

Exemption No. 14088

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

In the matter of the petition of

Ars Electronica Linz GmbH

for an exemption from parts 21, 45, 47, 61,
67 and §§ 91.7, 91.9(b)&(c), 91.103, 91.111,
91.113, 91.119(b) &(c), 91.126, 91.127,
91.129, 91.130, 91.151(a), 91.215, and
Section E of Part 91 of Title 14, Code of
Federal Regulations

Regulatory Docket No. FAA-2014-1095

GRANT OF EXEMPTION

By letter dated December 19, 2014, Mr. Brendan Murphy, Counsel for Intel Corporation in cooperation with Ars Electronica Linz GmbH, (hereinafter petitioner or operator), Perkins Coie LLP, 1201 Third Avenue, Suite 4900, Seattle, WA 98101 petitioned the Federal Aviation Administration (FAA) for an exemption from parts 21, 45, 47, 61, 67 and §§ 91.7, 91.9(b) & (c), 91.103, 91.111, 91.113, 91.119(b)&(c), 91.126, 91.127, 91.129, 91.130, 91.151(a), 91.215, and Section E of Part 91 of Title 14 Code of Federal Regulations (14 CFR). The petitioner requested to operate unmanned aircraft systems (UAS) to conduct light shows.

By letter dated May 5, 2015, the FAA requested the petitioner to provide additional information regarding its application. The petitioner responded to the request for information via a letter to the FAA dated May 19, 2015.

The petitioner supports its request with the following information:

The petitioner proposes to operate up to 200 Hummingbird unmanned aircraft to perform light shows that last about 5-8 minutes each. These shows would operate near or after sunset, but before the end of civil twilight. The UAs have light-emitting diodes (LED) modules which vary in color and brightness and fly in various formations in preprogrammed “animation.”

The petition for exemption describing the proposed operation and the regulations from which the petitioner seeks exemption is posted to the docket. To view the petition, visit <http://www.regulations.gov>, enter the regulatory docket number found on the first page of this document into the search box and click “Search,” then click on the “Open Docket Folder” link next to a result associated with the docket number.

The petitioner has provided the following information along with its petition to support its request for an exemption:

- 1) *Ars Ground Control Quick Start Guide*
- 2) AscTec preflight checklist, entitled *Indoor and outdoor test protocol*

The petition and the documents above are hereinafter referred to as the operating documents.

Discussion of Public Comments:

A summary of the petition was published in the Federal Register on June 22, 2015 (80 FR 35692). One comment was received. The Small UAV Coalition filed a comment supporting the petition. In particular, the Small UAV Coalition supports: (1) commercial operations to be conducted by a person who does not hold a private, recreational, or sport pilot certificate; (2) highly automated operations under the operational control of a certificated pilot; (3) operations from dusk until the end of twilight; (4) operations of 30-35 UAVs by a single flight controller; (5) operations close to airports; and (6) operations closer than 500 feet from persons not involved with the operations, with appropriate protections. The topics addressed in the comments by the Small UAV Coalition are addressed in the FAA analysis section below.

The FAA’s analysis is as follows:

The FAA has organized its analysis into four sections: (1) Unmanned Aircraft Systems (UAS), (2) the UAS pilot in command (PIC), (3) the UAS operating parameters, and (4) the public interest.

Unmanned Aircraft Systems (UAS)

