (c); 91.121; 91.151(a); 91.405 (a); 91.407(a) (1); 91.409 (a) (2); 91.417 (a) & (b).

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, Liberty Mutual Insurance Company, ("Liberty Mutual") Operator of Small Unmanned Aircraft Systems ("sUASs") equipped to conduct aerial photography for 1) home and business roof inspection and 2) large structure/fire site inspection (hereinafter "the Purpose" or "Use Case 1 and 2," respectively), hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its sUASs, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA in an exemption granted under either Section 333 or Section 49 U.S.C. §44701(f) .[1]

As described more fully below, the requested exemption would permit the operation of small, unmanned sUAS under controlled conditions in airspace that is 1) limited; 2) predetermined; and 3) would provide safety enhancements in the fields in which it will operate, which now depend upon conventional aircraft or humans climbing high and dangerous structures. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities to "…establish requirements for the safe operation of such aircraft systems in the national airspace system." Section 333(c) of the Reform Act.

The name and address of the applicant is:

Liberty Mutual Insurance Company
157 Berkeley Street
Boston, MA 02116
Attn: Antony Parchment
Ph: 617-357-9500

[1] Liberty Mutual relies upon the following exemptions where specific reference to an exemption is not provided: Exemptions 11062 thru 11067, 11080, 11109 through 11112, and 11114.

Regulations from which the exemption is requested:

14 C.F.R. § 61.113 (a) & (b)
14 C.F.R. § 61.133(a)
14 C.F.R. § 91.7(a)
14 C.F. R.§ 91.119
14 C.F.R. § 91.121
14 C.F.R. § 91.151 (a)
14 C.F.R. § 91.405 (a)
14 C.F.R. § 407 (a) (1)
14 C.F.R. § 409 (a) (2)
14 C.F.R. § 417 (a) & (b)

The Applicant

Liberty Mutual is a Fortune 100 company based in Boston, Massachusetts and is the third largest property and casualty insurer in the United States. Liberty Mutual is committed to providing broad, useful and competitively-priced insurance products and services to meet its customers' ever-changing needs. Since its founding in 1912, as a worker's compensation insurance company, Liberty Mutual's mission has been to make the world a safer, more secure place to live and work. In addition to its products and services, its safety breakthroughs, industry firsts, patents, and innovative programs have helped reduce workplace injury, illness, and disability for millions of men and women. It has $38.5B in annual revenues and operates in 17 countries.

Commitment to Safety

For 60 years, the **Liberty Mutual Research Institute for Safety** has helped to improve the safety and health of people throughout the world. Owned and operated by Liberty Mutual, the Institute conducts peer-reviewed research to advance scientific knowledge and help reduce injuries and prevent disability. Its credo is "helping people lead safer more secure lives." That's not just a saying etched into marble over the company's doors; it is a tenet Liberty Mutual lives by.

- In furtherance of advancing policyholder and worker safety, the Liberty Mutual Research Institute was founded in 1954. It is focused on finding ways to prevent injuries and disabilities. Its research is available to the public so that all may benefit from its studies.

Expertise & Experience

Liberty Mutual has a dedicated Claims Career Academy located in Hopkinton, MA and trainers located throughout the country whose mission is to educate and train personnel on new claims processes and technology.

As part of its commitment to safety and innovation, Liberty Mutual is asking for this exemption to reduce the risk of injury to its employees and contractors who participate in the process of adjusting claims for damage to buildings and other structures within the United States. Liberty Mutual's sUASs are multi-rotor, radio controlled helicopters. Liberty Mutual's sUAS Liberty 1, weighs 14 or fewer lbs. including payload[2]. It operates, under normal conditions at a maximum speed of 12 knots (with a programmed limit set to 5 knots while conducting an inspection). Ithas the capability to hover, and move in the vertical and horizontal planes simultaneously[3]. It will operate at altitudes of no more than 400 feet AGL, and only in line of sight. It will operate only within the areas that have been pre-approved by the policy holder and/or the land owner by giving their consent and no closer than 500 feet to property or persons, or a distance established pursuant to the safety assessment allowed in all recent Section 333 exemptions. The vehicle has GPS geo-fencing capabilities that will be set to prohibit the UAS from leaving the electronically bounded areas. The Liberty 1 sUAS will operate in conformity with Liberty Mutual's UAS Aircraft Flight Manual and Aircraft Flight Operations Manual, attached as Exhibit 1 and Exhibit 2 (hereinafter "the Manuals")[4]. Operations for the Liberty 1 UAS in compliance with these manuals will ensure that the sUAS will "not create a hazard to users of the national airspace system or the public"[5] and that the aircraft will operate in compliance with the conditions set forth in this application.

The Exemption Request

Use Cases 1 and 2

Liberty Mutual proposes two use cases for the requested exemption:

1. Roof Inspection

Liberty Mutual performs thousands of roof inspections throughout the United States every year. For most inspections, a Liberty Mutual field adjuster or contractor must ascend a ladder and preform the inspection, which has resulted in several significant falls and injuries over the years. The sUAS will be operated by a Liberty Mutual field adjustor or a technician to

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2 The Liberty 1 UAS will weigh 12 lbs, but Liberty Mutual is asking for an exemption weight of 14 lbs. to accommodate possible higher weights in the future due to a possible increase in the weight of the camera carried on the aircraft.

3 The Liberty 1 is designed to operate at speeds up to 37 knots. It will be programmed to limit its operating speed to 12 knots and will undertake imaging at 5 knots.

4 Applicant submits the Manuals marked "CONFIDENTIAL," as they contain proprietary confidential business information that is not released to the public and is protected under the Freedom of Information Act 5 USC §552 et. seq.

