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

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

August 25, 2015

Exemption No. 12601
Regulatory Docket No. FAA–2015–1039

Mr. Matthew Aljanich
Modern Technology Solutions, Inc.
5285 Shawnee Road, Suite 400
Alexandria, VA 22312

Dear Mr. Aljanich:

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

By letter dated April 7, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Modern Technology Solutions, Inc. (hereinafter petitioner or operator) for an exemption. The petitioner requested to operate an unmanned aircraft system (UAS) to conduct high precision aerial photogrammetry across agriculture, ranching, landscape, mining and infrastructure.

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 is an C-Astral Aerospace BRAMOR rTK.

In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation

has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection[1]. 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, Modern Technology Solutions, 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.

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

Conditions and Limitations

In this grant of exemption, Modern Technology Solutions, 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 C-Astral Aerospace BRAMOR rTK 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 August 31, 2017, unless sooner superseded or rescinded.

Sincerely,

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

Enclosures

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

MODERN TECHNOLOGY SOLUTIONS, INC.
PETITON FOR AN EXEMPTION
SEEKING RELIEF FROM THE REQUIREMENTS OF TITLE 14 OF THE CODE OF FEDERAL REGULATIONS SECTIONS 61.113(a) & (b), 91.7(a), 91.119, 91.151(a), 91.405(a), 91.407(a)(1), 91.409(a)(2), AND 91.417(a) & (b) CONCERNING COMMERCIAL OPERATION OF C-ASTRAL AEROSPACE BRAMOR rTK UNMANNED AIRCRAFT SYSTEMS
PURSUANT TO SECTION 333 OF THE FAA MODERNIZATION AND REFORM ACT OF 2012 (PUBLIC LAW 112-95)

Submitted on April 07, 2015

Modern Technology Solutions, Inc.
Matthew B. Aljanich
5285 Shawnee Road, Suite 400
Alexandria, VA 22312
703-564-3829

PETITION SUMMARY

MTSI seeks an exemption from the requirements of 14 C.F.R §§ 61.113(a) & (b), 91.7(a), 91.119, 91.151(b), 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a) (2), and 91.417(a) & (b), to operate a small Unmanned Aircraft System (sUAS) pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA). This exemption will permit MTSI to operate a sUAS for the commercial purpose of conducting high precision aerial photogrammetry across agriculture, ranching, landscape, mining and infrastructure, within the National Airspace System (NAS), over certain areas of the United States.

INTRODUCTION

I. MTSI Has The Required Small UAS Business Experience And Technical Expertise To Be Granted A Section 333 Exemption.

MTSI is a sUAS operator and high precision aerial photogrammetry provider that currently supports Department of Defense (DoD) and Department of Homeland Security (DHS) programs under restricted airspace operations and rules. MTSI has several in-house airworthiness and safety engineers who between them have over 50 years of experience in the manned and unmanned military and civil aviation certification business, and who are experts in UAS design standards and policy. These activities assist both good decision-making and influence safety culture within the company in the pursuit of safe sUAS operations and the mitigation and control of any associated risks.

Additionally, MTSI is a member of three of the six Federal Aviation Administration (FAA) UAS Test Sites and has several trained UAS pilots/operators who participate in test missions using sUAS. MTSI also supports the DHS Robotic Aircraft for Public Safety (RAPS) program as a Test and Evaluation (T&E) services provider, and in doing so has an industry wide understanding of current and emerging technologies in the UAS market place.

In bringing together our breadth of experience as a small UAS operator, precision photogrammetric analysis, certification experience, and business safety culture, our claim is that we are suitably experienced and qualified to safely operate the C-Astral Aerospace BRAMOR rTK (BRAMOR rTK) for commercial high precision photogrammetric operations.

II. Grating A Waiver To MTSI Is In The Public Interest.

From a Public Interest perspective, the FAA should grant a waiver to MTSI because MTSI use of the BRAMOR rTK will be in lieu of comparatively hazardous manned operations that are conducted with either fixed wing and/or rotary aircraft. Accordingly, the FAA can have confidence that there is at least an equivalent level or greater level of safety in the provision of precision photogrammetric services. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities under Section 333(c) of the Reform Act to "establish requirements for the safe operation of such aircraft systems in the national airspace system."

Further, as use of the BRAMOR rTK provides very high quality imagery at a fraction of the cost of using conventional manned aircraft for the same mission type, these savings result in enhanced efficiency and productivity for the affected activities, as well as environmental and safety benefits for the public at large.

III. MTSI Will Operate The BRAMOR rTK Small Unmanned Aircraft System Manufactured By C-Astral Aerospace.

The requested exemption would permit MTSI commercial operation of the BRAMOR rTK to perform precision aerial photogrammetry. The BRAMOR rTK takes a series of high quality, still digital images that are used to produce precision digital maps. Applications for these UAS devices and associated data processing functions include agriculture, mining volumetrics, habitat research, utilities/infrastructure inspection and geo-registered photogrammetry.

The BRAMOR rTK is comprised of an air and ground segment, consisting of a state of the art Global Positioning System (GPS) on board receiver, a portable Ground Control Station (GCS), the BRAMOR rTK Unmanned Aircraft (UA) blended wing body modular airframe with multiple sensor options, and catapult launcher to support takeoff operation. The BRAMOR rTK UAS combines high precision autonomous operations with data acquisition, turbulent air penetration and stability with long endurance. The BRAMOR rTK has a maximum gross weight of approximately 9 pounds 11 ounces, while having a platform length of 37.8 inches, a wingspan of 90.5 inches, a center module length of 26.4 inches, and a maximum speed of approximately 48 knots. The BRAMOR rTK is equipped with one main propeller, driven by a Lithium Polymer battery powered electric motor.

The BRAMOR rTK safety features include:

- Mature airframe design and autopilot
- Programmed lost link and loss of GPS signal procedures
- Low energy landing configuration via parachute deployment
- Emergency pilot override and control of parachute deployment
- Primary control through FCC approved 900MHz frequency transmission
- Configuration controlled Autopilot software based on the Lockheed Martin Kestral Autopilot and Procerus Virtual Cockpit Ground Control Station (GCS)

The BRAMOR rTK that will be operated by MTSI will be registered in accordance with 49 U.S.C. 44103, *Registration of Aircraft*, as well as 14 C.F.R Part 47, *Aircraft Registration*, and marked in accordance with 14 C.F.R. Part 45, *Identification and Registration Marking*.

IV. MTSI Will Operate The BRAMOR rTK Under The Following Operating Parameters.

MTSI will operate and maintain the BRAMOR rTK under controlled conditions at low altitude and in airspace as described herein. It will be operated by individuals who have an FAA approved Pilot License (at a minimum a Private Pilot License). The Operators (Pilot In Command)(PIC) and the Visual Observer (VO) are given BRAMOR rTK training by qualified MTSI trainers who have previously attended the C-Astral Aerospace, Original Equipment Manufacturer (OEM) training program. Finally, MTSI will communicate to the FAA through the certificate of waiver authorization (COA) process regarding the airspace in which the sUAS will operate.