The petitioner proposed using up to 200 Unmanned Aircraft (UA) controlled via a single ground control station (GCS) to conduct light shows. The petitioner stated that each UA, weighing less than two pounds and not capable of exceeding a speed of 30 knots, would be equipped with GPS systems programmed with a geo-fence and lost-link return-to-base function. The GCS would have the ability to command each UA to follow a pre-programmed flight trajectory with override capability by the operator. The GCS is comprised of a master computer and multiple secondary computers. The master computer has control over all of the aircraft at all times. The master computer is equipped with a “kill switch” function that immediately commands UA to enter an emergency home procedure. The secondary computers enable additional personnel to monitor subsets of UA thereby providing improved situational awareness. Furthermore, each UA would also be equipped with a secondary backup geo-fence feature which shuts off the aircraft engines when the UA departs the flight area. The petitioner also proposed conducting preflight inspections of all UA and conducting a simulated run through prior to each operation. The petitioner’s proposed operating methodology has been demonstrated in foreign countries and has not resulted in any failures that caused human injury or property damage. Furthermore the petitioner has improved their operating methodology and equipment as deficiencies have been recognized.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts*. In accordance with the statutory criteria provided in Section 333 of PL 112-95 in reference to 49 USC 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and their operation, the Secretary of Transportation has determined that these aircraft meet the conditions of Section 333 and that an airworthiness certificate is not required. Therefore, the FAA finds that the requested relief from 14 CFR part 21 and any associated noise certification and testing requirements of part 36 is not necessary.

The petitioner requested relief to the extent necessary to 14 CFR §91 subpart E *Maintenance, Preventive Maintenance, and Alterations*. The petitioner’s proposed operations would utilize UAS that may or may not be registered in the U.S. since the petitioner is a foreign company. 14 CFR § 91 subpart E only applies to U.S. registered civil aircraft; and would thus not apply to the petitioner if the UA they operate are registered outside the U.S. Prior UAS specific

relief has been granted in Grant of Exemption No. 11213 to Aeryon Labs, Inc. Therefore the FAA finds that exemption from 14 CFR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b) is warranted, to the extent necessary, subject to the conditions and limitations below.

The petitioner sought exemption from aircraft registration requirements contending that foreign ownership makes the aircraft ineligible for registration in the United States and that registration is not practical for this use case. However, subject to certain exceptions, aircraft are required to be registered prior to operation. *See* 49 U.S.C. § 44101-44103. Unmanned aircraft are aircraft subject to the registration requirement. *See* 49 U.S.C. § 40102(a)(6); Public Law 112-95, § 331(8). Therefore, the FAA may not exempt petitioners from those requirements. Additionally, we have added a condition to this exemption stating that, consistent with existing law, the operator will need to obtain a Foreign Aircraft Permit pursuant to 14 CFR § 375.41 if it will be using foreign civil aircraft in its operations.¹

UAS Pilot in Command (PIC)

The petitioner proposed operations with a PIC positioned next to the person who is the primary flight controller at the master computer. Specifically, the PIC would oversee the flight operation but would not physically command the master computer. The person who is the primary flight controller would be entering commands in to the master computer. The FAA has determined that the PIC must be in direct control of the master computer and all UA during the entire operation. By having direct control, the PIC is not dependent on the other personnel when needing to halt operations due to unforeseen developments or emergency situations. Since the PIC has overall responsibility for maintaining a safe operating environment, the FAA finds that the PIC must be sufficiently capable of directly controlling the GCS.

The petitioner requested relief from 14 CFR parts 61 and 67 including, specifically, sections 61.3 and 61.23. The petitioner stated that if additional relief beyond what had previously been granted under Section 333 exemptions at the time of its petition is not granted here, then the petitioner would utilize a PIC who held at least a private pilot certificate and third-class medical certificate consistent with what had been granted by the FAA. *See* Exemption No. 11109 (Dec. 10, 2014) (Clayco, Inc); Exemption No. 11110 (Dec. 10, 2014) (Trimble).

¹ *Foreign civil aircraft* means (a) an aircraft of foreign registry that is not part of the armed forces of a foreign nation, or (b) a U.S.-registered aircraft owned, controlled or operated by persons who are not citizens or permanent residents of the United States. 14 CFR §375.1.

Since the filing of Ars Electronica's petition, in Exemption No. 11213 to Aeryon Labs Inc., the FAA compared the aeronautical knowledge requirements of the commercial and private pilot certificates to the recreational and sport pilot certificates to determine how they differed and what would be required for a UAS pilot. The FAA determined that the UAS PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate along with a current FAA airman medical certificate or a valid U.S. driver's license. Therefore, as in Exemption No. 11213, Ars Electronica's PICs may hold any of these pilot certificates for operations conducted under this exemption.

