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

Aviation Safety

800 Independence Ave
Washington, DC 20591

In the matter of the petition of

Phoenix Air Unmanned, LLC

For an exemption from §§ 61.3(a)(1)(i), 61.23(a)(2), 89.105, 91.7(a), 91.119(c), 91.121, 91.151(b), 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) of Title 14, Code of Federal Regulations

Exemption No. 20973
Regulatory Docket No. FAA-2023-1827

PARTIAL GRANT OF EXEMPTION

By letter dated April 6, 2023, Mr. William E. Lovett, Managing Director of Phoenix Air Unmanned, LLC (PAU), 100 Phoenix Air Drive SW, Cartersville, GA 30120, petitioned the Federal Aviation Administration (FAA) on behalf of PAU for an amendment to Exemption No. 19398A. In that letter, PAU stated that it wants to retain Exemption No. 19398A, which is associated with a Special Airworthiness Certificate-Experimental Category. PAU also requested relief from 14 CFR § 91.7(a) in order to conduct commercial operations without an airworthiness certificate and to amend Condition and Limitations Nos. 1-5, 9, and 11 to reflect the requested addition of commercial operations to Exemption No. 19398A.

The FAA considered PAU's request to deal with both experimental operations and commercial operations together and determined that a resulting document would be too confusing. Therefore, the FAA decided to address the request for amendment as a fully independent document. On May 28, 2023, the FAA informed PAU of this determination and sent PAU a request for information to clarify PAU's requested relief as it relates to commercial operations. On June 2, 2023, PAU responded and provided clarification, thus the FAA acknowledges PAU's petition for an exemption from Sections 61.3(a)(1)(i), 61.23(a)(2), 89.105, 91.7(a), 91.119(c), 91.121, 91.151(b), 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption would allow PAU to operate the SwissDrones SDO 50 V2 unmanned aircraft system (SDO 50 V2) for the purposes of linear infrastructure

operations. These proposed operations include beyond visual line of sight (BVLOS)[1] operations over certain roads and transient operations over people within the right-of-way. Operations that do not meet the criteria for BVLOS due to population density, roadway congestion, or proximity to airports, would be flown within visual line of sight (VLOS) of the pilot in command (PIC) with certain restrictions. Moreover, PAU requests relief to the remote identification of unmanned aircraft regulation until the time that the manufacturer's equipment is available.

Petition for Exemption

PAU supports its request with the following information:

According to the CONOPS, PAU's BVLOS operational strategy is for PIC 1 to launch the aircraft, with assisted situational awareness from visual observer (VO)[2] 1 through electronic means. Approximately midway through the flight, PIC 1 initiates a handoff of controls to PIC 2 (who is located at the aircraft recovery site). PIC 2 then takes primary control over the aircraft via the ground control station. This handoff allows PIC 2 to send commands to the aircraft and receive telemetry data from the aircraft. VO 2 (who is located at the landing area with PIC 2) then has responsibility for situational awareness of the airspace through electronic means along with PIC 2. PIC 2 recovers the aircraft and prepares the aircraft for the next flight. The launch and recovery zones are adjacent to the flight corridor and are collocated next to the PICs and equipped vehicles. Should there be an irretrievable lost command and control (C2) link during the flight, the unmanned aircraft (UA) is programed to proceed along the flight corridor to the landing area.

PAU's VLOS operational strategy is for the PIC to launch the aircraft and keep it within visual line of sight. The PIC will be assisted by at least one VO. The VO will observe the aircraft and airspace around it without the assistance of a situational awareness tool.

Unmanned Aircraft Systems (UAS)

PAU proposes to use the SDO 50 V2 in its operations. PAU states the SDO 50 V2 is a multi-purpose, single turbine unmanned helicopter system with a max gross takeoff weight of 191.8 pounds. The maximum aircraft endurance is 96 minutes and cruise speed is factory-limited to 38.8 knots, during automated flight. PAU explains that the design features of the SDO 50 V2

[1] BVLOS throughout this document refers to an operation beyond the visual line of sight of the PIC. An operation where the UA remains within line of sight of a person other than the PIC (e.g., visual observer) or that is monitored indirectly by electronic means (e.g., electronic observer) is a BVLOS operation. Under § 91.113 the PIC is operating the aircraft and therefore responsible for maintaining vigilance so as to see and avoid and remain clear of other aircraft.

[2] The FAA notes that PAU uses the terms Flight Support Specialist and Visual Observer interchangeably in its petition to cover individuals who monitor the aircraft and surrounding airspace either directly with their own eyes during VLOS operations or through electronic means during BVLOS operations. The FAA, however, uses the term "electronic observers" (EO) to describe people who monitor the UA and surrounding airspace activity through electronic means rather than directly with their own eyes and uses the term Visual Observer (VO) to describe people who observe the UA and surrounding airspace activity directly with their own eyes. In the analysis portion of this exemption, the FAA uses the terms EO and VO as appropriate.

provide superior payload capacity, long endurance, stable flight characteristics, and a high degree of safety features.

PAU states that the SDO 50 V2 uses the innovative construction principle of intermeshing rotors, which uses a set of two rotors turning in opposite directions with each rotor mast mounted at a slight angle to the other so that the blades intermesh without making contact. The petitioner states that this arrangement also allows the helicopter to function without a tail rotor, which increases powertrain efficiency and reduces complexity.

According to PAU, an integrated autopilot system allows autonomous take-off and landing procedures as well as autonomous flight patterns. The SDO 50 V2 utilizes a full authority, Automatic Flight Control System (AFCS). The system is capable of automatic flying from take-off, hover, cruise, and landing. The AFCS contains a navigation function that allows pilots to upload autonomous flight plans and contingency plans. The core AFCS unit contains global positioning system inertial navigation system (GPS/INS), processing, air data, and associated input-output interfaces. It is an aluminum, electromagnetic interference shielded housing designed to maintain rigidity even in the event of aircraft failure. The AFCS is fed data from four navigation sensors: Novatel OEM719 GPS, We Control weIMU-3-1.07 IMU, Honeywell HRM2300 Magnetometer, and barometric altimeter. The SDO-50V2 AFCS automatically controls the UA actuators to provide the stability and control needed to maintain the flight plan or manual inputs.

According to the SwissDrones Unmanned Aircraft Flight Manual, PAU UFM Supplement for USA Operations, the UA is equipped with a red flashing anticollision light between the rotor heads on top of the aircraft, and one position light on each side of the aircraft. On the left-hand side, the position light is red facing forward and white facing backward. On the right-hand side, the position light is green facing forward and white facing backwards.

According to the SDO 50 V2 manual, the UA is capable of precision navigation. It has a maximum flight range up to 67 miles depending on the data link technology and the topography of the operational area. The UA is capable of a maximum flight time of up to 3.1 hours. Moreover, according to the manufacturer, SwissDrones, it provides for a CO2 emission reduction of up to 95% compared to manned helicopters.

Airworthiness:

PAU requests relief to 14 CFR § 91.7(a) in order to conduct civil operations without an airworthiness certificate. PAU explains that they satisfactorily completed Operational Suitability Demonstration flights and Emerging Technology Maintenance Validation.[3] PAU explains that they also demonstrated normal and abnormal flight operations to the FAA Aircraft Evaluation Division. PAU indicates that they demonstrated flight crew safety procedures and compliance with all conditions and limitations. PAU also asserts that they

[3] The FAA conducted an Emerging Technologies Maintainability Validation (ETMV), where the FAA determined the maintenance procedures in the SwissDrones SDO 50 V2 UAS maintenance manual were suitable for maintaining the UAS.

have significant experience operating in the utility right-of-way without increased risk to persons, vessels, vehicles, and structures. Specifically, PAU states that over the last five years, they have conducted 843.9 flight hours and 12,703.07 miles of UAS transmission line inspection flights under FAA waivers 107W-2021-02812, 107W-2022-00192 and 107W-2019-00055B.

In its General Operations Manual, PAU states that the PIC completes a UAS preflight inspection prior to each flight to ensure the UAS is fit to fly. Visual checks include, but are not limited to: inspection for cracks, dents, chafing, corrosion, damages and lose attachments (torque seal condition on attachment points) as well as checks on navigation and communication equipment and batteries.

Altimeter settings:

PAU also requests an exemption from 14 CFR § 91.121 altimeter settings, which requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. PAU asserts that in previously issued exemptions, the FAA stated that an equivalent level of safety to the requirements of 14 CFR § 91.121 could be achieved in circumstances where the PIC uses an alternative means for measuring and reporting UA altitude, such as global positioning system (GPS). PAU explains that their UAS relies on GPS altitude (dual redundancy GPS antennas) for altimeter setting, and that the PIC will check the UA altitude reading prior to each takeoff, effectively zeroing the UA's altitude at that point. In addition, PAU's BVLOS CONOPS also indicates that a barometric altimeter will be used. In its June 2, 2023, response to FAA's Request for Information, PAU further clarified to the FAA that before each flight, the altimeter is automatically calibrated to local barometric pressure and is cross-checked automatically for accuracy and error against the dual GPS altitude data. If there is an error, PAU states that the PIC is alerted by the ground control station before flight. PAU states that these requirements ensure that an equivalent level of safety will be achieved, and an exemption from the requirements of 14 CFR § 91.121 is, therefore, appropriate.

Fuel requirements:

By letter dated April 6, 2023, and in the May 4, 2023, response to a FAA request for information, PAU seeks relief from 14 CFR § 91.151(b), fuel requirements for flight in visual flight rules (VFR) conditions, which would otherwise require a 20-minute fuel reserve to be maintained. PAU states that it will adhere to the same 5-minute reserve power requirement which the FAA has previously granted in other exemptions.

Aircraft maintenance, preventative maintenance and repair:

Since the SDO 50 V2 does not have an airworthiness certificate and it cannot comply with the strict letter of the regulatory provisions, PAU requests relief to Sections 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) for its commercial operations. PAU states that the SDO 50 V2 is not a type-certificated aircraft and does not fall under 14 CFR Part 43. They explain the SDO 50 V2, which was previously granted a SAC-

EC, is an experimental aircraft.[4] PAU further states that PICs who will perform maintenance on the SDO 50 V2 have been trained and approved by the original equipment manufacturer (OEM) to perform specific maintenance tasks on the aircraft without requiring the aircraft to be evaluated by the OEM. PAU also indicates that PICs are trained and approved to complete specific maintenance tasks that are considered normal pre- and post-flight items. Additionally, according to PAU, major configuration changes, overhauls, etc. are required to be tested and approved by the OEM, SwissDrones. Both the SDO 50 V2 and PAU operations manuals require a Functional Check Flight (FCF) to take place following any maintenance performed on the aircraft. According to PAU, the aircraft will not be operated within the proposed CONOP until a successful FCF has been completed.

PAU also proposes to conduct maintenance, inspection, and recordkeeping in accordance with the PAU's SDO 50 2V operations and maintenance manuals and supplements. In addition, PAU states that PICs will conduct a pre-flight inspection of the UAS and all associated equipment to account for all discrepancies or inoperable components or both and, if these inspections reveal a condition that affects the safe operation of the UAS, the aircraft will be prohibited from operating until the necessary maintenance has been performed and the aircraft is found to be in a condition for safe flight with a follow-on FCF. PAU provided the FAA with copies of its Unmanned Aircraft Flight Checklist, Unmanned Aircraft Flight Manual for the SDO 50 V2, the General Maintenance Manual for the SDO 50 V2, the SDO 50 V2 Ground Control Station Associated Elements and Minimum Specifications, and the SDO 50 V2 General Maintenance Manual PAU Supplement for USA Operations.

Remote Identification:

PAU requests an exemption from 14 CFR part 89, Remote Identification of Unmanned Aircraft. PAU explains that the Remote Identification final rule (14 CFR part 89) provides a means to identify these aircraft and locate the person who controls them (e.g., operators, pilots in command), and allows the FAA, law enforcement, and national security agencies to distinguish compliant airspace users from those potentially posing a safety or security risk. PAU states that regulation permits the FAA and law enforcement to conduct oversight of persons operating UAS and to determine whether compliance actions, enforcement, educational, training, or other types of actions are needed to mitigate safety or security risks and foster increased compliance with regulations. PAU asserts that its CONOPS provides detailed information through multiple processes and lists those processes to show that both identification of the PAU SDO 50 V2, and the specific areas where operations occur can be easily identified.

UAS Pilot in Command (PIC) and Flight Personnel

Certification:

[4] The FAA notes that the PAU's request for relief from Sections 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) is based upon their original request for relief to operate a UAS with a SAC-EC for experimental purposes; however, for its commercial operations, PAU will be operating a UAS without an airworthiness certificate under the authority of 49 U.S.C. § 44807.

In its May 4, 2023, response to the FAA's request for information and during its discussion with the FAA dated May 12, 2023, PAU clarifies that it is seeking relief from Section 61.3(a)(1). PAU reasons that in exemptions similar to this one the FAA has issued relief so long as the pilots successfully complete the petitioner's training program for PICs; hold a remote pilot certificate with a small UAS rating issued in accordance with 14 CFR Part 107 and is in compliance with 14 CFR § 107.65; and passes a 14 CFR Part 61 airman knowledge test within the last 24 calendar months or hold part 61 pilot certificate with a current 14 CFR § 61.56 flight review. PAU explains that, while their current pilot staff all hold Part 61 certificates and second-class medicals, the requested relief is needed to enable PAU to utilize pilots who only hold a Part 107 certificates (no Part 61 certificates), hold third-class medicals, and are nevertheless properly trained and could do the job effectively in the future.[5]

In that same letter, PAU requests relief to Section 61.23(a) since in other cases similar to this one, the FAA determined that requiring a third-class medical certificate provides reasonable assurance that the pilot does not have any physical or mental condition that would interfere with the safe operation of the UAS.

UAS Operating Parameters

According to its CONOPS, PAU will limit its operations to low-density areas of Class G airspace. PAU explains that flights will occur directly above the right-of-way of the utility provider infrastructure. PAU supports this request by noting that transmission lines often begin and end in areas within five (5) statute miles of an airport or within areas of increased population or road traffic density and elaborates on the need to inspect an entire transmission line circuit regardless of where it falls against the proposed set of operational performance criteria.

Beyond Visual Line of Sight (BVLOS) Operations

PAU requests to conduct BVLOS operations, which is actually a request for relief from 14 CFR § 91.113. This was conveyed both in an application for a 14 CFR § 91.113 waiver for BVLOS, by letter dated January 26, 2022, and confirmed in their May 4, 2023, response to FAA request for information.[6]

PAU provided the FAA with its CONOPS to explain how they will achieve compliance with 14 CFR § 91.113(b) when the UA is beyond visual line of sight of the PIC.[7] The CONOPS explains that PAU will primarily use infrastructure masking operations (also referred to as

[5] *See,* Record of Conversation dated 5-1-2023 at FAA- 2023-1827.

[6] The FAA notes that it references PAU's January 26, 2022, petition for exemption to conduct research and development operations with a SAC-EC because it informs the regulatory relief being requested by PAU for its commercial operations. PAU confirmed this in its response to FAA request for information dated May 4, 2023.

[7] PAU's BLVOS operations begin and end within visual line of sight of the PIC. During the visual line of sight portions of the BVLOS operation, PAU will not use a traditional VO to assist the PIC with see-and-avoid responsibilities. This VLOS portion differs from PAU's VLOS operations, which will utilize traditional VOs to assist the pilot in observing the UA and the airspace. VLOS operations are discussed later in this section.

shielded operations) in low-density areas of Class G airspace as the mitigation for aircraft collision risk. Flights will occur directly above the right-of-way of the utility provider infrastructure. In addition to infrastructure masking, PAU states it will use the RangeVue architecture for their situational awareness and visualization system to monitor cooperative air traffic positions as well as PAU's own aircraft location. PAU states that components of this system include local and FAA (National Airspace System (NAS)-wide) surveillance sensors, data processing with alerting algorithms and system health monitoring, and visualization display software. PAU states the RangeVue system architecture is designed around a "remain well clear" premise of detecting and monitoring potential intruder aircraft at longer distances than what a human eye is capable. Moreover, PAU states it will use a Flight Support Specialist (FSS), a company terminology for VO (EO),[8] as a tactical mitigation for detect and avoid. The VO will support pre-flight activities such as participating in the briefing and monitoring operations electronically with the situational awareness tool and visualization system during the en route phase of flight. PAU explains that, while the PIC will lose direct sight of the UA during the operation, the VO (EO) can still monitor the UA and surrounding cooperative traffic on the ground control station screen (using the situational awareness tool and visualization system). PAU states the PIC still retains the overall responsibility to avoid other aircraft.

