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

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

April 17, 2015

Exemption No. 11368
Regulatory Docket No. FAA–2015–0103

Mr. E. Tazewell Ellett
Mr. Patrick R. Rizzi
Counsel for Topcon Positioning Systems, Inc.
Hogan Lovells US LLP
555 13th Street, NW
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Dear Messrs. Ellett and Rizzi:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

The Basis for Our Decision

By letter dated January 14, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Topcon Positioning Systems, Inc. (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to conduct aerial surveying, product demonstration flights for potential customers, UAS product training for customers, and research and development.

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

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

Airworthiness Certification

The UAS proposed by the petitioner are the Sirius Basic and Sirius Pro.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA−2014−0352), 11109 to Clayco, Inc. (*see* Docket No. FAA−2014−0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA−2014−0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA−2014−0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

Our Decision

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

Conditions and Limitations

In this grant of exemption, Topcon Positioning Systems, Inc. is hereafter referred to as the operator.

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

1. Operations authorized by this grant of exemption are limited to the Sirius Basic and Sirius Pro when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the

Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS-80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

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

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N-Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

24. The UA must remain clear and give way to all manned aviation operations and activities at all times.

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

    The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N-Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

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

This exemption terminates on April, 30, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/
John S. Duncan
Director, Flight Standards Service

BEFORE THE
FEDERAL AVIATION ADMINISTRATION

Topcon Positioning Systems, Inc., Petitioner.	Docket No. FAA-2015-_____

PETITION OF TOPCON POSITIONING SYSTEMS, INC.
FOR AN EXEMPTION FROM CERTAIN FEDERAL AVIATION REGULATIONS
TO PERMIT UNMANNED AIRCRAFT SYSTEMS (UAS) OPERATIONS

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DATE: January 14, 2015

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1. BACKGROUND INFORMATION: THE PETITIONER

Topcon Positioning Systems, Inc. ("TPS"), a subsidiary of Topcon Corporation, is headquartered in Livermore, California. TPS designs, manufactures, and distributes precise positioning products for the global surveying, construction, agriculture, civil engineering, mapping, asset management, and mobile control markets. TPS recently unveiled two small unmanned aircraft systems ("UAS") – Sirius Basic and Sirius Pro (collectively, "Sirius UAS") – for mapping a wide range of sites, land surveying, and facility inspections, as well as use in TPS' primary markets (e.g., mining & aggregate, earth moving/construction, and agriculture). TPS also entered into a worldwide distribution partnership agreement for these UAS with UAS manufacturer MAVinci GmbH ("MAVinci").

2. PROPOSED UAS OPERATIONS: THE EXEMPTION REQUEST

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 ("FMRA") and 14 C.F.R. ("FAR") §§ 11.61(b), 11.63(a), and 11.81, TPS requests that the FAA grant TPS an exemption from certain sections of the FAR (detailed below) so that TPS may commercially operate one or more small Sirius UAS for aerial surveying, product demonstration flights for potential customers, UAS product training for customers, and research and development for future product improvements related to these small UAS. As explained below, TPS' proposed UAS operations, as conditioned and limited herein, will not adversely affect safety, but rather will provide an equivalent or greater level of safety than that provided by the current rules and large manned aircraft operations. See FAR § 11.81.

3. PROPOSED CONDITIONS AND LIMITATIONS

The small UAS operations proposed in this Petition will be subject to the following conditions and limitations. Each of these conditions and limitations is consistent with previously granted small UAS Section 333 exemptions and FAA guidance. See, e.g., Exemption No. 11110 (December 10, 2014; Docket FAA-2014-0367) ("Trimble Exemption"); Exemption No. 11062 (September 25, 2014; Docket FAA-2014-0352) ("Astraeus Exemption"); Exemption No. 11109 (December 10, 2014; Docket FAA-2014-0507) ("Clayco Exemption"); Exemption No. 11136 (January 5, 2015; Docket FAA-2014-0508) ("AAS Exemption"). Collectively, these conditions and limitations ensure that the proposed small UAS operations will not adversely affect safety and will provide at least an equivalent level of safety to the current rules and large manned aircraft operations.

3.1 Conditions and limitations regarding the proposed UAS

TPS intends to operate the small Sirius UAS under the requested exemption. The Sirius UAS uses a battery-powered, single electric brushless 680 W motor system and a single propeller. Its payload is a Panasonic GX1 camera or the FUJIFILM X-M1; its navigation system is GPS/IMU aided; and it has three available flight modes – automatic, autopilot-assisted, and full manual.

Each Sirius UAS operated under the exemption will be subject to the following conditions and limitations:

3.1.1 Operations under the exemption will be limited to the Sirius UAS. The free-flying unmanned aircraft part of the Sirius UAS ("the UA") will have a gross weight of not more than 7 pounds, including energy sources, equipment, and payload. [Trimble Exemption Limitation No. 1.]

3.1.2 The UA has maximum dimensions of approximately 48 inches (l) x 65 inches (w) x 12.2 inches.

3.1.3 The UA will have a maximum ground speed of 70 knots indicated air speed. It has a typical cruise speed of 35 knots indicated air speed. [Trimble Exemption Limitation No. 2.]

3.1.4 The UA will have a maximum total flight time of 50 minutes.

3.1.5 The UA will be identified by its serial number and registered with the FAA in accordance with FAR Part 47. [Trimble Exemption Limitation No. 21.]

3.1.6 The UA will have identification markings in accordance with FAR Part 45, with the markings being as large as practicable. [Trimble Exemption Limitation No. 21.]

3.2 Conditions and limitations regarding the proposed UAS operations

All UAS operations under the exemption will be subject to the following conditions and limitations:

3.2.1 All UAS operations will be covered by an Air Traffic Organization ("ATO")-issued Certificate of Waiver or Authorization ("COA"). This COA will require that TPS request a Notice to Airman ("NOTAM") not more than 72 hours in advance of, nor less than 48 hours prior to, each UAS operation. [Trimble Exemption Limitation No. 20.]

3.2.2 The UA will operate only in Class G airspace. [Trimble Exemption Limitation No. 27.] It will not operate in Class B, C or D airspace without written approval from the FAA. [Astraeus Exemption Limitation No. 34.]

3.2.3 The UA will not operate within 5 nautical miles of the geographic center of a non-towered airport as denoted on a current FAA-published aeronautical chart unless a letter agreement with the airport's

management is obtained, and the operation is conducted in accordance with a NOTAM as required by TPS' COA. TPS will make this letter agreement available to the FAA upon request. [Astraeus Exemption Limitation No. 34.]

