

Exemption No. 11156

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591

In the matter of the petition of

TOTAL SAFETY U.S., INC.

for an exemption from part 21, Subpart H;
part 27; §§ 45.23(b); 45.27(a); 61.113;
91.7(a); 91.9(b)(2) and (c); 91.103;
91.109(a); 91.119; 91.121; 91.151(a);
91.203(a) and (b); 91.405(a); 91.407(a)(1);
91.409(a)(2); and 91.417(a) and (b)
of Title 14, Code of Federal Regulations

Regulatory Docket No. FAA-2014-0610

GRANT OF EXEMPTION

By letters dated August 13, 2014, and October 15, 2014, Mark A. Dombroff, McKenna Long & Aldridge LLP, Counsel for Total Safety U.S., Inc., 1676 International Drive, Penthouse, McLean, VA 22102, petitioned the Federal Aviation Administration (FAA) on behalf of Total Safety U.S., Inc. (Total Safety) for an exemption from part 21, Subpart H (§§ 21.171-21.199), part 27, §§ 45.23(b), 45.27(a), 61.113, 91.7(a), 91.9(b)(2) and (c), 91.103, 91.109(a), 91.119, 91.121, 91.151(a), 91.203(a) and (b), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) and (b) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption would allow operation of unmanned aircraft systems (UAS) for the purpose of conducting flare stack inspections for the oil, natural gas, petro-chemical, and pipeline industries.

The petitioner requests relief from the following regulations:

Part 21, Subpart H prescribes, in pertinent part, the procedural requirements for issuing airworthiness certificates.

Part 27 prescribes, in pertinent part, airworthiness standards for the issue of type certificates, and changes to those certificates, for normal category rotorcraft.

Section 45.23(b) prescribes, in pertinent part, that when marks include only the Roman capital letter "N" and the registration number is displayed on limited, restricted or light- sport

category aircraft or experimental or provisionally certificated aircraft, the operator must also display on that aircraft near each entrance to the cabin, cockpit, or pilot station, in letters not less than 2 inches nor more than 6 inches high, the words “limited,” “restricted,” “light-sport,” “experimental,” or “provisional,” as applicable.

Section 45.27(a) prescribes, in pertinent part, the requirement for rotorcraft operators to display certain marks on both sides of the cabin, fuselage, boom or tail.

Section 61.113(a) and (b) prescribe, in pertinent part, that—

- (a) No person who holds a private pilot certificate may act as a pilot in command (PIC) of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as PIC of an aircraft.
- (b) A private pilot may, for compensation or hire, act as PIC of an aircraft in connection with any business or employment if—
 - (1) The flight is only incidental to that business or employment; and
 - (2) The aircraft does not carry passengers or property for compensation or hire.

Section 91.7(a) prescribes, in pertinent part, that no person may operate a civil aircraft unless it is in an airworthy condition.

Section 91.9(b)(2) prohibits operation of U.S.-registered civil aircraft unless there is available in the aircraft a current approved Airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

Section 91.9(c) prohibits operation of U.S.-registered civil aircraft unless that aircraft is identified in accordance with part 45.

Section 91.103 prescribes, in pertinent part, that each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight, to include—

- (a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;
- (b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:
 - (1) For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual

containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

- (2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

Section 91.109(a) prescribes, in pertinent part, that no person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls.

Section 91.119 prescribes that, except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

- (a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
- (b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
- (c) Over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.
- (d) Helicopters, powered parachutes, and weight-shift-control aircraft. If the operation is conducted without hazard to persons or property on the surface—
 - (1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section, provided each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA; and
 - (2) A powered parachute or weight-shift-control aircraft may be operated at less than the minimums prescribed in paragraph (c) of this section.

Section 91.121 requires, in pertinent part, 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."

Section 91.151(a) prescribes that no person may begin 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,

during the day, to fly after that for at least 30 minutes.

Section 91.203(a) prohibits, in pertinent part, any person from operating a civil aircraft unless it has within it (1) an appropriate and current airworthiness certificate; and (2) an effective U.S. registration certificate issued to its owner or, for operation within the United States, the second copy of the Aircraft Registration Application as provided for in 14 CFR 47.31(c).

Section 91.203(b) prescribes, in pertinent part, that no person may operate a civil aircraft unless the airworthiness certificate or a special flight authorization issued under 14 CFR 91.715 is displayed at the cabin or cockpit entrance so that it is legible to passengers or crew.

Section 91.405(a) requires, in pertinent part, that an aircraft operator or owner shall have that aircraft inspected as prescribed in Subpart E of the same part and shall, between required inspections, except as provided in paragraph (c) of the same section, have discrepancies repaired as prescribed in part 43 of the chapter.

Section 91.407(a)(1) prohibits, in pertinent part, any person from operating an aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless it has been approved for return to service by a person authorized under § 43.7 of the same chapter.

Section 91.409(a)(2) prescribes, in pertinent part, that no person may operate an aircraft unless, within the preceding 12 calendar months, it has had an inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.