In their CONOPS, PAU sets forth the parameters for the operating environment. PAU states that operational parameters are limited to the sections of linear bulk-power or other electric line infrastructure owned and operated by a utility provider recognized by the U.S. Department of Energy. PAU states that a Geographic Information Systems and airspace analysis determines the equipment will operate as expected. Additionally, PAU states that the C2 Link is readily available in the operating area. PAU indicates that its PICs use pre-planned flight paths designed to avoid any known obstacles. PAU states that these flight paths are planned so that the UA route stays more than five nautical miles (NM) from public airports and avoids military training routes. PAU states that operations are only conducted in daytime Visual Flight Rules (VFR) conditions when the weather is within the UA system limitations described in the operating documents. PAU states that they will only conduct operations in sparsely populated areas, which PAU defines as areas where the population count is less than 12 people per square kilometer. PAU states that they will conduct all flight operations in Class G airspace and that they will stay within 100 feet (ft.) above the linear electric grid centerline, within 20 feet left or right of the centerline, and never more than 400 ft. above ground level (AGL). PAU states that they will file a Notice to Air Missions (NOTAM) in order to ensure that local airports, Fixed Base Operators, and general aviation are aware of intended BVLOS operations. PAU proposes to request a NOTAM not more than 72 hours in advance, but not less than 24 hours prior to each operation. PAU also coordinates with other

[8] The FAA notes that PAU uses the terms Flight Support Specialist and Visual Observer interchangeably in its petition to cover individuals who monitor the aircraft and surrounding airspace either directly with their own eyes during VLOS operations or through electronic means during BVLOS operations. The FAA, however, uses the term "electronic observers" (EO) to describe people who monitor the UA and surrounding airspace activity through electronic means rather than directly with their own eyes and uses the term Visual Observer (VO) to describe people who observe the UA and surrounding airspace activity directly with their own eyes. In the analysis portion of this exemption, the FAA uses the terms EO and VO as appropriate.

potentially affected local airspace users, such as crop applicators, private heliports, and private airports, as well as with the relevant utility to deconflict contracted manned aircraft operations over transmission lines under inspection from UAS.

In addition, PAU submitted an updated CONOPS that states that all BVLOS operations would use the services of at least two VOs (EOs) with one each at the takeoff and landing areas in operation vehicles that contain the situational awareness tool and visualization system through electronic means. PAU asserts that the PIC retains the overall responsibility to see-and-avoid other aircraft and explains that the VO (EO) and PIC must be able to communicate verbally at all times. Further, the CONOPS says that all crew members are in continuous full duplex communications throughout the flight. The CONOPS also indicates that the PIC establishes as sterile area which includes limiting communication to only that which is required for the safe execution of the planned operations. The use of personal electronic devices is prohibited during ground operations and all phases of flight.

PAU explains that the UAS can be seen by at least of one of the two PICs; or at least one of the VOs (EOs) who will monitor the activity electronically and is in the shadow of the infrastructure (shielded by the infrastructure) for the duration of the flight. PAU provided the FAA with copies of their VO (EO) training program as well as their VO (EO)qualifications.

PAU believes that due to the above operating mitigations and the low-risk environment in which their operations occur, they could conduct BVLOS operations in a safe manner.

In its May 4, 2023, Response to the FAA request for information, PAU also confirmed that they seek an exemption from 14 CFR § 91.119(c) Minimum safe altitudes, to the extent necessary to allow UAS operations over areas other than congested areas at altitudes lower than those permitted by rule. PAU stated an equivalent or greater level of safety would be achieved given the sparsely populated locations over rights-of-way where the proposed operations will occur.

PAU's operating documents indicate that the UAS is programed to a maximum operating altitude of 400 ft. AGL. To the extent an applicable Air Traffic Organization (ATO)-issued Certificates of Waiver or Authorization (COA) designates a lower maximum operating altitude, PAU states that it would comply with the altitude requirements of the ATO-issued COA. PAU maintains that the extremely remote and secure environment where PAU operations occur, flying at a low altitude increases the safety margin without posing any increased risk to people or property. PAU also claims that even at low altitudes, the UAS operations would be conducted at a level of safety equal to or greater than that achieved by a larger crewed aircraft performing similar activities at the altitudes required by § 91.119.

In both the January 26, 2022, and in the April 6, 2023, letters, PAU seeks relief from flight less than 500 ft. from non-participating structures, vessels, vehicles, or persons while the aircraft is performing normal flight operations within the utility right-of-way corridor. PAU asserts that per 14 CFR § 91.119(d)(l): a helicopter may be operated at less than the prescribed minimums 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. PAU asserts that SDO 50 V2 is a helicopter. PAU further states that since flight operations are conducted within a utility right-of-way, which is a controlled area considered to be sparsely populated, only the controlling utility may permit construction of structures in the right-of-way. PAU further explains that adjacent to a right-of-way non-participating structure may be located within 500 ft. of the flight path, but would not be directly overflown because they are not located underneath the transmission lines. Finally, PAU states that it has significant experience operating in the utility right-of-way without impact to persons, vessels, vehicles, and structures. In further support, PAU offers that it has conducted 843.9 flight hours and 12,703.07 miles of UAS transmission line inspection flights under FAA waivers 107W-2021-02812, 107W-2022-00192 and 107W-2019-00055B with UAS under 55 pounds.

Additionally, PAU seeks to cross certain roadways. A component of the PAU CONOPS and the Safety Risk Management documents submitted in support of this exemption contemplates BVLOS flights over transmission lines that cross roadways. PAU's roadway criteria includes a ground risk assessment involving automotive traffic count analysis and a detailed calculation of the probability that the UAS will collide with a moving vehicle. PAU's safety analysis found that, when traversing roadways with a flow rate of 770 cars per hour (12.8 cars/min), a UAS has a 9.91x10-7 probability that it will collide with the windshield of a vehicle traveling 30 mph.[9] PAU uses road traffic density where available to determine the number of cars per hour. According to PAU, these data sets are maintained by the state and county (depending on whether the road is a state or county road; the data is gathered on a semiannual or annual basis; and in some cases, such as gravel county roads, traffic density data is not available. In such cases, PAU states it will not fly over the road, unless it is a one-lane road or less (which cannot accommodate 770 cars/hour).

Visual Line of Sight (VLOS) Operations

PAU requests authority to operate the aircraft VLOS of the PIC in certain areas to complete powerline inspections under a specific VLOS set of operating limitations. PAU explains that transmission lines often begin and end in areas within five (5) statute miles of an airport or within areas of increased population or road traffic density, and that there is a need to inspect an entire transmission line circuit no matter where it falls against the proposed set of operational performance criteria.

PAU's VLOS operational strategy is for the PIC to launch the aircraft and keep it within visual line of sight. The PIC will be assisted by at least one VO. The VO will observe the aircraft and airspace around it without the assistance of a situational awareness tool.

In its May 4, 2023, response to FAA request for information, PAU argues that Grant of Exemption 19398A and its supporting documentation define the operating performance criteria for BVLOS flight operations to include population density and road traffic density data for ground risk mitigation and airport proximity criteria for air risk mitigation. According to PAU, because the SDO 50 V2 would be operated VLOS of the PIC in areas that do not

[9] Flow is the rate at which vehicles pass a given point on the roadway and is normally given in terms of vehicles per hour.

meet the performance criteria for BVLOS operations, the use of a specific population density criteria of people per square kilometer should not apply. In addition, in these circumstances, PAU states that it would be able to comply with 14 CFR § 91.113 right-of-way rules through the use of unaided visual means.

In addition, PAU requests VLOS operational limitations in areas where they cannot meet the requirements for BVLOS operations. PAU proposes, except for takeoff and landing, to fly the SDO 50 V2 over the transmission line environment to include utility right-of-way or substations. PAU indicates that they would ensure the transmission line environment is free from non-participating structures and contains limited non-participants in the right-of-way. PAU also explains that when entering or departing the transmission line environment for takeoff or landing, the PIC will visually ensure that the aircraft will not overfly people, vehicles, or structures. Moreover, PAU states that they will limit VLOS operations to transmission line sets that contain a segment that can be flown BVLOS per operational performance population density criteria. PAU further explains that they do not intend to operate the SDO 50 V2 in a VLOS capacity for continuous operations. PAU gives the following two examples:

(1) A 30-mile transmission line circuit that meets the BVLOS operating performance population density criteria for 29 miles but does not for the final mile would be eligible to fly VLOS for the final mile.

(2) A two-mile transmission line circuit that does not meet the BVLOS performance population density criteria would not be eligible to be flown BVLOS or VLOS.

PAU also requests the ability to fly across roads VLOS (i.e., allowing overflight of non-participating vehicles) using the same BVLOS criteria of fewer than 770 cars per hour. At roads where the volume is greater than 770 cars per hour, PAU proposes to only conduct those crossings VLOS when there is no traffic. Therefore, there will be no overflight of non-participating vehicular traffic in instances where the road traffic density is greater than 770 cars per hour.

Public Interest

PAU asserts that granting this relief is in the public interest because it enhances the safety achieved through UAS infrastructure inspection. PAU states that the proposed operation will enhance safety, as there are a number of fatalities each year involving aerial patrol of power lines using manned aircraft. PAU explains that traditional methods of energy infrastructure inspection utilize fixed wing aircraft, helicopters, bucket trucks, and other service vehicles, and asserts that using a UAS to inspect energy infrastructure is safer and more efficient than these traditional methods. PAU also states that FAA has recognized that this enhanced safety is realized even with UAS weighing more than 55 pounds because, unlike using manned aircraft of "significantly great proportions" to conduct the same operations, the "risk to an onboard pilot and crew during an incident or accident is eliminated with the use of a UAS for the proposed operation," and a UAS "would impact the surface with much less energy than a manned aircraft." PAU asserts that its UAS, weighing no more than 192 pounds and carrying

no crew offers the same enhanced safety, and that it is in the public interest to allow PAU to use the SDO 50 V2 to conduct energy infrastructure inspections.

PAU also asserts that approval of this exemption would advance the public interest by allowing for the efficient inspection of critical infrastructure. According to PAU infrastructure inspection by UAS can help to lower operations and maintenance costs and more quickly resolve problems in the delivery of electricity, both of which will benefit customers and are in the public interest.

Finally, PAU claims that the proposed BVLOS operations is also in the public interest because it will provide the FAA with valuable user experience on UAS linear infrastructure inspections, leading to further development of appropriate FAA regulations for UAS BVLOS operations.

Other Information Provided

As part of its petition, PAU provided materials marked as "proprietary." The FAA relied on this information marked as "proprietary" in the FAA's safety risk analysis to make determinations about PAU's capabilities. Accordingly, while the entirety of these materials have not been released, they have been identified in the docket for this exemption. *See,* Attachment 1.

Federal Register Notice

Although the petitioner requests that action on its petition not be delayed by publication in the *Federal Register*, the FAA found that the petition, if granted, would set a precedent. Therefore, to allow an opportunity for the public to comment on the petition, a summary of this petition was published in the *Federal Register* on May 25, 2023 (88 FR 33958 - 33959). Seven comments were received. Three commenters were in support of the petition; one supported some aspects and opposed others; one commenter opposed the petition; and two neutral.

The Association for Uncrewed Vehicle Systems International (AUVSI) and DroneUp commented in support of the PAU petition and believe that growing the use of drones for long-linear inspection will reduce the time between regular asset inspections, increase the quality of data and trend assessment of our aging power delivery infrastructure, and reduce the need for higher risk helicopter and low-level airplane flights, as well as asset climbing by linemen, allowing them to focus in on the most pressing fixes.

AUVSI and DroneUp both state that performance-based mitigations will allow for novel solutions to traditional risk conversations. Different combinations of aircraft, procedures, and sensors will be used to increase overall safety both in the NAS and on the ground below it. Operations will expand from low complexity airspace and low population density areas to more urban environments as companies and operators like PAU prove not only the safety of drones, but their value and low resource draw on air traffic control.

The FAA agrees that the use of drones for long-linear inspection is in the public interest because these inspections help industries catch potential problems before they can affect the safety and reliability of the oil, gas, goods, and electric power. As discussed in the FAA Analysis section below, the FAA has established conditions and limitations that are designed to enable safe operations in low-risk environments.

Elsight Ltd. (Elsight) states that when operating in BVLOS, the advantages and limitations of every available network individually should be taken into consideration and managed correctly to support the necessity of a C2 link and transmission of data to and from the unmanned aircraft system. Elsight argues that while flying long distances, communications of a single link could adversely affect the unmanned aircraft systems operation. Elsight proposed that C2 communication links should utilize all available network infrastructures. Using "Bonding Technology", Elsight explains, substantially enhances the links' safety and the connectivity between the operator and the UA.

The FAA agrees in concept that such a solution may be appropriate for operators in environments where a single C2 link method is known to be insufficient due to interference, coverage limitations, or other factors. However, with regard to PAU, the FAA has determined this technology is not necessary. As discussed in the FAA Analysis below, the FAA considered the effectiveness of the C2 Link. According to the operating documents, the SDO 50 V2 also has a second backup data link. This link is selectable by the PIC at the ground control station if the PIC determines the primary link signal will not be sufficient to maintain connection to the aircraft. The FAA notes that failover to the redundant link is immediate if primary link is lost. The signal strength varies based on a number of factors including terrain type, atmospheric conditions, obstacles, signal type, antenna, etc. According to the operating documents, the PAU PIC monitors signal strength from aircraft radios to ground radio(s) in real time. This allows the PICs to ensure positive C2 capability prior to hand-off between PICs and while enroute during BVLOS operations. The FAA has determined that assurance of a strong C2 link is important to the safety of flight operations and is imposing Condition and Limitation No. 30. Condition and Limitation No. 30 requires the PIC to determine that all control links used for the operation have signal that is strong enough to control the UA at the maximum planned distance for the operation prior to conducting operations under this exemption.

In addition, the FAA believes another layer of mitigations is necessary to ensure there is no adverse effect on safety. In particular, the FAA finds that a robust contingency procedure is needed. The standard response to contingencies must be one that avoids compounding the risk to other aircraft and persons, vehicles and vessels. Therefore, in Condition and Limitation No. 31, the FAA requires the PIC to prepare for a lost C2 link by programing lost link procedures so that the UA will remain within the operational corridor and proceed to a pre-determined landing area. This contingency procedure must avoid unexpected turn-around and altitude changes, and must provide the PIC with sufficient time to communicate with FAA's Air Traffic Control (ATC) if necessary.

Elsight expressed concern about C2 link failures. Elsight proposed that communication platforms should demonstrate reliability over time, long distances, and in harsh environmental

conditions to ensure the C2 communication stability and the resulting safety coming from a secure and unbreakable C2 link.

The FAA agrees that there is great value in secure and unbreakable C2 links, but recognizes that there are issues regarding capacity, technological development, and access to this technology. Therefore, the FAA is permitting expansion of UAS operations, which could be done safely through mitigation. This step is critical to integration of UAS into the NAS.

While not an unbreakable C2 link as described by Elsight in its comment, the FAA has determined that through a combination of UA features, operational procedures, and the Conditions and Limitations Nos. 30 and 31 of this exemption, PAU achieves a reliable C2 link with a sound contingency plan in the event of its failure. See FAA analysis for additional details.

Lastly, Elsight proposed that any communication hardware and/or software must have the flexibility to interchange and operate through different IP links. This flexibility and interchangeability will allow for solutions that can adhere to regulatory requirements as technological advancements in network infrastructure continue to evolve in the coming years. Elsight states that they believe that only communication solutions that can adapt over time present a viable method of operations for BVLOS commercial flights across the industry, for any sized UAS.

While the FAA is a strong supporter of flexibility and interchangeability of hardware and software, issues related to the evolution of C2 hardware and software are beyond the scope of this exemption.

The National Agricultural Aviation Association (NAAA) opposes PAU's proposed operations, stating that permitting BVLOS operations will markedly compromise safety for low-altitude manned aircraft. The NAAA states that the Part 137 manned aircraft industry is arguably the segment of manned aviation most affected by the proposed BVLOS operations with operations occurring from 500 ft. above ground level (AGL) down to 10 ft. AGL and turns occurring at an average of 38 ft. AGL with an average horizontal turn-around distance of 1750 ft. Specifically, the proposed use of infrastructure masking in low-density areas of Class G airspace as the primary mitigation method for aircraft collision risk disregards the frequent use of this airspace by aerial application operators.