3.2.4 Each UA will remain at least 3 nautical miles from any public towered airport to the extent possible.

(a) The Topcon Solutions Center in Pleasanton, California, where some UAS operations will be operated, is approximately 2.5 miles south of the Livermore Municipal Airport, which has a control tower and runways in an east/west configuration. For these UAS operations at the Topcon Solutions Center, the PIC will follow the procedures set forth in Limitation 3.2.5 below.

3.2.5 Prior to each UAS operation in which the UA will operate within 3 nautical miles of a public towered airport, the PIC will ensure that the FAA Air Traffic Control officials with responsibility for that airport are notified in advance of the UAS operation; that, subject to the airport's and ATC's agreement, the PIC will maintain two-way radio communications with the airport's ATC tower facility during such flight operations; and that the operation is conducted in accordance with a NOTAM as required by TPS' COA.

3.2.6 Prior to UAS operations, the radio frequency spectrum used for operation and control of the UA (2.4 GHz) will comply with Federal Communications Commission (FCC) and other appropriate government oversight agency requirements. [Trimble Exemption Limitation No. 22.]

3.2.7 The minimum crew for each UAS operation will consist of one Pilot in Command ("PIC") and one Visual Observer/Flight Assistant ("VO/FA"). The PIC will be designated before the flight and cannot transfer his/her designation for the duration of the flight. The PIC must ensure that the VO/FA can perform the functions prescribed for the VO/FA in the Operator's Manual. [Trimble Exemption Limitations Nos. 4 and 5.]

3.2.8 The UA will be operated within visual line of sight ("VLOS") of the PIC at all times. The VLOS will be unaided, except for corrective lenses as set forth on the PIC's FAA-issued airman medical certificate. The VO/FA may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. [Trimble Exemption Limitations Nos. 4 and 5.]

3.2.9 During each UAS operation, the PIC and the VO/FA must be able to communicate verbally with each other at all times. [Trimble Exemption Limitation No. 5.]

3.2.10 The PIC is prohibited from beginning a UAS flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with at least 30% battery power remaining. [AAS Exemption Limitation No. 22.]

3.2.11 Prior to each UAS operation, each member of the crew who will be conducting the UAS operation will participate in a safety briefing about the UAS operation, as outlined in the Operator's Manual, and the crew will complete the UA preflight inspection and preflight checklist per the Operator's Manual.

3.2.12 Prior to each UAS operation, the PIC will inspect the UAS (including the Ground Control Station) to ensure it is in a condition for safe flight. If the inspection reveals a condition that affects the safe operation of the UAS, the UAS is prohibited from operating until the necessary maintenance has been performed and documented, and the UAS is found to be in a condition for safe flight. [Trimble Exemption Limitation No. 7.]

3.2.13 Prior to each UAS operation, the PIC will review the weather, the UAS battery requirements, the UA takeoff and landing distances, and the UAS performance, and will account for all relevant site-specific conditions per the Operator's Manual.

3.2.14 All maintenance and alterations will be properly documented in the UA records. [Trimble Exemption Limitation No. 7.] TPS' Sirius UAS maintenance personnel will make a record entry in the UAS logbook or equivalent document of the corrective action taken against discrepancies discovered between inspections. [Trimble Exemption Limitation No. 14.]

3.2.15 Prior to each UAS flight, a zero altitude initiation point will be established and confirmed for accuracy by the PIC. [Astraeus Exemption, at 21; AAS Exemption, at 17.]

3.2.16 During each UAS operation, the UA will remain at or below 400 feet above ground level ("AGL"). [Trimble Exemption Limitation No. 3.]

3.2.17 All UAS operations will be conducted over private or controlled-access property with permission from the land owner/controller or authorized representative. Permission from the land owner/controller or authorized

representative will be obtained for each flight to be conducted. [Trimble Exemption Limitation No. 34.]

3.2.18 The UA will operate at least 500 feet from all non-participating persons, vessels, vehicles, and structures unless:

(a) Barriers or structures are present that sufficiently protect non-participating persons from the UA and/or debris in the event of an accident. TPS must ensure that non-participating persons remain under such protection; and if a situation arises where non-participating persons leave such protection and are within 500 feet of the UA, flight operations will cease immediately; and/or

(b) The UA is operated near vessels, vehicles or structures where the land owner/controller has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

[AAS Exemption Limitation No. 30.]

3.2.19 Operations of the UA may be conducted at distances less than 500 feet from participating persons, vessels, vehicles or structures that perform an essential function in connection with these special purpose operations or are otherwise necessary for such operations. Operations closer than 500 feet from the PIC, VO/FA, operator trainees, essential persons, and potential customers are permitted when operationally necessary, but never so close as to present an undue hazard, per FAR § 91.119(a). [Trimble Exemption Limitation No. 32.]

3.2.20 All UAS operations will take place during visual meteorological conditions (VMC) only. [Trimble Exemption Limitation No. 28.]

3.2.21 TPS will not operate UAS flights under Special Visual Flight Rules (SVFR). [Astraeus Exemption Limitation No. 31.]

3.2.22 All UAS operations will take place during daylight hours. UAS operations will not be conducted during night, as defined in FAR § 1.1. [Trimble Exemption Limitation No. 26.]

3.2.23 During each UAS operation, the UA will avoid, remain clear of, and yield right-of-way to all manned aerial operations and activities (including, but not limited to, ultralight vehicle, parachute, parasailing, and hang glider activities). [Trimble Exemption Limitation No. 24.]

3.2.24 Each UAS operation will maintain a safe distance from any structure or facility that has a national security implication that is known to TPS and whose airspace is identified as Special Use Airspace on the most recent Sectional Map.

3.2.25 The UA will 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. [Trimble Exemption Limitation No. 28.]

3.2.26 The UAS will not be operated by the PIC from a moving device or vehicle. [Trimble Exemption Limitation No. 25.]

3.2.27 Any UAS that has undergone maintenance or alterations that affect the UAS operation or UA flight characteristics (e.g., replacement of a flight critical component) must undergo a functional maintenance test flight in accordance with the Operator's Manual.

3.2.28 The PIC who conducts the functional maintenance test flight will make an entry about the flight in the UA records. [Trimble Exemption Limitation No. 8.]

3.2.29 For each UAS operation, the UAS will be programmed so that if the UAS loses its communications, the UA will return to a pre-determined location within the private or controlled-access property, and land or be recovered in accordance with the Operator's Manual. [Trimble Exemption Limitation No. 17.] For each UAS operation, the UAS will be programmed so that if the UAS loses its GPS signal, the UA will circle down at its current location or will circle in its then-current position at its established safety altitude in accordance with the Operator's Manual. These actions are part of the Sirius UAS' Lost Link Procedures. Alternatively, the PIC can take over control of the UA using the RC controller and execute safe landing procedures in accordance with the Operator's Manual.