5 Reform Act Section 333 (b).

capture high resolution imagery and/or video of residential or commercial roofs and elevated fascia to a level of quality that allows an adjustor to use the imagery to identify damage and wear caused by meteorological events such as wind and hail. For commercial properties, the imagery also will be used to identify the condition of equipment on the roof such as air conditioning units, other mechanical equipment, ducting, etc.

2. Large Structure Surveying / Fire Site Surveying

The UAS will be operated by a Liberty Mutual adjustor or technician to capture high resolution imagery/video of large structures (wide and tall) such as warehouses, high rise buildings, bridges, and construction sites, as well as "birds eye" views of fire and explosion sites.

Given the small size of the sUASs involved, no more than 14 lbs., speed of operation (12/5 knots), and the restricted environment within which they will operate, the applicant falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UASs to commence immediately.

This exemption application is submitted to fulfill Congress' express goal in passing Sections 333(a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems may operate safely in the national airspace system (NAS) before completion of the rulemaking required under Section 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; and
- Operation of the UAS within visual line of sight of the Operator.

Reform Act § 333 (a). Lastly, if the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system." *Id.* §333(c) (emphasis added).[6]

[6] Applicant interprets this provision to place a duty on the Administrator to not only process applications for exemptions under section 333, but for the Administrator to craft conditions for the safe operation of the UAS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.

The Federal Aviation Act expressly grants the 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:

> 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.

49 U.S.C. §44701(f). *See also* 49 USC §44711(a); 49 USC §44704; 14 CFR §91.203(a)(1)

This authority to grant exemptions reaches such issues as authorization of commercial operation of aircraft without an FAA issued pilot's license.

Liberty Mutual in filing this application is requesting that the FAA combine the grant of the Section 333 exemption with a standard Certificate of Operation (COA) that will allow commercial operations of its Liberty 1 UAS without the necessity of filing for a COA for each flight, unless such flight is to be conducted in an area not approved in the exemption. Compliance with the conditions agreed to herein and that may be imposed by the FAA, as set forth in prior Section 333 exemptions, provide the separation needed from other aircraft.

In addition, given that all operations will be conducted below 400 AGL feet and no closer than 5 nautical miles of the geographic center of an airport as denoted on a current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained, Liberty Mutual requests that operations over congested or densely populated areas be allowed. Liberty 1 UAS will have GPS geo-fencing, it will operate at a very low altitude, within confined areas, at low speed and weighs no more than 14 lbs.. Such operations will only be undertaken with the approval of the land or home owner, as set forth herein, and will comply with the requirements that operations be no closer than 500 feet to the adjacent building unless the land owner has provided permission, and the Operator has made a safety assessment of the risk from such operations. (See proposed condition #26)

Operator Requirements

Given the sUAS proposed by Liberty Mutual, Operators should not be required to hold a private pilot license. Liberty Mutual believes that 1) the operator, instead of understanding how to operate a passenger carrying aircraft, should have knowledge and experience that enables the safe operation of a small, remotely piloted UAS,should understand airspace restrictions andhow to ensure separation from other aircraft as well as non-participants and property; 2) the Liberty 1 UAS has built-in technical capabilities that limit the potential for unsafe operation and 3) there are other security screening mechanisms already in existence that Liberty Mutual will utilize to ensure the operators are acting consistently with national security interests.

Given the UAS safety features outlined below, Liberty Mutual proposes that its operations under this Exemption request 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 Liberty Mutual's training program for operation of the UAS.

Liberty Mutual notes that 1) 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;[7] and 2) that the Notice of Proposed Rulemaking entitled Operation and Certification of Small Unmanned Aircraft Systems, 80 F.R. 9544 (February 23, 2015) ("NPRM"), does not require the operator to hold a private pilot license or a third class medical.

The Liberty 1 UAS has a navigation and control system and auto-pilot that allow it to execute very accurate pre-programed flights. Flights are pre-programmed with GPS waypoint to establish perimeters beyond which the aircraft will not operate. Flights under auto-pilot are not directed by positive manual input, but through pre-programmed flight parameters that are executed by the auto-pilot. In the case of unplanned events, the Operator inputs pre-programmed evasive maneuvers from the control unit, and the autopilot executes those maneuvers. Pre-programmed Operator interventions include; initiation of holding at present position; suspension of mission; fly back to launch point; abort mission and land immediately; and emergency power cut off and land (flight termination system).

Additional automated safety functions and safety enhancing features of the Liberty 1 UAS include the following:

1) Auto-pilot detection of lost GPS or of insufficient satellites initiates an immediate landing.
2) Low power on the aircraft triggers escalating alarms at GCS at 35% and 10% levels. Low power beyond 10% triggers an immediate landing.
3) If the auto-pilot detects a lost-link to the ground controller, the UAS will hold position at its current location for 5 seconds and if the signal is not restored, execute a return to home and land.
4) Redundant "kill switches" that enable completely shutting the aircraft down in flight in the event of a loss of control or uncommanded deviation from the flight path.
5) The aircraft, weighs less than 14lbs., fully loaded.
6) The motors are driven by pulse width modulated signals, not analog signals.
7) The aircraft will operate for the Purposes at no more than 5 knots (while imaging) nor above 200 feet above the structure (imaging altitude) or a maximum of 400 feeet AGL.