V. Organizational Safety Culture And Design Features Of The BRAMOR rTK.

In addition to operational conditions and procedures, the safety arguments that MTSI offers to operate a BRAMOR rTK are as follows:

- Positive MTSI safety culture and relevant experience
  - — Corporate Safety Management Systems (SMS) approved at the CEO level
  - — Prior experience operating sUAS for U.S. DoD customers on military ranges
  - — Experienced pilots are type trained on the BRAMOR rTK safety commands and

system safety features, to include parachute folding and stowing, and setting up the launch catapult

— Led FAA Safety Certification effort for UAS Texas Test site; additionally, MTSI's current role is as Safety Manager

- Selection of a safe UAS design
  — MTSI selected the BRAMOR rTK as a safe design that met the functional requirements for precision photogrammetry missions. The ability of the pilot to configure autopilot and parachute behavior modes (for primary failures and degraded flight conditions such as low battery, lost link and lost GPS signal) was seen as positive mitigation for design hazards relating to personal injury, or damage to property.

THEREFORE, in accordance Section 333, MTSI seeks an exemption from the requirements of 14 C.F.R §§ 61.113(a) & (b), 91.7(a), 91.119, 91.151(b), 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a) (2), and 91.417(a) & (b), to operate a sUAS pursuant Section 333 of the FMRA, in order to expand services to a wider commercial customer base. The objective of MTSI high precision aerial photogrammetry is to provide niche data products for a variety of commercial, public, and residential uses, specifically targeting:

- Agriculture
- Ranching
- Mining
- Infrastructure

BASIS FOR PETITION

Pursuant to the provisions of the Federal Aviation Regulations (FAR) (14 C.F.R. § 11.61) and Section 333 of FMRA, *Special Rules for Certain Unmanned Aircraft Systems*, Petitioner (MTSI), petitions the Administrator, for an exemption from the requirements of 14 C.F.R §§ 61.113(a) & (b), 91.7(a), 91.119, 91.151(b), 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), and 91.417(a) & (b), to operate the BRAMOR rTK UAS in the NAS, for the commercial purpose of conducting high precision aerial photogrammetry.

According to the relevant speed, weight, size, and limited operating area associated with the unmanned aircraft and its operation, MTSI proposed operation of BRAMOR rTK UAS meets the

conditions of FMRA Section 333 and therefore, will not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H.

In accordance with 14 C.F.R. § 11.81, MTSI provides the following information in support of its petition for exemption:

I. Name And Address Of The Petitioner.

The name and address of the Petitioner and point of contact is:

Modern Technology Solutions, Inc.
5285 Shawnee Road, Suite 400
Alexandria, VA 22312
POC: Matthew Aljanich
703-564-3829
Email: matt.aljanich@mtsi-va.com

II. The Specific Sections Of 14 C.F.R. From Which MTSI Seeks Exemption.

1. MTSI seeks Exemption From The Requirements Of Section 61.113(a) And (b).

Section 61.113, entitled Private Pilot Privileges and Limitations: *Pilot in command*, subsections (a) and (b) prescribe the following, in relevant part:

(a) No person who holds a private pilot certificate may act as a pilot in command (PIC) of an aircraft that is carrying passengers or property for compensation or hire; nor may that person, for compensation or hire, act as PIC of an aircraft.

(b) A private pilot may, for compensation or hire, act as PIC of an aircraft in connection with any business or employment if—

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

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

2. MTSI Seeks Exemption From The Requirements Of Section 91.7(a).

Section 91.7, entitled *Civil aircraft airworthiness*, subsection (a), states the following:

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

3. MTSI Seeks Exemption From The Requirements of Section 91.119.

Section 91.119, entitled *Minimum safe altitude: General*

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.

4. MTSI Seeks Exemption From The Requirements Of Section 91.151(a).

Section 91.151, entitled Fuel requirements for flight in VFR conditions, subsection (a), states the following:

> (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.

5. MTSI Seeks Exemption From The Requirement Of Section 91.405(a).

Section 91.405, entitled *Maintenance required*, subsection (a), states the following:

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[.]

6. MTSI Seeks Exemption From The Requirements Of Section 91.407(a)(1)

Section 91.407, entitled *Operation after maintenance, preventive maintenance, rebuilding, or alteration*, subsection (a)(1), states the following:

(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[.]

7. MTSI Seeks Exemption From The Requirements Of Sections 91.409 (a)(2).

Section 91.409, entitled *Inspections*, subsection (a), states the following:

(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 –

(2) An inspection for the issuance of an airworthiness certificate in accordance with part 21 of this chapter.

8. MTSI Seeks Exemption From The Requirements Of Sections 91.417(a) And 91.417(b).

Section 91.417, entitled *Maintenance records*, subsections (a) and (b), state the following:

(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.

III. The Extent Of Relief MTSI Seeks And The Reason MTSI Seeks The Relief.

1. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Section 61.113(a) And (b).

MTSI requests relief from Section 61.113(a) and (b) entitled *Private pilot privileges and limitations: Pilot in command*, to the extent necessary to allow a PIC holding at least a private pilot certificate (or higher level certificate), as well as a current and valid airman medical certificate, and who has met certain flight-hour and currency requirements, to conduct high precision aerial photogrammetry using the BRAMOR rTK UAS for compensation or hire (commercial purposes).

MTSI requests this relief because the limitations set forth in Section 61.113(a) and (b) state that a private pilot may, for compensation or hire, act as PIC of an aircraft in connection with any business or employment if: (1) The flight is only incidental to that business or employment; and (2) The aircraft does not carry passengers or property for compensation or hire.

Unlike a conventional aircraft that carries a pilot, passengers, and cargo, the pilot of the BRAMOR rTK is remotely controlling an unmanned system carrying a camera as payload only. While the BRAMOR rTK has a high degree of pre-programmed and autonomous control, MTSI plans to use a UAS Type experienced, manufacturer trained, and FAA qualified private pilot for all operations, from mission planning through to managing the control of the BRAMOR rTK during the mission.

The BRAMOR rTK has an autonomous navigation and control system based on the Lockheed Martin Kestral Autopilot and Procerus Virtual Cockpit GCS. Flights are not directed by a

pilot in the UAS flight control loop once the BRAMOR rTK is airborne. All flights are pre-programmed based on GPS coordinates and guidance, and do not require pilot intervention unless there is an unplanned event or equipment malfunction. Automated fail-safe functions (event triggers and programmed UAS behavior) are shown in Figure 2.

In the case of unplanned events, the operator pre-programmed behaviors are issued from the BRAMOR rTK autopilot. Pre-programmed operator interventions include fly-level, fly-home, roll 20deg, climb to min Height Above Ground (HAG) and deploy parachute. At any time, the operator can also override the autopilot and command the parachute deployment.

Given the fail-safe features of the BRAMOR rTK design, MTSI proposes that UAS operators should not be required to hold a commercial pilot certification and that an equivalent level of safety will be provided by allowing operation using a private pilot's certificate under the conditions described in this Petition. Moreover, MTSI submits that an equivalent level of safety will be maintained because no PIC will be allowed to operate the BRAMOR rTK UAS unless that PIC has met certain flight-hour and currency requirements, demonstrating that the PIC is able to safely operate either the BRAMOR rTK UAS in a manner consistent with the operations specifications as described in this exemption, to include evasive and emergency maneuvers, as well as maintaining appropriate distances from people, vessels, vehicles and structures.

Additionally, MTSI provides that all flights of the BRAMOR rTK UAS, conducted by the operator pursuant to the grant of this Petition: (1) will be incidental to MTSI's business; and (2) will not carry passengers or property for compensation or hire.

2. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Section 91.7(a).