3.2.30 The PIC will adhere to the written emergency procedures in the Manuals and suspend the UAS operation and UA flight in the event of unpredicted obstacles or emergencies in accordance with the Operator's Manual. [Trimble Exemption Limitation No. 18.]

3.2.31 The documents required by FAR §§ 91.9 and 91.203 will be available to the PIC at the Ground Control Station of the UAS at any time the UA is operating, and will be made available to the FAA or any law enforcement official upon request. [Trimble Exemption Limitation No. 23.]

3.2.32 The UA may not be operated over congested or densely populated areas. These areas include but are not limited to the yellow areas

depicted on World Aeronautical Charts (WAC), Sectional Aeronautical Charts (Sectionals), or Terminal Area Charts (TAC). However, aeronautical charts may not reflect pertinent local information. It will be the PIC's responsibility to maintain the minimum safe altitudes required by FAR § 91.119 (subject to an exemption granted herein). [Trimble Exemption Limitation No. 30.] If the Topcon Solutions Center in Pleasanton, California, is considered to be located within a broader congested or densely populated area, this Limitation will not apply to small UAS operations conducted over Topcon's land there.

3.2.33 Any incident, accident or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA will be reported to the FAA's UAS Integration Office (AFS-80) within 24 hours. Accidents will be reported to the National Transportation Safety Board ("NTSB") per instructions contained on the NTSB website. [Trimble Exemption Limitation No. 35.]

3.3 Conditions and limitations regarding the Pilot in Command and other crewmember qualifications and training

The PIC and other crewmembers for each UAS operation under the requested exemption will be subject to the following conditions and limitations:

3.3.1 The PIC will possess at least an FAA private pilot certificate and a third-class airman medical certificate. The PIC also will satisfy the flight review requirements of FAR § 61.56 in an aircraft for which the PIC is rated on his or her pilot certificate. [Trimble Exemption Limitation No. 15.]

3.3.2 The PIC and VO/FA will have successfully completed the manufacturer's authorized training for the Sirius UAS.

3.3.3 Each PIC will have demonstrated through the manufacturer's authorized training program that he or she is able to safely operate the UAS in a manner consistent with how the UAS will be operated under the exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles, and structures. TPS must document and make a record of such training and make such documentation available upon request by the FAA. Flights for the purposes of training TPS' PICs and VO/FAs (training, proficiency, and experience-building) are permitted under the terms of this exemption. Said training operations, however, may only be conducted during dedicated training sessions. [AAS Exemption Limitation No. 15.]

3.3.4 TPS will not permit any PIC to operate its Sirius UAS unless that PIC has demonstrated through TPS' training and currency requirements that he or she is able to safely operate the UAS in accordance with Limitation No. 3.3.3. [Clayco Exemption Limitation No. 16.]

3.4 Conditions and limitations regarding TPS manuals related to UAS operations

TPS has two manuals containing procedures for the UAS operations under the exemption: the Sirius Aerial Image UAS & MAVinci Desktop Manual ("Operator's Manual" or "Operations Manual") and the Sirius Aerial Image UAS & MAVinci Service Manual ("Service Manual") (collectively, "the Manuals"). A confidential copy of each of the Manuals will be submitted to the FAA Assistant Chief Counsel for International Law, Legislation, and Regulations as supporting documentation for this Petition. The Manuals contain information that is highly proprietary to TPS

and/or MAVinci, and TPS requests that the FAA treat the Manuals as confidential and not disclose them to the public. The Manuals will be subject to the following limitations and conditions:

3.4.1 The Manuals and the exemption must be maintained and made available to the FAA upon request. If a discrepancy exists between the conditions and limitations in the exemption and the procedures outlined in the Manuals, the conditions and limitations in the exemption take precedence and must be followed. Otherwise, TPS must follow the procedures as outlined in the Manuals. [Trimble Exemption Limitation No. 6.]

3.4.2 TPS may update or revise its Manuals, and it is TPS' responsibility to track such revisions and present updated and revised documents to the FAA upon request. TPS must also present updated and revised documents if it petitions for an extension or amendment of the exemption. If TPS determines that any update or revision would affect the basis upon which the FAA granted the requested exemption, then TPS must petition for an amendment to the exemption. TPS will contact the FAA's UAS Integration Office (AFS-80) if questions arise regarding updates or revisions to the Manuals. [Trimble Exemption Limitation No. 6.]

3.4.3 The Manuals contain information about the Sirius UAS' performance and limitations.

3.4.4 The Manuals contain the procedures for UAS operations, including preflight inspections, which will account for all discrepancies, i.e., inoperable components, items or equipment. [Trimble Exemption Limitation No. 9.]

3.4.5 The Manuals contain the requirements and procedures for a functional maintenance test flight of the UAS and aircraft record entry. [Trimble Exemption Limitation No. 8.]

3.4.6 TPS must carry out its maintenance, inspections, and record keeping requirements in accordance with the Manuals. Maintenance, inspection, and alterations must be noted in the aircraft logbook, including total flight hours, description of work accomplished, and the signature of the authorized Sirius UAS maintenance personnel returning the Sirius UAS to service. [Trimble Exemption Limitation No. 11.]

3.4.7 The Sirius UAS maintenance personnel maintaining and servicing TPS' UAS must receive, and document, the training called for in the Manuals. [Trimble Exemption Limitation No. 12.]

3.4.8 Each UAS operated under the exemption will comply with all manufacturer System and Safety Bulletins, and that requirement is set forth in the Manuals. [Trimble Exemption Limitation No. 13.] TPS will maintain copies of all manufacturer System and Safety Bulletins, and will make them available to the FAA upon request.

3.4.9 TPS will follow the manufacturer's UAS aircraft/component, maintenance, overhaul, replacement, inspection, and life limit requirements. [Trimble Exemption Limitation No. 10.]

3.4.10 The Manuals contain procedures for performing and documenting of maintenance, preventive maintenance, alterations, status of replacement/overhaul component parts, and the total time in service of the UAS (and for maintaining the corresponding records).

4. REQUEST FOR DETERMINATION UNDER SECTION 333 OF FMRA

In accordance with FMRA Sec. 333, TPS requests that the Secretary of Transportation determine that TPS' proposed small UAS operations (i) do not create a hazard to users of the National Airspace System or the public, and (ii) do not pose a threat to national security.

TPS further requests that, based on the Secretary's determination, the FAA determine – as it did in the Astraeus Exemption, Clayco Exemption, and AAS Exemption – that relief from FAR Part 21 and any associated noise certification and testing requirements of FAR Part 36 is not necessary for the UAS operations proposed in this Petition.[1]

5. INFORMATION REQUIRED BY 14 C.F.R. § 11.81 TO SUPPORT A PETITION FOR EXEMPTION

As required by FAR § 11.81, TPS provides the following information in support of this Petition:

5.1 Contact information:

Name: Topcon Positioning Systems, Inc. submits this Petition for Exemption, through counsel, E. Tazewell Ellett and Patrick R. Rizzi.