Section 91.417(a) and (b) prescribes, in pertinent part, that—

(a) Each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:

(1) Records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft (including the airframe) and each engine, propeller, rotor, and appliance of an aircraft. The records must include—

(i) A description (or reference to data acceptable to the Administrator) of the work performed; and

(ii) The date of completion of the work performed; and

(iii) The signature, and certificate number of the person approving the aircraft for return to service.

(2) Records containing the following information:

- (i) The total time in service of the airframe, each engine, each propeller, and each rotor.
 - (ii) The current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance.
 - (iii) The time since last overhaul of all items installed on the aircraft which are required to be overhauled on a specified time basis.
 - (iv) The current inspection status of the aircraft, including the time since the last inspection required by the inspection program under which the aircraft and its appliances are maintained.
 - (v) The current status of applicable airworthiness directives (AD) and safety directives including, for each, the method of compliance, the AD or safety directive number and revision date. If the AD or safety directive involves recurring action, the time and date when the next action is required.
 - (vi) Copies of the forms prescribed by § 43.9(d) of this chapter for each major alteration to the airframe and currently installed engines, rotors, propellers, and appliances.
- (b) The owner or operator shall retain the following records for the periods prescribed:
- (1) The records specified in paragraph (a)(1) of this section shall be retained until the work is repeated or superseded by other work or for 1 year after the work is performed.
 - (2) The records specified in paragraph (a)(2) of this section shall be retained and transferred with the aircraft at the time the aircraft is sold.
 - (3) A list of defects furnished to a registered owner or operator under § 43.11 of this chapter shall be retained until the defects are repaired and the aircraft is approved for return to service.

The petitioner supports its request with the following information:

The petition and the following supporting documentation are hereinafter referred to as the operating documents:

- 1) TotalSafety DJI S1000 sUAS Aircraft Flight Manual
- 2) TotalSafety U.S., Inc. Global Integrated Industrial Safety Services UAS Operations Manual

The FAA has organized the petitioner's information into four sections: 1) the unmanned aircraft system (UAS), 2) the UAS pilot in command (PIC), 3) the UAS operating parameters, and 4) the public interest.

Unmanned Aircraft System

The UAS proposed by the petitioner is the *DJI Innovations S1000 Multi-rotor Rotorcraft* (hereinafter referred to as "the unmanned aircraft (UA)"). The petitioner states that the UA to be operated under this request has eight rotors and eight motors in an octocopter configuration, is less than 25 lbs. when fully loaded, and will be operated at low speeds, carrying neither a pilot nor passenger, explosive materials or flammable liquid fuels, and operates exclusively within a sterile area as set out in the operating documents. In addition, the manufacturer has integrated numerous safety features into the design of the UA, as described in the petitioner's operating documents, to ensure the safety of persons and property within and surrounding the limited operating area. The petitioner further describes that, in the event the UA loses communications or its global positioning system (GPS) signal, the UA will have the capability to return to a pre-determined location within the sterile area and land. It will also have the capability to abort a flight in the event of unpredicted obstacles or emergencies.

The petitioner states that given the size, weight, speed, and limited operating area associated with the aircraft to be utilized by the applicant, an exemption from 14 CFR part 21, Subpart H *Airworthiness Certificates* and 14 CFR part 27 *Airworthiness Standards: Normal Category Rotorcraft*, subject to certain conditions and limitations, is warranted and meets the requirements for an equivalent level of safety under 14 CFR part 11 and Section 333 of the FAA Modernization and Reform Act of 2012 (PL 112-95). The petitioner further states that UAS operated without an airworthiness certificate in the restricted sterile environment and under the conditions and limitations proposed by the petitioner will be at least as safe, or safer, than a conventional aircraft (fixed wing or rotorcraft) operating with an airworthiness certificate issued under 14 CFR part 21, Subpart H and not subject to the proposed conditions and limitations.

The petitioner states that even though its UAS will have no airworthiness certificate, an exemption has been requested from 14 CFR § 45.23(b) as the UA will have no entrance to the cabin, cockpit, or pilot station on which the word "Experimental" can be placed. Given the size of the UA, the petitioner notes that the two-inch lettering will be impossible. The petitioner asserts that an equivalent level of safety will be provided by having the UA marked with the word "Experimental" on the fuselage in compliance with 14 CFR § 45.29(f).

The petitioner states that the maintenance requirements in the pertinent sections of 14 CFR part 91 are only applicable to aircraft with an airworthiness certificate in accordance with part 43. The petitioner states that the maintenance requirements contained in part 43 and part 91 should not apply to its UAS because the UAS was never issued an airworthiness certificate. The petitioner has stated that it intends to conduct all maintenance in accordance with the operating documents.

UAS Pilot In Command (PIC)

The petitioner states that while its proposed operation is considered to be a commercial operation, the UA will be operated in a very confined and controlled area, within visual line of sight (VLOS) of the pilot. Furthermore, the UA will not carry a pilot or passengers on board, which considerably reduces the potential for personnel injury. The petitioner suggests that by utilizing licensed private pilots as pilot in command (PIC), the proposed operations will not adversely affect safety because of the confined and controlled area of operations. The petitioner also states that the PIC will have additional qualifications and training prior to operations conducted under this exemption. In support of its position, the petitioner references the exemption granted to Astraeus Aerial [Exemption No. 11062] which permits commercial motion picture filming with UAS utilizing private pilots.