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[7] *See* Federal Aviation Administration, Notice N-8900.227, Unmanned Aircraft Systems (UAS) Operational Approval, at 20-21 (July 30, 2013);

As the FAA has determined in Exemptions 11062 thru 11067,11080 and 11110 (the "Exemptions"), in comparing the requirements for private pilot knowledge and the knowledge required for a commercial pilot, that knowledge associated with a private pilot license, and therefore private pilot ground school, was sufficient to allow private pilots to operate sUASs under those exemptions. Based upon that analysis, Liberty Mutual believes successful completion of FAA private pilot ground school is a suitable predicate to operating the sUAS under this exemption.

Liberty Mutual proposes that the Operator accumulate required sUAS flight training hours through the operation of sUASs rather than flight hours in conventional aircraft. Those hours are more relevant to the operations proposed herein than hours gained in obtaining a private pilot's certificate in conventional or rotor aircraft. Those aircraft are orders of magnitude heavier than the sUAS and carry not only the pilot himself, but also passengers and fuel, none of which is carried in the sUAS. These conventional aircraft fly over all sorts of airspace without the permission or knowledge of the land owner. The sUAS is controlled by a handheld radio controller and the vehicle is operated within the line of sight. The requirements of Part 61.127 (commercial flight proficiency) and §61.107 (private flight proficiency), to the extent they are relevant to UAS operations, can be taught in the training proposed herein. As a review of the requirements of part 61.127 and 107 demonstrate, the issues presented as they relate to a 12 pound aircraft, operating at less than 5 knots during filming operations are those taught in ground school and in flight training with the particular UAS and not gained from accumulating flight hours in a fixed wing or rotorcraft gas or jet A powered aircraft completing cross country flights and take offs and landings at controlled and uncontrolled airports.

As to national security review of pilots, each of Liberty Mutual's pilots will obtain a Trusted Traveler review (Global Entry Pass) from TSA prior to operating the UAS. This review will vet the Operators against any known terrorist or no fly listings that are relevant.

Liberty Mutual additionally asks that the exemption be issued without the requirement for a visual observer. As set forth herein, an equivalent level of safety is provided by the size, speed and control capabilities of the aircraft, as well as the operational procedures that will be applicable to all flight hereunder. These obviate the need for the visual observer. The Operator will be operating the aircraft, always within line of sight. He or she will walk and follow the aircraft around the inspection area so that while it is flying its pre-programed flight path, the UAS will always be directly in his or her line of sight. The Operator will not be distracted by viewing the pictures taken during the flight. Rather, once the sUAS is launched, the Operator's only duty will be to watch the flight of the UAS over the structure and intervene to address flight path deviations or other issues that arise during the flight. The functions that an observer performs where the aircraft is flown at long distances from the launch area will not be necessary as the Operator will always have the aircraft in his or her direct sight. The observer also will not be necessary because the Operator will conduct a pre-flight inspection of the area, will cordon off the area and will perform frequent visual scans of the area while the vehicle is operating. Liberty Mutual again notes that the NPRM does not require the use of a visual observer.

Given the clear direction in Section 333 of the Reform Act; the authority contained in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing battery powered UASs for these functions instead of turbine or gas power aircraft/rotorcraft and operations with pilots having at least a private pilot license, the grant of the requested exemptions is in the public interest[8].

Aircraft and Equivalent Level of Safety

The applicant proposes that the exemption requested herein apply to civil aircraft that have the characteristics and that operate with the limitations listed herein. These limitations provide for at least an equivalent or even higher level of safety to operations under the current regulatory structure because the proposed operations represent a safety enhancement to the operations conducted with conventional aircraft or with humans climbing up and around structures. These conditions are drawn from Exemptions 11136, 11138, 11172, 11174 and 11177.

These limitations and conditions to which Liberty Mutual (referred to as "Operator") agrees to be bound when conducting commercial operations under an FAA issued exemption include:

1) Operations authorized by this grant of exemption are limited to the aircraft described in the Operator's manual, which is a multi-rotor helicopter weighing up to 14 pounds: Liberty 1 ("UA"). Proposed operations of any other aircraft will require a new petition or a petition to amend this grant.

2) The UA may not be flown at an indicated airspeed exceeding 12 knots (5 knots during inspections).

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

4) The UA must be operated within visual line of sight (VLOS) of the Aircraft Operator at all times. This requires the Aircraft Operator to be able to use human

[8] Should the FAA determine that it cannot grant such an exemption for operations without a FAA licensed private pilot, despite the showing made herein, under the statutory authority the FAA already has, Liberty Mutual will operate its aircraft with pilots holding at least a private pilot certificate issued by the FAA. In that event, Liberty Mutual requests that the exemption be granted with conditions similar to those contained in numbered paragraphs 14-15 in Exemption 11136.

vision unaided by any device other than corrective lenses, as specified on the Operator's FAA-issued airman medical certificate.

5) The Exemption Holder's Manuals must be amended to include all conditions and limitations required by the FAA. The Manuals must be maintained and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in the exemption and the procedures outlined in the Exemption Holder's Operator's manual, the conditions and limitations in the exemption take precedence and must be followed. Otherwise, the Aircraft Operator must follow the procedures as outlined in its Aircraft's manual.

The Exemption Holder may update or revise its Manuals. It is the Exemption Holder's responsibility to track such revisions and present updated and revised documents to the Administrator upon request. The Exemption Holder must also present updated and revised documents if it petitions for an extension or amendment of this exemption. If the Exemption Holder determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the Exemption Holder must petition for amendment to its exemption.

6) Prior to each flight, the Aircraft Operator must inspect the UAS to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the 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. The Ground Control Station must be included in the preflight inspection. All maintenance and alterations must be properly documented in the aircraft records.

7) 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 in accordance with the Exemption holder's Manuals. The Aircraft Operator who conducts the functional test flight must make an entry in the UAS aircraft records of the flight. The requirements and procedures for a functional test flight and aircraft record entry must be added to the Exemption Holder's Operator's manual.