Mailing address:
E. Tazewell Ellett
Patrick R. Rizzi
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(T) 202-637-8644 (Ellett) / 202-637-5659 (Rizzi)
(F) 202-637-5910

[1] Astraeus Exemption, at 14, 22; Clayco Exemption, at 10, 16; AAS Exemption, at 12, 18. If the FAA concludes that the UAS operations proposed in this Petition require an exemption from FAR Parts 21 and/or 36, then TPS requests that the FAA include that in the exemption.

E-mail addresses:

tazewell.ellett@hoganlovells.com
patrick.rizzi@hoganlovells.com

5.2 The specific section or sections of the FAR from which TPS seeks an exemption:

FAR § 61.113(a) and (b) – Private pilot privileges and limitations: Pilot in command.
FAR § 91.7(a) – Civil aircraft airworthiness.
FAR § 91.119(b) and (c) – Minimum safe altitudes: General.
FAR § 91.121 – Altimeter settings.
FAR § 91.151 – Fuel requirements for flight in VFR conditions.
FAR § 91.405(a) – Maintenance required.
FAR § 91.407(a)(1) – Operation after maintenance, preventive maintenance, rebuilding, and inspections.
FAR § 91.409(a)(1) and (2) – Inspections.
FAR § 91.417(a) and (b) – Maintenance records.

5.3 The extent of relief sought and the reason relief is sought:

TPS proposes to conduct small UAS operations, as described herein, for aerial surveying, product demonstration flights for potential customers, UAS product training for customers, and research and development for future product improvements related to these small UAS. In order to be able to conduct these UAS operations, TPS petitions the FAA, pursuant to FAR §§ 11.61(b), 11.63(a), and 11.81(b), for an exemption from the following FAR for the reasons noted:

FAR § 61.113(a) and (b) – Private pilot privileges and limitations: Pilot in command.

The regulation states, in relevant part:

> (a) Except as provided in paragraphs (b) through (h) of this section, no person who holds a private pilot certificate may act as pilot in command of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as pilot in command of an aircraft.
>
> (b) A private pilot may, for compensation or hire, act as pilot in command of an aircraft in connection with any business or employment if:

(1) The flight is only incidental to that business or employment; and

(2) The aircraft does not carry passengers or property for compensation or hire.

(c) ****.

TPS requests an exemption from this regulation to the extent necessary to permit TPS to conduct UAS operations using PICs who hold an FAA private pilot certificate. While TPS recognizes that the FAA normally requires a PIC to hold a commercial pilot certificate where there is compensation either to the pilot or for the operation, TPS requests that the FAA exempt TPS and its PICs from this requirement since the use of a private pilot as the PIC for the UAS operations under this exemption will be more safe than the use of a commercial pilot for manned aircraft operations. Unlike conventional aircraft, the Sirius UAS is remotely controlled, with no crew or passengers, and battery-powered. The fulfillment of the additional requirements for a private pilot to become qualified as a commercial pilot would not lead to any additional safety benefits when UAS operations are involved.

The differences between the ***aeronautical knowledge*** requirements for private pilots and for commercial pilots are significant in the traditional world of manned aircraft. A pilot who wishes to operate flights that involve the carriage of persons or property for compensation or hire is typically expected to improve his or her aeronautical knowledge with respect to the operation of those larger manned aircraft. For instance, the prospective commercial pilot is expected to be able to operate more complex aircraft and in conditions other than VMC. Pilots seeking to become commercial pilots for manned aircraft must acquire additional aeronautical knowledge about the use of performance charts and aeronautical charts (beyond that which a private pilot must obtain for VFR), night operations, and the use of air navigation aids/facilities.[2] However, no aspect of this

[2] FAR § 61.125, Aeronautical knowledge for commercial pilots, paras. (b)(7) (use of performance charts), (b)(9) (use of aeronautical charts beyond that necessary for flight under VFR), (b)(10) (use of air navigation aids), and (b)(14) (night and high-altitude operations).

incremental additional knowledge is significant for the daytime, VMC small UAS operations over private or controlled access properties proposed in this Petition.

The differences between the *aeronautical experience* requirements for private pilots and for commercial pilots are also significant. However, the additional experience required for a commercial pilot certificate is required to a great extent to allow the upgrading pilot to acquire experience of a type that a commercial PIC of a manned aircraft must obtain in order to safely conduct commercial operations in a larger manned aircraft. For instance, the applicant for a commercial certificate with a single-engine land rating must obtain 50 hours of cross-country flight, 10 hours of instrument training, 10 hours of time in a complex aircraft, 10 hours of solo time, and 5 hours in night VFR conditions.[3] In addition, a great deal of time is required for a pilot of a larger manned aircraft seeking to become a commercial pilot to ensure that the pilot's takeoffs and landings can be conducted safely enough so as not to imperil the passengers and property aboard the manned aircraft. In this regard, there is a fundamental difference between the type of experience that the PIC of a manned aircraft should have, versus the type of experience that the PIC of a small UAS should have, in order to avoid imperiling passengers or property. In TPS' case, the small amount of property carried aboard the UA will be TPS property. While the pilot will be compensated, all risk of damage to the property (in fact to the UAS itself) will be borne by TPS. There is no expectation or need for the PIC of the UA to have the type of experience that a commercial pilot for a manned aircraft would have. In short, almost none of the aeronautical experience requirements, beyond those necessary for private pilots and as set forth in the Sirius UAS manufacturer's written authorized training program, is relevant to the PIC who will operate the small UAS over private or controlled access property as proposed in this Petition. Accordingly, there is no reason to require the UAS PIC to have more experience than that required for the private pilot certificate.

The differences between *flight proficiency* requirements for private pilots and for commercial pilots involve areas such as "[h]igh-altitude operation" and other areas that have no bearing on the

[3] See FAR § 61.129.

small UAS operations at issue in this Petition.[4] To the extent that differences exist between the standards of performance for flight proficiency as demonstrated by prospective private versus prospective commercial pilots, those standards are not significant here where the operations will be conducted strictly during daylight VMC conditions, within VLOS, at altitudes no higher than 400 feet AGL.

Given that TPS plans to operate its Sirius UAS in Class G airspace over private or controlled-access property at altitudes of 400 feet AGL or less, the parallel nature of private pilot aeronautical knowledge requirements to those of commercial requirements, the limited airmanship skills necessary to operate the Sirius UAS, and the lack of additional safety benefits for the proposed UAS operations here resulting from commercial pilot experience, the PIC under this exemption should only be required to hold a private pilot certificate and third-class airman medical certificate. Such a condition would be consistent with the certificate requirements imposed on the PIC in the Astraeus Exemption, Trimble Exemption, AAS Exemption, and Clayco Exemption.