The FAA acknowledges that manned agricultural operations and BVLOS operations would occur in many of the same areas. However, aviation is a highly regulated industry and there are processes and procedures in place to reduce the risk of a collision. As explained in its analysis below, the FAA has determined that through PAU outreach efforts and the requirement of both parties to publish NOTAMs that both PAU and agricultural operators should have sufficient advance notice of UAS and manned operations in the area. In addition, this exemption restricts operations to flight corridors over the linear infrastructure, so other operators will know where to look for UAs and could predict the UA's flight path. Further, the UA is significantly more visible than birds and high voltage wires; and, it is equipped with an anti-collision light, adding to one's ability to see a UA even during the day.

The NAAA also comments that UAS present a hazard to low-flying pilots similar to that presented by birds and other low-altitude obstacles such as other manned aircraft and towers. UAs would cause more damage to manned aircraft than a typical airborne wildlife strike. The FAA agrees that a UA strike could have catastrophic consequences, and as discussed in the FAA Analysis below has imposed conditions and limitations that greatly reduce the likelihood of such an occurrence including Condition and Limitation Nos. 21-25, which limit the area of operation to low-altitude, low-risk, Class G airspace very near electric wires, which manned aircraft avoid. The FAA also requires in Condition and Limitation No. 32 that the operator employ an outreach strategy that coordinates with other potentially affected aircraft operators prior to any BVLOS operations. This includes coordination with other utilities with assets that intersect the flight path. In addition, Condition and Limitation No. 33 requires PUA to file a Notice to Air Missions (NOTAM) in order to ensure that local airports, Fixed Base Operators, and general aviation (GA) are aware of intended operations. Furthermore, Condition and Limitation No. 38 limits operations to the daytime and for the UA to be equipped with an anti-collision light to allow other airspace users to better see the UA.

The NAAA further states that the petitioner's proposed use of an air traffic situational awareness system to secondarily mitigate aircraft collision risk is not proven by any standard or evidence. Without FAA-certified evidence of this system's capability, reliability and suitability for dealing with the unique nature of aerial application operations, NAAA is concerned that there will be insufficient protection for the safety of aerial applicators.

The FAA acknowledges that there are no certification standards for situational awareness tools. Nevertheless, PAU's situational awareness tool is well known to the FAA and to some in industry. The tool has been proven effective for helping UAs remain well clear in many FAA waivers including, but not limited to 107W-2021-02812, 107W-2022-00192 and 107W-2019-00055B and boasts over 843.9 flight hours and 12,703.07 miles of UAS transmission line inspection flights. The FAA believes that it is in the public interest to allow the use of RangeVue as it uses ADS-B and other feeds to provide detect functions. While there are no established standards for this DAA technology, this situational awareness tool is acceptable to the FAA for operations under this exemption. Further, by enabling its use, the FAA gains valuable insight into developing effective operational mitigations to better ensure safety and inform the development of appropriate standards.

As NAAA rightly points out in its discussion of bird strike statistics and given the number of wire strikes by agricultural pilots, agricultural operations are riskier than most other types of manned operations. On the surface, UA operations add to the list of known hazards. However, preventing UA operations in the same area entirely is unreasonable. Doing so would place the interests of manned agricultural operations over the interests of the power and energy industry, as well as those of the segment of the agricultural industry which use UAS instead of manned operations. Therefore, the FAA is trying to strike a balance of user interests by keeping the operations separate, while furthering the integration of UAS into the NAS.

Airman Certification:

Both the NAAA and the Air Line Pilots Association Int. (ALPA) commented that UAS pilots should have a commercial pilot's license. The NAAA believes that additional hours required to earn an advanced pilot license is justified since BVLOS operations are more complicated

than other flights and someone operating UAS BVLOS will presumably be operating much more frequently and for longer durations than someone operating an UA for other reasons. ALPA contends that the pilot must hold at least the equivalent of an FAA commercial pilot certificate for an appropriate category and class for the type of aircraft being flown as well as specific and adequate training on the UAS make and model intended for use. ALPA contends that a higher class of license is justified because this requirement increases safety in the NAS, and safety should not be compromised.

The FAA agrees that safety should not be compromised. Because training and certification must be relevant to an operation, the FAA has long granted relief to UAS pilots from holding a commercial pilot certificate.[10] Much of the aeronautical experience and flight training for a commercial pilot certificate is not applicable to UAS operations, whether VLOS or BVLOS, since UAS are operated differently than manned aircraft. In addition, the aeronautical experience currently necessary to obtain a pilot certificate under Part 61 does not equip the certificate holder with all of the tools necessary to pilot a UAS safely. Therefore, for the reasons discussed in the FAA's analysis below, and consistent with recently issued exemptions, the FAA is granting PAU relief to 14 CFR 61.3(a)(1) subject to the conditions and limitations of this exemption. This includes requiring pilots to hold a Part 107 remote pilot certificate; meet the aeronautical knowledge recency requirements of 14 CFR § 107.65; and to either complete a Part 61 knowledge within the previous 24 months to ensure retention of the necessary knowledge to operate safely in the NAS under 14 CFR part 91 or hold a sport pilot or higher-grade pilot certificate and meet the flight review requirements of 14 CFR § 61.56.

14 CFR § 89.105 – Remote identification (Remote ID):

NAAA believes all UA should be operated broadcasting Remote ID. The multiple processes outlined from the CONOPS cannot provide transient manned aviation operations with the equivalent information transparency required therein. Similarly, ALPA states that PAU must be able to comply with the rules on Remote ID and Tracking along with any other minimum equipage requirements. ALPA asserts that remote ID and tracking requirements are a critical necessity to ensure that in the case of loss link or fly-away of a UAS the appropriate steps can be taken to monitor the location of the UAS and coordinate with ATC if necessary.

The FAA supports the use of remote ID but recognizes that equipage involving new or retrofitted technology takes time. As discussed in the FAA Analysis below, the FAA has not granted relief to Part 89 in this exemption because deviation authority is available. Ultimately, the decision to authorize the use of this UA without remote identification will be dealt with outside this exemption.

Civil aircraft airworthiness:

The NAAA commented that all aircraft operated in the NAS should be held to high airworthiness standards.

The FAA agrees. Regulatory standards frame, guide and normalize operations. They provide a common language to measure and evaluate performance and protect consumers by ensuring a

[10]See Astraeus Aerial, Exemption No. 11062, Issued on September 25, 2014.

level of safety and durability. They take time, understanding, experience and consensus to develop. The FAA is striving to develop airworthiness standards that are appropriate to UAS operations and the associated risk. In the meantime, both FAA and industry need to learn from existing operations and adopt best practices. By enabling low-risk operations by exemptions, the FAA gains valuable insight into developing effective operational mitigations to better ensure safety and inform the development of appropriate standards.

The NAAA argues that the UA should be equipped with visible strobe lighting and visibly distinguishable colors.

Regarding the NAAA's comment concerning painting the unmanned aircraft in visually distinguishable colors, the FAA agrees that this proposal may help to mitigate visual acquisition difficulties of an UA. However, the FAA determined that while painting the UA in visually distinguishable colors may aid non-participants in identifying an active UA aircraft operation, anti-collision lighting is a better mitigation for this purpose and defers to the operator for incorporation of any additional visual mitigation measures such as painting UA.

The NAAA asserts that "vigilance shall be maintained be each person operating an aircraft so as to see and avoid other aircraft" is not met with BVLOS operations as proposed by the petitioner.

The FAA disagrees with NAAA as "vigilance" doesn't equate to perfect situational awareness. If it did, all operations including Part 137 agricultural operations would be required to have ADS-B In and Out. Those not equipped with both In and Out are limited to what they could see from the cockpit, in all cases a less-than 365-degree view of the airspace around them. The FAA has determined that PAU is meeting its requirement for vigilance by executing its outreach activities, planning and verifying routes, and flying close to infrastructure in a predictable flight path.

NAAA asserts that the PIC should have a reliable means of determining the actual altitude of the aircraft to prevent exceeding the authorized flight altitude envelope. Along the same lines, ALPA argues that processes or mitigations, such as redundant control capability, fail-safe systems, backups, and specific validated procedures for system and equipment failures must be in place.

The FAA agrees. The SDO 50 V2 is equipped with a couple of altitude indicators as well as a system that alerts the PIC to any irregularities in the readings.

The NAAA believes that the FAA needs to establish a standard flight time the UA needs to have in its power reserve to safely land (e.g., 5 minutes, 10 minutes, etc.), and enforce that flight time as a requirement for any petitions granted. ALPA comments that "while being powered by traditional Jet-A turbine fuel, the petitioner is requesting relieve from the fuel reserve requirement, without justification." The NAAA states that the FAA will need to conduct an analysis of the aircraft performance and operational environments to determine whether the safety baseline of this technological functionality can be performed reliably and repeatedly to an equivalent level of safety.

While the FAA agrees that each operator must have sufficient reserves of fuel and/or power to safely conclude operations factoring in unexpected situations; the FAA has determined that

setting a single standard would require a single set of variables. For example, during short flights of 5 minutes where the takeoff and landing are the same location, it would be unreasonable to require a reserve of 10 minutes. On the other hand, for long-duration operations of several hours or more where an airport is necessary for takeoff and landing, 10 minutes. of reserve fuel might not be sufficient. Therefore, in Condition and Limitation No. 10 the PIC is prohibited from beginning a flight unless, considering wind and forecast weather conditions, there is enough available fuel for the UA to conduct the intended operation with sufficient reserves such that the PIC can land the UA without posing an undue risk to aircraft or people and property on the ground, or the reserve power recommended by the manufacturer, if greater, is satisfied.

Maintenance:

The NAAA believes that any aircraft, manned or unmanned, that is intended for use in the NAS be adequately maintained and inspected. The criteria may be different from that used in manned aircraft, but standards should be established and complied with. Records (maintenance logs) should be provided as proof that these requirements are being met.

The FAA agrees and, in this exemption, requires the PIC to conduct a pre-flight inspection and determine the aircraft is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, such as 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 aircraft is found to be in a condition for safe flight. The FAA also requires the operator to follow the original equipment manufacturers (OEM) operating limitations, maintenance, service bulletins, overhaul, replacement, inspection, and life limit requirements for the UAS and its components as well as operator supplemental manuals.

The FAA also requires that maintenance be performed by qualified individuals who have been trained by the manufacturer in proper techniques and procedures for these UAS and all maintenance must be recorded in the aircraft records including a brief description of the work performed, date of completion and the name of the person performing the work. Moreover, any maintenance or alterations that affect the UAS operation or flight characteristics, such as replacement of a flight critical component, must undergo a functional operational check test flight prior to conducting further operations under this exemption. See details in FAA analysis below.

ALPA[11] does not believe PAU submitted sufficient information to determine whether the petitioner has provided the necessary risk mitigations for an equivalent level of safety.

The FAA has considered ALPA's concerns regarding if there has been sufficient information furnished to determine whether PAU has provided the necessary risk mitigations for an equivalent level of safety. As noted in previous exemptions, the FAA relies on materials

[11] ALPA states that their comment provides a few of their highest priority comments/concerns and that they have provided extensive comments on specific criteria to a previous petition from PAU found at (https://www.regulations.gov/comment/FAA-2022-0124-0004). The FAA previously responded to those comments in Exemption No. 19839.

marked as proprietary by a petitioner to make determinations about the petitioner's capabilities as part of its safety risk analysis. Proprietary information is not posted on the docket pursuant to 14 CFR § 11.35(b). If received, the FAA will process a Freedom of Information Act (FOIA) request for proprietary information under the DOT procedures found in 49 CFR Part 7. Moreover, the FAA notes that, while the details of the PAU's safety case are proprietary, the publicly available petition contains a summary of the key enabling technologies, which have been proven effective in similar scenarios and have been used previously by PAU to safely conduct both VLOS and BVLOS operations. The FAA has thoroughly reviewed all of PAU's submitted documents and concluded PAU has provided the necessary information for evaluation and risk mitigation. Accordingly, while these materials have not been released in their entirety, information about the materials has been provided in Attachment 1.

Additionally, ALPA opposes PAU's request to conduct BVLOS operations because PAU does not clearly identify the class of airspace where the proposed BVLOS operations will be authorized to take place, and states that without that information it could be concluded that PAU's BVLOS operations will be conducted in controlled airspace near crewed commercial operations.

As discussed in the FAA analysis below, the FAA is requiring operations conducted pursuant to this exemption to occur in Class G airspace. This exemption doesn't contemplate operations in Class B, C, D and E airspace.

Finally, ALPA is concerned that because the waiver request is not for a single specific operation or location, but rather for all operations of the same general type, the FAA's oversight task is considerably increased. ALPA asserts that specific details of every operation must be communicated to the FAA for approval to ensure that operation and location-specific mitigations result in the same level of safety currently being maintained. The FAA's limited resources may be significantly taxed by the continuing use of waiver requests.

The FAA has evaluated PAU's operating documents and focused on their processes and procedures. The FAA is satisfied that PAU has developed a standard way of performing all tasks necessary to operate safely within the scope of this exemption. Furthermore, this exemption is predicated on compliance with the conditions and limitations, which limit the scope of the operation to Class G airspace; sparsely populated areas; over pre-planned flight paths designed to avoid any known obstacles; over rights-of-way; except for takeoff and landing, over linear infrastructure; and within 100 ft. above and 20 ft. right or left of the centerline of the infrastructure that is being inspected. Therefore, the FAA concludes that revisiting these materials prior to every operation is unnecessary and counterproductive.

In providing comments on PAU's petition, ALPA also commented on the BVLOS ARC's recommendations regarding 14 CFR § 91.113 and that they oppose any proposed changes thereto, including the transfer of any "see and avoid" responsibilities. ALPA also states that the BVLOS ARC report included rulemaking recommendations for the modification of 14 CFR Parts 61, 91, 107, 135, and the establishment of "new parts" for BVLOS operations and the associated certification of aircraft and pilots. ALPA states that it takes exception to the

recommendations for regulations that would erode the current safety levels of airline operations, by the introduction of new operations authorized to be conducted in the same airspace, but at reduced levels of safety.

The FAA acknowledges these comments and notes that this exemption is not a proposed rulemaking and does not propose changes to existing regulations.

Landmasters LLC opines that UAS operations is a risky industry, as most services use software to plot a route versus manual control.

The FAA is unaware of evidence suggesting that a PIC's manual control is safer than automation that uses software to plot a route. On the contrary, the FAA determined the use of preplanned routes is critical to the safety of BVLOS operations. In PAU's case, flight plans go through a triple verification process prior to being uploaded to the aircraft and are then reviewed and verified by PIC 1 and PIC 2 prior to launch in order to minimize errors in the flight planning process. In addition, the aircraft flight controller performs a check for corrupted waypoints prior to upload to the aircraft. If there is a corrupted waypoint, the aircraft will not accept the upload and will not allow the aircraft to takeoff. The FAA finds that the aircraft's automation is critical to the safety of the operation and requires in Condition and Limitation No. 28 except in emergency situations, the SDO 50 V2 to be in flown in automatic mode.

Landmasters comments that in the interest of safety, local residents should be made aware of the operation be it a non-soliciting notice by mail or digitally. They state that the general public still has concerns over spying and while a notice won't eliminate fears entirely, it does put a face or brand to the operation versus an unknown aircraft lacking visual sight or a visual observer.

The FAA acknowledges the privacy concerns raised by Landmasters. While the FAA has consistently stated that privacy concerns are beyond the scope of the FAA's mission to ensure safety and efficiency of aviation operations in the NAS, the FAA intends to continue collaborating with the public, stakeholders, and other agencies with authority and subject matter expertise in privacy law and policy.

Landmasters believes that BVLOS poses a risk of personal injury to people on the ground such as utility checks on power stations, active bridges, and more. They reference Road Rangers and Highway Patrol's utilization of messaging signs, safety cones, and arrows to warn motorists and the same should apply for UAS inspections.

While the FAA's scope doesn't extend to motor safety, it notes that motorists are routinely warned of activities that affect their driving as well as the traffic around them. UAS operations should not affect motorists. The FAA is concerned that signage advising motorist of UA transient operations overhead may distract drivers and encourage them to look up rather than on the road ahead of them, creating an unsafe condition.

In the case of power stations all personnel on the premise need notice of the operation and to cease machinery but keep power to ensure the UAS footage can spot any electrical damage like frayed wires emitting sparks.

The FAA acknowledges Landmasters' concerns, and notes that this comment is outside the scope of the FAA's authority and this exemption.