MTSI seeks relief from Section 91.7(a) entitled *Civil aircraft airworthiness*, to the extent required to allow MTSI to determine that the BRAMOR rTK UAS is in airworthy condition prior to every flight by ensuring that the UAS is in compliance with the BRAMOR rTK Operators Manual, BRAMOR rTK Maintenance Manual, MTSI BRAMOR rTK SOP, and MTSI SMS.

MTSI seeks the requested relief because the BRAMOR rTK UAS does not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H. While MTSI intends to conduct commercial operation of the BRAMOR rTK without an airworthiness certificate, MTSI will

adhere to maintenance and inspection schedules in accordance with the BRAMOR rTK Maintenance Manual, BRAMOR rTK Operators Manual and the MTSI BRAMOR rTK SOP. This will provide an adequate and appropriate level of continuing airworthiness and flight safety through compliance with manufacturer inspections and checklists prior to, during, and after each flight. Therefore, MTSI will ensure that the BRAMOR rTK UAS is in airworthy condition based upon compliance with the prescribed operating documents prior to every flight.

3. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Section 91.119.

MTSI seeks relief from Section 91.119 entitled *Minimum Safe Altitudes*, to the extent required to allow MTSI to conduct sUAS Operations not higher than 400 feet Above Ground Level (AGL), while avoiding congested or populated areas that are depicted in yellow on VFR sectional charts. All operations will be planned in feet AGL and any altitude reported to ATC also in feet AGL. The MTSI operator will also ensure that a minimum safe altitude AGL is established during the preparation and execution of each mission. MTSI seeks the requested relief from section 91.119 because BRAMOR rTK operations will occur no higher than 400 feet AGL.

Further, no flight will be planned or executed without the permission of the land owner or those who control the land and access to it. By providing advance notice to the landowner, affected individuals will be aware of the MTSI sUAS operations.

As shown in Figure 2, emergency landing via parachute is both pre-programmable and operator initiated from the GCS in the event of failures or hazardous conditions being present. The BRAMOR rTK with parachute deployed is highly conspicuous and has a low energy state at landing (approx. 60J, based on a 5 m/s descent velocity).

4. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Section 91.151(a).

MTSI seeks relief from Section 91.151(a) entitled *Fuel requirements for flight in VFR conditions*, to the extent required to allow flights of the Lithium Polymer battery powered BRAMOR rTK UA during daylight hours in visual meteorological conditions (VMC), under visual flight rules (VFR), while maintaining sufficient reserve battery power for controlled recovery to the planned landing area. The Operator accomplishes this by both autonomous and manual monitoring

of battery health. A low battery voltage triggers a "land now" command as configured in Figure 2. MTSI seeks the requested relief because without an exemption from Section 91.151(a), the flight time duration of the battery powered BRAMOR rTK UA will unduly constrain the practicality of precision aerial photogrammetry flight operations that MTSI proposes to conduct in connection to this Petition.

Under typical flight conditions, the BRAMOR rTK batteries provide approximately 150 minutes of powered flight. Through procedural adherence to VFR conditions and BRAMOR rTK operating limits, voltage monitor is an acceptably safe method to allow the UAS to return to its planned landing zone, from anywhere within the envisaged operating range to be used for photogrammetric data collection missions.

4. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Sections 91.405(a), 91.407(a)(1), 91.409(a)(2).

Because Sections 91.405(a), 91.407(a)(1), 91.409(a)(2) require an aircraft operator or owner to have the aircraft inspected, repaired, returned to service by an authorized person, and inspected for issuance of an airworthiness certificate, MTSI seeks relief from these Sections to the extent maintenance of the BRAMOR rTK will be performed by approved MTSI UAS operators, in accordance with the BRAMOR rTK Maintenance Manual and the BRAMOR rTK Operator Manual; moreover, the BRAMOR rTK UAS does not require an airworthiness certificate because it meets the conditions of FMRA Section 333 for operation without an airworthiness certificate. This approach will ensure that the BRAMOR rTK UAS is in airworthy condition and full working order prior to initiating flight, or after having maintenance or repairs performed.

Due to the simplicity of the system, quarterly, and yearly inspections are not required. Inspections conducted in normal daily operations (identified below) are sufficient for all flight operations:

- Pre-flight inspection (completed prior to the start of the day's flight operations)
- Turnaround inspection (completed between flight events)
- Post-flight inspection (completed after the conclusion of flight operations)

In accordance with the MTSI BRAMOR rTK SOP, all maintenance actions preformed will require the completion of a Maintenance Action Form (MAF). All MAFs will be kept in Aircraft Discrepancy Books (ADB). All maintenance actions will be inspected by a qualified second party

prior to being signed off as completed. At the completion of a flight event, the PIC shall log any discrepancies observed in the ADB. Furthermore, MTSI will document and maintain all maintenance records for the BRAMOR rTK UAS.

5. Extent Of Relief MTSI Seeks And The Reason MTSI Seeks Relief From Sections 91.417(a) & (b).

Because Sections 91.417(a) & (b) requires that the aircraft operator or owner keeps records of maintenance and/or alterations, showing that maintenance work that has been accomplished by certificated mechanics, or licensed pilots, MTSI seeks relief from these Sections to the extent maintenance records of the BRAMOR rTK will be kept by approved MTSI UAS operators, in accordance with the BRAMOR rTK Maintenance Manual, the MTSI-BRAMOR rTK Standard Operating Procedure (SOP), and the BRAMOR rTK Operator Manual. Further, discrepancy log books will be kept for both the aircraft and GCS components that will contain all closed and/or open maintenance actions performed. As stated above, MTSI will document and maintain all maintenance records for the BRAMOR rTK UAS.

IV. The Reasons Why Granting MTSI Request Would Benefit The Public As A Whole.

A granting of the present Petition by the Administrator will further the public interest by allowing MTSI, using an environmentally sensitive commercial approach, to safely, efficiently, and economically perform high precision aerial photogrammetry across agriculture, ranching, landscape, mining and infrastructure over certain areas of the United States.

1. The Public Will Benefit From Decrease Of Comparatively Hazardous Manned Operations In The NAS.

In this instance, the Administrator should grant relief to MTSI because MTSI use of the BRAMOR rTK will be in lieu of comparatively hazardous manned operations that are conducted with either fixed wing and/or rotary aircraft. Accordingly, the FAA can have confidence that there is at least an equivalent level or greater level of safety in the provision of precision photogrammetric services. Approval of this exemption would thereby enhance safety and fulfill the Secretary of Transportation's (the FAA Administrator's) responsibilities under Section 333(c) of the Reform Act to "establish requirements for the safe operation of such aircraft systems in the national airspace system."

Additionally, by reducing the amount of manned aircraft needed to perform of precision photogrammetric aerial services, an exemption allowing the use of a BRAMOR rTK UAS will reduce the amount of manned aircraft in the NAS, reduce noise and air pollution, as well as increase the safety of life and property in the air and on the ground. This also has a positive corresponding effect on reducing the amount of air traffic handled by air traffic control during the ground, takeoff, departure, arrival, and landing phases of flight operations, as the BRAMOR rTK UA does not require an airport to takeoff or land.