For these reasons, TPS requests that the FAA grant an exemption to permit TPS to use as PIC of the proposed UAS operations pilots who hold a private pilot certificate and a third-class airman medical certificate, so long as they satisfy the conditions and limitations proposed in this Petition, including the PIC qualification and training requirements.

FAR § 91.7(a) – Civil aircraft airworthiness.

The regulation states in relevant part:

> (a) No person may operate a civil aircraft unless it is in an airworthy condition. . . .

[4] Compare FAR § 61.127, flight proficiency for commercial pilots (in particular §§ 61.127(b)(1)(x) and (b)(2)(x)), with FAR § 61.107, flight proficiency for private pilots.

TPS requests an exemption from this provision to the extent necessary.[5] The Sirius UAS will not require an airworthiness certificate under FAR Part 21, Subpart H, and thus relief is requested from this regulation. See Trimble Exemption, at 16. An exemption is warranted because TPS understands that, notwithstanding the lack of an airworthiness certificate, the FAA will consider its "compliance with [TPS'] Manuals to be sufficient means for determining an airworthy condition" and that TPS must still determine the UA's airworthiness prior to each flight based on compliance with such Manuals. See Trimble Exemption, at 16.

FAR § 91.119(b) and (c) – Minimum safe altitudes: General.

The regulation states:

> Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:
>
> (a) *Anywhere.* An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.
>
> (b) *Over congested areas.* Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.
>
> (c) *Over other than congested areas.* An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.
>
> (d) *Helicopters, powered parachutes, and weight-shift-control aircraft.* If the operation is conducted without hazard to persons or property on the surface—
>
> > (1) A helicopter may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section, provided each person operating the helicopter complies with any routes or altitudes specifically prescribed for helicopters by the FAA; and

[5] TPS requests exemption from FAR § 91.7(a) based on the relief granted in the Trimble Exemption, at 16, 21. However, TPS notes that the FAA determined that no such exemption was needed in the Astraeus Exemption, at 19, 22.

> (2) A powered parachute or weight-shift-control aircraft may be operated at less than the minimums prescribed in paragraph (c) of this section.

TPS requests an exemption from this regulation to the extent necessary to permit TPS to conduct its UAS operations at altitudes lower than those permitted by FAR § 91.119, since such altitudes are one of the key benefits of using small UAS for these flights. Even at these low altitudes, TPS' UAS operations will be conducted at a level of safety at least equal to that which would be achieved if larger manned aircraft were to be used at the altitudes required by FAR § 91.119.

With respect to paragraph (a), TPS intends to comply with this requirement to the same extent as would a manned aircraft, meaning that the UA must operate at an altitude such that the loss of a single power unit aboard the UA or used by the UAS would still permit an emergency landing "without undue hazard to persons or property on the surface." TPS agrees with the FAA's reasoning on this issue in the Astraeus Exemption, at 20, and therefore does not believe that relief is required from paragraph (a).

With respect to paragraph (b), TPS plans to operate these small UAS over private or controlled-access properties, which are not themselves congested areas, but which may be located within a broader heavily populated and congested area. Accordingly, TPS does not believe that an exemption is warranted from this paragraph covering "congested areas". However, as the FAA has noted (Trimble Exemption, at 18), there is no precise definition of "congested areas," and the PIC can obtain such information from the local Flight Standards District Office; but, even if these small UAS operations were to operate over areas somehow construed as being "congested", the proposed UAS operations will be far safer than operations by larger manned aircraft operating in compliance with the minimum altitude requirements (1,000 feet altitude). The operation of a much heavier, faster aircraft with an onboard pilot and other crewmembers, at 1,000 feet over a congested area, with a load of combustible fuel, unquestionably provides a lower level of safety than an operation conducted by a very small, extremely lightweight, battery-operated UA over private or controlled

access property that, at all times from takeoff to landing, can be safely operated well below the altitudes used by manned aircraft and continuously within VLOS of the PIC on the ground. To the extent necessary, TPS requests relief from paragraph (b).

With respect to paragraph (c), TPS requests an exemption to allow UAS operations down to the surface, both in sparsely populated areas and in "other than congested" areas. TPS' UAS operations require lower-level flying, but have a number of self-imposed restrictions to ensure at least an equivalent level of safety. For example,

- All operations will avoid congested or populated areas.
- All operations will be conducted over private or controlled access property.
- Permission from the land owner/controller will be obtained prior to the beginning of each flight.
- TPS will timely file a NOTAM for each flight.
- The UA will operate at least 500 feet from all non-participating persons, vessels, vehicles, and structures unless:
    - Barriers or structures are present that sufficiently protect non-participating persons from the UA and/or debris in the event of an accident. TPS must ensure that non-participating persons remain under such protection; and if a situation arises where non-participating persons leave such protection and are within 500 feet of the UA, flight operations will cease immediately; and/or
    - The UA is operated near vessels, vehicles or structures where the land owner/controller has granted permission and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

Even with a grant of this exemption, the UAS operations will be at least as safe as operations by manned aircraft that comply with this paragraph. Flying a manned aircraft, given its weight, size, speed, and fuel load, would pose a significant risk relative to the use of a small UA, with a smaller

size and weight, operating at much lower speeds, with batteries rather than a significant fuel load, and at all times within VLOS of the PIC on the ground who has a wide view. Accordingly, as the FAA determined in the Trimble Exemption, at 17-18, relief is warranted here provided that TPS adheres to its Manuals and the additional conditions and limitations outlined above and in the exemption. For these reasons, TPS requests relief from the entirety of paragraph (c).

TPS does not request relief from paragraph (d), because it applies only to helicopters (and allows operation at lower altitudes only if on a prescribed helicopter route) and powered parachute-type aerial vehicles.

FAR § 91.121 – Altimeter settings.

The regulation states, in relevant part:

> (a) Each person operating an aircraft shall maintain the cruising altitude or flight level of that aircraft, as the case may be, by reference to an altimeter that is set, when operating—
>
> (1) Below 18,000 feet MSL, to—
>
> (i) The current reported altimeter setting of a station along the route and within 100 nautical miles of the aircraft;
>
> (ii) If there is no station within the area prescribed in paragraph (a)(1)(i) of this section, the current reported altimeter setting of an appropriate available station; or
>
> (iii) In the case of an aircraft not equipped with a radio, the elevation of the departure airport or an appropriate altimeter setting available before departure; or
>
> (2) At or above 18,000 feet MSL, to 29.92″ Hg.
>
> (b) * * * *.