Additionally, the petitioner notes that flare stack inspections occur in refineries or other areas where access to the public is strictly limited and controlled. Under virtually all circumstances, the property and structures surrounding the flare stack is owned by the controlling entity. As a result, the operation will have no substantial impact on any third persons not involved in the inspection.

UAS Operating Parameters

The petitioner states that all flights will be operated within VLOS of a pilot and/or observer, and that the UA flights will be limited to a maximum altitude of 400 feet above ground level (AGL). The petitioner further states that an operator will ensure that only consenting personnel will be allowed within 100 feet of the UA operation. In addition, the aircraft will be operated at a lateral distance of at least 100 feet from any inhabited structures, buildings, vehicles, or vessels not associated with the operation or who have not signed a waiver in advance of the operation. The petitioner asserts that an equivalent level of safety can be achieved given the size, weight, and speed of the UAS, as well as the controlled location where it is operated. The petitioner states that the UAS will be operated within a safe operating perimeter, the boundaries of which will be determined by operations personnel and the UAS PIC based on the specific site. The petitioner argues that, compared to flight operations with aircraft or rotorcraft weighing far more, and the lack of flammable fuel, any risk associated with its UAS operations is far less than those with conventional aircraft. The petitioner's operating documents describe a scope of operations that includes inspection of any property, structures, materials, or natural landscape features located within a client's physical property. However, Section V of the petition specifically limits the scope as follows, "Petitioner seeks an exemption from several interrelated provisions of 14 CFR Parts 21, 45 and 91 for purposes of conducting Flare Stack inspections using sUASs."

With respect to preflight actions, the petitioner has requested an exemption from 14 CFR § 91.103, because it will not have approved rotorcraft flight manuals on board the aircraft. The petitioner asserts that an equivalent level of safety will be achieved by the PIC taking all preflight actions as set forth in the operating documents, including reviewing weather, flight battery requirements, landing and takeoff distances, and aircraft performance data before

initiation of flight. Additionally, the petitioner states that the operating documents will be located at the ground station with the operator at all times.

The petitioner notes that it may need an exemption from 14 CFR § 91.121, as its UAS has a GPS altitude read out instead of a barometric altimeter. The petitioner asserts that an equivalent level of safety will be achieved because the operator will confirm the altitude of the launch site shown on the GPS altitude indicator before flight. Moreover, the PIC will use the GPS altitude indicator to constantly monitor the UA's height, thus ensuring operation at safe altitudes.

With respect to 14 CFR § 91.151(a), the petitioner notes that the UA has a battery life of approximately 15 minutes. The petitioner argues that, given the limitations on the UA's proposed altitude and operational area, a reduced fuel reserve is warranted. The petitioner believes that limiting flights to 25% of battery power will provide an acceptable safety margin for achieving an equivalent level of safety.

Public Interest

The petitioner states that, given the small size of the UA involved and the restricted sterile environment within which it will operate, its proposed operation is in compliance with the type of operation which Congress envisioned when crafting Public Law 112-95. The petitioner states that the proposed operation has a great public benefit because safety inspections will be conducted using a UA as opposed to sending a human observer to the top of the flare stack or using helicopters to inspect the flare stack, thereby reducing the risk to human life. The petitioner further asserts that the use of a UA will reduce the hazards and emissions associated with the alternate use of helicopters to conduct similar inspection operations. Due to the size of the UA and the restricted areas in which the UAS will operate, approval of the application presents no national security issue. The petitioner states that, given the clear direction in Section 333, the strong equivalent level of safety surrounding the proposed operations, and the significant public benefit, including enhanced safety, granting the requested exemption is in the public interest.

Discussion of Public Comments:

A summary of the petition was published in the Federal Register on September 2, 2014 (79 FR 52105). Two comments were received. The Small UAV Coalition (hereafter the Coalition) supported the petition, whereas the Air Line Pilots Association, International (ALPA) opposed the petition.

The Coalition believes that Total Safety's petition demonstrates that its small UAS operations can be conducted safely on privately owned or controlled property, with a number of voluntary safety precautions. With regards to the petitioner's request for an exemption from the airworthiness certification regulation and the certification requirements for normal category rotorcraft, the Coalition asserted that the operational limitations proposed by the petitioner should be more than adequate to grant an exemption from airworthiness certification. The Coalition noted that similar small UAV operations, conducted by hobbyists and modelers, are appropriately permitted without such

certification. The Coalition stated that it does not believe that heightened safety measures should be required for Total Safety simply because of the commercial nature of its operations. The Coalition noted that Total Safety's operations do not pose a risk to any congested area or populated area. The Coalition stated that small unmanned aerial vehicles (UAVs) that operate for any purpose, commercial or non-commercial, should be judged based upon the precautions taken for safe operation, taking into consideration the relevant technical parameters of the UAV and UAS.