14 CFR §1.1 defines a PIC as the person who has final authority and responsibility for the operation and safety of the flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate for the conduct of the flight. Accordingly, the FAA grants relief from §§ 61.101(e)(4) and (5), and 61.113(a), to allow a PIC holding a recreational or private pilot certificate to operate a UAS for compensation and hire, subject to the conditions and limitations below.² The FAA is also granting relief from § 61.315(a) as previously determined in Exemption No. 11213, to permit the holder of a sport pilot certificate to act as the PIC of UAS operated under this exemption.

Additionally, the PIC must hold either a medical certificate issued under 14 CFR part 67 or a U.S. issued driver's license as previously determined in Exemption No. 11213. The PIC must also comply with 14 CFR § 61.53, *Prohibition on operations during medical deficiency*. See Exemption 11213 (Aeryon Labs) for relief granted from *Medical certificates: Requirement and duration* § 61.23(a) and § 61.23(c).

The FAA also considered medical certificate requirements for a visual observer. As in Exemption No. 11213, the FAA determined that this is not necessarily subject to the conditions and limitations below. In particular, the UA must never be operated beyond the actual visual capabilities of the VO, and the VO and PIC must have the ability to maintain VLOS with the UA at all times. It is the responsibility of the PIC to be aware of the VO's visual limitations and limit operations of the UA to distances within the visual capabilities of both the PIC and VO.

The petitioner may conduct practice sessions, in advance of performances, to increase proficiency and build experience. All practice sessions must be conducted in accordance with all conditions and limitations listed in this exemption.

² Similar relief from § 61.315(c)(2) and (3) is not necessary because these limitations on sport pilot certificate privileges only apply to light-sport aircraft (LSA). The UAS being operated under this exemption are not LSA.

UAS Operating Parameters

The petitioner proposed using one master computer in conjunction with several secondary computers. The master computer controls all aircraft in flight and is connected by a cable to secondary computers that enable monitoring of subsets of aircraft. The secondary computers serve as an interface that enables the secondary controllers to monitor the aircraft assigned to them and to reposition or land the aircraft if necessary. If a secondary computer malfunctions, the PIC can still reposition or land any aircraft because the master computer has control over all aircraft at all times. The petitioner proposed using one secondary computer per 35 aircraft flown in the show. The FAA agrees that a crew member using a secondary computer to help monitor UA will help the PIC maintain situational awareness during the operation. The FAA is requiring that for every 35 UA there must be one secondary computer and one crew member to specifically monitor that subset of UA as proposed by the petitioner.

The petitioner proposed using two VOs to aid in the operation. The petitioner stated that each VO would be able to scan a 180 degree field of view. The FAA has determined that the PIC would need to have four VOs assisting the PIC in looking for manned aircraft approaching the operating area as well as UAS deviating from preplanned routes and/or the operating area. The petitioner's proposed plan would require the VOs to be located near the operating area. The FAA does not find that this would necessarily enable VOs to easily determine the location of UAS relative to the boundaries of the operating area. Therefore, four VOs must be stationed around the operating area boundaries to better track the multitude of aircraft being flown simultaneously, and provide additional risk mitigation should the dual geo-fencing fail. The VOs must be able to notify the PIC to stop the operation should the UAs fly outside of the intended flight area.

The petitioner proposed operating a maximum groundspeed up to 3 m/s in order to reduce time lag between position commands and the aircrafts actual position. The FAA agrees that limiting UA speed to 6 knots (7 mph) reduces the risk of a midair collision between UA during operations.

The petitioner proposed an exclusion zone that would act as a safety buffer between the outer geo-fencing boundary and nonparticipants. The petitioner proposed to base the safety buffer on the maximum distance the UA could travel based on a speed of 10 m/s with no power at the geo-fence boundary. The FAA finds that there is insufficient data at this time to determine that geo-fencing alone will provide adequate safety mitigations. Therefore, the FAA is requiring a 500 foot stand-off distance between the operating area and nonparticipants.