It is not clear to TPS that an exemption from this section is required because, although the regulation expressly applies only to aircraft maintaining a “cruising altitude” and dictates the altimeter setting that must be used while at that cruising altitude, cruising altitudes for VFR flights do not begin

– according to FAR § 91.159 – until "more than 3,000 feet above the surface".[6] Nonetheless, TPS requests an exemption from FAR § 91.121 to the extent necessary to permit TPS to conduct the small UAS operations described in this Petition. See Astraeus Exemption, at 21-22 (granting relief from this section with conditions and limitations).

TPS recognizes the critical importance of ensuring that any UAS operated by TPS maintain altitude to an accurate reference such that other aircraft and the FAA may rely on TPS's UAS to be operating as proposed. The Sirius UAS does not use a barometric altimeter. Instead, it determines altitude based on a GPS signal. To ensure the accuracy of the GPS signal, the PIC will check the UA altitude reading prior to each takeoff, and will effectively zero the UA's altitude at the point of takeoff, to ensure that measurements of the UA's altitude are as accurate as possible relative to the local elevation. To the extent that this methodology does not satisfy FAR § 91.121 or any other regulation, TPS requests an exemption to permit UAS operations using this methodology.

FAR § 91.151 – Fuel requirements for flight in VFR conditions.

The regulation states:

> (a) No person may begin a flight in an airplane under VFR conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and, assuming normal cruising speed—
>
> (1) During the day, to fly after that for at least 30 minutes; or
>
> (2) At night, to fly after that for at least 45 minutes.
>
> (b) 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.

TPS requests an exemption from FAR § 91.151 to permit TPS to plan its UAS operations as described above. The proposed small UAS operations in this Petition will (i) involve operations in which one or more UAS is transported by means other than its own power to the operational

[6] FAR § 91.159; see also Aeronautical Information Manual, at Chpt. 3, Sec. 1, Tbl. 3-1-1para. 3-1-2. (Jul. 24, 2014).

location, and (ii) begin and end at the operational site, with the takeoff, entire flight, and landing all taking place within the immediate proximity to each other while remaining at all times within VLOS of the PIC.

The goal of FAR § 91.151 is to ensure that pilots plan for an extra 20 or 30 minutes of fuel at their first intended point of landing in order to account for unexpected possible delays en route and at the first planned destination. Many of these delays that plague manned aircraft are simply not an issue with the proposed small UAS operations over private or controlled access property, because there is virtually no "en route" portion of the flight, and any problems at the point of landing are extremely unlikely to cause delays, since a UA can always land just a few feet away if the intended point of landing becomes unusable.

Given the relatively short operating time for the Sirius UAS (50 minutes), requiring a full 30 minutes of reserve "fuel" (battery power) could take up nearly all of the available time for UAS operations. TPS believes that using a smaller reserve for UAS flight planning purposes will be at least as safe as using the reserves required by FAR § 91.151 for manned aircraft. Using a reserve of 30% battery power for a daylight UA flight, for instance, will be adequate where the UA is essentially at its first point of landing from the moment it takes off (since there is no en route phase of flight), since the risks for delay at the intended landing area are not as great as for manned aircraft landings. To that end, and consistent with AAS Exemption Limitation No. 22, the PIC under the requested exemption will be prohibited from beginning a UAS flight unless (considering wind and forecast weather conditions) there is enough power to fly at normal cruising speed to the intended landing point and land the UA with at least 30% battery power remaining. TPS believes that these limitations will further ensure that the proposed reserve planning and operational requirements that TPS is requesting to use under the exemption will provide at least an equivalent level of safety.

For these reasons, TPS requests an exemption from FAR § 91.151(a) to permit it to plan and conduct UAS operations such that only 30% of the battery power (instead of 30 minutes) is available

at the end of the planned UAS operation. FAR § 91.151(b) covers only rotorcraft and thus is not applicable to the small UAS operations TPS is proposing.

FAR § 91.405(a) – Maintenance required.

The regulation states, in relevant part:

> Each owner or operator of an aircraft—
>
> (a) Shall have that aircraft inspected as prescribed in subpart E of this part and shall between required inspections, except as provided in paragraph (c) of this section, have discrepancies repaired as prescribed in part 43 of this chapter;
>
> (b) ****.

TPS requests an exemption from FAR § 91.405(a) to permit TPS to conduct the UAS operations proposed in this Petition without having to perform the inspections and discrepancy repairs required by FAR § 91.405(a). In the Astraeus Exemption and the Trimble Exemption, the FAA determined that the proposed UAS operations required exemption from FAR § 91.405(a), and that the achievement of an adequate level of safety required certain conditions and limitations, some of which were proposed by the petitioner and some of which were imposed by the FAA. These included requirements to develop and document maintenance, overhaul, replacement, and inspection requirements in the absence of manufacturer's requirements; procedures to document and maintain maintenance records with regard to the petitioner's UAS; UAS technician qualification criteria; and requirements to document comprehensive preflight inspection procedures.

TPS has proposed several conditions and limitations in Section 3 of this Petition related to maintenance and inspections consistent with those in the Astraeus Exemption and the Trimble Exemption. TPS believes that these conditions and limitations provide a level of safety at least equivalent to that provided by FAR § 91.405(a), the Astraeus Exemption, and the Trimble Exemption. For this reason, TPS requests an exemption from FAR § 91.405(a) to permit TPS to conduct UAS operations as proposed in this Petition, subject to the conditions and limitations

proposed above, without having to perform the inspections and discrepancy repairs required by FAR § 91.405(a).

TPS does not believe that an exemption from the remaining paragraphs of FAR § 91.405 is required, since TPS will make appropriate logbook entries in aircraft maintenance records in accordance with paragraph (b), appropriately mark any inoperative instrument or item of equipment for which maintenance has been properly deferred in compliance with paragraph (c), and appropriately placard listed discrepancies that include inoperative instruments or equipment in compliance with paragraph (d).

FAR § 91.407(a)(1) – Operation after maintenance, preventive maintenance, rebuilding or alteration.

The regulation states:

> (a) No person may operate any aircraft that has undergone maintenance, preventive maintenance, rebuilding, or alteration unless—
>
> (1) It has been approved for return to service by a person authorized under §43.7 of this chapter; and
>
> (2) The maintenance record entry required by §43.9 or §43.11, as applicable, of this chapter has been made.
>
> (b) ****.
>
> (c) ****.

TPS requests an exemption from FAR § 91.407(a)(1) to permit TPS to conduct UAS operations as proposed in this Petition without having to have the UAS approved for return to service by a person authorized under FAR § 43.7. In the Astraeus Exemption and the Trimble Exemption, the FAA determined that the proposed UAS operations required exemption from FAR § 91.407(a)(1), and that achieving an adequate level of safety required conditions and limitations similar to those in the Trimble Exemption and the Astraeus Exemption.