The Air Line Pilots Association, International (ALPA), which represents the safety interests of over 51,000 professional airline pilots flying for 31 airlines in the United States and Canada, submitted a comment in opposition to the petition. ALPA's long-held position is that all aircraft operating in the National Airspace System (NAS) must operate to the same high level of safety. ALPA commented on the sterile area which the UAS will operate within and states there must be a means to ensure that the UAS remains within this area and that non-participating aircraft remain clear of the airspace. The FAA has added conditions and limitations to this document to help ensure the separation of manned and unmanned aircraft. Furthermore, the FAA will define the operational area and will provide additional special provisions via a Certificate of Waiver or Authorization (COA). The special provisions will also discuss requirements for issuance of Notices to Airmen (NOTAMS) which alert non-participating aircraft of the UAS operations.

ALPA referred to the petitioner's statement that the aircraft carries no explosive materials or flammable liquid fuels, however noted that the aircraft carries a lithium polymer battery which have numerous associated fire and explosion hazards. ALPA referenced a battery safety study. However, the FAA notes that safety study was primarily conducted to determine how certain battery cells react in a fire situation aboard manned airplanes. Given the size of the battery and the operating conditions of the UAS, the FAA concludes that the use of a lithium polymer battery will not pose an undue safety risk for the proposed operations.

ALPA commented that the petitioner describes communications between the pilot and observer as via voice and/or text. ALPA is concerned that the potential latency associated with text messaging does not allow for prompt communications between the pilot and observer. As in *Astraeus Aerial* [Exemption No. 11062], the FAA does not permit text messaging as an appropriate means of communication between the PIC and VO. This issue has been addressed in the conditions and limitations section of this exemption.

ALPA noted that the petitioner's aircraft does not have a barometric altimeter which is required by 14 CFR § 91.121. ALPA questioned the petitioner's ability to operate to the same level of safety as other aircraft operated commercially in the NAS. This comment is addressed in the FAA analysis below.

ALPA opposed the petitioners request to operate in the NAS without completing an airworthiness certification evaluation. ALPA also commented that it believes all aircraft operating in the NAS should operate at the same high level of safety, and believes that UAS operated in the NAS must be in an airworthy condition. ALPA noted that appropriate mitigations for compliance with 14 CFR § 91.113, Right of Way Rules, must be implemented given the significance of this requirement. These comments are addressed in the FAA analysis

below.

ALPA believed that operations for compensation or hire should be conducted by appropriately licensed commercial pilots with second class medical certificates. This comment is addressed in the FAA's analysis of 14 CFR § 61.113 below.

ALPA questioned the petitioner's intent with regard to providing flight instruction because the petitioner has not requested an exemption to 14 CFR§ 61.195 which defines the requirements for flight instructors. Flight instruction is discussed in the FAA's analysis of 14 CFR § 91.109 below.

ALPA expressed concern with potential communications and command link failures which may result in a loss of control of the aircraft. ALPA suggested that appropriate mitigations should be developed to ensure safe operations. The FAA has reviewed the operating documents provided by the petitioner in addition to the safety features of the DJI S1000. Given this operational and safety information and the controlled area of operations, the FAA believes the risk associated with a communications and command link failure is sufficiently mitigated.

ALPA also expressed concern, stating that because the waiver request is not for a specific operation but rather for all operations of the same general type, the FAA's oversight task is considerably increased. Per the conditions and limitations below, the FAA has prescribed operator, pilot, and notification requirements to ensure that appropriate oversight can occur.

The FAA's analysis is as follows:

Unmanned Aircraft System (UAS)

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts*, Subpart H, *Airworthiness certificates*, and 14 CFR part 27, *Airworthiness Standards, Normal Category Rotorcraft*. In accordance with the statutory criteria provided in Section 333 of PL 112-95 in reference to 49 USC 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, Subpart H, and part 27, and any associated noise certification and testing requirements of part 36 is not necessary.

Flare stack inspections are hazardous and present unique difficulties for persons conducting inspections and maintenance of this infrastructure. The inspections are normally conducted utilizing personnel to physically inspect the flare stack. Helicopters are also used to transport inspection personnel to the top of the flare stack so that a physical inspection may be conducted. The petitioner plans to utilize a UAS to closely photograph the flare stack, which reduces the need for inspectors to personally view the flare stack. Manned helicopters assisting in flare stack inspections can weigh 6,000 lbs. or more and are operated by an onboard pilot, in addition to other onboard crewmembers, as necessary. The petitioner's UA will weigh less than 25 lbs. with no onboard pilot or crew. The pilot and crew will be remotely located

from the aircraft. The limited weight and restricted sterile area significantly reduces the potential for harm to participating and nonparticipating individuals or property in the event of an incident or accident. The risk to an onboard pilot and crew during an incident or accident is eliminated with the use of a UA for the inspection operation. In addition, utilizing UAS to conduct flare stack inspections will reduce the need for inspection personnel to perform this hazardous activity.

Manned aircraft are at risk of fuel spillage and fire in the event of an incident or accident. The UA carries no fuel, and therefore the risk of fire following an incident or accident due to fuel spillage is eliminated.