The petitioner has requested relief from 14 CFR § 91.7(a), *Civil aircraft airworthiness*. While the petitioner's UAS will not require an airworthiness certificate, the FAA has determined that for the purposes of this exemption the pilot may determine the aircraft is in an airworthy condition prior to flight. The FAA's regulations state that the PIC of a civil aircraft is responsible for determining whether the aircraft is in a condition for safe flight. Therefore, relief from § 91.7(a) is granted.

The petitioner requested relief from 14 CFR § 91.9(b) and (c) *Civil aircraft flight manual, marking, and placard requirements* and § 91.203 *Civil aircraft: Certifications required*. The FAA has previously determined that relief from these sections is not necessary. *See* Exemption No. 11213. Relevant materials may be kept in a location accessible to the PIC in compliance with the regulations.

The petitioner requested relief from 14 CFR § 91.103, *Preflight action*. Relief from 14 CFR § 91.103 is not granted since the FAA is requiring that the petitioner utilize a qualified PIC as discussed previously.

The petitioner requested relief from 14 CFR § 91.111, *Operating near other aircraft*, stating that relief is necessary since the UAs will be operating as close as six meters apart in order to display the light show features while using a small area of airspace. The petitioner proposed formation flights that would be pre-planned and verified through computer simulation. Moreover, the UAS will all be operated by the same PIC. Nevertheless, because of the steps the petitioner will take to plan and verify each operation and low speed at which the flights will be operated, the FAA is granting relief from § 91.111(a). Relief from 91.111(b) is not necessary because formation flights are permitted when arranged between the PIC of each aircraft in the formation. Here, petitioner will have only one PIC for the operation.

The petitioner requested relief from 14 CFR §91.113 *Right-of-way rules: Except water operations* since there will be no pilot in the UA to "see and avoid" other aircraft. Section 91.113(b) requires a pilot to maintain vigilance "so as to see and avoid other aircraft." That section requires an aircraft pilot to have the perspective of being inside the aircraft, something that is not possible for the operator of a small UAS at this time. *See* 80 Fed. Reg. 9544, 9549 (Feb. 23, 2015) (Proposed Rule: Operation and Certification of Small [UAS]). The FAA is not granting relief to Section 91.113. However, the FAA is currently addressing the see and avoid requirement through COAs such as those required for operation under this exemption.

Operations Near People

With the exception of the people directly participating in the safe operation of the UAS or the intended purpose of the operation, a UA may only be operated within 500 feet of a person when barriers or structures are present that sufficiently protect that person from the UA and/or debris or hazardous materials such as fuel or chemicals in the event of an accident. Under these conditions, the operator must ensure that nonparticipating persons remain under such protection for the duration of the operation. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner that does not cause undue hazard to persons.

Small UA may be flown over or within 500 feet of people subject to the conditions and limitations below.

All people associated with the operations, such as VOs and other people directly participating in the operation must be briefed by the PIC on the potential risk of the proposed flight operation(s) and acknowledge and consent to those risks. The FAA routinely uses briefings as a means to notify passengers and others of safety information and to risks of certain operations. *See, e.g.*, 14 CFR §§ 91.319(d)(1) (advising passengers of experimental nature of an aircraft); 136.7 (air tour briefings). The requirement to obtain consent provides an additional margin of safety by building upon the briefing requirement to ensure that participants have acknowledged that UA will be operated within 500 feet.

1. Operations Near Vessels, Vehicles, and Structures

Operations near vessels, vehicles, and structures are those operations in which UA are operated within 500 feet of such objects. To conduct such operations, the PIC must: (1) have permission from a person with legal authority over any vessels, vehicles or structures located within 500 feet of the UA's operating area; and (2) make a safety assessment of the risk of operating closer to those objects and determine that no undue hazard would result from the operation.

In consideration of the above, the FAA finds that:

- a. Relief from § 91.119(a), which requires operating at an altitude that allows a safe emergency landing if a power unit fails, is not granted. The FAA expects the petitioner to be able to perform an emergency landing without undue hazard to persons or property on the surface if a power unit fails.
- b. Relief from § 91.119(b), operation over congested areas, is not granted, because this exemption prohibits operations over congested or densely populated areas.