Landmasters believes drone activities will deliberately operate around populated areas as the focal point.

The FAA appreciates Landmasters' concerns regarding the areas of operation of PAU. The FAA notes that PAU's operations are restricted to the areas of operation described in its operating documents (Class G airspace; sparsely populated areas; over pre-planned flight paths designed to avoid any known obstacles; over rights-of-way; except for takeoff and landing, over linear infrastructure; and within 100 ft. above and 20 ft. right or left of the centerline of the infrastructure that is being inspected).

Landmasters asserts that having a dedicated liftoff and landing position barred from public entry is a solid solution, ensuring no unaware civilians may disrupt the aircraft or pilot.

The FAA agrees and, notes that PAU's operating documents describe the procedures it follows to ensure the takeoff and landing areas are clear of people.

Additionally, the FAA received comments on a Federal Register Notice (2023 FR 11024) published May 25, 2023, on BVLOS operations, which provided the FAA with additional technical input on key concepts and potential approaches in this exemption, as well as the development of future policy.

Specifically, there were a number of comments on the defined volume of airspace surrounding critical infrastructure, ranging from adherence to the BVLOS ARC recommendation of 100 ft. above and 100 ft. laterally, to 300-400 ft. lateral separation, or even no preset defined area; rather, the area be tailored to each use case, factoring in obstacles, infrastructure, and/or operating environment. As discussed in the FAA analysis, the FAA determined that an area of 100 ft. above and within 20 ft. of centerline of the critical infrastructure based on a risk assessment of PAU's proposed operation provides sufficient separation from manned aviation.

Some commenters suggested that the FAA restrict certain areas in allowing shielded operations, including near airports, heliports, approach paths to an airport, hospitals, municipal infrastructure, and vertiports or dedicated Urban Air Mobility (UAM) routes except for circumstances in which the UA are cooperative. The FAA acknowledges the array of disparate opinions on the subject of where shielded operations should be permitted and in seeking a balanced approach, the FAA determined to permit shielded operations where and when they could be conducted without adversely affecting safety when implementing a series of mitigations (automation, planning, outreach, a situational awareness tool and in a low-risk environment). The FAA analysis below contains an in-depth discussion of FAA decision points as related to PAU's proposed operation.

PAU indicates that its PICs use pre-planned flight paths designed to avoid any known obstacles. PAU states that these flight paths are planned so that the UA route stays more than five nautical miles (NM) from public airports and avoids military training routes. The FAA agrees with commenters that shielded operations should not occur near airports and heliports and imposed Condition and Limitation No. 22 which requires that BVLOS operations be

conducted beyond prescribed distances of 2 to 5 miles from the airport reference point (ARP) of a public use airport, heliport, gliderport, or seaport listed in the Digital - Chart Supplement (d-CS), Chart Supplement of the U.S. Government Flight Information Publications. The FAA also imposes Condition and Limitation No. 23, which explains that this exemption does not authorize flight within UAS flight restricted areas, as described under CFR 14 Part 99.7. The FAA notes that aircraft three nautical miles out on a stabilized approach path to an airport should be descending on a standard 3-degree glidepath which is equivalent to about 300 ft. per nautical mile. Thus, the aircraft altitude at three nautical miles should be 900 ft. above touchdown elevation of the airport and maintain a 500-foot buffer from a UAS operating at 400 ft. AGL. Also, vertiports are already covered as obstacles to be avoided; and there are no dedicated Urban Air Mobility routes yet.

With respect to operations around hospitals and municipal infrastructure, in this exemption the FAA has stopped short of restricting operations around hospitals reasoning that restricting operations to a small corridor above the wires and over rights-of-ways would naturally preclude operations over hospitals. Moreover, the FAA did not find a compelling reason to prohibit operations over municipal infrastructure since certain transient operations, subject to the conditions and limitations of this exemption, were determined to not adversely affect safety (see discussion in the FAA analysis below) and thus permitted under this exemption. And, to address areas where high concentrations of people could be expected, the FAA prohibits operations over assemblies of people, as set forth in Condition and Limitation Nos. 40 and 41.

The FAA also received comments that were concerned with how and when BVLOS UAS operations enter into and exit from the shielded area and ensuring that they occur safely and efficiently without disrupting crewed aircraft operations outside of the shielded area as opposed to specific offset distances. The FAA notes that by using their situational awareness tool, the PIC and EO can see both cooperative and non-cooperative for a few miles around the takeoff and landing areas. Therefore, the UA does not rely on the infrastructure to shield its operations at the takeoff and landing areas, and there should be no disruptions to any other aircraft, crewed or uncrewed.

Shielded Operations are defined as operations conducted in the radial airspace surrounding an obstruction or infrastructure in which a manned aircraft is not expected to operate. The FAA agrees that for shielded operations to work as expected, people need to be able to see the infrastructure from the air, so underground pipelines (which require ground-penetrating radar or other technology to see) would not offer the protection or shield needed since other airspace operators would not be able to see the underground pipelines. With respect to PAU's exemption, this is not a concern since PAU will be operating over visible power lines.

The FAA received a number of comments from the Lighter than Air (LTA) community, citing concerns with potential changes to right-of-way; danger to humans; LTAs' limited maneuverability; lack of a UAS detect-and-avoid requirement; collision with UAS; LTAs' inability to see and avoid UAS; lack of ADS-B in LTA; and possible cessation of the LTA industry.

The FAA acknowledges that people who operate balloons, paragliders, hang gliders, skydivers, powered parachutes, and other ultralight crafts have legitimate concerns when

operating in close proximity to UAs which are not equipped with on-board DAA systems. On the surface, UA operations add to the list of known hazards which include high voltage wires and unequipped agricultural operations. However, as previously stated with respect to objections raised by the NAAA, preventing UA operations in the same area entirely is unreasonable as it places the interests of traditional operations over the interests of the power and energy industry as well as others who benefit from UAS operations. Therefore, the FAA is trying to strike a balance of user interests by keeping the operations safely out of conflict, while furthering the integration of UAS into the NAS.

Critical to keeping operations from conflicting is the outreach and coordination this exemption requires of PAU as well as the requirement for all airspace users to issue and read all of the NOTAMs for the area where they intend to fly. Such information is necessary to factor into decision making.

Helicopter Association International on behalf of other Associations requested that the comment period be extended. The FAA denied this request on June 8, 2023, and its response can be found at Docket No. FAA-2022-0124-0021 at www.regulations.gov.

The FAA's Analysis

Unmanned Aircraft Systems (UAS)

Airworthiness:

The SDO 50 V2 does not have an airworthiness certificate. Title 49 U.S.C. § 44807 provides the Secretary of Transportation (hereinafter Secretary) with authority to determine whether a certificate of waiver, certificate of authorization, or a certificate under Section 44703 or Section 44704, is required for the operation of certain UAS. Section 44807(b) instructs the Secretary to base their determination on which types of UAS do not create a hazard to users of the NAS or the public. In making this determination, the Secretary must consider the size, weight, speed, operational capability of the UAS, and other aspects of the proposed operation. The Secretary delegated this authority to the Administrator on October 1, 2021. In accordance with the statutory criteria provided in 49 U.S.C. § 44807, and in consideration of the size, weight, speed, and operational capability, proximity to airports and populated areas, and specific operations, a determination has been made that this aircraft does not create a hazard to users of the NAS or the public.

PAU requests relief from 14 CFR § 91.7(a), which prohibits the operation of an aircraft that is not in an airworthy condition. PAU explains that they satisfactorily demonstrated normal and abnormal flight operations for the FAA Aircraft Evaluation Division as well as flight crew safety procedures and compliance with all conditions and limitations of Exemption No. 19398A. PAU also claims that they have significant experience operating in the utility right-of-way without increased risk to persons, vessels, vehicles, and structures.

In its General Operations Manual, PAU states that the PIC completes a preflight inspection of the UAS prior to each flight to ensure it is fit to fly. Visual checks include, but are not limited

to inspection for cracks, dents, chafing, corrosion, damages & lose attachments (torque seal condition on attachment points) as well as checks on navigation and communication equipment and batteries.

During the Emerging Technologies Maintainability Validation performed by the Aircraft Evaluation Division on the SDO 50 V2 the FAA observed the PIC conduct the preflight inspection. The PAU PIC identified one of the main drive gears (the PEEK gear) had numerous teeth missing. PAU removed the aircraft from service until repairs could be made. This reaffirmed the validity of PAU's preflight inspection.

Based on the above, and the operational restrictions included in PAUs proposed operations, to ensure there is no adverse effect on safety in granting relief to 14 CFR § 91.7(a), the FAA is limiting the scope of the operations to those described in the operating documents (Attachment 1) in Condition and Limitation No. 2; and prohibiting the PIC from operating a UA unless it is in a condition for safe flight as determined by an inspection of the UA prior to every flight in Condition and Limitation No. 6.

In consideration of these conditions and limitations, as well as the Secretary's determination under Section 44807, the FAA finds that there would be no adverse effect on safety by operating the SDO 50 V2 without an airworthiness certificate. Thus, relief from 14 CFR § 91.7(a) is granted.

Altimeter settings:

PAU requests an exemption from 14 CFR § 91.121 altimeter settings, which requires a person operating an aircraft below 18,000 ft. Mean Sea Level (MSL) to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. PAU intends to use several altitude reporting systems, including a barometric altimeter and GPS-derived capabilities. In their Response to FAA Request for Information dated June 2, 2023, PAU clarified that before each flight, the altimeter is automatically calibrated to local barometric pressure and is cross-checked automatically for accuracy and error against the dual GPS altitude data. If there is an error, the ground control station alerts the PIC. The PIC performs a secondary cross-check to ensure that the local altitude shown is "zeroed" out in the UA prior to takeoff. During the operation, the PIC monitors the ground control station for aircraft position, altitude, attitude, and direction in real-time.

The FAA finds that for BVLOS operations a correct altitude reading is critical to the safety of the operation. Based on the above, the FAA finds that the PICs will use the correct altitude reading and that no adverse impact to safety is achieved.[12] Therefore, relief to 14 CFR § 91.121 is granted. The FAA notes that 14 CFR § 91.121 is written in reference to MSL.

[12] The FAA notes that it has previously determined that an equivalent level of safety to the requirements of 14 CFR § 91.121 can be achieved in circumstances where the PIC uses an alternative means for measuring and reporting UA altitude, such as global positioning system (GPS), and that the FAA has previously found GPS as a reliable way of determining the altitude of the aircraft.

Altitude values expressed in MSL are measured against the sea level, which makes the measurement inconstant and not obvious if the operation itself is not at sea level. Despite MSL being considered the "true" altitude; for operations close to the ground as this one is, AGL is more useful for providing a sense of awareness for the PIC as a gauge of how far away the UA is from the ground. Also, PAU's operation is tied to the ground as the operation is limited to 100 ft. AGL above the linear electric grid centerline. AGL readings will account for extreme changes in the topography. Therefore, the FAA requires reporting to be in ft. AGL in Condition and Limitation No. 11. Considering the limited altitude of the proposed operations, relief from 14 CFR § 91.121 is granted, subject to compliance with the conditions and limitations contained in this document.

Fuel requirements:

PAU requests relief from 14 CFR § 91.151(b), Fuel requirements for flight in visual flight rules (VFR) conditions, which prescribes that no person may begin a flight in a rotorcraft 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, to fly after that for at least 20 minutes. PAU states that it will adhere to the same 5-minute reserve requirement which the FAA has previously granted in other exemptions.

With respect to endurance, the Unmanned Aircraft Flight Manual SDO 50 V2 contains a fuel table and prescribes a fuel reserve of 2.0 L (8-9 min) to be added to mission. Many factors affect fuel consumption such as wind-speed, cruise speed, payload air resistance and more. Therefore, as set forth in Condition and Limitation No. 10, the FAA is prohibiting the PIC from beginning a flight unless, considering wind and forecast weather conditions, there is enough available fuel for the UA to conduct the intended operation with either sufficient reserves such that the PIC can land the UA without posing an undue risk to aircraft or people and property on the ground, or the reserve fuel recommended by the manufacturer, if greater, is satisfied. The reserve power will ensure that in the event of an emergency, the PIC can land the aircraft in a known area without posing an undue risk to aircraft or people and property on the ground. Because this exemption requires such a comprehensive preflight verification as well as in-flight checks, the FAA finds that compliance with this condition and limitation will ensure the operations PAU conducts under this exemption achieve the necessary level of safety that compliance with 14 CFR § 91.151(b) provides. Relief from 14 CFR § 91.151(b) is, therefore, granted.[13]

Aircraft maintenance, preventative maintenance and repair:

PAU requests relief to 14 CFR §§ 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417 (b). Based on the information provided by PAU, PAU's pilots who perform maintenance on the SDO 50 V2 UAS have been trained and approved by the OEM to perform specific maintenance tasks on the aircraft without requiring the aircraft

[13] In this case, the FAA considered relief to Section 91.151(b) as it relates to fuel. In addition, the FAA notes that the same rationale would apply to electric-powered UAs. Moreover, the FAA has similarly granted relief to Section 91.151(a) for both fuel- and electric- powered UA using the same rationale.

to be evaluated by the OEM. Maintenance tasks like major configuration changes and overhauls are required to be tested and approved by the OEM. The FAA finds these procedures would not adversely affect safety.

To ensure a level of safety equivalent to what would be achieved by strict compliance with those regulations, Condition and Limitation No. 8 of this exemption requires that maintenance, preventive maintenance, rebuilding, and alterations be performed by qualified individuals who have been trained in proper techniques and procedures for these UAS, as described in their applicable operating documents. Therefore, relief to 14 CFR § 91.403(b) is granted.

In light of PAU's request to conduct commercial BVLOS operations, including shielded operations, the FAA reviewed PAU's maintenance program and considered whether relief to those regulations were still appropriate for the proposed BVLOS operations.[14] PAU indicates that its proposed conduct of maintenance, inspection, and recordkeeping will be performed in accordance with the PAU's SDO 50 2V operations and maintenance manuals and supplements. In addition, PAU states that PICs will conduct a pre-flight inspection of the UAS and all associated equipment to account for all discrepancies or inoperable components or both and, if these inspections reveal a condition that affects the safe operation of the UAS, the aircraft will be prohibited from operating until the necessary maintenance has been performed and the aircraft is found to be in a condition for safe flight with a follow-on functional test flight. As in Exemption No. 17792, Avitas Systems, the FAA finds that, after careful review of the PAU's operating documents, compliance with PAU's maintenance, inspection, and preflight procedures, in conjunction with the conditions and limitations of this exemption ensure an equivalent level of safety can be achieved with regards to 14 CFR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b), provided that each UAS operated under this exemption complies with the original equipment manufacturers (OEM) operating limitations, maintenance, service bulletins, overhaul, replacement, inspection, and life limit requirements for the UAS and its components as well as operator supplemental manuals. This requirement is located in Condition and Limitation No. 7. Also, for tracking purposes, all maintenance must be recorded in the aircraft records, as required by Condition and Limitation No. 8. Therefore, the relief to 14 CFR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) is granted. Further, to ensure ready access to pertinent information, all Operations Manuals, Aircraft Maintenance and Service Manuals, Federal Communications Commission (FCC) Grant of Equipment Authorization, and a copy of this exemption must be accessible to the PIC at the control station during all operations that occur under this exemption, and for oversight purposes made available to the Administrator upon request. This requirement is addressed in Condition and Limitation No. 2.

Moreover, to ensure the aircraft is in proper working condition before using the aircraft for commercial purposes, any maintenance or alterations that affect the UAS operation or flight

[14] PAU provided the FAA with copies of its Unmanned Aircraft Flight Checklist, Unmanned Aircraft Flight Manual for the SwissDrones SDO 50 V2, the General Maintenance Manual for the SwissDrones, the SwissDrones SDO 50 V2 Ground Control Station Associated Elements and Minimum Specifications, and the SwissDrones General Maintenance Manual PAU GMM Supplement for USA Operations.

characteristics, such as replacement of a flight critical component, must undergo a functional operational check test flight prior to conducting further operations under this exemption. Functional operational check flights must be conducted in VLOS by a PIC and other personnel required to conduct the functional operational check test (such as a mechanic or technician) and must remain at least 500 ft. from all other people. The functional operational check flight must be conducted in such a manner to not pose an undue hazard to persons and property. And for oversight purposes, the operator must permit the FAA Administrator and his representative to observe functional test flights upon the request. These requirements are included in Condition and Limitation No. 9.