This exemption does not require an electronic means to monitor and communicate with other aircraft, such as transponders or sense and avoid technology. Rather the FAA is mitigating the risk of these operations by placing limits on altitude, requiring enhanced stand-off distance from clouds, permitting daytime operations only, and requiring that the UA be operated within VLOS and yield right of way to all manned operations. Additionally, the operator will be required to request a NOTAM prior to operations to alert other users of the NAS.

The petitioner's UA has the capability to operate safely after experiencing certain in-flight failures. The UA is also able to respond to a lost-link event with a pre-coordinated, predictable, automated flight maneuver. The PIC has the ability to terminate the flight operation or initiate the automated return to home procedure outlined within the operating documents. These safety features provide an equivalent level of safety compared to a manned aircraft performing a similar operation and address ALPAs comment on mitigating risk of command and control link failures.

Regarding the petitioner's requested relief from 14 CFR § 45.23(b), Display of marks, the petitioner requests this relief under the assumption that marking with the word "experimental" will be required as a condition of a grant of exemption. However, this marking is reserved for aircraft that are issued experimental certificates under 14 CFR § 21.191. The petitioner's UAS will not be certificated under § 21.191, and therefore the "experimental" marking is not required. Since the petitioner's UAS will not be certificated under § 21.191, a grant of exemption for § 45.23(b) is not necessary.

The petitioner has also requested relief from 14 CFR § 45.27(a), *Location of Marks*. Given that an exemption from § 45.23(b) is not necessary, an exemption from § 45.27(a) is also not necessary. Markings must be as large as practicable per § 45.29(f).

Regarding the petitioner's requested relief from 14 CFR §§ 91.405(a) *Maintenance required*, 91.407(a)(1) *Operation after maintenance, preventive maintenance, rebuilding, or alteration*, 91.409(a)(2) *Inspections*, and 91.417(a) and (b) *Maintenance records*, the FAA has determined that relief from § 91.409(a)(1) is also necessary, because it is an alternate inspection requirement of § 91.409(a)(2). As provided in the operating documents, 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.

Therefore, the FAA finds that adherence to the petitioner's operating documents and the conditions and limitations below, describing the requirements for maintenance, inspection, and recordkeeping, are sufficient to ensure that safety is not adversely affected. Accordingly, the FAA finds that exemption from 14 CFR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) is warranted.

Pilot In Command (PIC) of the UAS

Regarding the petitioner's requested relief from 14 CFR § 61.113 *Private pilot privileges and limitations*, the FAA must consider the appropriate level of pilot certification for the petitioner's proposed operations. The petitioner states it would operate its UAS with a private pilot holding a second-class airman medical certificate. Under current regulations, civil operations for compensation or hire require a PIC holding a commercial pilot certificate per 14 CFR part 61. Based on the private pilot limitations in accordance with pertinent parts of 14 CFR § 61.113(a) and (b), a pilot holding a private pilot certificate cannot act as a PIC of an aircraft for compensation or hire unless the flight is only incidental to a business or employment. However, in Grant of Exemption No. 11062 to Astraeus Aerial (Astraeus), the FAA determined that a PIC with a private pilot certificate operating the Astraeus UAS would not adversely affect operations in the NAS or present a hazard to persons or property on the ground. Additionally, as previously determined by the Secretary of Transportation, the requirement to have an airman certificate ameliorates security concerns over civil UAS operations conducted in accordance with Section 333.

ALPA stated its opposition to the petitioner's proposed operation by a non-commercial certificated pilot and believes the operation should be conducted by a PIC holding a current FAA commercial pilot certificate with an appropriate category and class rating for the type of aircraft being flown and a current second-class airman medical certificate.

The FAA has analyzed the petitioner's proposed operation, considered the comment above, and determined it does not differ significantly from the situation described in Grant of Exemption No. 11062 (Astraeus). The petitioner plans to operate in the NAS over private property while also limiting access to the property during UA operations. Given: 1) the similar nature of the petitioner's proposed operating environment to that of Astraeus, 2) the parallel nature of private pilot aeronautical knowledge requirements to those of commercial requirements, and 3) the airmanship skills necessary to operate the UAS, the FAA finds that the additional manned airmanship experience of a commercially certificated pilot would not correlate to the airmanship skills necessary for the petitioner's proposed operations. Therefore, the FAA finds that a PIC holding a private pilot certificate and a second-class airman medical certificate is appropriate for the proposed operations.

With regard to the airmanship skills necessary to operate the UAS, the petitioner has proposed a training program consisting of five hours operating the UAS to be used for the purpose of conducting the operations described in the operating documents. In accordance with the

operating documents, the PIC must maintain an understanding of all operational features and normal, abnormal, and emergency procedures of the UAS. The petitioner also proposes that the PIC maintain currency by requiring three take-off and three landing operations of the UA within the previous 90 days. These requirements are included in the conditions and limitations below.

Additionally, the conditions and limitations below stipulate that the petitioner may not permit any PIC to operate unless that PIC has demonstrated through the petitioner's training and currency requirements that the PIC is able 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 people, vessels, vehicles, and structures.

The petitioner indicates it will supplement its proposed operation(s) with a visual observer (VO) possessing a current second-class airman medical certificate and other knowledge and currency requirements prescribed in its operating documents. The conditions and limitations below stipulate that the PIC must ensure that the VO can perform the functions prescribed in the operating documents. It is the responsibility of the PIC to limit operations of the UA to distances within the visual capabilities of both the PIC and VO.