- c. Relief from § 91.119(c) is necessary because the aircraft will be operated at altitudes below 500 feet AGL. Section 91.119(c) states that no person may operate an aircraft below the following altitudes: *over other than congested areas*, an altitude of 500 feet above the surface, except over open water or sparsely populated areas. The FAA finds operations conducted in compliance with the conditions and limitations in this exemption warrant relief from § 91.119(c).
- d. Relief from § 91.119(d) is not necessary. Although this section allows operations below the minimums set forth in the other paragraphs of 91.119 for helicopters, the conditions and limitations below control operations under this exemption.

Per 14 CFR § 91.119, manned aircraft are commonly flown at altitudes of 500 feet above the surface in areas over other than congested areas. In all previous grants of exemption under Section 333, the FAA has limited operating altitudes to less than 400 feet AGL. The FAA finds that UAS operations at altitudes above 400 feet AGL introduce greater risks to manned aviation because of see-and-avoid difficulties when manned and unmanned aircraft operate in shared airspace. As in prior exemptions, the FAA is limiting operations under this exemption to 400 feet AGL as stated in the conditions and limitations below.

The petitioner did not request relief from 14 CFR § 91.121, *Altimeter settings*, the FAA finds that relief may be necessary for UAS operations. When the UA is equipped with a barometric altimeter, relief from § 91.121 is not necessary. When the UA is not equipped with a barometric altimeter, an alternate means for measuring and reporting UA altitude is necessary, such as global positioning system (GPS). As stated in the conditions and limitations below, the FAA requires altitude be reported in feet AGL. The petitioner may choose to set the altitude indicator to zero feet AGL rather than local barometric pressure or field altitude before flight. Considering the limited altitude of the proposed operations, relief from 14 CFR § 91.121 is granted to the extent necessary to comply with the applicable conditions and limitations stated below.

In previous exemptions, the FAA required that UA return to a pre-determined location within the private or controlled area of operation if UAS lose communication or GPS signal. The FAA has re-examined the situation where GPS signal is lost or the PIC loses communications with a UA and determined that these two situations employ unique functions and incur different failure modes. Therefore, the FAA has included two separate conditions and limitations addressing each situation. In the situation where GPS signal is necessary to safely operate a UA, the PIC is required to immediately recover or land the UA. However, if a UA can be operated safely without GPS signal, the operation may continue. If the PIC loses command or control link with a UA, that UA must follow a pre-determined route to either

reestablish link or immediately land. The modified conditions and limitations preserve the same intent and level of safety, while also adding clarity and reducing restrictiveness for the operator.

The petitioner requested relief from 14 CFR §§ 91.126 *Operating on or in the vicinity of an airport in Class G airspace*, 91.127 *Operating on or in the vicinity of an airport in Class E airspace*, 91.129 *Operations in Class D airspace*, 91.130 *Operations in Class C airspace*. The petitioner also requested relief from 14 CFR § 91.215, *ATC transponder and altitude reporting equipment and use*. These regulations already enable an operator to request authorization from ATC in lieu of meeting the other requirements of these sections. Furthermore, the petitioner did not provide sufficient justification to ensure that the proposed operation with an exemption from these regulations would provide an equivalent or better level of safety. Accordingly, exemptions from 14 CFR §§ 91.126, 91.127, 91.129, 91.130, and 91.215 are not granted.

The petitioner has requested relief from 14 CFR § 91.151(a), *Fuel requirements for flight in VFR conditions*. Prior UAS specific relief has been granted in Exemption Nos. 8811, 10808, and 10673 for daytime, Visual Flight Rules (VFR) conditions. The conditions and limitations below prohibit the PIC from beginning a UAS flight unless (considering wind and forecast weather conditions) there is enough available power for UAS to operate for the intended operational time and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater. The FAA finds that this provides sufficient reason to grant relief from 14 CFR § 91.151(a)(1) to the extent necessary and in accordance with the conditions and limitations below for all UAS listed in this exemption.