2. The Public Will Benefit From The Safety And Efficiency Of The BRAMOR rTK UAS.

The BRAMOR rTK provides very high quality imagery at a fraction of the cost of using conventional manned aircraft for the same mission type, these savings result in enhanced efficiency and productivity for the affected activities, as well as environmental and safety benefits for the public at large. The BRAMOR rTK UA is Lithium Polymer battery powered and serves as a safe, efficient, and economical alternative to the manned aircraft traditionally utilized to obtain aerial imagery. By reducing the amount of manned aircraft needed to conduct high precision aerial photogrammetry, an exemption allowing the use of a BRAMOR rTK UAS will reduce the amount of manned aircraft in the NAS, reduce noise and air pollution, as well as increase the safety of life and property in the air and on the ground.

By using the BRAMOR rTK UAS to perform aerial photogrammetry, the substantial risk to life and property in the air and on the ground, which is usually associated with traditional manned aircraft flight operations, will be substantially reduced or completely eliminated. Aside from the lack of flight crew members located onboard the aircraft, the BRAMOR rTK UA (weighing approximately 9 pounds 11 ounces at maximum gross weight with a platform length of 37.8 inches, a wingspan of 90.5 inches, a center module length of 26.4 inches, and with no fuel on board), has less physical potential for collateral damage to life and property on the ground, and in the air, compared to the manned aircraft that typically conduct similar operations (e.g., Cessna Skylane 182T, weighing approximately 3,000 pounds with a wingspan of approximately 36 feet, a length of 29 feet, and a fuel capacity of 1,140 lbs.). The BRAMOR rTK with parachute deployed is highly conspicuous and has a low energy state at landing, approximately 60J, based on a 5 m/s descent velocity. (According to a DoD Tri-Service group evaluating applicable NATO STANAG's,

STANAG 4703 and STANAG 4746, studies indicate that the probability of fatality resulting from impacts from small UAS, occurring at or below an energy state of 66J, is extremely improbable.)

V. The 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 MTSI Seeks An Exemption.

1. Reasons Why The BRAMOR rTK UA Meets The Conditions Of The FAA Modernization and Reform Act of 2012 (FMRA) Section 333.

Due to the size, weight, speed, and limited operating area associated with the BRAMOR rTK UAS and associated operation, MTSI believes operation of the BRAMOR rTK UAS meets the conditions of FMRA Section 333, and therefore, will not require an airworthiness certificate in accordance with 14 C.F.R. Part 21, Subpart H.

FMRA Section 333 provides authority for a UAS to operate without airworthiness certification and identifies the requirements for considering whether a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security. In part, FMRA Section 333 states the following:

> *(b) Assessment of Unmanned Aircraft Systems.--In making the determination under subsection (a), the Secretary shall determine, at a minimum—*
>
> *(1) which types of unmanned aircraft systems, if any, as a result of their size, weight, speed, operational capability, proximity to airports and populated areas, and operation within visual line of sight do not create a hazard to users of the national airspace system or the public or pose a threat to national security; and*
>
> *(2) whether a certificate of waiver, certificate of authorization, or airworthiness certification under section 44704 of title 49, United States Code, is required for the operation of unmanned aircraft systems identified under paragraph (1).*
>
> *(c) Requirements for Safe Operation.--If the Secretary determines under this section that certain unmanned aircraft systems may operate safely in the national airspace system, the Secretary shall establish requirements for the safe operation of such aircraft systems in the national airspace system.*

By seeking this exemption, MTSI submits that the BRAMOR rTK UAS can operate safely in the NAS pursuant to FMRA Section 333, as demonstrated by: (a) the characteristics of the BRAMOR rTK UAS; (b) the pilot certification requirement; and (c) the specific operating limitations.

a. The Specifications Of The BRAMOR rTK UAS Demonstrate Its Safe Characteristics.

The BRAMOR rTK UAS does not create a hazard to users of the NAS or the public, or otherwise pose a threat to national security considering its size, weight, speed, and operational capability.

i. Technical Specifications Of The BRAMOR rTK UAS.

The technical specifications of the BRAMOR rTK are set forth by the BRAMOR rTK Specifications and Data Sheet, attached hereto as Annex A.

ii. The BRAMOR rTK UAS Autonomous Flight And Navigation Modes Enable The UAS To Remain Within A Defined Operational Area.

The BRAMOR rTK UAS may be operated in both manual and fully autonomous flight modes, enabling it to remain within a defined operating area. A complete description of the flight and navigational modes of the BRAMOR rTK UAS is in the BRAMOR rTK User Manual, attached hereto as Annex B.

iii. The BRAMOR rTK UAS Has Programmed Lost Link And Loss Of GPS Signal Procedures, And Includes A Parachute Recovery System.

When the Control Link is lost, the BRAMOR rTK UA has programmed lost link and loss of GPS signal procedures. The design features include a low energy landing configuration via parachute deployment, and emergency pilot override and control of the parachute deployment system.

A complete description of the Failsafe Functions of the BRAMOR rTK UAS is set forth in the BRAMOR rTK User Manual, attached hereto as Annex B.

iv. The BRAMOR rTK GCS And Its Operation.

A complete description of the operation and specifications of the BRAMOR rTK GCS and flight control software is provided in the BRAMOR rTK User Manual. The BRAMOR rTK User Manual is attached as Annex B.

b. Flight Operations Of BRAMOR rTK UAS Is Limited To The Line Of Sight Of A Certificated Pilot in Command With A Visual Observer.

MTSI will only utilize certificated pilots who possess a current and valid airman medical certificate to act as a pilot in command (PIC) of the BRAMOR rTK UAS. Additionally, a visual observer will assist all pilots during flight time.

c. Flights Of BRAMOR rTK UAS Will Be Conducted Pursuant To Specific Operating Limitations.

In seeking this exemption, MTSI proposes to commercially operate BRAMOR rTK UAS for the special purpose of conducting high precision aerial photogrammetry over certain areas of United States, pursuant to the following specific operating limitations:

1. All operations will occur less than 400ft AGL and at velocities <45kts (or 23m/s).
2. All altitudes reported to Air Traffic Control (ATC) will be in feet AGL.
3. All operations will be conducted in Class G airspace, not within 5 nautical miles of the geographic center of an airport, and not over congested or densely populated areas depicted in yellow on VFR charts.
4. Air Traffic Organization (ATO) issued civil COA's will be obtained prior to operations
5. Operations will be limited to private or controlled access property with permission from the land- owner or authorized representative for each mission.
6. Operations will be limited to Visual Meteorological Conditions (VMC) and Visual Flight Rules (VFR).
7. Operations will occur during civil daylight hours only.
8. Operations will remain clear of manned aircraft flights.

9. BRAMOR rTK aircraft will be operated to remain within unaided Visual Line of Sight (VLOS).
10. Required permissions and permits will be obtained from territorial, state, county or city jurisdictions, including local law enforcement, fire, or other appropriate governmental agencies where this is necessary.
11. Maximum weight of the BRAMOR rTK aircraft will be <5kg.
12. BRAMOR rTK Operators Manual will be available at each operating location.
13. Maintenance and Functional Test Flights will be performed after any servicing or repairs in accordance with the BRAMOR rTK Maintenance Manual.
14. Preflight Inspections will be performed before every mission.
15. Operators (Pilot In Command (PIC) and the Visual Observer (VO)) are given BRAMOR rTK training by qualified MTSI trainers who have previously attended the C-Astral, Original Equipment Manufacturer (OEM) training program.
16. Operators will comply with OEM Safety Bulletins and maintain the UAS in an airworthy condition.
17. PIC will hold a current FAA issued Private Pilot License and third class medical certificate.
18. PIC will be current before commercial operations are performed and will record all hours and dates flown in a log book.
19. Normal and emergency procedures and checklists are available and briefed before each mission.
20. Abort criteria are detailed in pre-mission briefings to all participants.
21. PIC will ensure operations only continue with an aircraft battery voltage between 16.8v - 14.6v and GCS battery voltage above 10.0v.
22. MTSI owned BRAMOR rTK will have registered serial number and its FAA identification markings (N-number) will be externally visible and as large as practicable.