8) The Exemption Holder must follow the manufacturer's UAS aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements, with particular attention to flight critical components that may not be addressed in the manufacturer's manuals.

9) The Exemption Holder must carry out its maintenance, inspections, and record keeping requirements in accordance with the Operator's Manuals. Maintenance, inspection, and alterations must be noted in the aircraft logbook, including total

flight hours, description of work accomplished, and the signature of the authorized technician returning the UAS to service.

10) The authorized technicians must receive and document training referenced in the Exemption Holder's Manuals.

11) Each UAS operated under this exemption must comply with all manufacturer System and Safety Bulletins.

12) The Exemption Holder's maintenance personnel must make a record entry in the UAS logbook or equivalent document of the corrective action taken against discrepancies discovered between inspections.

13) Prior to commencing operations, the Aircraft Operator shall have logged at least 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 and 5 hours in the make and model.

14) 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 and land or be recovered in accordance with the Exemption Holder's Manuals.

15) The Aircraft Operator must abort the flight in the event of unpredicted obstacles or emergencies, including unauthorized people entering the flight area, in accordance with the Exemption Holder's Manuals.

16) The Aircraft Operator is prohibited from beginning a UAS flight unless (considering wind and forecast weather conditions) there is enough power to fly to the first point of intended landing and, assuming normal cruising speed, to fly after that for at least 10 minutes.

17) All aircraft operated in accordance with the 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.

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

19) The documents required under 14 CFR 91.9 and 91.203 must be available to the Operator 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.

20) The UA must remain clear and yield the right of way to all other manned operations and activities at all times (including, but not limited to, ultralight vehicles, parachute activities, parasailing activities, hang gliders, etc.).

21) The UA may not be operated by the Aircraft Operator from any moving device or vehicle.

22) UAS operations may not be conducted during night, as defined in 14 CFR 1.1.

23) All operations must be conducted under visual meteorological conditions (VMC). 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 Operator.

24) During operations the UA may not operate within 5 nautical miles of the geographic center of an airport as denoted on a current FAA-published aeronautical chart unless a letter of agreement with that airport's management is obtained, and the operation is conducted in accordance with a NOTAM, if as required by the Operator's COA. The letter of agreement with the airport management must be made available to the Administrator upon request.

25) The UA may not be operated over congested or densely populated areas unless the conditions set for in #26 are satisfied. These populated areas include but are not limited to the yellow areas depicted on World Aeronautical Charts (WAC), Sectional Aeronautical Charts (Sectionals), or Terminal Area Charts (TAC). However, aeronautical charts may not reflect pertinent local information. Ultimately, it is the Operator's responsibility to maintain the minimum safe altitudes required by § 91.119 (d) (1).

26) 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 debris in the event of an accident. The Aircraft Operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 30 feet of the UA, flight operations must cease immediately and/or;

b. The aircraft is operated near vessels, vehicles or structures where the land owner/controller has granted permission and/or the

Aircraft Operator has made a safety assessment of the risk of operating closer to those objects and;

c. Operations near the Aircraft Operator do not present an undue hazard to the Operator per § 91.119(a).

27) All operations shall be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative. Permission from land 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.

Specific Uses Public Benefits

Liberty Mutual proposes use of its UAS provided equivalent or augmented levels of safety for each of the uses proposed herein:

The present systems of inspecting the roofs of buildings, Use Case 1, and large structures site surveys, Use Case 2, are now conducted by either humans climbing on the roofs and structures that are steep, tall, slippery, weakened or otherwise hazardous or by the use of conventional aircraft. The current procedures can result in significant injuries to the people who must climb on the roofs or require the use of aircraft that are orders of magnitude greater in size than the sUAS. Either method, manual inspection or large conventional aircraft, results in increased risk of injury due to personnel falling off roofs or ladders, carrying heavy ladders and dealing with confined and dangerous spaces, or increased risk from low altitude flyovers with helicopters or fixed wing aircraft inspecting buildings after damage from storms or other disasters, such as earthquakes or fires. Such flights are, of course, significantly more expensive than those undertaken with a sUAS. The present system exposes those not only in the immediate area of inspection, but those who are along the path of flight associated with the arrival and departure of the conventional aircraft at the inspection site because the aircraft must be flown to and from the site. By contrast, the sUAS is carried to the site and transits no other property. Conventional aircraft carry flammable fuels that are not carried by the UAS and emit pollutants associated with internal combustion engines. The sUASs proposed herein are battery powered and have no emissions.

Equivalent Level of Safety

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

Section 61.113(a) & (b) limit private pilots to non-commercial operations. Unlike a conventional aircraft that carries a pilot, passengers, and cargo, the Liberty 1 UAS is remotely controlled with no passengers or property of others on board. Section 61.133(a) requires an individual with a commercial pilot's license to be pilot in command of an aircraft for compensation or hire. Liberty Mutual respectfully proposes that Operator requirements should take into account the characteristics of the particular UAS. Liberty 1 UAV has a high degree of pre-programmed control and various built-in technical capabilities that strictly limit the potential for operation outside of the operating conditions set forth in the exemption application.

The Liberty 1 UAS has navigation and control system comprised of a Ground Control Station (GCS) and auto-pilot system that can be pre-programmed to set operational boundaries . All flights are pre-programmed with precision GPS guidance. Flights are not directed by positive manual control except where needed to conduct immediate evasive maneuvers or respond to a safety of flight issue. In the case of unplanned events, the Operator may input pre-programmed evasive maneuvers from the control unit, and the onboard autopilot executes those maneuvers. Pre-programmed Operator interventions include initiation of holding at present position; suspension of mission; fly back to launch point; abort mission and land immediately; and emergency power cut off and land (Flight Termination System).