Remote Identification:

PAU requests an exemption from 14 CFR Part 89, which establishes remote identification requirements for UAs operated in the United States. Given the regulation and PAU's reasons for requesting relief, the FAA has narrowed the request to 14 CFR § 89.105. Section 89.105 states that except as otherwise authorized by the Administrator or as provided in 14 CFR § 89.120, after September 16, 2023, no person may operate an UA within the airspace of the United States unless the operation meets the requirements of 14 CFR § 89.110 or § 89.115.

Since the relief PAU requests is covered by 14 CFR § 89.105, which contains deviation authority, PAU can submit an application for authorization using form 7711-2, available online in an electronic form, and submit to ridauthorizations@faa.gov. Therefore, relief to 14 CFR § 89.105 is denied.

UAS Pilot in Command (PIC) and Flight Personnel

Pilot certification and qualifications:

The regulation 14 CFR § 61.3(a)(1)(i) requires, in part, that a pilot of a civil aircraft of the United States hold a pilot certificate issued under 14 CFR Part 61. Under 14 CFR Part 61, a person acting as pilot for compensation or hire is required to hold a commercial pilot certificate, hold a second-class medical certificate, and meet the recent flight experience requirements of 14 CFR Part 61 unless granted relief, which the FAA has done repeatedly for pilots of UAS operations for many years.[15]

Recently, the FAA has granted relief from the requirement to hold any of the 14 CFR Part 61 pilot certificates listed in 14 CFR § 61.3(a)(1). For example, in Exemption No. 17992C, Avitas, Inc., the FAA found that given the operational limitations, minimum pilot experience requirements, and the operator's training program; a remote pilot certificate issued under 14 CFR Part 107 provides the FAA with sufficient assurance of the pilots' qualifications and abilities to perform the duties related to the operations authorized by that exemption. The

[15] See e.g., Exemption No. 11062, Astraeus Aerial where the FAA granted relief to 14 CFR § 61.113(a) and 61.113(b) explaining that the foundation of aeronautical knowledge required for private pilots is parallel to that required for commercial pilots, and the experience obtained beyond a private pilot certificate in pursuit of a commercial pilot certificate in manned flight does not necessarily aid a pilot in the operation of UAS.

FAA finds that the same rationale for providing relief to Avitas in Exemption No. 17992C is applicable to PAU, and therefore, grants PAU's request for relief from 14 CFR § 61.3(a)(1) subject to the conditions and limitations discussed below.

The FAA continues to support the determination made in Exemption No. 17992C, that a 14 CFR Part 107 certificate ensures the PIC is qualified to perform duties that are unique to UAS, such as aspects of "see-and-avoid" and loss-of-positive-control, safety issues; and that compliance with 14 CFR § 107.65 ensures the certificate holder's knowledge is current and remains so. Further, the FAA continues to support the determination that successful completion of a 14 CFR Part 61 knowledge test every 24 months will ensure that pilots understand the full scope of flight operations conducted under 14 CFR Part 91 and remain knowledgeable. The FAA notes that persons who hold a sport pilot or higher-grade pilot certificate and meet the flight review requirements of 14 CFR § 61.56 also understand the full scope of flight operations conducted under 14 CFR Part 91, so those individuals need not take and pass the airman knowledge test if they have already demonstrated through the completion of a flight review with a flight instructor that they possess the knowledge required by this testing requirement. Accordingly, as set forth in Condition and Limitation No. 12, PAU's PICs must hold a 14 CFR Part 107 certificate, be in compliance with 14 CFR § 107.65 and pass a Part 61 airman knowledge test within the prior 24 months. As an alternative to taking a Part 61 airman knowledge test every 24 months, the PIC may hold a sport pilot or higher-grade certificate and meet the flight review requirements of 14 CFR § 61.56.

The FAA notes that a person granted relief to 14 CFR § 61.23(a)(2) and required to hold a third-class medical certificate by a condition and limitation of an issued exemption may not be holding the regulatorily appropriate medical certificate as required by 14 CFR § 61.3(c)(1). Therefore, the FAA grants relief to 14 CFR § 61.3(c)(1) to the extent that it is necessary to allow the PIC to hold a third-class medical certificate instead of the regulatorily required second-class medical certificate.

In addition to the requirements above, the FAA has determined PAU's training and qualification program for PICs is critical to safe operations. The FAA has carefully analyzed the training curriculum and has reviewed both the UAS-specific and the operator-specific training for BVLOS operations since generally applicable rules for BVLOS operations under 14 CFR Part 91 do not exist. Based on this review, the FAA determined that both the UAS-specific and operator-specific training contain all the elements needed to enable the 14 CFR Part 107 certified pilot to safely conduct the BVLOS operation using VOs and EOs, shielded operations and electronic monitoring systems.

Training must be provided as described in PAU General Operations Manual. See Condition and Limitation Nos. 2 and 20. The FAA finds that the PAU training program consists of academic and practical instruction and evaluation. The program focuses on fundamental aviation concepts as well as aircraft-specific systems and operations. In addition, PAU indicates in its petition that under their training program a pilot must successfully complete more than 50 hours of UAS specific training to qualify to conduct BVLOS operations over energy infrastructure. PAU's CONOPS indicates that all direct participants be trained in BVLOS operations. The FAA agrees that these qualifications are fundamental to safe

operations. Therefore, in Condition and Limitation No. 12 the FAA requires PIC to successfully complete of PAU's training program prior to operations under this exemption as it ensures the PIC knows how to fly the aircraft, program the routes, plan for contingencies, and do all the things required of the to operate the UAS safely.

Further, to ensure their training is effective, the PIC must be able to demonstrate to the operator that they are able to operate the UA safely, including fluency in conducting evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles, and structures, as set forth Condition and Limitation No. 16. To ensure the crew is focused on learning and building confidence and familiarity with the UAS and its operations, all training operations must be conducted during dedicated training sessions. *See,* Condition and Limitation 20. To ensure the quality of the training doesn't erode, the FAA is requiring that crew training be conducted in accordance with the operating training program described in PAU's training program, as outlined in Condition and Limitation No. 20.

Additionally, as set forth in Condition and Limitation No. 12, the FAA is requiring the PIC to have final responsibility and authority for the safe operation and flight of the aircraft in accordance with relevant regulations and company policies and procedures; execute vehicle commands through the ground control station and monitors system health status information; and be responsible for flight conduct and contingency management.

Finally, for oversight purposes, the FAA is requiring that the PIC present his or her credentials upon request from: an authorized representative of the Administrator; an authorized representative of the National Transportation Safety Board; any Federal, State, or local law enforcement officer; and any authorized representative of the Transportation Security Administration, see Condition and Limitation No. 4.

Observer certification and qualifications[16]

PAU's General Operating Manual indicates that all crewmembers, PICs and VOs (which includes traditional VOs used during VLOS operations and EOs used during BVLOS operations) are required to maintain a remote pilot certificate issued under 14 CFR part 107.

In other exemptions where VOs were directly watching the aircraft and airspace in lieu of the PIC, such as Exemption Nos. 18601, 18339, and 18163, the FAA found that VOs were performing pilot functions under Section 91.113 on behalf of the PIC and granted VOs relief from the requirement 14 CFR § 61.3 to hold a commercial pilot certificate and instead determined that the VOs in those exemptions must hold a 14 CFR Part 107 remote pilot certificate and comply with 14 CFR § 107.65 to ensure the safety of the operation. The VOs in those instances were responsible for confirming visibility requirements and overall weather conditions for the PIC. The FAA notes that PAU's proposed operation is different from those previously granted exemptions in that once the UA is beyond the direct sight of the PIC, the operation relies solely on the EOs to monitor the UA's airspace on behalf of the PIC. Although the EO is not technically performing the pilot duty of "see" in the see-and-avoid on

[16] *See,* footnote 6 for discussion of PAU's use of VO and FAA's use of EO.

behalf of the PIC since they are looking at a monitor rather than the airspace itself, the EO advises the PIC of the UAs location, the surrounding airspace, hazards in the airspace and weather which the PIC cannot do for themselves. Therefore, the FAA has determined that the role the EO plays in advising the PIC of information related to the UA and surrounding airspace, and the PICs reliance on this information, is identical to that of the VOs who have been determined to be performing pilot duties in Exemption Nos. 18601, 18339 and 18163. Given the PICs reliance on the information from the EO, the FAA has determined that same rationale applies here as that applied to VOs in Exemption Nos. 18601, 18339, 18163. Therefore, the FAA is requiring PAU's EOs to hold a 14 CFR Part 107 remote pilot certificate and comply with 14 CFR § 107.65 as set forth in Condition and Limitation No. 14.

Additionally, upon consideration of the EO's duties and responsibilities in the operation and the 14 CFR Part 107 knowledge testing requirements, the FAA has determined that in addition to holding a 14 CFR Part 107 remote pilot certificate and complying with 14 CFR § 107.65, to ensure the safety of the operation the EO must successfully complete the petitioner's training and qualification program. It is the same training program that PAU's pilots participate in and is discussed above. The FAA finds that the aeronautical knowledge covered in the training program, along with the certification and testing requirements are sufficient to prepare PAU's EOs to perform their jobs under the operating parameters allowed under this exemption. Therefore, the EOs must be qualified in accordance with the operator's training program before participating in operations under this exemption, pursuant to Condition and Limitation No. 15.

The FAA notes that PAU is also requesting VLOS operations. In such instances the PIC will have the capability of seeing the UA for the entire duration of the flight. Therefore, the traditional VOs supporting those operations are supporting the PIC in his see-and-avoid responsibilities rather than performing them on the PIC's behalf; therefore, the VOs are not required to hold an airman certificate issued under 14 CFR Parts 61 or 107. Nevertheless, the FAA has determined that a VO is necessary for VLOS operations to assist the PIC by scanning the sky and ground for obstacles that could impede a successful flight. Therefore, the VO must be fit for duty and trained. To that end, in Condition and Limitation No. 17, the FAA is requiring the VO to have adequate visual abilities that enable them to see the unmanned aircraft clearly, recognize terrain and obstructions, and see and avoid aerial or ground hazards and other aircraft without undue hesitation. Each VO must be able to establish and maintain by unaided vision, except vision that is corrected by the use of corrective lenses, a normal field of vision allowing them to see all potential hazards without hesitation. The FAA also requires the VOs to be qualified in accordance with the operator's training program before participating in operations under this exemption, pursuant to Condition and Limitation No. 15. It is the same training program that PAU's pilots and EO's participate in and is discussed above. The FAA finds that the aeronautical knowledge covered in the training program is sufficient to prepare PAU's VOs to perform their jobs under the operating parameters allowed under this exemption.

Finally, the FAA determined that effective communication among the crew is essential to safe operations and should be maintained at all times during the operation. Therefore, in Condition and Limitation No. 44, the FAA requires all crew, including the PIC, VOs and EOs to

maintain two-way voice communications with each other during operations. If communication occurs by electronic device: the device must be continuous full-duplex; the PIC must be able to use the device hands-free; and the PIC must ensure that there is a reliable back-up communication method. Further, electronic messaging or texting is not permitted during flight operations. During operations, no person on whom the PIC relies for safe conduct of the operation may engage in communications not relevant to the operation. These conditions ensure reliability of communication throughout the flight and allow the PIC, VO and the EOs to communicate with the least distraction from other duties required for the safe operation of the UA.

Medical certification: pilots

PAU requests relief from the requirement contained in Section 61.23(a)(2)(ii) that its PICs hold a second-class medical certificate because in Exemption No. 19398A, the FAA determined that requiring a third-class medical certificate provides reasonable assurance that the pilot does not have any physical or mental conditions that would interfere with the safe operation of the UAS. PAU proposes to have all its PICs maintain a third-class medical certificate. As discussed below, the FAA agrees that a third-class medical certificate would provide reasonable assurance that the pilot does not have any physical or mental conditions that would interfere with the safe operation of the UAS.

Under 14 CFR Part 61, a pilot must hold a commercial pilot certificate and at least a second-class medical certificate when conducting operations for compensation or hire. The FAA has previously required UAS pilots exercising commercial privileges to hold a second-class medical certificate because requiring a second-class medical certificate provided a reasonable assurance that the pilot did not have any physical or mental condition that would interfere with the safe operation of the UAS. However, recently the FAA conducted an additional safety analysis with respect to the medical certificate requirements for commercial UAS operations and reconsidered this position in Exemption No. 18601B.[17] In Exemption No. 18601B, Amazon Prime Air, the FAA found that the use of pilots holding the minimum of a valid third-class medical certificate would not adversely affect the safety of the petitioner's operation and granted relief to 14 CFR § 61.23(a)(2). The same rationale applies to this exemption. Therefore, the FAA finds that requiring that PAU's PICs hold at least a third-class medical certificate provides reasonable assurance that the pilot does not have any physical or mental condition that would interfere with the safe operation of the UAS. See Condition and Limitation No. 12. The FAA also notes that PAU's PICs are prohibited from conducting flight operations during medical deficiency in accordance with 14 CFR § 61.53(a). This requirement is consistent with the FAA's policy as set forth in more recently issued exemptions.[18] This requirement is in Condition and Limitation No. 13.

Medical certification: Observers

[17] Exemption 18601B, issued November 9, 2022, to Amazon Prime Air.
[18] See Exemption No. 19398A, issued to Phoenix Air Unmanned, LLC, February 28, 2023; Exemption No. 18601B, issued to Amazon Prime Air, November 9, 2022; Exemption No. 20050, issued to Supernal, LLC, April 24, 2023; Exemption No. 17992C, issued to Avitas, May 19, 2023.

With respect to EOs, because PAU's EOs are responsible with providing the same support to the PIC as a traditional VO (albeit through electronic monitoring rather than direct observation), the FAA finds that, as with VOs, holding a medical certificate is not warranted for these personnel. PAU's EOs do not have the ability to control or issue a direct command to the aircraft during flight operations. As a result, the risks associated with the medical episodes are lower for them. However, the operator's EOs must have adequate visual abilities that enable them to see the unmanned aircraft clearly, recognize terrain and obstructions, and see and avoid aerial or ground hazards and other aircraft, without undue hesitation. The EOs must be able to establish and maintain by unaided vision, except vision that is corrected by the use of corrective lenses, a normal field of vision allowing them to see all potential hazards without hesitation. Furthermore, the EO and any other direct participant may not participate in the operation if they know or have reason to know of any physical or mental condition that would interfere with the safe operation of the aircraft. These requirements are in Condition and Limitation Nos. 17 and 18.

With respect to VOs, medical certification is not required because for VLOS operations conducted under this exemption VOs are not required to hold a pilot certificate under 14 CFR Part 61 or 107. Nevertheless, as discussed below in the section titled, VLOS Operations, the FAA determined that VOs are essential to the VLOS operation as an operational mitigation. Therefore, VOs must have adequate visual abilities that enable them to see the unmanned aircraft clearly, recognize terrain and obstructions, and see and avoid aerial or ground hazards and other aircraft, without undue hesitation. The VOs must also be able to establish and maintain by unaided vision, except vision that is corrected by the use of corrective lenses, a normal field of vision allowing them to see all potential hazards without hesitation. Furthermore, the VO and any other direct participant may not participate in the operation if they know or have reason to know of any physical or mental condition that would interfere with the safe operation of the aircraft. These requirements are in Condition and Limitation Nos. 17 and 18.

Finally, the FAA determined that all direct participants (such as the PICs, the VO and EOs) in the operation must be fit for duty and be at their duty stations during the operations. Therefore, in Condition and Limitation No. 19, the FAA prohibits flights from being initiated unless all direct participants are fit for duty, are at their stations, and are committed to being at their stations for the duration of the flight.

UAS Operating Environment:

PAU requests to conduct BVLOS operations in an application for a 14 CFR § 91.113 waiver and by letter dated January 26, 2022. PAU also confirmed this in their response to the FAA request for information dated May 4, 2023. The FAA interprets these as a request for relief from 14 CFR § 91.113(b). PAU also requests VLOS operations by letter dated May 4, 2023.

According to 14 CFR § 91.903, Policy and procedures, the Administrator may issue a certificate of waiver authorizing the operation of aircraft in deviation from any rule listed in § 91.905 if the Administrator finds that the proposed operation can be safely conducted under the terms of that waiver. Section 91.905 lists 14 CFR § 91.113 as a provision that may be

waived. However, while the FAA may issue a certificate of waiver for 14 CFR § 91.113, the FAA may also choose to issue an exemption instead provided the requirements for an exemption have been met. For the reasons discussed below, the FAA is granting PAU relief from 14 CFR § 91.113(b) and has determined that the proposed operations would not adversely affect safety, provided PAU complies with conditions and limitations set forth in this exemption. The effect of this relief is that PAU will not need to apply for COAs to fly in Class G airspace. This is expressed in Condition and Limitation No. 21, which authorizes the operations conducted under this exemption in the NAS. The other conditions and limitations related to BVLOS and VLOS operations for PAU's proposed operation are discussed below.