23. BRAMOR rTK GCS complies with authorized 900Mhz FCC radio frequency spectrum usage.

24. No operations will be conducted from moving platforms.

25. Operations will remain at least 500ft from nonparticipating persons. Permitted vessels, vehicles and structures that are within 500ft will require the PIC to complete a safety risk assessment worksheet to ensure there is no undue hazard present. A record of the risk assessment will be kept as a temporary Annex to the MTSI BRAMOR rTK Standard Operating Procedure (SOP) for that mission.

26. Incidents exceeding limits or operating conditions as described, or that result in injury or damage to property (other than the sUAS itself), will be reported to the FAA UAS Integration Office (AFS-80) and NTSB within 24hrs. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

2. Reasons Why An Exemption From The Requirements Of Section 61.113(a) And (b) Would Not Adversely Affect Safety.

MTSI petitions that the equivalent level of safety established by Section 61.113(a) and (b) will be maintained because no PIC will be allowed to operate the BRAMOR rTK UAS unless that PIC has demonstrated, by meeting minimum flight-hour and currency requirements, that the PIC is able to safely operate the BRAMOR rTK UAS in a manner consistent with the exemption, to include evasive and emergency maneuvers, and maintaining appropriate distances from people, vessels, vehicles and structures.

Given the fail-safe features of the BRAMOR rTK design, MTSI proposes that UAS operators should not be required to hold a commercial pilot certification and that an equivalent level of safety will be provided by allowing operation using a private pilot's certificate under the conditions described in this Petition.

Unlike a conventional aircraft that carries a pilot, passengers, and cargo, the pilot of the BRAMOR rTK is remotely controlling an unmanned system carrying a camera as payload only. While the BRAMOR rTK has a high degree of pre-programmed and autonomous control, MTSI

plans to use a UAS Type experienced, trained, and FAA qualified private pilot for all operations; from mission planning through to managing the control of the BRAMOR rTK during the mission.

The BRAMOR rTK has an autonomous navigation and control system based on the Lockheed Martin Kestral Autopilot and Procerus Virtual Cockpit GCS. Flights are not directed by a pilot in the UAS flight control loop once the BRAMOR rTK is airborne. All flights are pre-programmed based on GPS coordinates and guidance, and do not require pilot intervention unless there is an unplanned event or equipment malfunction. Automated fail-safe functions (event triggers and programmed UAS behavior) are shown in Figure 2.

In the case of unplanned events, the operator pre-programmed behaviors are issued from the BRAMOR rTK autopilot. Pre-programmed operator interventions include fly-level, fly-home, roll 20deg, climb to min Height Above Ground (HAG) and deploy parachute. At any time, the operator can also override the autopilot and command the parachute deployment.

Therefore, considering MTSI proposed area of operations, and the operating limitations set forth-above, the parallel nature of private pilot aeronautical knowledge requirements to those of commercial pilot requirements as identified in Exemption Number 11062, and the airmanship skills necessary to safely operate the BRAMOR rTK UAS, MTSI submits that the additional manned airmanship experience of a commercially certificated pilot would not correlate to the airmanship skills necessary for MTSI's specific proposed flight operations.

MTSI seeks the same FAA grant of relief from Section 61.113(a) and (b) specific to UAS, in circumstances similar to those granted relief in the following Exemption Numbers: 11062, 11063, 11064, 11065, 11066, 11067, 11080, 11109, 11110, 11112, 11136, 11138, 11150, 11153, 11156, 11158, 11159, 11160, and 11161.

MTSI will ensure safe operations by not allowing any PIC to operate the BRAMOR rTK UAS unless that PIC has demonstrated, by meeting minimum flight-hour and currency requirements, that the PIC is able to safely operate the BRAMOR rTK UAS in a manner consistent with the exemption, including evasive and emergency maneuvers and maintaining appropriate distances from people, vessels, vehicles and structures.

3. Reasons Why An Exemption From The Requirements Of Section 91.7(a) Would Not Adversely Affect Safety.

To maintain the equivalent level of safety established by Section 91.7(a), prior to every flight, MTSI will ensure that the BRAMOR rTK UAS is in an airworthy condition based upon the UAS's compliance with its associated operating documents and with the stated conditions and limitations outlined in this Petition.

While MTSI intends to conduct commercial operation of the BRAMOR rTK without an airworthiness certificate, MTSI will adhere to maintenance and inspection schedules in accordance with the BRAMOR rTK Operators Manual and the MTSI BRAMOR rTK SOP. This will provide an adequate and appropriate level of continuing airworthiness and flight safety through compliance with manufacturer inspections and checklists prior to, during, and after each flight.

Moreover, the FAA has previously granted relief from Section 91.7(a) specific to UAS in circumstances similar to those identified in this Petition under Exemption Number 11062, 11063, 11064, 11065, 11066, 11067, 11080, 11109, 11110, 11112, 11136, 11138, 11150, 11153, 11156, 11157, 11158, 11159, 11160, and 11161.

4. Reasons Why An Exemption From The Requirements Of Section 91.151(b) Would Not Adversely Affect Safety.

A grant of this exemption would ensure an equivalent level of safety established by 14 C.F.R. Section 91.151(b) as a result of (1) the technical specifications of the BRAMOR UAS; (2) the limitations on the proposed flight operations; and (3) the location of the proposed flight operations.

Under typical flight conditions, the BRAMOR rTK batteries provide approximately 150 minutes of powered flight. Through procedural adherence to VFR conditions and BRAMOR rTK operating limits, voltage monitor is an acceptably safe method to allow the UAS to return to its planned landing zone, from anywhere within the envisaged operating range to be used for photogrammetric data collection missions. Safe flight, with respect to maintaining sufficient reserve battery power for controlled recovery to the planned landing area, is achieved by both autonomous and manual monitoring of battery health (low battery voltages trigger a "land now" command and is configured as shown in Figure 2).

Accordingly, MTSI will ensure safe operations of the Lithium Polymer battery powered BRAMOR rTK UA during daylight hours in VFR conditions, while maintaining sufficient reserve

battery power for controlled recovery to the planned landing area. The MTSI Operator accomplishes this by both autonomous and manual monitoring of battery health, and initiating recovery when a low battery voltage triggers a command to "land now" as configured in Figure 2.

Previous exemptions granted by the FAA concerning Section 91.151 establish that safety is not adversely affected when the technical characteristics and operating limitations of the UAS are considered. Moreover, the FAA has previously granted relief from Section 91.151 specific to UAS, in circumstances similar to those to those identified in this Petition under Exemption Number's 8811, 10808, 10673, 11042, 11062, 11063, 11064, 11065, 11066, 11067, 11080, 11109, 11110, 11136, 11138, 11150, 11153, 11156, 11157, 11158, 11159, 11160, and 11161.