Additional automated safety functions and safety enhancing features of the Liberty 1 include the following:

1.1. Auto-pilot detection of lost GPS or of insufficient satellites initiates an immediate landing.
1.2. Low power on the aircraft triggers escalating alarms at GCS at 35% and 10% levels. Low power beyond 10% triggers an immediate landing.
1.3. If the auto-pilot detects a lost-link to the ground controller, the UAS will hold position at its current location for 5 seconds and if the signal is not restored, execute a return to home and land.
1.4. Redundant "kill switches" that enable completely shutting the aircraft down in flight in the event of a loss of control or uncommanded deviation from the flight path.
1.5. The aircraft, weighs less than 14lbs., fully loaded.
1.6. The motors are driven by pulse width modulated signals, not analog signals.
1.7. The aircraft will operate for the Purposes at no more than 5 knots (while imaging) nor above 200 feet above the structure (imaging altitude) or a maximum of 400 AGL.

Given these safety features, Liberty Mutual proposes that Operators of the Liberty 1 UAS 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 the manufacturer's or Liberty Mutual's training program for operation of the UAS.

Liberty Mutual 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 where 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). Likewise, Liberty Mutual notes that the NPRM does not require that the Operator hold a private pilot license issued by the FAA.

Given these conditions and restrictions, an equivalent level of safety will be provided by allowing operation of the Liberty 1 UAS without a private pilot's certificate or a commercial pilot's certificate, under the conditions set forth herein.

The risks associated with the operation of the Liberty 1 UAS (given its size, speed, operational capabilities, and lack of combustible fuel) are so diminished from the level of risk associated with private pilot operations or commercial operations contemplated by Part 61 with conventional aircraft (fixed wing or rotorcraft), that allowing operations of the UAS as set forth above meets or exceeds the present level of safety provided under 14 C.F.R. § 61.113(a) & (b) and does not rise to the level of requiring a commercial pilot to operate the aircraft under § 61.133(a).

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

This regulation requires that no person may operate a civil aircraft unless it is in airworthy condition. Should the exemption be granted allowing commercial operation of the UAS without an airworthiness certificate, no standard will exist for airworthiness of the UA. Given the size of the aircraft and the requirements that the Operator has agreed to as it relates to airworthiness, as contained in the manual, an equivalent level of safety will be achieved by insuring compliance with the manuals prior to each flight. The FAA has granted exemptions to conduct similar operations in Exemptions 11062 through 11067, 11080 and 11110.

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

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, provided the person operating the helicopter complies with any route or altitudes prescribed for helicopters by the FAA. As this exemption is for a sUAS that is a helicopter and the exemption requests authority to operate at altitudes up to 200 AGL, an exemption may be needed to allow such operations. .

The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner, facility owner, and/or local officials. Because of the advance notice to the property owner and participants, all affected individuals will be aware of the planned flight

operations as set forth in the Manuals. Compared to flight operations with aircraft or rotorcraft weighing far more than the maximum 55 lbs. and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented by conventional aircraft operating at or below 500 AGL in the aerial photography industry. In addition, the low-altitude operations of the sUAS will ensure separation between these small-UAS operations and the operations of conventional aircraft that must comply with Section 91.119. The FAA has granted exemptions to conduct similar operations in Exemptions 11062 through 11067, 11080 and 11110.

14 C.F.R. §91.121 Altimeter Settings

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "…to the elevation of the departure airport or an appropriate altimeter setting available before departure." As the Liberty 1 UAS, in manual or emergency mode, will not have a barometric altimeter display, but instead a GPS altitude display, an exemption will be needed. An equivalent level of safety will be achieved by the Operator, pursuant to the procedures set forth in the Manuals as indicated before flight. The FAA has granted exemptions to conduct similar operations in Exemptions 11062 through 11067, 11080 and 11110.

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

Section 91.151(a) prohibits an individual from beginning "a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing, and, assuming normal cruising speed – (1) During the day, to fly after that for at least 30 minutes; or (2) At night, to fly after that for at least 45 minutes."

The battery powering the sUAS provides approximately 40 minutes of powered flight. To meet the 30-minute reserve requirement in 14 CFR §91.151, sUAS flights would be limited to approximately 10 minutes in length. Given the limitations on the UAS's proposed flight area and the location of its proposed operations within a predetermined area, a longer time frame for flight is reasonable.

Applicant believes that an exemption from 14 CFR §91.151(a) falls within the scope of prior exemptions. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with FAR 91.151 (a)). Operating the small UAS, in a tightly controlled area where only people and property owners or official representatives who have signed waivers will be allowed, with less than 30 minutes of reserve fuel, does not engender the type of risks that Section 91.151(a) was intended to alleviate given the size and speed of the small UAS.

Applicant believes that an equivalent level of safety can be achieved by limiting flights to 30 minutes or 25% of battery power whichever happens first. This restriction would be more

than adequate to return the sUAS to its planned landing zone from anywhere in its limited operating area.

Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, 10808 and Exemptions 11062, through11067, 11080 and 11110.

14 C.F.R. §91.405 (a); 91.407 (a) (1); 91.409(a) (2); 91.417(a) & (b): Maintenance Inspections

These regulations require that an aircraft Operator or owner "shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter...," and others shall inspect or maintain the aircraft in compliance with Part 43.