The FAA Air Traffic Organization (ATO) reviews all proposed UAS operations and evaluates the safety of these operations relative to the requested airspace through the existing COA process. The majority of current UAS operations occurring in the NAS are being coordinated through air traffic control (ATC) by the issuance of a COA. This process not only makes local ATC facilities aware of UAS operations, but also provides ATC the ability to consider airspace issues that are unique to UAS operations.

The FAA has issued a COA to this operator, which is attached to this exemption. The COA sets the requirements for alerting other users of the NAS to the UAS activities being conducted. The conditions and limitations below prescribe the requirement for the petitioner to follow the terms of a COA. If the petitioner intends to conduct operations outside of the parameters of what is permitted under the attached COA it may apply to the ATO for a new or amended COA.

Public Interest

The FAA finds that a grant of exemption is in the public interest. The exemption ensures safe progression of UAS integration into the National Airspace System and therefore gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

The following table summarizes the FAA's determinations regarding the relief sought by the petitioner:

Relief considered (14 CFR)	FAA determination (14 CFR)
21	Relief not necessary
45	Relief not granted
47	Relief not granted
61.23(a) and (c)	Relief granted with conditions and limitations
61.101(e)(4) and (5)	Relief granted with conditions and limitations
61.113(a)	Relief granted with conditions and limitations
61.315(a)	Relief granted with conditions and limitations
91.7(a)	Relief granted with conditions and limitations
91.9(b)	Relief not granted
91.9(c)	Relief not granted
91.103	Relief not granted
91.111(a)	Relief granted
91.111(b)	Relief not necessary
91.113	Relief not granted
91.119(a)	Relief not granted
91.119(b)	Relief not granted

Relief considered (14 CFR)	FAA determination (14 CFR)
91.119(c)	Relief granted with conditions and limitations
91.119(d)	Relief not necessary
91.121	Relief granted with conditions and limitations
91.126	Relief not granted
91.127	Relief not granted
91.129	Relief not granted
91.130	Relief not granted
91.151(a)(1)	Relief granted with conditions and limitations
91.203	Relief not necessary
91.215	Relief not granted
91.405(a)	Relief granted with conditions and limitations
91.407(a)(1)	Relief granted with conditions and limitations
91.409(a)(1) and (2)	Relief granted with conditions and limitations
91.417(a) and (b)	Relief granted with conditions and limitations

The FAA's Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Ars Electronica is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), to the extent necessary to allow the petitioner to conduct UAS operations according to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, Ars Electronica is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this exemption are limited to Hummingbird UAS when weighing less than 2 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this grant. The PIC may only operate up to 200 Hummingbird UAS simultaneously.
2. If operations authorized herein involve the use of foreign civil aircraft, before conducting any commercial air operations under this authority, the operator must obtain a Foreign Aircraft Permit pursuant to 14 CFR §375.41. Application instructions are specified in 14 CFR §375.43. Applications should be submitted by electronic mail to the DOT Office of International Aviation, Foreign Air Carrier Licensing Division. Additional information can be obtained via <https://cms.dot.gov/policy/aviation-policy/licensing/foreign-carriers>.
3. UA may not be operated at a speed exceeding 6 knots (7 mph). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 6 knot speed restriction. In no case will UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.
4. UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL. This limitation is in addition to any altitude restrictions that may be included in the applicable COA.
5. The operator must notify the nearest controlling Flight Standards District Office (FSDO) within 72 hours of practice sessions and performances. Notification may be made by telephone, electronic means, or in writing.
6. *Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA)*. All operations must be conducted in accordance with an ATO-issued COA. The exemption holder must apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.
7. UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal Government.

8. All operations must utilize four visual observers (VO). UAS must be operated within visual line of sight (VLOS) of the PIC and VOs at all times. VOs may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VOs and PIC must be able to communicate verbally at all times. Electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that all VOs can perform the duties required of VOs.
9. This exemption and all documents needed to operate UAS and conduct operations in accordance with the conditions and limitations stated in this exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption, the applicable ATO-issued COA, and the procedures outlined in the operating documents, the most restrictive conditions, limitations, or procedures apply and must be followed. The operator may update or revise its operating documents as necessary. The operator is responsible for tracking revisions and presenting updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its exemption. The FAA's UAS Integration Office may be contacted if questions arise regarding updates or revisions to the operating documents.
10. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and essential flight personnel only and must remain at least 500 feet from all other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.
11. The operator is responsible for maintaining and inspecting UAS to ensure that they are in a condition for safe operation.
12. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS are in a condition for safe flight. The pre-flight inspection must account for all

potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft are prohibited from operating until the necessary maintenance have been performed and the UAS are found to be in a condition for safe flight.