5. Reasons Why An Exemption From The Requirements Of Sections 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), And 91.417(a) & (b) Would Not Adversely Affect Safety.

In seeking this exemption, MTSI submits that the equivalent level of safety with regard to the regulatory maintenance and alteration requirements established by Sections 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), and 91.417(a) & (b) will be met because maintenance of the BRAMOR rTK will be performed by approved MTSI UAS operators, in accordance with the BRAMOR rTK Operator Manual and the BRAMOR rTK Maintenance Manual. This will ensure that the BRAMOR rTK UAS is in airworthy condition and full working order prior to initiating flight, or after having maintenance or repairs performed.

Due to the simplicity of the system, quarterly, and yearly inspections are not required. Inspections conducted in normal daily operations (identified below) are sufficient for all flight operations:

- Pre-flight inspection (completed prior to the start of the day's flight operations)
- Turnaround inspection (completed between flight events)
- Post-flight inspection (completed after the conclusion of flight operations)

In accordance with the MTSI BRAMOR rTK SOP, all maintenance actions preformed will require the completion of a Maintenance Action Form (MAF). All MAFs will be kept in Aircraft Discrepancy Books (ADB). Furthermore, MTSI will document and maintain all maintenance records for the BRAMOR rTK UAS.

Maintenance records for the BRAMOR rTK will be kept by approved MTSI UAS operators, in accordance with the BRAMOR rTK Operator Manual, MTSI BRAMOR rTK SOP, and BRAMOR rTK Maintenance Manual. Discrepancy logbooks will be kept for both the aircraft and GCS components, which will contain all closed and/or open maintenance actions performed.

Since the BRAMOR rTK UAS will be inspected as prescribed by the operating documents, MTSI will maintain the equivalent level of safety established by Sections 91.405(a), 91.409(a)(1), and 91.409(a)(2). A copy of the BRAMOR rTK User Manual, the BRAMOR rTK Maintenance Manual, the BRAMOR rTK Operating Manual, and the BRAMOR rTK UAS Maintenance LOG are attached hereto in Annex B.

Similarly, the exemption sought will not adversely affect safety because MTSI will use trained technicians to perform maintenance, alterations or preventive maintenance on the UAS using the practices prescribed by the associated operating documents.

Furthermore, the exemption sought would maintain an equivalent level of safety established by Sections 91.407, 91.417(a) and 91.417(b), because all maintenance of the BRAMOR rTK UAS will be performed by trained technicians. Maintenance will be documented and maintained utilizing the Monthly Maintenance Log, and all maintenance records will be kept on file.

Previous exemptions granted by the FAA concerning Sections 91.405(a), 91.407(a)(1), 91.409(a)(1) & (a)(2), and 91.417(a) & (b) establish that safety is not adversely affected when the technical characteristics and operating limitations of the UAS are considered.

In consideration of MTSI's proposed operating limitations, the operating documents, and the technical aspects of the BRAMOR rTK UAS, MTSI submits that safety will not be adversely affected by granting exemption from 14 C.F.R. Sections 91.405(a), 91.407(a)(1) and (a)(2), 91.409(a)(2), and 91.417(a) and (b). The FAA has previously granted relief specific to UAS in circumstances similar to those identified in this Petition under Exemption Number's 11062, 11063, 11064, 11065, 11066, 11067, 11080, 11109, 11110, 11112, 11136, 11138, 11150, 11153, 11156, 11157, 11158, 11159, 11160, and 11161.

7. The FAA May Prescribe Any Other Conditions For Safe Operation.

In accordance with Section 333 of the FMRA, and 14 C.F.R. § 21.16, entitled *Special Conditions*, MTSI requests that the FAA prescribe special conditions, if any, for the intended

operation of the BRAMOR rTK UAS, which contain such safety standards that the Administrator finds necessary to establish a level of safety equivalent to that established by 14 C.F.R. Part 21, Subpart H, and 14 C.F.R §§ 61.113(a) & (b), 91.7 (a), 91.119, 91.151(a), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) & (b).

Prescribed special conditions will permit safe operation of the UAs for the limited purpose of conducting high precision aerial photogrammetry over certain areas of the United States for compensation or hire. FMRA Section 333 sets forth the requirements when considering if a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security. It also provides the authority for UAS to operate without airworthiness certification in accordance with any requirements that must be established for the safe operation of the UAS in the NAS.

Likewise, the Administrator may prescribe special conditions pursuant to 14 C.F.R. § 21.16, for operation of the BRAMOR rTK UAS, since the airworthiness regulations of 14 C.F.R. Part 21 do not contain adequate or appropriate safety standards for the design features of this aircraft.

Therefore, in accordance with FMRA Section 333 and 14 C.F.R. § 21.16, the FAA may prescribe special safety standards or conditions for MTSI's intended operation of the BRAMOR rTK UAS, which the Administrator finds necessary to establish a level of safety equivalent to that established by 14 C.F.R. Part 21, Subpart H, and 14 C.F.R Sections 61.113(a) & (b), 91.7(a), 91.119, 91.151(a), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) & (b).

VI. A Summary That Can Be Published In The Federal Register, stating: The Rules From Which MTSI Seeks Exemption:

MTSI seeks exemption from the requirements of 14 C.F.R Sections 61.113(a)&(b), 91.7(a), 91.191, 91.151(a), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) & (b).

A Brief Description Of The Nature Of The Exemption MTSI Seeks:

This exemption will permit MTSI to commercially operate a small Unmanned Aircraft System for the purpose of conducting high precision aerial photogrammetry over certain areas of the United States.

VII. Any Additional Information, Views, Or Arguments Available To Support MTSI's Request.

MTSI petitions the Administrator for an exemption to be granted pursuant to the authority of FMRA Section 333 and 14 C.F.R. Part 11, as set forth in this Petition.

FMRA Section 333 sets forth the requirements for considering whether a UAS will create a hazard to users of the NAS or the public, or otherwise pose a threat to national security. It additionally provides the authority for any such UAS to operate without airworthiness certification.

As highlighted in this Petition, MTSI seeks an exemption to operate the BRAMOR rTK UAS in the NAS, because it can be done safely, without creating any hazard to users of the NAS, or the public. It also does not otherwise pose a threat to national security. Further, as MTSI is a respected industry leader in the aviation safety community, MTSI will continue to advocate through experience best practice, and through our in involvement with UAS community organizations like ASTM, RTCA & AUVSI.

CONCLUSION

Pursuant to 14 C.F.R. § 11.61 and Section 333 of the FMRA, MTSI seeks an exemption, which will permit safe commercial operation of the BRAMOR rTK UAS, for the limited purpose of conducting high precision aerial photogrammetry over certain areas of the United States. Approval of the exemption allowing commercial operations of the MTSI owned and operated BRAMOR rTK for precision photogrammetric work, will enhance safety by reducing risk. Conventional manned aerial operations present greater risks associated with grossly higher aircraft weights, energy, carry large quantities of fuel, and passengers. Manned photogrammetry aircraft also fly to and from the imaging location. In contrast, a BRAMOR rTK weighing less than 5kg and powered by batteries eliminates a significant portion of any hazard associated with loss of positive control during routine photogrammetry operations.

In granting this Petition, the FAA Administrator fulfills the Congressional mandate of the FMRA, advances the interests of the public, and allows MTSI to safely, efficiently, and economically operate the BRAMOR rTK UAS commercially within the NAS.