Given that these sections and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to the applicant. Maintenance will be accomplished by the Operator or manufacturer pursuant to the flight manual and operating handbook as referenced in the Manuals attached as confidential Exhibits An equivalent level of safety will be achieved because these small UASs are very limited in size and will carry a small payload and operate only in defined areas for limited periods of time. If mechanical issues arise, the UAS can land immediately and will be operating from no higher than 400 feet AGL. As provided in the Aircraft Flight Operations Manual the Operator will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, the Operator and manufacturer are most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety. The FAA has granted exemptions for similar operations in Exemptions 11062 through 11067, 11080 and 11110.

****

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

Applicant seeks an exemption from the following rules:

14 C.F.R. §§ 61.113(a) & (b); 91.7(a); 91.119; 91.121; 91.151(a); 91.405(a); 91.407(a)(1); 91.409(a)(2) and 91.417 (a) & (b) to operate commercially a small unmanned vehicle (55 lbs. or less) in insurance survey operations for homes and large structure claims.

Privacy and National Security

All flights will occur over private or controlled access property with the property owner's prior consent and knowledge. Inspection will be of inanimate objects in areas where the owners will have consented to the inspections or otherwise have agreed to allow the UAS and the Operator to be in the area where inspection will take place.

The size of the UAS, its speed and restricted area of operation do not raise national security issues.

Summary

Approval of exemptions allowing commercial operations of sUASs for aerial photography for 1) home and business roof inspection and 2) large structure/fire site inspection will enhance safety by reducing risk. Conventional operations, using jet or piston powered aircraft, ladders or placing people on roofs or tall, hazardous or weakened structures, exposes them to higher risks than those created by use of a sUAS. Conventional aircraft that operate at extremely low altitudes just feet from the subject being inspected and in extreme proximity to people and structures present the risks associated with vehicles that weigh in excess of 6,000 lbs., carrying large amounts of jet A or other fuel (140 gallons for jet helicopters). Such aircraft must fly to and from the project location. In contrast, a sUAS weighing fewer than 14 lbs. and powered by batteries eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The sUAS is carried to the target area and not flown. The sUAS 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, weighting less than 14 lbs., conducted under the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein. These lightweight aircraft operate at slow speeds, close to the ground, and in areas that are under the control of the customer for the inspections and, as a result, are far safer than conventional operations conducted with turbine helicopters operating in close proximity to the ground and people or the use of individuals to climb the structures to conduct the inspections.

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 within visual line of sight and national security – provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of applicant's UAS for the Purposes outlined herein and are consistent with exemptions already granted, including Exemptions11171 through 11174, 11176, 11177.

Sincerely,

Jonathan B. Hill
M. Anne Swanson
Cooley LLC
Counsel for Liberty Mutual LLC.

John McGraw
John McGraw Aerospace Consulting, LLC
Agent for Liberty Mutual LLC

cc: James Williams
Robert Pappas
Jake Troutman
Dean Griffith, Esq.
Thuy H. Cooper

APPENDIX A

SUMMARY OF LIBERTY MUTUAL SECTION 333 EXEMPTION REQUEST

For publication in the *Federal Register,* Liberty Mutual hereby provides pursuant to Part 11 a summary of its exemption application to allow commercial operation of the Liberty 1 unmanned aircraft for purposes of 1) home and business roof inspection; and 2) large structure/fire site inspection. An exemption is requested from the following regulations:

14 C.F.R. § 61.113(a) & (b);

14 C.F.R. § 91.7(a);

14 C.F.R. § 91.119(c);

14 C.F.R. § 91.121;

14 C.F.R. § 91.151(a);

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) & (b)

Cooley LLP

Jonathan B. Hill
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May 13, 2015

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

Re: FAA- Docket 2015-0513 Supplement to Application/Amendment

Dear Sir/Madam:

Enclosed please find an amendment to the application for exemption filed by Liberty Mutual Insurance Company found in Docket FAA-2015-0513. Confidential exhibits are not included and will be submitted separately with a request for confidential treatment.

Sincerely,

Jonathan B. Hill
Cooley, LLP
Counsel for Liberty Mutual Insurance Company

Encl.

cc: James Williams
Robert Pappas
Jake Troutman
Dean Griffith
Thuy H. Cooper

Cooley LLP

Jonathan B. Hill
202/776-2725
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May 13, 2015

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

Re: FAA-Docket 2015-0513 Supplement to Application/Amendment

Dear Sir or Madam:

On February 27, 2015, Liberty Mutual Insurance Company ("Liberty Mutual") submitted an exemption application pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11. (FAA Docket 20125-0513) That exemption was to authorize the commercial operation of "Liberty I" aircraft, as described in the exemption, in commercial service for two use cases also described in the application.

Liberty Mutual herein amends that application to include the following aircraft:

1. "Liberty 2".
2. "Liberty 3"
3. "Liberty 4"

Liberty 2, as described in the Aircraft Flight Manual (AFM), is a fixed wing aircraft. Liberty 3 is a quadcopter and Liberty 4 is a hexacopter, each described in detail in the confidential AFMs filed herewith. Each weighs less than 55 lbs. and are equipped to conduct aerial photography as described in the original application under the conditions outlined in the original application or, as may be established by the FAA in the exemption granted under either Section 333 or Section 49 U.S.C. §44701(f). As set forth, Liberty Mutual asks that this application be processed under the FAA's Summary Approval Process. To that end, Liberty Mutual will accept the conditions set forth in Exemption No. 11309 and 11460 granted on April 8, 2015 and May 5, 2015, two of several exemptions granted for the use of fixed wing aircraft for aerial data collection.

As this amended Exemption request is identical to the exemptions already granted, this request should qualify for summary processing as the FAA has already given public notice of and granted similar exemptions. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in this 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." As with the approval of the Closed Set Exemptions and the General Aerial Photography Exemptions, approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities to "…establish requirements for the safe operation of such aircraft systems in the national airspace system." Section 333(c) of the Reform Act.