BVLOS Operations:

Operational area parameters

Seeing and avoiding other aircraft is essential for all operations, and PAU's petition and CONOPS explain the operating environment and mitigations they will put in place to ensure that their aircraft remains well clear of other aircraft, people, vessels, vehicles, or structures. PAU's operating documents list the parameters for BVLOS operations, as described above on page 6 of this exemption. The FAA has analyzed these parameters and has determined that they greatly reduce the likelihood of an encounter between the UAS and a person in the air or on the ground. Therefore, the FAA finds that PAU establishes a low-risk environment for operations. Any operation that fails to meet all of these parameters falls outside the scope of BVLOS operations authorized under this exemption. To ensure that the area of operation remains a low-risk and safety is not adversely affected, the FAA imposes several conditions and limitations. First, in Condition and Limitation No. 21, the FAA limits operations to only those that meet all of the following criteria: in Class G airspace; in sparsely populated areas;[19] over pre-planned flight paths designed to avoid any known obstacles; over rights-of-way; except for takeoff and landing, over linear infrastructure; and within 100 ft. above and 20 ft. right or left of the centerline of the infrastructure that is being inspected. Compliance with these criteria establishes a separation between the proposed operations and the vast majority of other aircraft, and mitigates potential interaction with people, vessels, vehicles, or structures.

Second, in Condition and Limitation No. 22, the FAA prohibits BVLOS operations closer than prescribed distances from the airport reference point (ARP) of a public use airport, heliport, gliderport, or seaport listed in the Digital - Chart Supplement (d-CS) or the Chart Supplement of the U.S. Government Flight Information Publications. This ensures there is an appropriate buffer between manned aircraft during takeoff and landing and the UA.

Third, in Condition and Limitation No. 23, the FAA notes that it does not authorize flight within UAS flight restricted areas. As such the exemption does not authorize flight within UAS flight restricted areas. Since FAA authorization of operations in the NAS does not

[19] For the purpose of BVLOS operations, PAU defines sparsely populated areas as areas where the population count is less than 12 people per square kilometer.

extend to these types of areas, the FAA informs the operator of the proper procedure for obtaining authorization for flight in UAS flight restricted areas.

Environmental parameters

To ensure that the low-risk operational environment is maintained and that safety is not adversely affected, the FAA imposes Condition and Limitation Nos. 24 and 25. In Condition and Limitation No. 24, the FAA prohibits the UA from being operated less than 500 ft. below or less than 2,000 ft. horizontally from a cloud or when visibility is less than 3 statute miles from the PIC. This requirement ensures the UA does not operate so close to a cloud as to create a hazard to other aircraft operating in the NAS.

PAU's operating documents limit operations to daytime[20] visual flight rules (VFR) conditions and when the weather is within the UA system limitations described in the operating documents. This means operations will not occur in clouds, heavy precipitation, low visibility, winds of more than 40 km/h, 21.6 knots METAR, and otherwise adverse weather conditions. All of the FAA's analysis is predicated on these conditions and the FAA has determined that such conditions ensure that a low-risk operational environment is maintained and safety is not adversely affected. Therefore, in Condition and Limitation No. 25, the FAA limits operations to daytime, VFR conditions, and when weather is within the UA system limitations described in the operating documents.

Operational mitigations

In addition to the parameters above, the FAA also considered PAU's use of operational mitigations including PAU's use of a situational awareness tool and visualization system, which provides the PIC and EO with situational awareness of the operational airspace by incorporating various radar and information feeds; and PAU's use of rights-of-way, which reduces the likelihood of encounters with people and structures and determined that these factors are effective at preserving a low-risk operational environment. The FAA also considered operations close to infrastructure, which also reduces encounters with other aircraft since such operations occur where manned aircraft operations are not generally expected or conducted. Therefore, the FAA establishes in Condition and Limitation No. 26, the PIC may conduct BVLOS operations whereby when the UA is not within the visual line of sight of the PIC, rather the UA is monitored electronically by one of the two EOs and is reliant on the infrastructure to shield the operations. Shielded Operations are defined as operations conducted in the radial airspace surrounding an obstruction or infrastructure in which a manned aircraft is not expected to operate. In such situations, under Section 91.113 the PIC is operating the aircraft and is, therefore, responsible for maintaining vigilance so as to see and avoid and remain clear of other aircraft.

[20] The FAA notes that while the SDO 50 V2 is equipped for nighttime operations, PAU does not request relief, nor do its procedures include nighttime operations. Further, the FAA did not contemplate nighttime operations in its analysis.

The FAA considered the operational strategy of PAU's operation. According to the PAU CONOPS, the normal operation strategy is for PIC 1 to launch the aircraft, with assisted situational awareness from VO 1 (which the FAA terms EO 1) through electronic means. Approximately midway through the flight, PIC initiates a handoff of controls to PIC 2 (who is located at the aircraft recovery site). PIC 2 then takes primary control over the aircraft via the ground control station. This handoff allows PIC 2 to send commands to the aircraft and receive telemetry data from the aircraft. VO 2 (who is located at the landing area with PIC 2 and who the FAA refers to as EO 2) then has responsibility for situational awareness of the airspace along with PIC 2. PIC 2 recovers the aircraft and prepares the aircraft for the next flight. The FAA determined this strategy will not affect the safety of the NAS provided the crew is properly trained (as discussed above) and the PIC briefs all participants involved in the operation on safety of flight, hazards, risks, mitigations, and the contents of this exemption prior to the operation, as set forth in Condition and Limitation No. 27. Since this exemption is predicated on the use of two EOs, the FAA determined a two EOs are needed. Therefore, in Condition and Limitation No. 43, the FAA requires use of the services of at least two EOs for BVLOS operations.

Moreover, the EOs must use a situational awareness tool that provides surveillance to in real-time. The components of this tool include local and FAA NAS-wide surveillance sensors, data processing with alerting algorithms and system health monitoring as well as visualization display software. The feeds include the ADS-B NextGen surveillance network; the Airport Surface Surveillance Capability (ASSC) and ASDE-X surface data; En Route and terminal radars; and the Wide area multilateration systems. The feeds combine an aircraft's positioning source, aircraft avionics, and a ground infrastructure to create an accurate surveillance interface between cooperative aircraft (ADS-B equipped) and ATC; allow EOs to see aircraft and ground vehicles on the airport surface, and on approach and departure paths within a few miles of the airport; and provides EOs with the exact location of equipped aircraft, as well as its spatial relationship to other aircraft. The situational awareness tool and visualization system augments the information obtained from the feeds with locally deployed infrastructure to include local ADS-B sensors, ground primary radars and UAS ground control station telemetry radar. The visualization display software has three range rings assigned to it at 2.4 NM, one NM, and at 2000 ft. Incursions within the outer rings are considered informational are highlighted with a white halo. Incursions within the middle ring are considered warnings are highlighted with yellow halos. Incursions within the inner ring are considered critical and are be highlighted in red. DAA alerting algorithms are compliant with the TRCA DAA MOPS and based on well clear criteria for UAS. The system is man-in-the-loop and not interfaced with the SDO 50 V2 autopilot. The PIC will need to take manual flight action based on what the EO sees on the display. At the takeoff and landing areas the system can detect all cooperative (equipped with ADS-B) and noncooperative traffic for approximately 1.5 miles but varies depending on topography and atmospheric conditions. Beyond this, the system can only detect cooperative traffic.

Using this system, the EOs must scan their area of responsibility and immediately notify the PIC when they observe any hazard to safety of flight. The PIC still retains the overall responsibility to avoid other aircraft.

The FAA considered the aircraft's automation. PAU asserts and the FAA agrees that the use of preplanned routes is critical to the safety of the operation. According to the CONOPS, all flight plans go through a triple verification process by PAU designated Mission Planners prior to being uploaded to the aircraft and are then reviewed and verified by PIC 1 and PIC 2 prior to launch in order to minimize errors in the flight planning process. All PAU flight planning is conducted in a sterile environment whereby the Mission Planner is not subject to interruptions. Flight plans cannot be changed by the PICs except for the launch and recovery points. Launch and recovery points can be slightly adjusted in the field based on actual site conditions and obstacles. If mission points need to be updated, the mission plan is sent back to a designated Mission Planner for adjustment. In addition, the aircraft flight controller performs a check for corrupted waypoints prior to upload to the aircraft. If there is a corrupted waypoint, the aircraft will not accept the upload and will not allow the aircraft to takeoff. The FAA finds that the aircraft's automation is critical to the safety of the operation and requires in Condition and Limitation No. 28, except in emergency situations, that the SDO 50 V2 must be flown in automatic mode.

The FAA also considered the effectiveness of the C2 Link, which is the communication signal over which the aircraft and the ground control station communicate. According to the operating documents, the SDO 50 V2 also has a second backup data link. This link is selectable by the PIC at the ground control station if the PIC determines the primary link signal will not be sufficient to maintain connection to the aircraft. The FAA notes that failover to the redundant link is immediate if primary link is lost. The signal strength varies based on a number of factors including terrain type, atmospheric conditions, obstacles, signal type, antenna, etc. According to the operating documents, the PAU PIC monitors signal strength from aircraft radios to ground radio(s) in real time. This allows the PICs to ensure positive C2 capability prior to hand-off between PICs and while enroute during BVLOS operations. The FAA has determined that assurance of a strong C2 link is important to the safety of flight operations and is imposing Condition and Limitation No. 30. Condition and Limitation No. 30 requires the PIC to determine that all control links used for the operation have signal that is strong enough to control the UA at the maximum planned distance for the operation prior to conducting operations under this exemption.

In addition, the FAA determined that another layer of mitigations is necessary to achieve no adverse impact to safety to 14 CFR § 91.113(b). In particular, the FAA finds that a robust contingency procedure is needed. The standard response to contingencies must be one that avoids compounding the risk to other aircraft and persons, vehicles and vessels. Therefore, in Condition and Limitation No. 31, the FAA requires the PIC to prepare for a lost C2 link by programing lost link procedures so that the UA will remain within the operational corridor and proceed to a pre-determined landing area. This contingency procedure must avoid unexpected turn-around and altitude changes and must provide the PIC with sufficient time to communicate with ATC if necessary.

The FAA considered PAU's flight planning procedures. According to the CONOPS flight planning is a three-step process: 1) generate waypoints from utility customer linear electric infrastructures data which includes latitude, longitude, and structure height, which is turned into a preprogrammed waypoint directly over the top of the electric line structures; 2) analyze

risk along the flight path using air and ground risk criteria using a population database that shows geographical distribution of populations at one-kilometer resolution over an average 24-hour period traffic volumes and maps showing airports; 3) select launch and recovery site as close to the electric line as possible considering factors such as landowner permissions, ground obstacles, and radio line of sight[21] along the flight path. The FAA determined that PAU's planning is critical to the safety of the operation and is imposing Condition and Limitation No. 29, which requires operational area boundaries, obstacles and other ground risks to be identified, located and factored into the flight planning.

Procedural considerations

The FAA reviewed PAU's procedures and considered that during shielded operations, the flight crew is unable to view uncooperative aircraft around the path of the SDO 50 V2. Given this, the FAA considered the PAU's coordination with other potentially affected local airspace users, such as crop applicators, private heliports, hot air balloon operators, hang gliders, paragliding operations, and private airports, as well as with the relevant utility to deconflict contracted manned aircraft operations over transmission lines. The FAA determined that this outreach is a critical element for reducing the likelihood of encountering non-cooperative traffic during shielded operations. Therefore, in Condition and Limitation No. 32 the FAA requires that the operator to employ an outreach strategy that coordinates with other potentially affected aircraft operators prior to any BVLOS operations. This includes coordination with other utilities with assets that intersect the flight corridor since they may also be conducting aerial surveillance of the same area. Moreover, PAU states that they will file a Notice to Air Missions (NOTAM) in order to ensure that local airports, Fixed Base Operators, and general aviation (GA) are aware of intended BVLOS operations. PAU proposes to request a NOTAM not more than 72 hours in advance, but not less than 24 hours prior to each operation. The FAA determined the submission of NOTAM, to inform other airspace users of the location of PAU's operations will also contribute to a low-risk environment and thus requires it in Condition and Limitation No. 33.

The FAA considered whether there should be a prescribed limit to the length of time and/or distance BVLOS operations could remain in the shadow of the infrastructure (or shielded) where the flight crew could monitor only the cooperative traffic surrounding the operation and the SDO 50 V2 itself. The FAA considered a number of factors. First, after the FAA Emerging Technologies Branch (AFS-170) completed both an Operational Suitability Evaluation (OSE) and an Emerging Technologies Maintainability Validation (ETMV) on the SDO50V2 operated by PAU, the FAA determined the SDO 50 V2 is reliable, durable and fit-for-purpose in the proposed operating environment. The FAA oversaw demonstrations of a simulated conflict scenario with a non-participating aircraft as well as the manual intervention and subsequent return to original flight plan; demonstrations of the ability of the UA to switch to the secondary navigation when the primary navigation fails during the takeoff, cruise and landing phases of flight; and demonstrations of complete C2 failure contingencies. Second, the FAA determined the SDO 50 V2 is capable of precision navigation and the automation software reliably keeps the aircraft on track and within the operating corridor. Third, there are

[21] Radio line of sight is the direct path from a transmitter to the receiver.

natural limitations to the distance and duration of shielded operations such as an aircraft's endurance, fuel and weather. Given these qualities and capabilities, the FAA determined that as long as the UAS is reliable, durable and fit for purpose; the C2 link is maintained, and the PIC is able to move the aircraft to a safe location in emergency situations; the length or duration or both of the shielded operation need not be prescribed by the FAA. Instead, the distance or duration or both of shielded operations will be defined by the performance of the technology. Therefore, the FAA is imposing the performance-based Condition and Limitation No. 34 which establishes that BVLOS operations may proceed without limitation of time or distance so long as the aircraft has been proven to be reliable, durable and fit-for-purpose; the C2 link is maintained; and the PIC could effectively move the aircraft out of the way of known traffic, and subject to all other conditions and limitations, in particular, Condition and Limitation No. 10.

Finally, not only does the PIC have overall responsibility for the safety of the operations, his or her role is critical to the safety of the operation. It is the PIC who assembles and checks that all the elements of a safe operation are in place. The PIC becomes familiar with all available meteorological information in the area; the PIC determines whether there is suitable weather conditions in the flight area and verifying the flight can be conducted in compliance with VFR, with a minimum of 3 miles visibility; the PIC checks the NOTAM and Temporary Flight Restriction (TFR) databases to ensure there are no TRFs, GPS degradation, or flight restrictions in the operating area; and reviews the in-person site surveys to ensure the area is free of industrial hazards, recreational activities, or dwellings, or any other obstacle to a safe flight. These activities as well as those discussed throughout the FAA's analysis above, serve to assist the PIC in ensuring the UA remains clear and gives way to all other aviation operations and activities at all times. Accordingly, the FAA requires the PIC to ensure the UA remains well clear and gives way to other aircraft at all times except as it relates to uncooperative traffic when relying on shielded operations as set forth in Condition and Limitation No. 37. Well clear means 2000 ft. horizontally and 250 ft. vertically from other aircraft. This is a standard the FAA is setting so industry and regulators have the same understanding of the meaning of the term. Further, the Condition and Limitation No. 37 prohibits operations that cause hazard to persons or property on the surface or in the air. If at any time safety of human beings or property on the surface or in the air is in jeopardy, the PIC must cease operations.

The FAA requires contingency plans. In the analysis above, the FAA discussed how the PIC must submit a NOTAM to inform other airspace users of their operation and to consult the NOTAM and Temporary Flight Restriction (TFR) databases to see if there will be other aircraft operations in area. Conversely, the PIC must be available to the FAA Air Traffic Control (ATC) in the event they need to contact him or her. Therefore, in Condition and Limitation No. 35, the FAA requires the PIC to be accessible to the FAA, via phone number provided in NOTAM or during initial coordination, for direct, real-time communication and coordination purposes for the duration of UAS operations. While rare in Class G airspace at such low altitudes, ATC may delay, limit, prohibit, or terminate UAS operations when it has concerns regarding the safety of manned aircraft operations in the area. Therefore, the FAA imposes Condition and Limitation No. 36, which informs the operator and the PIC that ATC

may delay, limit, prohibit, or terminate UAS operations when it has concerns regarding the safety of manned aircraft operations in the area.