THEREFORE, in accordance with the Federal Aviation Regulations and the FAA Modernization and Reform Act of 2012, Section 333, MTSI respectfully requests that the Administrator grant this Petition for an exemption from the requirements of 14 C.F.R Sections 61.113(a) & (b), 91.7(a), 91.119, 91.151(a), 91.405(a), 91.407(a)(1), 91.409(a)(2), and 91.417(a) &

(b), and permit MTSI to operate the BRAMOR rTK UAS commercially for the purpose of conducting high precision aerial photogrammetry over certain areas of the United States.

Respectfully submitted,

Matthew B. Aljanich

ARTIFACTS

MTSI is submitting (confidentially) the following documents in support of this Petition for the BRAMOR rTK UAS – these documents are proprietary and not for public release:

- C-Astral BRAMOR rTK Specification Sheet
- Lockheed Martin Kestral Autopilot Specification Sheet
- BRAMOR rTK Operators Manual
- BRAMOR rTK Maintenance Manual
- MTSI-BRAMOR rTK Standard Operating Procedure (SOP)
- MTSI-BRAMOR rTK Maintenance Action Form
- BRAMOR rTK Pre-flight Checklist & Emergency Checklists
- MTSI Safety Management System

Annex A - BRAMOR rTK Technical Data (Proprietary)

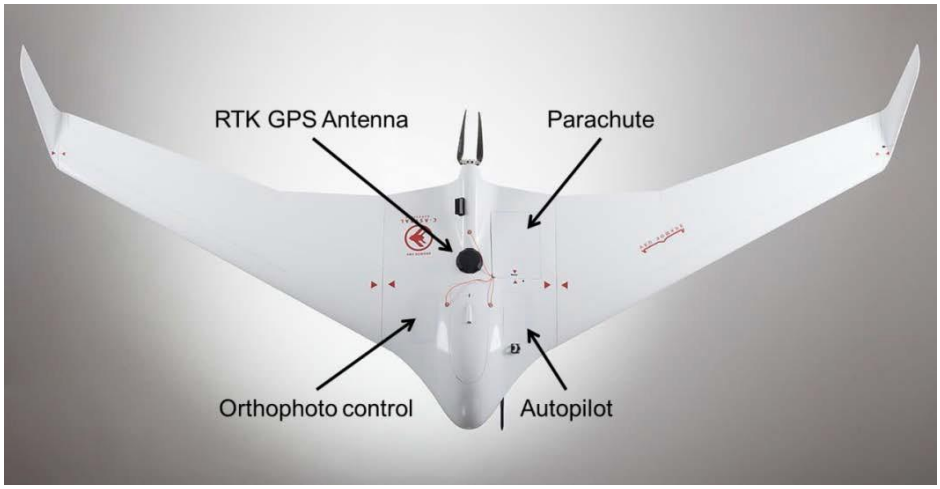


Figure 1 – BRAMOR rTK

Table 1 – Airframe Details

Wingspan	230 cm
Platform length	96 cm
Center module length	67 cm
Engine	Brushless
Onboard power	li-po batteries
Max. T/O Weight	5kg

Table 2 – Flight Envelope

Optimal cruise speed	16m/s
Max horizontal speed	23m/s
Endurance	Up to 150 minutes
Command & control RF	868 MHz or 900 MHz
Command & control range	Up to 40 km
Takeoff	Autonomous / catapult
Navigation	Autonomous / waypoints array
Landing	Autonomous / parachute
Emergency failsafe's	User-Pre-program

Table 3 – Aircraft Limits

Wind speed aloft	12m/s
Min/Max Air Temps	-10C to 45C
Max Altitude	4500m

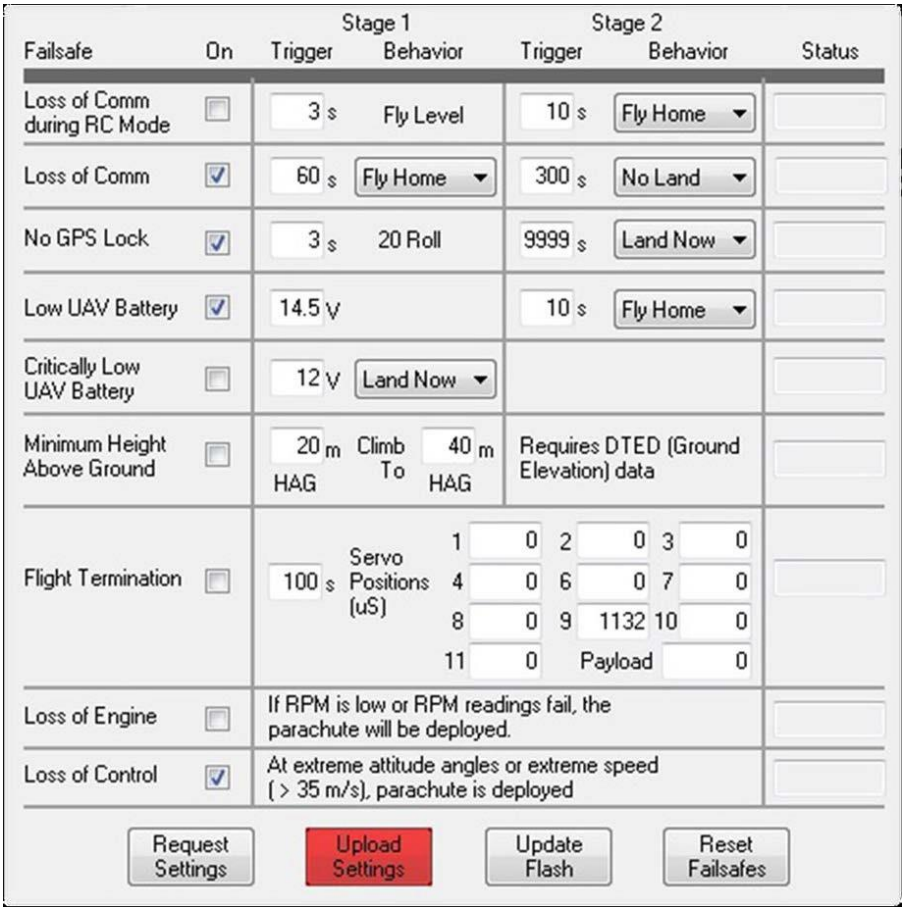
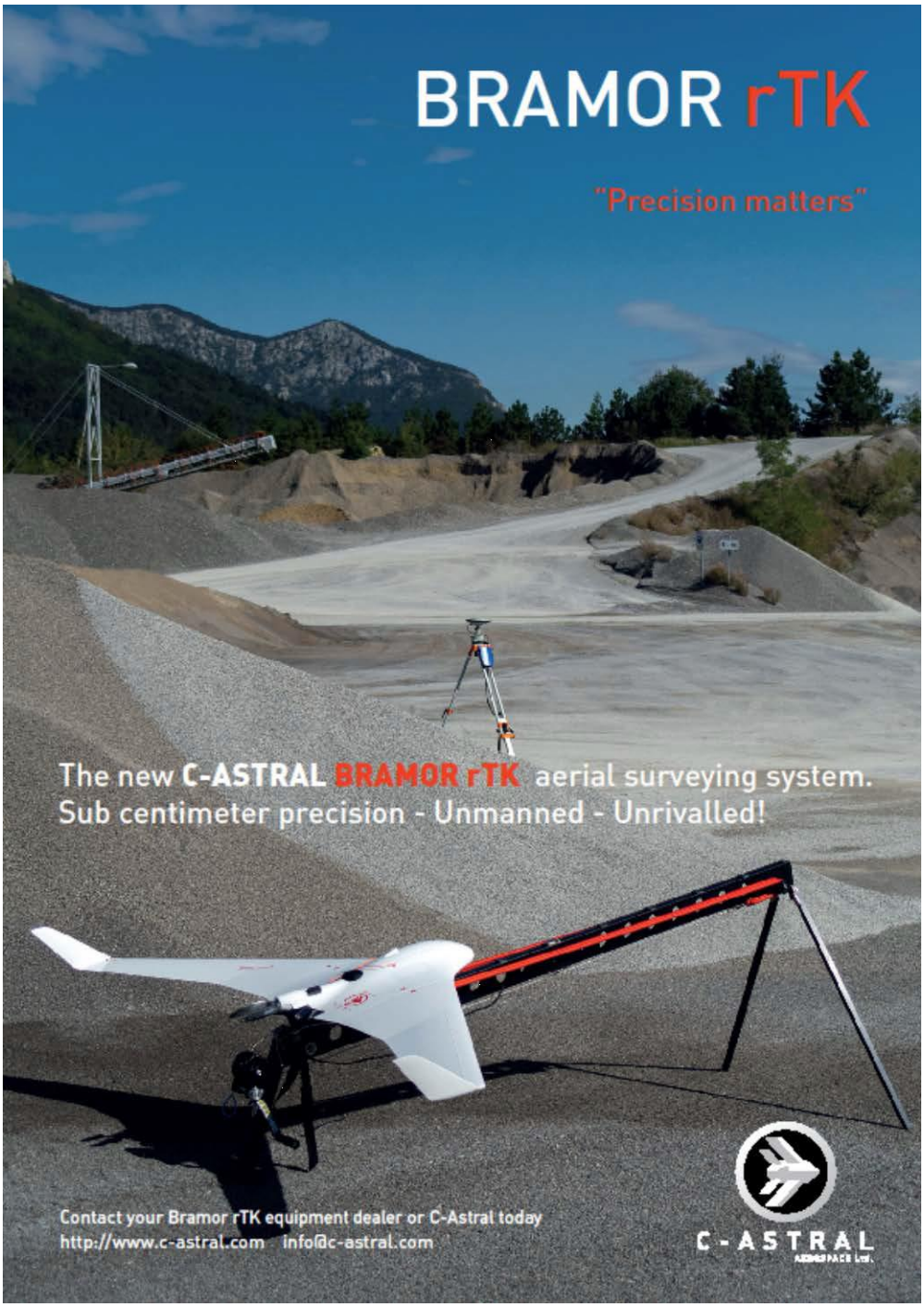