The name and address of the applicant is:

Liberty Mutual Insurance Company
157 Berkeley Street
Boston, Massachusetts 02116
Attn: Antony Parchment
Ph: 617-357-9500

Regulations from which the exemption is requested:

14 C.F.R. 61.113 (a) & (b)
14 C.F.R. 91.119
14 C.F.R. 91.121
14 C.F.R. 91.151 (a)
14 C.F.R. 91.405 (a)
14 C.F.R. 407 (a) (1)
14 C.F.R. 409 (a) (2)
14 C.F.R. 417 (a) & (b)

This amended exemption application is expressly submitted to fulfill Congress' goal in passing Section 333(a) through (c) of the Reform Act. This law directs the Secretary of Transportation to consider whether certain unmanned aircraft systems may operate safely in the national airspace system (NAS) before completion of the rulemaking required under Section 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 UASs 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.

Reform Act § 333 (a). Lastly, if the Secretary determines that such vehicles "may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft in the national airspace system." *Id.* § 333(c) (emphasis added)[1].

[1] Applicant interprets this provision to place the duty on the Administrator to not only process applications for exemptions under section 333, but for the Administrator to craft conditions

The Federal Aviation Act, in addition to the authority granted by Section 333 of Reform 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, that includes sUASs, from the requirement that all civil aircraft must have a current airworthiness certificate.

The Administrator may grant an exemption from a requirement of a regulation prescribed under subsection (a) or (b) of this section or any sections 44702-44716 of the Transportation Act if the Administrator finds the exemption in the public interest. 49 U.S.C. §44701(f). *See also* 49 U.S.C. § 44711(a); 49 U.S.C. § 44704; 14 C.F.R. § 91.203 (a) (1).

Liberty Mutual business and its proposed uses for the additional aircraft are described in its original exemption application in this docket, which is incorporated herein. These aircraft will operate at altitudes of no more than 400 feet, as further explained, and only in line of sight. They will operate only within the areas as described in the Amended Flight Operations Manual ("FOM") and Aircraft Flight Manuals ("AFMs") attached as Exhibits 1 through 4.[2] Operations in compliance with these manuals will ensure that the sUAS will "not create a hazard to users of the national airspace system or the public"[3] and that the aircraft will operate in compliance with the conditions set forth in this application.

Given the small size of the sUASs involved and the restricted environment within which they will operate, the applicant falls squarely within that zone of safety (an equivalent level of safety) in which Congress envisioned that the FAA must, by exemption, allow commercial operations of UASs to commence immediately. Also due to the size of the UASs, the restricted areas in which the relevant sUASs will operate and the fact that aircraft will be flown by pilots holding at least a FAA pilot license, approval of the application presents no national security issue.

Given the clear direction in Section 333 of the Reform Act, the authority contained in the Federal Aviation Act, as amended; the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, reduction in environmental impacts, including reduced emissions associated with allowing battery powered UASs for these functions instead of turbine or gas power aircraft/rotorcraft and operations with pilots having at least a private pilot license, the grant of the requested exemptions is in the public interest. Accordingly, the applicant respectfully requests that the FAA grant the requested exemption and this amendment without delay.

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for the safe operation of the UAS, if it should be determined that the conditions set forth herein do not fulfill the statutory requirements for approval.

2 Applicant submits the amended FOM and AFM for each aircraft applied for hereunder, marked "CONFIDENTIAL", as they contain propriety business information that is not released to the public and is protected under the Freedom of Information Act 5 U.S.C. § 553 etc.

3 Reform Act Section 333 (b).

AIRCRAFT AND EQUIVALENT LEVEL OF SAFETY

The FAA has granted exemptions to the following regulations in the listed exemptions; 14 C.F.R. §§ (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), 91.405 (a)(1), 91.409 (a) (1) and (2) and 91.417(a) and (b) to allow aerial data collection (See, FAA Exemptions 11309,11460 and 11490)

14 C.F.R. Part 61: Private Pilot Privileges and Limitations: Pilot in Command

Sections 61.113 (a) & (b) limit private pilots to non-commercial operations**.** Because the UAS will not carry a pilot or passengers, the proposed operations can achieve the equivalent level of safety of current operations by requiring the PIC operating the aircraft to hold a certificate issued by the FAA authorizing operation of any aircraft (ATP, Commercial, Private, Recreational or Sport). Unlike a conventional aircraft that carries the pilot and passengers, the sUAS is remotely controlled with no living thing on board. The area of operation is controlled and restricted, and all flights are planned and coordinated in advance as set forth in the Manual. The level of safety provided by the requirements included in the Manual exceeds that provided by a single individual holding a commercial pilot's certificate operating a conventional aircraft. The risks associated with the operation of the sUAS are so diminished from the level of risk associated with commercial operations contemplated by Part 61 when drafted, that allowing operations of the sUAS as requested with any certificate issued by the FAA as the PIC exceeds the present level of safety achieved by 14 C.F.R. Part 61. The FAA has granted exemptions for private pilots to conduct similar operations in Exemptions 11062, 11213, 11360 and 11447.

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

Section 91.119 establishes safe altitudes for operation of civil aircraft. Section 91.119 (d) allows helicopters to be operated at less than the minimums prescribed, provided the person operating the helicopter complies with any route or altitudes prescribed for helicopters by the FAA. As this exemption is for a sUAS that are helicopters and the exemption requests authority to operate at altitudes up to 400 AGL an exemption may be needed to allow such operations. As set forth herein, except for the limited conditions stated in the Manual, the UAS will never operate at higher than 400 AGL.