Operating parameters of the UAS

Regarding the petitioner's requested relief from 14 CFR § 91.7(a) *Civil Aircraft Airworthiness*, the petitioner's request is based on the fact that no airworthiness certificate will be issued for the UAS and that no FAA regulatory standard exists for determining airworthiness. While the petitioner's UAS will not require an airworthiness certificate in accordance with 14 CFR part 21, Subpart H, the FAA considers the petitioner's compliance with its operating documents to be a sufficient means for determining an airworthy condition. Therefore, relief from § 91.7(a) is granted. The petitioner is still required to ensure that its aircraft is in an airworthy condition – based on compliance with the operating documents prior to every flight, and as stated in the conditions and limitations below.

Additionally, in accordance with 14 CFR § 91.7(b), the PIC of the UAS is responsible for determining whether the aircraft is in a condition for safe flight. The FAA finds that the PIC can comply with this requirement, therefore relief from §91.7(b) is not necessary.

Regarding the petitioner's requested relief from 14 CFR § 91.9 *Civil aircraft flight manual, marking, and placard requirements* and 14 CFR § 91.203(a) and (b) *Civil aircraft: Certifications required*, the FAA has previously determined that relief from these sections is not necessary. Relevant materials may be kept in a location accessible to the PIC in compliance with the regulations.

Regarding the petitioner's requested relief from 14 CFR § 91.103, *Preflight Action*, the petitioner's operating documents require the PIC to take certain actions before flight to ensure the safety of the flight. Although there will be no approved Airplane or Rotorcraft Flight Manual available, the FAA believes that the petitioner can comply with the other applicable requirements in 14 CFR § 91.103(b)(2). The procedures outlined in the operating documents

address the FAA's concerns regarding compliance with § 91.103(b). The PIC will take all actions including reviewing weather, flight battery requirements, landing, and takeoff distances/conditions, and aircraft performance data before initiation of flight. The FAA has imposed stricter requirements with regard to visibility and distance from clouds; this is to both keep the UA from departing VLOS and to preclude the UA from conflicting with other aircraft operating in the NAS. The FAA also notes the risks associated with sun glare; the FAA believes that the PIC's and VO's ability to still see other air traffic, combined with the PIC's ability to initiate a return-to-home sequence, are sufficient mitigations in this respect. The PIC will also account for all relevant site-specific conditions in his or her preflight procedures. Therefore, the FAA finds that exemption from 14 CFR § 91.103 is not necessary.

Regarding the petitioner's requested relief from 14 CFR § 91.109 *Flight instruction; Simulated instrument flight and certain flight tests*, the petitioner did not describe training scenarios in which a dual set of controls would be utilized or required, i.e. dual flight instruction, provided by a flight instructor or other company-designated individual, that would require that individual to have fully functioning dual controls. Rather, the petitioner intends to accomplish training as referenced in the operating documents. Furthermore, the FAA is requiring that the petitioner's PICs possess at least a private pilot's certificate. Also, this exemption will require that training operations only be conducted during dedicated training sessions. The FAA finds that safety will not be adversely impacted if the petitioner follows the training outlined in the operating documents. As such, the FAA finds that the petitioner can conduct its operations without the requested relief from § 91.109.

As stated above, the training proposed by the petitioner does not require a person who holds a flight instructor certificate. Therefore, with regard to ALPA's comment on providing flight instruction, the FAA finds that the suggested relief from 14 CFR § 61.195 is not necessary.

Regarding the petitioner's requested relief from 14 CFR § 91.119, *Minimum safe altitudes*, the petitioner did not specify the paragraph(s) in 14 CFR § 91.119 from which it requires relief. Relief from § 91.119(a), which requires operating at an altitude that allows a safe emergency landing if a power unit fails, is not granted. The FAA expects the petitioner to be able to perform an emergency landing without undue hazard to persons or property on the surface if a power unit fails. Relief from 14 CFR § 91.119(b), operation over congested areas, is not granted because the petitioner did not provide sufficient information necessary for the FAA to determine whether the operation poses an adverse impact to safety were it to operate over congested areas.

The petitioner proposes to maintain a 100-foot buffer from personnel not associated with its operations unless appropriate waivers have been obtained. The petitioner also proposes to operate no closer than 100 feet from buildings. With regard to persons not directly involved in the flight operation, the petitioner did not provide an explanation for exposing those persons to increased risk than what is provided for in the rule. Therefore, the FAA is requiring that prior to conducting UAS specific operations, all persons not essential to flight operations (nonparticipating persons) must remain at appropriate distances. In open areas this requires the UA to remain 500 feet from all persons other than essential flight personnel (i.e. the PIC, VO, and the Sensor Operator). The FAA has also considered that the UA in this case will weigh 25

pounds or less. If barriers or structures are present that can sufficiently protect nonparticipating persons from debris in the event of an accident, then the UA may operate closer than 500 feet to persons afforded such protection. 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. When considering how to immediately cease operations, the primary concern is the safety of those nonparticipating persons. In addition, the FAA finds that operations may be conducted closer than 500 feet to vessels, vehicles and structures when the land owner/controller grants such permission and the PIC makes a safety assessment of the risk of operating closer to those objects.