As an additional level of mitigation geared toward deconfliction with other aircraft, the FAA has determined that an anti-collision light helps the UA to be conspicuous regardless of the time of day. Therefore, in Condition and Limitation No. 38, the FAA is requiring the UA to be equipped and operated with an anti-collision light. for all BVLOS operations. While BVLOS operations are limited to daytime operations under this exemption, the anti-collision light must meet the standard of visibility for at least 3 statute miles between the beginning of evening civil twilight and the end of morning civil twilight.

Furthermore, to ensure operational area, environmental parameters, operational and procedural mitigations, and procedures remain a condition of this grant of an exemption, in Condition and Limitation No. 2, the FAA requires the Operator to follow the procedures as outlined in its operating documents. While 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. Further, if the Operator determines that any update or revision would affect the Operator's ability to comply with any requirement of this exemption, then the Operator must petition for an amendment to this grant of exemption. See Condition and Limitation No. 3.

In summary, the FAA considered the operational area, environmental parameters, operational and procedural mitigations, and determined that relief to 14 CFR § 91.113(b), subject to the conditions and limitations of this exemption, would not adversely affect safety; therefore, relief to 14 CFR § 91.113(b) is granted.

<u>BVLOS operations under 500 ft. AGL over people, vessels, vehicles, structures and roadways</u>

Below 500 ft.:

PAU seeks relief from 14 CFR § 91.119(c) Minimum safe altitudes, to the extent necessary to allow UAS operations over areas other than congested areas at altitudes lower than those permitted by the regulation. Section 91.119(c) requires an altitude of 500 ft. above the surface, except over open water or sparsely populated areas, in which case the aircraft may not be operated closer than 500 ft. to any person, vessel, vehicle, or structure. PAU claims that even at low altitudes, the UAS operations would be conducted at a level of safety equal to or greater than that achieved by a larger crewed aircraft performing similar activities at the altitudes required by 14 CFR § 91.119. The FAA finds that relief from 14 CFR § 91.119(c) is necessary because the SDO 50 V2 would be operated at altitudes below 500 ft. AGL, and within 500 ft. of people, vessels, vehicles and structures. The FAA considers that the SVO 50 V2 is significantly smaller, lighter, slower, less noisy and more maneuverable than manned aircraft; the UAS is programed to a maximum operating altitude of 400 ft. AGL (but is restricted to up to 100 ft. above the infrastructure except for takeoff and landing); operations will occur in sparsely populated areas; the level of safety of this aircraft is not enhanced by greater distances above the ground; and, flying below most air traffic increases the safety margin without posing an increased risk to people or property. The FAA finds there is no

change to the level of safety. Therefore, the FAA grants relief from this provision, thus allowing the aircraft to be operated at altitudes below 500 ft. AGL.

Roadways:

PAU seeks to cross certain roadways. A component of the PAU CONOPS and the Safety Risk Management documents submitted in support of this exemption contemplates BVLOS flights over transmission lines that cross roadways. PAU's roadway criteria include a ground risk assessment involving automotive traffic count analysis and a detailed calculation of the probability that the UAS will collide with a moving vehicle. PAU's safety analysis found that, when traversing roadways with a flow rate of 770 cars per hour (12.8 cars/min), a UAS has a 9.91x10-7 probability that it will collide with the windshield of a vehicle traveling 30 mph. PAU uses road traffic density where available to determine the number of cars per hour. These data sets are maintained by the state and county (depending on whether the road is a state or county road. The data is gathered on a semiannual or annual basis. In some cases, such as gravel county roads, traffic density data is not available. In such cases, PAU states it will not fly over the road, unless it is a one-lane road or less (which cannot accommodate 770 cars/hour).

The FAA considered PAU's roadway criteria, which includes a ground risk assessment involving automotive traffic count analysis and a detailed calculation of the probability that the UAS will collide with a moving vehicle and concluded that this is a sufficiently low risk and finds that paved roadways with a flow rate of 770 cars per hour or fewer are acceptable for transient BVLOS operations. In addition to paved roads with less than 770 cars/hour, crossing one-lane gravel or dirt roads and paved access roads with no traffic count data are also acceptable because they are too small to support 770 cars/hour.

The FAA explored the operational risk described above in a pre-decisional Operational Issue Paper and concluded that the combination of BVLOS mitigations, proven procedures, and UA emergency features reduce the likelihood of UA conflicts with motorists and determined that safety is not adversely affected by permitting both transient operations over low-density roadways and over persons, vessels, vehicles, and structure in the operational corridor subject to the conditions and limitation discussed below.

In order to ensure that operations remain low risk as described in both the PAU and the FAA's operational risk assessment, in Condition and Limitation No. 39, the FAA limits BVLOS operations over roadways only to those roadways with a flow rate of 770 cars per hour or less. Roadways with greater than 770 cars/hour must be crossed within VLOS of the PIC to ensure there is no overflight of people or vehicular traffic. Further, in order to ensure the risk remains low, all roads must be crossed in minimal time necessary to safely complete a flight.

People and structures:

PAU seeks relief from 14 CFR § 91.119(c) in order to fly less than 500 ft. from non-participating structures and people while the aircraft is performing normal flight operations

within the utility right-of-way corridor. PAU asserts that the SDO 50 V2 is a helicopter, and that 14 CFR § 91.119(d)(l) permits a helicopter to be operated at less than the prescribed minimums 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. The assertion that the SDO 50 V2 is a helicopter is immaterial since the SDO 50 V2 is a UAS and an uncertified aircraft. In such cases, the FAA must ensure that the practice of flying closer than 500 ft. to people, vessels, vehicles, structures does not adversely impact safety. If 14 CFR § 91.119(d) were applicable, then the practice of flying closer than 500 ft. to people, vessels, vehicles, structures would become routine for all such operations without the benefit of FAA's safety analysis. However, the FAA has determined that 14 CFR § 91.119(d)(l) does not apply to uncertified aircraft that fly under 49 U.S.C. § 44807 authority.

In support of relief from 14 CFR § 91.119(c), PAU states that since flight operations are conducted within a utility right-of-way, which is considered to be sparsely populated and only the controlling utility may permit construction of structures in the right-of-way. PAU further explains that structures may be located within 500 ft. of the flight path adjacent to a right-of-way, but they would not be directly overflown because they are not located underneath the transmission lines. Finally, PAU states that it has significant experience operating in the utility right-of-way without impact to persons, vessels, vehicles, and structures. PAU offered that it has conducted 843.9 flight hours and 12,703.07 miles of UAS transmission line inspection flights under FAA waivers 107W-2021-02812, 107W-2022-00192 and 107W-2019-00055B.

The FAA considered the following factors: the safety work used to justify operations over roadways (discussed above); that people don't reside in rights-of-way; and that rights-of way are sparsely populated because of the effects of high voltage electricity on one's health; and determined that transient operations over people would not adversely affect safety.

Neither PAU nor the FAA's analysis considers sustained flight over people, vessels, vehicles, structures and roadways. Since the risks associated with sustained flight was not evaluated, the FAA prohibits it in Condition and Limitation No. 40.

Likewise, since neither PAU nor the FAA's analysis considers operations over assemblies of people; since people could assemble in low population density areas; and because the FAA wants to ensure the operations remain low risk; the FAA is also prohibiting transient flight over open air assemblies of people in Condition and Limitation No. 41.

Visual Line of Sight (VLOS):

Since transmission lines often begin and end in areas within five (5) statute miles of an airport or within areas of increased population or road traffic density, and there is a need to inspect an entire transmission line circuit no matter where it falls, PAU requests authority to operate the SDO 50 V2 within VLOS of the PIC in such areas to complete powerline inspections. PAU's VLOS operational strategy for VLOS operations is that the PIC to launch the aircraft and keep it within visual line of sight for the entire duration of the operation. The PIC will be assisted by at least one VO. The VO will participate in the preflight activities including the

briefing, ensure the takeoff and landing areas are clear of debris and people and finally, the VO will observe the aircraft and airspace around it without the assistance of a situational awareness tool.

In its May 4, 2023, response to the FAA's request for information, PAU argues that because the SDO 50 V2 would be operated VLOS in areas that do not meet the criteria for BVLOS operations, the use of a specific population density criteria of people per square kilometer should not apply. In such circumstances, PAU states that it would be able to comply with 14 CFR § 91.113 through the use of "unaided visual means," which the FAA understands to mean within the direct line of sight of the PIC. PAU also states that its VLOS operations are limited to transmission line sets that contain a segment that can be flown BVLOS per operational performance population density criteria; and that PAU will not operate the SDO 50 V2 in a VLOS capacity for continuous operations. PAU also asserts that they would ensure the transmission line environment is free from non-participating structures and contains limited non-participants in the right-of-way. PAU also explains that when entering or departing the transmission line environment for takeoff or landing, the PIC will visually ensure that the aircraft will not overfly people, vehicles, or structures.

In making the determination to grant PAU relief to 14 CFR § 91.113(b), the FAA considered the following factors: PAU's PICs and VOs are trained and qualified as described above; the planning procedures are thorough and are the same for both BVLOS and VLOS; the aircraft will fly along preplanned routes on autopilot; the operation is in Class G airspace and will stay within the right-of-way within 100 ft. above the linear electric grid centerline and within 20 ft. left or right of the centerline, all of which are discussed in the FAA analysis above. The FAA determined, based on the mentioned factors, that VLOS operations with the safety appropriate mitigations will not adversely affect safety. Therefore, relief from 14 CFR § 91.113(b) to conduct VLOS operations is granted subject Condition and Limitation No. 42 where the FAA requires the PIC to keep the UA within visual line of sight for VLOS operations. This means the PIC must be able to, with natural unaided vision except for corrective lenses, see the UA and determine its orientation, height above the surface, and direction of flight. The UA must be conspicuous so as to be obvious within the VLOS area. Since there are areas where VLOS operations will occur, such as near airports, are congested, and the PICs monitor the ground control station screen, the UA and the surrounding airspace, the FAA determined a VO is needed. Therefore, in Condition and Limitation No. 43 the FAA requires use of the services of at least one VO for VLOS operations. The VO must be able to see the aircraft directly or monitor the airspace around it. VOs must scan their area of responsibility and immediately notify the PIC when they observe any hazard to safety of flight. The PIC still retains the overall responsibility to avoid other aircraft.

<u>VLOS operations over people, vessels, vehicles, structures and roadways</u>:

PAU also requests the ability to fly over occupied roadways within VLOS of the PIC using the same BVLOS criteria of fewer than 770 cars per hour. The FAA analyzed operations over people, vessels, vehicles, structures and roadways in greater detail above in the section titled, "*BVLOS operations under 500 ft. AGL over people, vessels, vehicles, structures and roadways*" and determined that the same rationale applies for VLOS operations. Therefore, in

Condition and Limitation No. 39, the FAA limits operations over occupied roadways only to those roadways with a flow rate of 770 cars per hour or less.

At roads where the volume is greater than 770 cars per hour, PAU proposes to only conduct those crossings when there is no traffic, and the operation is within VLOS of the pilot. Therefore, there will be no overflight of non-participating vehicular traffic in instances where the road traffic density is greater than 770 cars per hour, as set forth in Condition and Limitation No. 39, which prohibits operations over non-participating vehicular traffic for roadways denser than 770 cars per hour according to data sets maintained by the state and county government (depending on whether the road is a state or county road).

Further, in order to keep the risk as low as possible, all roads must be crossed in minimal time necessary to safely complete a flight. This is noted in the discussion of BVLOS operations over roadways above and the same rationale applies here. The FAA establishes this requirement in Condition and Limitation No. 39.

Neither PAU nor the FAA's analysis considers sustained VLOS flight over people, vessels, vehicles, structures and roadways. Since the risks associated with sustained flight was not evaluated, the FAA prohibits it in Condition and Limitation No. 40.

Likewise, since neither PAU nor the FAA's analysis considers VLOS operations over assemblies of people; since people could assemble in low population density areas; and because the FAA wants to ensure the operations remain low risk; the FAA is also prohibiting transient flight over open air assemblies of people in Condition and Limitation No. 41.

Reporting:

Reporting on accidents, incidents and major deviations provides the FAA with a way to monitor potential problems and root causes as they recur. The documentation of these problems and root causes increases the likelihood that repeating failures will be noticed and corrected before they develop into more serious incidents or accidents. Moreover, accumulating data on accidents, incidents and deviations provides the FAA with a needed opportunity to validate assumptions, develop best practices to share with industry, and to inform regulatory actions.

Under 49 CFR Part 830, operators are required to report occurrences involving UAS if it results in a death or serious injury; or the UAS holds an airworthiness certificate and sustains substantial damage. The FAA determined that this regulation is, in part, circumvented by exemptions such as this one which permits the use of an uncertified aircraft (per authority in 49 U.S.C. § 44807), if it does not include a condition and limitation that requires reporting. Since neither the FAA nor the public would benefit by reduced reporting as it would undermine the FAA's ability to oversee such operations, in Condition and Limitation No. 5, the FAA is requiring the operator to report all accidents and incidents to the Flight Standards District Office (FSDO) having jurisdiction over the area of the demonstration operation, to law enforcement as required by local law, and National Transportation Safety Board (NTSB) if the occurrence meets the criteria stated in 49 CFR Part 830. All documentation and

equipment associated with the operation shall be preserved and presented to the examining authorities at their request.

Because of the complexity and scope of PAU's operation and because PAU is using an uncertified aircraft; the FAA has determined that this grant of exemption is contingent on monthly reporting. In this manner, the FAA will have access to data to support a more meaningful understanding of the strengths and weaknesses of shielded operations. Therefore, as set forth in Condition and Limitation No. 45, the operator must report operational data to the FAA by the 10th of each month, including the number of times the UA transgresses the lateral or vertical boundaries of the flight corridor. These reports must be made on the following form entitled, (OMB Form No. pending) and submitted to the FAA via Aeronautical Data Exchange at https://adx.faa.gov.

Public Interest

The FAA has determined that granting this exemption is in the public interest. UAS have been used for aerial surveillance of linear infrastructure for many years. They help provide inspection for the oil and gas pipelines, and railways as well as electricity lines. These inspections help those industries catch potential problems before they can affect the safety and reliability of the oil, gas, goods, and electric power. UAS offer a quieter, cleaner, cheaper option to manned aircraft.

Historically, powerline inspection was expensive, time-consuming and inefficient. They were done by teams of people dispatched to inspect assets in person, covering many miles each day. Team members climbed poles, inspected vegetation over tough terrain in all types of weather and in physically challenging conditions. Eventually, ground teams were augmented with visual inspections by helicopter. For some in the power industry, advances in technology (such as high-definition cameras to get close up pictures of the wires and connections; thermal imagining to identify hotspots; light distancing and ranging (LIDAR) for developing three-dimensional maps; and hyperspectral imagining to identify plant species) have led to greater efficiencies compared to teams of people walking, driving or flying the line with a manned aircraft, results in resource savings for the utilities and, thus for the consumers who pay for them.

Also, the UA will not carry passengers or crew unlike manned aircraft, which are bigger, noisier, carry crew and carry significantly more flammable fuel. The FAA has also determined that this exemption promotes the safe progression of UAS into the NAS through enabling BVLOS UAS infrastructure inspections. Finally, the FAA expects to obtain critical performance information and increase its understanding of risk mitigation measures the operations will involve, leading to further development of appropriate FAA regulations for UAS BVLOS operations. Therefore, the enabling effect of this exemption provides good cause to find that the UAS operation conducted under this exemption is in the public interest.

The FAA's Decision

In consideration of the foregoing, I find that a grant of an exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 106(f), 40113, 44701 and 44807, delegated to me by the Administrator, Phoenix Air Unmanned, LLC is granted an exemption from 14 CFR § 61.3(a)(1)(i), 61.3(c)(1), 61.23(a)(2), 91.7(a), 91.113(b), 91.119(c), 91.121, 91.151(b), 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), and 91.417(b) to the extent necessary to allow PAU to operate the SwissDrones SDO 50 V2 UAS, to operate the for the purposes of linear infrastructure operations, subject to the conditions and limitations listed below. The request for relief from 14 CFR Part 89 is denied, as there is an alternate method of compliance.