TPS has proposed maintenance-related conditions and limitations in this Petition, which it believes provide a level of safety at least equivalent to that provided by FAR § 91.407(a)(1) and the conditions and limitations in the Trimble Exemption and Astraeus Exemption. For this reason, TPS requests an exemption from FAR § 91.407(a)(1) to permit TPS to conduct UAS operations as proposed in this Petition, subject to the proposed conditions and limitations, without having to have the UAS approved for return to service by a person authorized under FAR § 43.7.

TPS does not believe that an exemption from the remaining paragraphs of FAR § 91.407 is required, since TPS will require that maintenance record entries are made as required, in compliance with paragraph (a)(2), and since no persons will be carried following maintenance performed on the UAS, making paragraphs (b) and (c) moot.

FAR § 91.409(a)(1) and (2) – Inspections.

The regulation states, in relevant part:

> (a) Except as provided in paragraph (c) of this section, no person may operate an aircraft unless, within the preceding 12 calendar months, it has had—
>
> (1) An annual inspection in accordance with part 43 of this chapter and has been approved for return to service by a person authorized by §43.7 of this chapter; or
>
> (2) An inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.
>
> No inspection performed under paragraph (b) of this section may be substituted for any inspection required by this paragraph unless it is performed by a person authorized to perform annual inspections and is entered as an "annual" inspection in the required maintenance records.
>
> (b) ****.

TPS requests an exemption from FAR § 91.409(a)(1) and (2) to permit TPS to conduct UAS operations as proposed in this Petition without having to obtain the annual inspection and airworthiness certificate inspection required by FAR § 91.409(a)(1) and (2). In the Trimble Exemption and the Astraeus Exemption, the FAA determined that the proposed UAS operations

required exemption from FAR § 91.409(a)(1) and (2), and that achieving an adequate level of safety required conditions and limitations similar to those set forth in those previously-granted exemptions.

TPS has proposed maintenance and inspection-related conditions and limitations in this Petition, which it believes provide a level of safety at least equivalent to that provided by FAR § 91.409(a)(1) and (2), the Trimble Exemption, and the Astraeus Exemption. For this reason, TPS requests an exemption from FAR § 91.409(a)(1) and (2) to permit TPS to conduct UAS operations as proposed in this Petition, subject to the proposed conditions and limitations, without having to obtain the annual inspection and airworthiness certificate inspection required by FAR § 91.409(a)(1) and (2).

FAR § 91.417(a) and (b) – Maintenance records.

The regulation states, in relevant part:

> (a) Except for work performed in accordance with §§91.411 and 91.413, each registered owner or operator shall keep the following records for the periods specified in paragraph (b) of this section:
>
> > (1) Records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft (including the airframe) and each engine, propeller, rotor, and appliance of an aircraft. The records must include—
> >
> > > (i) A description (or reference to data acceptable to the Administrator) of the work performed; and
> > >
> > > (ii) The date of completion of the work performed; and
> > >
> > > (iii) The signature, and certificate number of the person approving the aircraft for return to service.
> >
> > (2) Records containing the following information:
> >
> > > (i) The total time in service of the airframe, each engine, each propeller, and each rotor.
> > >
> > > (ii) The current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance.

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

TPS requests an exemption from FAR § 91.417(a) and (b) to permit TPS to conduct UAS operations as proposed in this Petition without having to keep the records described in FAR § 91.417(a) and (b). The FAA determined in the Trimble Exemption and the Astraeus Exemption that the proposed UAS operations required exemption from FAR § 91.417(a) and (b), and that an adequate level of safety required conditions and limitations similar to those set forth in those previously-granted exemptions.

TPS has proposed maintenance, inspection, and records-related conditions and limitations in this Petition, which it believes provide a level of safety at least equivalent to that provided by FAR § 91.417(a) and (b), the Trimble Exemption, and the Astraeus Exemption. For this reason, TPS requests an exemption from FAR § 91.417(a) and (b) to permit TPS to conduct UAS operations as proposed in this Petition, subject to the proposed conditions and limitations, without having to keep the records described in FAR § 91.417(a) and (b).

Additional FAR Provisions.

The Petition does not seek exemption from certain regulations based on the reasoning and FAA precedent outlined below in the footnote.[7]

However, TPS also requests that, to the extent that the FAA concludes that an exemption from one or more other provisions of the FAR would be required to permit the UAS operations

[7] This Petition does not seek exemption from:

> FAR Part 21 or 36, based on the reasoning in the Astraeus Exemption, at 14, and Clayco Exemption, at 10.

> FAR § 91.7(b), based on the reasoning in the Trimble Exemption, at 17.

> FAR §§ 91.9(b)(2) and 91.203(a) and (b), based on the reasoning in the FAA's August 8, 2014 Memorandum titled "Interpretation regarding whether certain required documents may be kept at an unmanned aircraft's control station" ("FAA's August 8, 2014 Memorandum"), the Astraeus Exemption, at 19-20, 22, and the Trimble Exemption, at 17, 20.

> FAR §§ 45.23(b) and 91.9(c), based on the reasoning in the Astraeus Exemption, at 14, and Trimble Exemption, at 14, related to FAR § 45.23(b), and assuming that the markings on the UA used to comply with FAR Part 45, Subpart C requirements are as large as practicable.

> FAR §§ 47.3(b)(2) and 47.31(c), based on the reasoning in the FAA's August 8, 2014 Memorandum, and assuming that all UA are registered in accordance with FAR Part 47.

> FAR § 91.103(b)(2), based on the FAA's reasoning in the Astraeus Exemption, at 20, and Clayco Exemption, at 14, which concluded that an exemption from the preflight action requirements is not necessary when the grant of an exemption for UAS operations includes conditions that satisfy preflight action requirements. TPS proposes such conditions in this Petition.

> FAR § 91.109, based on the FAA's reasoning in the Astraeus Exemption, at 20, and Clayco Exemption, at 14, which concluded that an exemption from the requirement for dual flight controls for flight or simulator training or for flight testing is not necessary when there is no indication that dual flight controls will be used during any flight or simulator training or flight testing.

described in this Petition, the FAA grant an exemption from those FAR provisions as necessary to permit the UAS operations described in this Petition.[8]

5.4 Reasons why granting the request would be in the public interest:

A grant of the exemption would be in the public interest because it would enhance safety for the general public, TPS employees, and TPS customers.

First, the ability to use a small UAS to conduct the operations described herein, subject to the conditions and limitations proposed in this Petition, will enable TPS to have access to more complete data about aerial surveys, topography, demonstration flights, and maintenance flights, which – in turn – will enable TPS to conduct safe and effective aerial survey, demonstration or maintenance/repair flights that minimize the risk of harm to the general public, TPS employees, and TPS customers.