Thus, the FAA finds that relief from § 91.119(c) is necessary because all operations will be conducted below 400 feet AGL and may be operated closer than 500 feet from persons, vessels, vehicles, and structures as described above. Provided adherence to the procedures in the operating documents and the additional conditions and limitations outlined below, the FAA finds that relief from § 91.119(c) is warranted. Because of the conditions and limitations below, relief from § 91.119(d) is not applicable.

Regarding the petitioner's requested relief from 14 CFR § 91.121 *Altimeter Settings*, the UAS uses a GPS altitude indicator rather than a barometric altimeter. As stated in the conditions and limitations below, the FAA requires any altitude reported to Air Traffic Control (ATC) to be in feet AGL. The petitioner may choose to set the GPS altitude indicator to zero feet AGL rather than local barometric pressure or field altitude before flight. Considering the limited altitude of the proposed operations, relief from 14 CFR § 91.121 is granted to the extent necessary to comply with the applicable conditions and limitations stated below.

Regarding the petitioner's requested relief from 14 CFR 91.151(a) *Fuel requirements for flight in VFR conditions*, relief has been granted for manned aircraft to operate at less than the minimums prescribed in 14 CFR § 91.151(a), including Exemption Nos. 2689, 5745, and 10650. In addition, similar UAS-specific relief has been granted in Exemption Nos. 8811, 10808, and 10673 for daytime, VFR conditions. The petitioner states that its UAS operations will be conducted in a controlled sterile environment, with UA under 25 pounds, and within VLOS. These factors, combined with the petitioner's stated intention to terminate flights with 25% remaining battery power, provides the FAA with sufficient reason to grant the requested relief from 14 CFR § 91.151(a). In accordance with the conditions and limitations below, the PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 25% battery power remaining.

Additionally, in evaluating the petitioner's proposed operating parameters with regard to VLOS and a safe operating perimeter, the FAA considered operations from a moving device or vehicle. Since the petitioner did not discuss provisions for these circumstances, the conditions and limitations below preclude operations from moving devices or vehicles.

As stated in Section V of the petition, the scope of the petitioner's proposed operation is the

conduct of flare stack inspections using UAS. Although the petitioner’s operating documents describe a broader scope of operations including inspection of any property, structures, materials, or natural landscape features located within a client’s physical property, the petitioner did not provide information, descriptions, or data in support of these use cases. Therefore the FAA’s analysis was limited to use of UAS for the inspection of flare stacks and the conditions and limitations below restrict the UAS operation to this purpose only.

Regarding an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA), the majority of current UAS operations occurring in the NAS are being coordinated through ATC by the issuance of a COA. This is an existing process that not only makes local ATC facilities aware of UAS operations, but also provides ATC the ability to consider airspace issues that are unique to UAS operations. The COA will require the operator to request a NOTAM, which is the mechanism for alerting other users of the NAS to the UAS activities being conducted. The conditions and limitations below prescribe the requirement for the petitioner to obtain an ATO-issued COA.

Public Interest

The FAA finds that a grant of exemption is in the public interest. The enhanced safety and reduced emissions achieved using a UAS 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.

The table below summarizes the FAA’s determinations regarding regulatory relief:

<u>Relief considered (14 CFR)</u>	<u>FAA determination (14 CFR)</u>
Part 21, Subpart H	Relief not necessary
Part 27	Relief not necessary
45.23(b)	Relief not necessary
45.27(a)	Relief not necessary
61.113(a) and (b)	Relief granted with conditions and limitations
91.7(a)	Relief granted with conditions and limitations
91.9(b)(2) and (c)	Relief not necessary
91.103	Relief not necessary
91.109(a)	Relief not necessary
91.119	Paragraphs (a) and (b) relief are not granted; paragraph (c) granted with conditions and limitations; paragraph (d) relief is not warranted

91.121	Relief granted with conditions and limitations
91.151(a)	91.151(a)(1), day, granted with conditions and limitations
91.203(a) and (b)	Relief not necessary
91.405(a)	Relief granted with conditions and limitations
91.407(a)(1)	Relief granted with conditions and limitations
91.409(a)(1) and (2)	Relief granted with conditions and limitations
91.417(a) and (b)	Relief granted with conditions and limitations

The FAA’s 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, Total Safety U.S., Inc. is granted an exemption from 14 CFR §§ 61.113(a) and (b); 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 unmanned aircraft systems (UAS) for the purpose of conducting sterile area flare stack inspections for the oil, natural gas, petro-chemical, and pipeline industries. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

Relative to this grant of exemption, Total Safety U.S., Inc. is hereafter referred to as the operator.

The petition and the following supporting documentation are hereinafter referred to as the operating documents:

- 1) TotalSafety DJI S1000 sUAS Aircraft Flight Manual
- 2) TotalSafety U.S., Inc. Global Integrated Industrial Safety Services UAS Operations Manual

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.