Conditions and Limitations

In this grant of exemption, Phoenix Air Unmanned, LLC is hereinafter referred to as "the Operator."

General:

1. Operations authorized by this exemption are limited to the SwissDrones SDO 50 V2 UAS conducted by the Operator and are limited to linear infrastructure operations. The aircrafts maximum takeoff weight must not exceed 191.8 pounds. Proposed operations of any other UAs require a new petition or a petition to amend this grant.

2. 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 Operator must follow the procedures as outlined in its operating documents. The documents listed in Appendix 1 of this grant, the applicable Federal Communications Commission (FCC) license, and a copy of this exemption must be accessible to the PIC at the control station during all UAS operations that occur under this exemption. They must be made available to the Administrator upon request. Where a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in any of the aforementioned documents, the most restrictive provision must be followed.

3. 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 the most current documents if petitioning for extension of or amendment to this grant of exemption. If the Operator determines that any update or revision would affect the Operator's ability to comply with any requirement of this exemption, then the Operator must petition for an amendment to its grant of exemption. If questions arise regarding updates or revisions to the operating documents, the Operator may contact the Flight Standards Service General Aviation and Commercial Division (AFS-800), 800 Independence Ave. SW, Washington, DC 20591. Telephone: 202-267-1100, Email: 9-AFS-800-Correspondence@faa.gov.

4. The PIC and EO must present his or her remote pilot certificate, 14 CFR Part 61 certificate or 14 CFR Part 61 pilot knowledge test results (as applicable), proof of current flight review (as applicable), and photo identification if requested from: an authorized representative of the Administrator; an authorized representative of the National Transportation Safety Board (NTSB); any Federal, State, or local law enforcement officer; and any authorized representative of the Transportation Security Administration (TSA).

5. The operator must report all accidents and incidents to the Flight Standards District Office (FSDO) having jurisdiction over the area of the demonstration operation, to law enforcement as required by local law, and National Transportation Safety Board (NTSB) if the occurrence meets the criteria stated in 49 CFR Part 830. All documentation and equipment associated with the operation shall be preserved and presented to the examining authorities at their request.

UAS:

6. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the aircraft is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, such as 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 aircraft is found to be in a condition for safe flight.

7. The operator must follow the original equipment manufacturers (OEM) operating limitations, maintenance, service bulletins, overhaul, replacement, inspection, and life limit requirements for the UAS and its components as well as operator supplemental manuals.

8. Maintenance must be performed by qualified individuals who have been trained by the manufacturer in proper techniques and procedures for these UAS and all maintenance must be recorded in the aircraft records including a brief description of the work performed, date of completion and the name of the person performing the work.

9. Any maintenance or alterations that affect the UAS operation or flight characteristics, such as replacement of a flight critical component, must undergo a functional operational check test flight prior to conducting further operations under this exemption. Functional operational check flights must be conducted in visual line of sight by a PIC and other personnel required to conduct the functional operational check test (such as a mechanic or technician) and must remain at least 500 ft. from all other people. The functional operational check flight must be conducted in such a manner to not pose an undue hazard to persons and property. The operator must permit the FAA Administrator and his representative to observe functional test flights upon the request.

10. The PIC is prohibited from beginning a flight unless, considering wind and forecast weather conditions, there is enough available fuel for the UA to conduct the intended operation with sufficient reserves such that the PIC can land the UA without posing an undue risk to aircraft or people and property on the ground, or the reserve power recommended by the manufacturer, if greater, is satisfied.

11. All altitude must be reported in ft. AGL.

Qualifications, certifications and training:

12. The PIC has final responsibility and authority for the safe operation and flight of the aircraft in accordance with relevant regulations and company policies and procedures. Executes vehicle commands through the ground control station and monitors system health status information. Responsible for flight conduct and contingency management. Their qualifications must include:

    a) Successful completion of the operator's training program for PICs;
    b) Hold a remote Pilot Certificate with a small UAS rating issued in accordance with 14 CFR Part 107 and be in compliance with Section 107.65;
    c) Pass either a sport, recreational, or private pilot FAA airman knowledge test before acting as PIC, or, in the alternative, hold any 14 CFR Part 61 pilot certificate (other than a student pilot certificate) and meet the flight review requirements of 14 CFR § 61.56; and
    d) Hold at least a third-class medical certificate.

13. The PIC may not conduct the operation if the PIC knows or has reason to know of any medical condition that would make the PIC unable to meet the requirements for at least a third-class medical certificate or is taking medicine or receiving treatment for a medical condition that results in the PIC being unable to meet the requirements for at least a third-class medical certificate.

14. Each EO must hold a valid remote pilot certificate with a small UAS rating issued under 14 CFR Part 107 and be in compliance with Section 107.65.

15. Each VO and EO must satisfactorily complete the operator's training and qualification program before conducting operations under this exemption.

16. The PIC must demonstrate to the operator that they are able to operate the UA safely, including fluency in conducting evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles, and structures.

17. Each VO and EO must comply with the following vision requirements:

    a) Each VO must have adequate visual abilities that enable them to see the unmanned aircraft clearly, recognize terrain and obstructions, and see and avoid aerial or ground hazards and other aircraft without undue hesitation. Each VO must be able

to establish and maintain by unaided vision, except vision that is corrected by the use of corrective lenses, a normal field of vision allowing them to see all potential hazards without hesitation.

b) Each EO must have adequate visual abilities that enable them to observe the electronic display which displays the airspace awareness as described in the petition.

18. The VO and EO and any other direct participant may not participate in the operation if the know or has reason to know of any physical or mental condition that would interfere with the safe operation of the aircraft.

19. The PIC is prohibited from initiating a flight unless all direct participants are fit for duty, are at their stations, and are committed to being at their stations for the duration of the flight.

20. All training operations must be conducted only during dedicated training sessions for the petitioner's employees and must be conducted in accordance with the operating training program described in operator's training program.

Operating environment:

21. Operations conducted under this exemption are authorized in the National Airspace System (NAS). The operations must occur:
    a. In Class G airspace;
    b. In sparsely populated areas;
    c. Over pre-planned flight paths designed to avoid any known obstacles;
    d. Over linear infrastructure with right-of-way, except for takeoff and landing; and
    e. Within 100 ft. above and 20 ft. right or left of the centerline of the infrastructure that is being inspected.

22. BVLOS operations must be beyond the following distances from the airport reference point (ARP) of a public use airport, heliport, gliderport, or seaport listed in the Digital - Chart Supplement (d-CS), Chart Supplement of the U.S. Government Flight Information Publications:
    a. 5 nautical miles (NM) from an airport having an operational control tower;
    b. 3 NM from an airport having a published instrument flight procedure, but not having an operational control tower;
    c. 2 NM from an airport not having a published instrument flight procedure or an operational control tower; and
    d. 2 NM from a heliport.

23. This exemption does not authorize flight within UAS flight restricted areas. It is the operator's responsibility to ensure that proposed UAS operating area does not enter a UAS flight restricted areas as described under CFR 14 part 99.7, Temporary Flight Restriction (TFR), Special Security Instruction (SSI) Location and contact information for the TFR SSI is provided in the relevant NOTAM and depicted on the FAA

website: https://udds-faa.opendata.arcgis.com. Anyone seeking to enter a TFR SSI must request permission and receive advance authorization via the contacts listed on the website (https://udds-faa.opendata.arcgis.com).

24. The UA may not be operated less than 500 ft. below or less than 2,000 ft. horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

25. Operations are limited to daytime, VFR conditions, and when weather is within the UA system limitations described in the operating documents.

26. The PIC may conduct BVLOS operations whereby when the UA is not within the visual line of sight of the PIC, rather the UA is monitored by electronic means by one of the two EOs and is reliant on the infrastructure to shield the operations. Shielded Operations are defined as operations conducted in the radial airspace surrounding an obstruction or infrastructure in which a manned aircraft is not expected to operate. In such situations, under Section 91.113 the PIC is operating the aircraft and is, therefore, responsible for maintaining vigilance so as to avoid and remain clear of other aircraft.

27. The PIC must brief all participants involved in the operation on safety of flight, hazards, risks, mitigations, and the contents of this exemption.

28. Except in emergency situations, the SDO 50 V2 must be in flown in automatic mode for BVLOS operations.

29. Operational area boundaries, obstacles and other ground risks must be identified, located and factored into the flight planning.

30. Prior to conducting operations under this Exemption, the PIC must determine all control links used for the operation have signal that is strong enough to control the UA at the maximum planned distance for the operation.

31. The PIC must prepare for a lost Command and Control (C2) link by programing lost link procedures so that the UAS will remain within the operational corridor and proceed to a pre-determined landing area. This contingency procedure must avoid unexpected turn-around and altitude changes and must provide the PIC with sufficient time to communicate with FAA's Air Traffic Control (ATC), if necessary.

32. The operator must employ an outreach strategy and coordinate with other potentially affected aircraft operators prior to conducting any BVLOS operations. In addition, the operator must coordinate with other utilities whose assets intersect the UA's flight path to ensure they will not be conducting operations in the same area.

33. Prior to conducting operations under this exemption, a Notice to Air Missions (NOTAM) must be filed by contacting the NOTAM Flight Service Station at 1-877-4-US-NTMS (1-877-487- 6867) not more than 72 hours in advance, but not less than 24 hours prior to the operation.

34. BVLOS operations may proceed without limitation of time or distance so long as the aircraft has been proven to be reliable, durable, and fit-for-purpose; the C2 link is maintained; and the PIC could effectively move the aircraft out of the way of known traffic.

35. The PIC must be accessible by the FAA, via phone number provided in NOTAM for direct real-time communication and coordination purposes for the duration of UAS operations.

36. ATC may delay, limit, prohibit, or terminate UAS operations when it has concerns regarding the safety of manned aircraft operations in the area.

37. The PIC must ensure the UA remains well clear and gives way to all other aviation operations and activities at all times except as it relates to uncooperative traffic when relying on shielded operations. Well clear means 2000 ft. horizontally and 250 ft. vertically from other aircraft. Operations must not cause hazard to persons or property on the surface or in the air. If at any time safety of human beings or property on the surface or in the air is in jeopardy, the PIC must cease operations.

38. For all BVLOS operations, the UA must be equipped and operated with an anti-collision light. While BVLOS operations are limited to daytime operations under this exemption, the anti-collision light must meet the standard of visibility for at least 3 statute miles between the beginning of evening civil twilight and the end of morning civil twilight.

39. Operations over occupied roadways is limited to those roadways with a flow rate of 770 cars per hour or fewer. Roadways with greater than 770 cars/hour must be crossed within VLOS of the PIC. In such cases, overflight of people and vehicular traffic is prohibited. All roads must be crossed in minimal time necessary to safely complete a flight.

40. Sustained flights over people, vessels, vehicles, structures and roadways are prohibited. Only transient flights are permitted over people, vessels, vehicles, structures and roadways within the utility right-of-way.

41. Transient flight over open air assemblies of people is prohibited.

42. When conducting VLOS operations, the UA must remain within the visual line of sight of the PIC. VLOS means the PIC must be able to, with natural unaided vision except for corrective lenses, see the UA and determine its orientation, height above the surface, and direction of flight. The UA must be conspicuous to be obvious within the VLOS area. VOs must be used as an operational mitigation; however, the PIC must be able to see the UA throughout the flight.

43. All operations must utilize the services of at least one VO for VLOS operations and at least two EOs for BVLOS operations. EOs must use a situational awareness tool that provides surveillance capability of the UA airspace in real-time. The tool must use subscription-based surveillance data feeds from the FAA national sensor networks such as ADS-B NextGen surveillance network, the Airport Surface Surveillance Capability (ASSC) and ASDE-X surface data, En Route and terminal radars and the Wide area multilateration systems and augments them with locally deployed infrastructure including Local ADS-B sensors, Ground primary radars and UAS GCS telemetry radar. EOs and VOs must scan their area of responsibility and immediately notify the PIC when they observe any hazard to safety of flight. The PIC still retains the overall responsibility to avoid other aircraft.

44. All crew, including the PIC, EOs and VOs, must maintain two-way voice communications with each other during operations. If communication occurs by electronic device: the device must be continuous full-duplex; the PIC must be able to use the device hands-free; and the PIC must ensure that there is a reliable back-up communication method. Electronic messaging or texting is not permitted during flight operations. During operations, no person on whom the PIC relies for safe conduct of the operation may engage in communications not relevant to the operation.

Reporting:

45. The operator must report operational data for the prior month to the FAA by the 10th of each month, including the number of times the UA transgresses the lateral or vertical boundaries of the flight corridor. These reports must be made on the form entitled, *Unmanned Aircraft System (UAS) Monthly Flight Report, Unmanned Aircraft System (UAS) Basic Specifications Report, Unmanned Aircraft System (UAS) Corrective Maintenance Report, and Unmanned Aircraft System (UAS) Flight Anomaly Report* (OMB Form No. pending). Forms must be submitted to the FAA via Aeronautical Data Exchange at https://adx.faa.gov.

Failure to comply with any of the above conditions and limitations may result in the immediate suspension or rescission of this exemption.

The Effect of the FAA's Decision

This exemption terminates on August 31, 2025, unless sooner superseded or rescinded.

To request an extension or amendment to this exemption, please submit your request by using the Regulatory Docket No. FAA-2023-1827 (*http://www.regulations.gov*). In addition, you should submit your request for extension or amendment no later than 120 days prior to the expiration listed above, or the date you need the amendment, respectively.

Any extension or amendment request must meet the requirements of 14 CFR § 11.81.

Issued in Washington, D.C., on August 24, 2023.

/s/
David Boulter
Acting Associate Administrator
Aviation Safety

Attachment 1

Supplemental Document(s)	Information Received
Unmanned Aircraft Flight Checklist SDO 50 V2 V3 Document Number: 01316-AH 10.05.22	This Safety Checklist is designed to assist the PIC in ensuring the UAS is working properly in every phase of flight including takeoff and landing.
Unmanned Aircraft Flight Manual SwissDrones SDO 50 V2 01299-AD 19.05.22	This manual describes how to operate the UAS safely and is one of the following documents needed for safe operation and continued airworthiness.
General Operations Manual 202 GA-61	This manual provides the framework for operational requirements for PAU and establishes standards and procedures intended to promote the safe and efficient operation of PAU's unmanned aerial systems.
General Maintenance Manual SwissDrones Type: SDO 50 Model: SDO 50 V2	This General Maintenance Manual (GMM) will help you to perform simple maintenance work, install the main rotor blades, and give you instructions on proper preservation of your aircraft. All information in this manual is based on the current state of development of the UAS SDO 50 UAS and is applicable to the models SDO 50 V2 and SDO 50 V3.
Beyond Visual Line of Sight Linear Electric Infrastructure Inspection Concept of Operations PAU BVLOS CONOP v1.5 (21MAR2023)	Document that describes their expectation of operations. It contains the parameters of their flights as well as outlines their procedures and mitigations.
Visual Observer Training Curriculum Version 2 14 October 2022	Visual Observer Course Map, which is not available in other materials.
Visual Observer Training Course Content related to road crossing higher density roads	These two slides present the ground safety procedures VOs will use in the event they crossroads that are higher density.
SwissDrone SDO 50 V2 Ground Control Station Associated Elements and Minimum Specifications	This is a list of equipment hardware and software that will be used in connection with operations under this exemption.
SwissDrones General Maintenance Manual PAU GMM Supplement for USA Operations	This document contains the deviations from the maintenance manual for operations under this exemption.
SwissDrones Unmanned Aircraft Flight Manual SDO 50 V2 and SDO 50 V3 Doc no. 01299-AD Release date: 19.05.22	This manual. describes how to operate the UAS safely and is one of the documents needed for safe operation and continued airworthiness.
SwissDrones Unmanned Aircraft Flight Manual PAU UFM Supplement for USA Operations	This document contains the deviations from the aircraft flight manual for operations under this exemption.

Safety Risk Management Document Updated hazard analysis XCEL Energy 09/08/2021	FAA's independent safety risk analysis for Xcel Energy (Xcel) proposed operation. It brings together relevant information to enable the FAA management officials to: • understand the proposed operation • understand its associated safety risk, safety risk controls (as proposed by the operator), and supporting safety data/rationale • provide input to the FAA's decision to grant or deny the waiver or exemption. While not prepared for this exemption, we used this to better understand common risks to the proposed operation.
Operational Issue Paper prepared by FAA	This pre-decisional document explores how the operator ensures an acceptable risk of collision with manned aircraft when operating a UAS within 100 ft. of ground obstacles.