Second, given TPS' primary objective of providing a functional and safe UAS, this exemption would allow TPS to provide a comprehensive training, repair/service, and testing program for its customers who operate, or seek to operate, the small Sirius UAS. It is in the public interest for TPS to offer these types of programs so that (i) owners/operators of these small Sirius UAS are properly educated about safe flight operations and (ii) repairs done to the Sirius UAS are appropriately tested.

Third, the use of the small, lightweight, battery-powered Sirius UAS for these topographical aerial surveys and related operations is far less risky than undertaking those operations with a much heavier, much faster, much larger, manned helicopter or other aircraft loaded with fuel and a crew. As the FAA acknowledged in the Trimble Exemption, at 13:

> "The [TPS] pilot and crew will be remotely located from the aircraft. The limited weight and construction with impact absorbent materials significantly reduces the potential harm to persons or damage to property in the event of an incident or accident. The risk to an onboard pilot and crew during an incident or accident is eliminated with the use of a UAS for the aerial surveying operation.

[8] TPS would be happy to provide follow-on documentation providing the rationale underlying any such additional exemptions.

> Manned aircraft are at risk of fuel spillage and fire in the event of an incident or accident. [The Sirius UAS] carries no fuel [it is battery-powered] and therefore the risk of fire following an incident or accident due to fuel spillage is eliminated."

These distinctions, coupled with the safety-related features of the Sirius UAS such as Loss Link Procedures, redundant flight control systems, real-time telemetry, airspace awareness system, and terrain following, demonstrate that the Sirius UAS operations proposed in this Petition are far less risky than if operated by larger and heavier manned aircraft.

5.5 Reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which exemption is sought:

Throughout this Petition, TPS has explained many reasons why granting an exemption from each section of the FAR from which relief is sought would result in UAS operations that provide a level of safety at least equal to, or greater than, that provided by the rule from which exemption is sought. Moreover, the many conditions and limitations proposed in this Petition also ensure at least an equivalent level of safety, as the FAA concluded in the Trimble Exemption and the Astraeus Exemption.

In general, the risks of any proposed UAS operation interfering with a manned aircraft is minimized by the low altitude at which the UAS will operate; the locations at which the UAS will operate (e.g., Class G airspace, private or controlled access property, away from airports); the small size/low weight and relatively slow speed of the Sirius UAS; the restriction of UAS operations to VMC and daytime conditions; the requirement for the PIC to maintain VLOS of the UA at all times; and the condition to obtain a NOTAM before each UAS flight, among other conditions and limitations. The risks to persons or property on the ground are also minimized by the small size/low weight of the Sirius UAS; the 500-foot set-off from non-participating persons or structures; the prohibition on flights over congested or densely populated areas; the PIC's VLOS requirement; and limiting operations to private or controlled access property, among others. These parameters, conditions, and limitations proposed in the Petition provide substantial protection against

interference with manned aircraft operations or with the safety of persons or property on the ground. In addition, under the proposed conditions and limitations in Section 3 of this Petition, TPS will coordinate extensively, as warranted, with the FAA, with local airports, and with property owners to ensure that all UAS operations under the exemption are at least as safe as would be manned aircraft operations used for similar purposes.

The Sirius UAS also has several safety-related protocols in case there is any lost link between the UA and the operator. These Lost Link Procedures are covered in the Operator's Manual and can handle lost links alone or in combination. As an example, if a GNSS link is lost, the autopilot sends an error message to the computer notifying the computer operator, who can notify the PIC to take control of the UAS and land. If the PIC does not take over control within a preset time, the UAS will begin to circle slowly and descend to land. If an RC link and data link are both lost, the UAS will return to the takeoff position and circle. The "return home command" can return the UA to its takeoff position or to another location established as "home" during the creation of the flight plan at any time during a flight. TPS can also end a UAS flight via a command from the computer telling the UA to land at a defined area automatically, or the PIC can take control of the UA using the RC controller.

In addition, another key safety feature of the MAVinci System is its dual control links. The MAVinci Ground Control Station ("GCS") and MAVinci Remote Control ("RC") consoles are dual, robust, and independent systems, affording a redundant means of controlling the UA – significantly increasing operational security. The 2.4 GHz RC console is connected wirelessly to the Sirius UA for piloting in autopilot assisted and fully manual modes. The MAVinci GCS functions from the laptop through the 2.4 GHz Connector antenna, providing fully autonomous flight. Should either system fail, the other system remains fully operational and is capable of providing safety of flight for the UAS.

For these reasons, granting an exemption from each section of the FAR from which relief is sought would not adversely affect safety, and would provide a level of safety at least equal to, or greater than, that provided by the rule from which exemption is sought.

5.6 Summary that can be published in Federal Register, including the rule from which exemption is sought, a brief description of the nature of the exemption sought:

TPS proposes that the FAA use the following as the summary:

> Docket No.: FAA-2015-_____
>
> *Petitioner:* Topcon Positioning Systems, Inc.
>
> *Sections of 14 CFR:* 61.113(a) and (b), 91.7(a), 91.119(b) and (c), 91.121, 91.151, 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b).
>
> *Description of Relief Sought:* Petitioner seeks an exemption to conduct small UAS commercial operations for aerial surveying, product demonstration flights for potential customers, UAS product training for customers, and research and development for future product improvements related to these small UAS.

5.7 Additional information that supports request:

TPS is prepared to provide additional information that the FAA might find helpful, or to answer questions in response to any FAA requests. A confidential copy of each of the Manuals and the Topcon Certified Training Program will be submitted to the FAA Assistant Chief Counsel for International Law, Legislation, and Regulations as supporting documentation for this Petition. The Manuals and Topcon Certified Training Program contain information that is highly proprietary to TPS and/or MAVinci, and TPS requests that the FAA treat the Manuals and Topcon Certified Training Program as confidential and not disclose them to the public.

5.8 Request to exercise the privileges of the exemption outside the U.S.:

TPS does not request to exercise the privileges of the exemption outside the United States.

5.9 Attachments:

In support of this Petition, TPS will provide copies of the Manuals and the Topcon Certified Training Program to the FAA Assistant Chief Counsel for International Law, Legislation, and Regulations. As noted above, TPS requests confidential treatment by the FAA of the Manuals and Certified Training Program. These documents contain non-public, confidential information that is highly proprietary to TPS and/or MAVinci. These confidential documents are also submitted under 14 C.F.R. § 11.35(b), and are exempt from public disclosure under the Freedom of Information Act, 5 U.S.C. § 552 et seq.

6. CONCLUSION

For the foregoing reasons, TPS respectfully requests that the FAA grant this Petition for Exemption.

Respectfully submitted,

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