The following conditions and limitations are subject to all flights utilizing this exemption:

1. Operations authorized by this grant of exemption are limited to the following aircraft described in the operating documents which has eight rotors and eight motors in an octocopter configuration weighing less than 25 pounds: *DJI Innovations S1000 Multi-rotor Rotorcraft*. Proposed operations of any other aircraft will require a new petition or a petition to amend this grant.

2. UAS operations under this exemption are limited to conducting sterile area flare stack inspections for the oil, natural gas, petro-chemical, and pipeline industries.
3. The UA may not be flown at a ground speed exceeding 50 knots.
4. 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 operating documents. All altitudes reported to ATC must be 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 medical certificate.
6. All operations must utilize a visual observer (VO). 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 functions prescribed in the operating documents.
7. The VO must not perform any other duties beyond assisting the PIC with seeing and avoiding other air traffic and other ground based obstacles/obstructions and is not permitted to operate the camera or other instruments.
8. The operating documents and this grant of exemption 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 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 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.
9. Prior to each flight the PIC 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.

10. 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. The PIC who conducts the functional test flight must make an entry of the flight in the UAS aircraft records.
11. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment, not already covered in the relevant sections of the operating documents.
12. The operator must follow the UAS manufacturer's aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements.
13. The operator must carry out its maintenance, inspections, and record keeping requirements, in accordance with the operating documents. Maintenance, inspection, alterations, and status of replacement/overhaul component parts must be noted in the aircraft records, including total time in service, description of work accomplished, and the signature of the authorized person returning the UAS to service.
14. Each UAS operated under this exemption must comply with all manufacturer Safety Bulletins.
15. The authorized person must make an entry in the aircraft record of the corrective action taken against discrepancies discovered between inspections.
16. The PIC must possess at least a private pilot certificate and at least a current second-class medical certificate. 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.
17. Prior to operations conducted for the purpose of flare stack inspection the PIC must have completed the operator's training as prescribed in the operating documents. During that training, the PIC must have accumulated and logged, in a manner consistent with 14 CFR 61.51(b), a minimum of five hours as UAS pilot operating the make and model of the UAS to be utilized for operations under the exemption. Training, proficiency, and experience-building flights can be conducted under this grant of exemption to qualify the operator's PIC(s), VO(s), and Sensor Operator(s). However, said training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights the PIC is required to operate the UA with appropriate distances in accordance with 14 CFR § 91.119.
18. Prior to operations conducted for the purpose of flare stack inspection the PIC must have completed the operator's currency requirements as prescribed in the operating documents. The PIC must have completed at least three take-offs and three landings in the preceding 90 days as UAS pilot operating the make and model of the UAS to be utilized for operations under the exemption to maintain currency. Take-off and landing

currency flights can be conducted under this grant of exemption. When establishing or regaining currency, said currency flights may only be conducted during dedicated training/currency sessions. During training, proficiency, experience-building flights, and dedicated currency flights the PIC is required to operate the UA with appropriate distances in accordance with 14 CFR § 91.119.

19. Prior to operations conducted for the purpose of flare stack inspection the PIC, VO, and Sensor Operator must have met all qualification, training, and currency requirements, as outlined in the operating documents. A record of completion of these requirements must be documented and made available to the Administrator upon request.
20. The operator may not permit the PIC to operate the UAS for the purpose of flare stack inspection unless the PIC has demonstrated and logged in a manner consistent with 14 CFR 61.51(b), 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 people, vessels, vehicles, and structures.
21. 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.
22. The UA may not operate within 5 nautical miles of the airport reference point as denoted on a current FAA-published aeronautical chart.
23. 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.
24. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the planned operating area and land or be recovered in accordance with the operating documents.
25. The PIC must abort the flight in the event of unpredicted obstacles or emergencies in accordance with the operating documents.
26. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with 25% battery power remaining.
27. The operator must obtain an Air Traffic Organization (ATO) issued Certificate of Waiver or Authorization (COA) prior to conducting any operations under this grant of exemption. This COA will also require the operator to request a Notice to Airman (NOTAM) not more than 72 hours in advance, but not less than 48 hours prior to the operation. All operations shall be conducted in accordance with airspace requirements in

the ATO issued COA including class of airspace, altitude level and potential transponder requirements.

28. 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.
29. 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.
30. The 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 UAS is operating. These documents must be made available to the Administrator or any law enforcement official upon request.
31. The UA must remain clear and yield the right of way to all manned operations and activities at all times.
32. The UAS may not be operated by the PIC from any moving device or vehicle.
33. The UA may not be operated over congested or densely populated areas.
34. 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 and/or;
 - b. The aircraft is operated near vessels, vehicles or structures where the owner/controller of such vessels, vehicles, or structures has granted permission 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, and;
 - c. Operations nearer to the PIC, VO, Sensor Operator, operator trainees or essential persons do not present an undue hazard to those persons per § 91.119(a).
35. 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.

36. 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.nts.gov.

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 January 31, 2017, unless sooner superseded or rescinded.

Issued in Washington, DC, on January 29, 2015.

/s/

John Barbagallo

Acting Deputy Director, Flight Standards Service