13. Prior to each flight, the operator must conduct computer simulations to verify the aircraft will maintain appropriate separation from each other, fly within airspeed limits and stay within the predefined airspace.
14. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components. UAS operated under this exemption must comply with all manufacturer safety bulletins.
15. *PIC certification:* Under this exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.
16. *PIC qualifications:* The PIC must demonstrate the ability to safely operate the UAS in a manner consistent with how it will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures before operating non-training, proficiency, or experience-building flights under this exemption. PIC qualification flight hours and currency may be logged in a manner consistent with 14 CFR § 61.51(b), however UAS pilots must not log this time in the same columns or categories as time accrued during manned flight. UAS flight time must not be recorded as part of total time.

Under all situations, the PIC is responsible for the safety of the operation. The PIC is also responsible for meeting all applicable conditions and limitations as prescribed in this exemption and ATO-issued COA, and operating in accordance with the operating documents. All practice operations must be conducted during dedicated practice sessions and may or may not be for compensation or hire. The operation must be conducted with a dedicated VO who has no collateral duties and is not the PIC during the flight. The VO must maintain visual sight of the aircraft at all times during flight operations without distraction in accordance with the conditions and limitations below.

Furthermore, the PIC must operate the UA not closer than 500 feet to any nonparticipating person without exception.

17. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.
18. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.
19. For UAS operations where GPS signal is necessary to safely operate the UA, the PIC must immediately recover/land the UA upon loss of GPS signal.
20. If the PIC loses command or control link with the UA, the UA must follow a pre-determined route to either reestablish link or immediately recover or land.
21. The PIC must abort the flight operation if unpredicted circumstances or emergencies that could potentially degrade the safety of persons or property arise. The PIC must terminate flight operations without causing undue hazard to persons or property in the air or on the ground.
22. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.
23. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.
24. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.
25. The UA must remain clear of, and give way to, any manned aircraft at all times.

26. The UAS may not be operated by the PIC from any moving device or vehicle.
27. All flight operations must be conducted at least 500 feet from all persons, vessels, vehicles, and structures unless when operating:
- a. *Over or near people directly participating in the safe operation of the UAS.* People directly participating in the safe operation of the UAS include the PIC, VO, and other consenting personnel that are directly participating in the safe operation of the UA.
 - b. *Near nonparticipating persons.* Except as provided in subsections (a) of this section, a UA may only be operated closer than 500 feet to a person when barriers or structures are present that sufficiently protect that person from the UA and/or debris or hazardous materials such as fuel or chemicals in the event of an accident. Under these conditions, the operator must ensure that the person remains under such protection for the duration of the operation. If a situation arises where the person leaves such protection and is within 500 feet of the UA, flight operations must cease immediately in a manner that does not cause undue hazard to persons.
 - c. *Near vessels, vehicles and structures.* Prior to conducting operations the operator must obtain permission from a person with the legal authority over any vessels, vehicles or structures that will be within 500 feet of the UA during operations. The PIC must make a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.
28. All operations shall be conducted over private or controlled-access property with permission from a person with legal authority to grant access. Permission will be obtained for each flight to be conducted.
29. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) in accordance with its UAS accident reporting requirements.
30. All operations shall be conducted with a PIC operating the master computer. Additionally, secondary computers are required to monitor the UA with no more than 35 UAs per secondary computer. The secondary computers must be operated by trained and qualified personnel as described in the petitioner's operating documents.

Unless otherwise specified in this exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on December 31, 2017, unless sooner superseded or rescinded.

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/s/

John S. Duncan