The equivalent level of safety will be achieved given the size, weight, speed of the UAS as well as the location where it is operated. No flight will be taken without the permission of the property owner, facility owner and local officials. Because of the advance notice to the property owner and participants all affected individuals will be aware of the planned flight operations as set forth in the Manual. Compared to flight operations with aircraft or rotorcraft weighting far more than the maximum 55lbs. proposed herein and the lack of flammable fuel, any risk associated with these operations is far less than those presently presented with conventional aircraft operating at or below 500 AGL in the aerial photography industry. In addition, the low-altitude operations of the sUAS will ensure separation between these small-UAS operations and the operations of conventional aircraft that must comply with Section 91.119. The FAA has

granted exemptions to conduct similar operations in Exemptions 11062, 11213, 11360 and 11447.

14 C.F.R. § 91.121: Altimeter Settings

This regulation requires each person operating an aircraft to maintain cruising altitude by reference to an altimeter that is set "…to the elevation of the departure airport or an appropriate altimeter setting available before departure." As each sUAS model in at least one operating mode will not have a barometric altimeter, but instead a GPS altitude read out, an exemption will be needed. An equivalent level of safety will be achieved by the operator, pursuant to the Manual and Safety Check list, confirming the altitude of the launch site shown on the GPS altitude indicator before flight. The FAA has granted exemptions to conduct similar operations in Exemptions 11062, 11213, 11360 and 11447.

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

Section 91.151 (a) prohibits an individual from beginning "a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing, and, assuming normal cruising speed – (1) During the day, to fly after that for at least 30 minutes; or (2) At night, to fly after that for at least 45 minutes."

The battery powering the sUAS provides approximately 40 minutes of powered flight. To meet the 30 minute reserve requirement in 14 C.F.R. § 91.151, sUAS flights would be limited to approximately 10 minutes in length. Given the limitations on the UAS's proposed flight area and the location of its proposed operations within a predetermined area, a longer time frame for flight in daylight or night VFR conditions is reasonable.

Applicant believes that an exemption from 14 C.F.R. § 91.151(a) falls within the scope of prior exemptions. *See* Exemption 10673 (allowing Lockheed Martin Corporation to operate without compliance with FAR 91.151 (a)). Operating the small UAS, in a tightly controlled area where only people and property owners or official representatives who have signed waivers will be allowed, with less than 30 minutes of reserve fuel, does not engender the type of risks that Section 91.151(a) was intended to alleviate given the size and speed of the small UAS.

Applicant believes that an equivalent level of safety can be achieved by limiting flights to 5 minutes of reserve time on the batteries. This restriction would be more than adequate to return the sUAS to its planned landing zone from anywhere in its limited operating area.

Similar exemptions have been granted to other operations, including Exemptions 2689F, 5745, 10673, 10808 and Exemptions 11062, 11213, 11360 and 11447.

14 C.F.R. Part 91: Maintenance Inspections

These regulations require that an aircraft operator or owner "shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except

as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter...," and others shall inspect or maintain the aircraft in compliance with Part 43.

Given that these section and Part 43 apply only to aircraft with an airworthiness certificate, these sections will not apply to the applicant. Maintenance will be accomplished by the operator pursuant to the flight manual and operating handbook as referenced in the FOM attached as confidential *See* Exhibit 1. An equivalent level of safety will be achieved because these small UASs are very limited in size and will carry a small payload and operate only in areas for limited periods of time. If mechanical issues arise the UAS can land immediately and will be operating from no higher than 400 feet AGL. As provided in the FOM the operator will ensure that the UAS is in working order prior to initiating flight, perform required maintenance, and keep a log of any maintenance performed. Moreover, the operator is the person most familiar with the aircraft and best suited to maintain the aircraft in an airworthy condition to provide the equivalent level of safety. The FAA has granted exemptions for similar operations in Exemptions 11062, 11213, 11360 and 11447.

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

Applicant seeks an exemption from the following rules:

14 C.F.R. §§(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), 91.405 (a)(1), 91.409 (a) (1) and (2) and 91.417(a) and (b) to operate commercially a small unmanned vehicle (55 lbs. or less) in motion picture and television operations and aerial data collection.

Approval of exemptions allowing commercial operations of sUASs for the Use Cases will enhance safety by reducing risk. Keeping employees and contractors off structures and away from property that is damaged as the result of manmade or natural disasters will reduce injuries and save lives-also reducing costs. Conventional operations, using jet or piston power aircraft, operate at extremely low altitudes in extreme proximity to people and structures present risks associated with vehicles that weigh in the neighborhood of 6,000 lbs., carrying large amounts of jet A or other fuel (140 gallons for jet helicopters). Such aircraft must fly to and from the project location. In contrast, a sUAS weighing fewer than 55 lbs. and powered by batteries eliminates virtually all of that risk given the reduced mass and lack of combustible fuel carried on board. The sUAS is carried to the target area and not flown. The sUAS 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, weighting less than 55 lbs., conducted in the strict conditions outlined above, will provide an equivalent level of safety supporting the grant of the exemptions requested herein. These lightweight aircraft operate at slow speeds, close to the ground, and in areas that are under the control of the customer for the inspections and, as a result, are far safer than conventional operations conducted with turbine helicopters operating in

close proximity to the ground and people or the use of people to climb the structures to conduct the inspection.

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 within visual line of sight and national security – provide more than adequate justification for the grant of the requested exemptions allowing commercial operation of applicant's UASs for the Purposes outlined herein and are consistent with exemptions already granted, including Exemptions 11309, 11460 and 11490.

Sincerely,

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