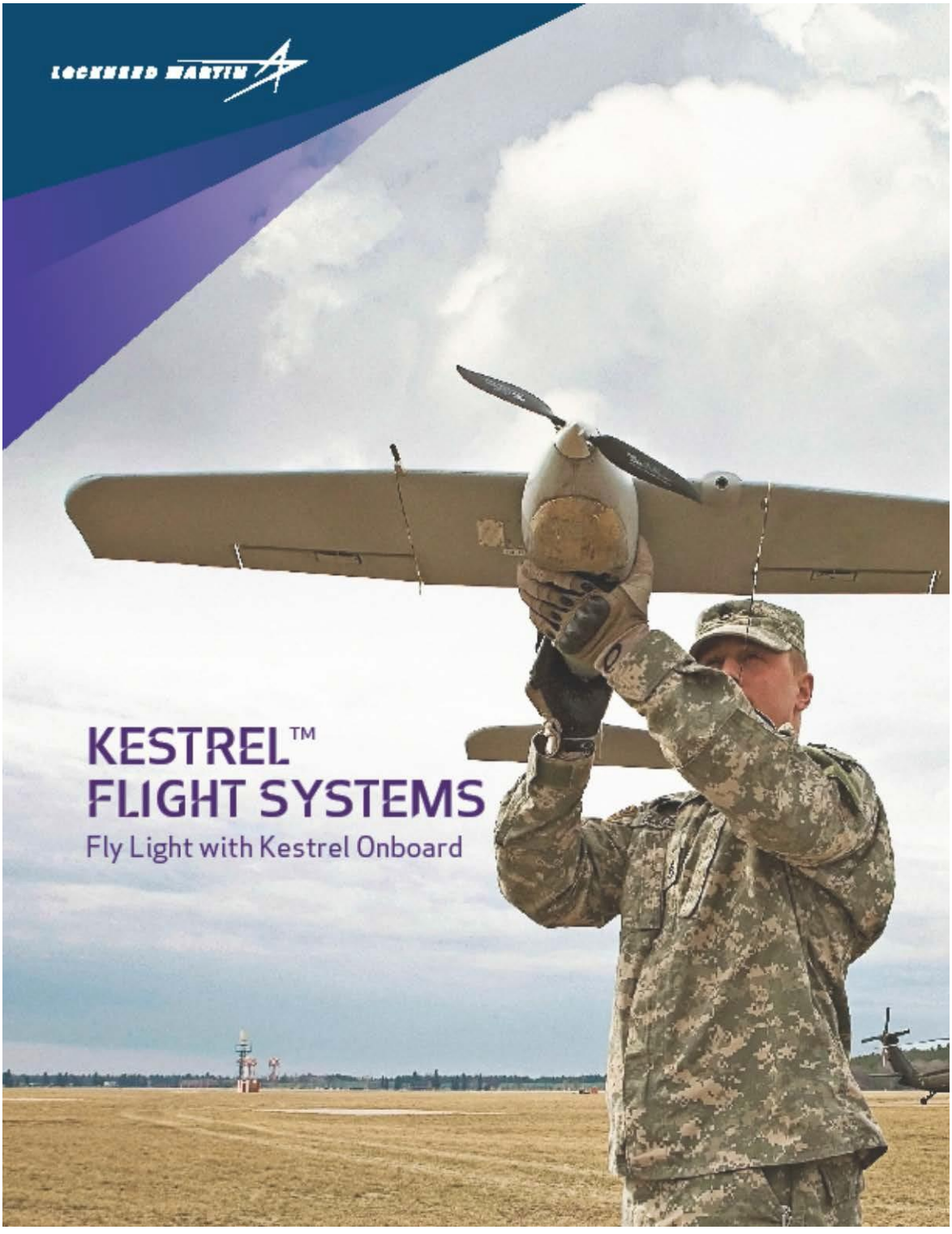
Figure 2 – User Failsafe Configuration

Annex B – Supporting Artifacts (Proprietary)

1. BRAMOR rTK Specification Sheet



2. Kestrel Flight Systems Specification Sheet - Proprietary



3. BRAMOR rTK User Manual - Proprietary

USER MANUAL
FOR ORTOPHOTO AND GIMBAL VERSION WITH VIRTUAL COCKPIT 2.6

19/8/2014
Document Version v1.406

4. BRAMOR rTK Maintenance Manual - Proprietary

BRAMOR UNMANNED AIRCRAFT SYSTEM

MAINTENANCE MANUAL

26/6/2014
Document Version v1.3

5. MTSI-BRAMOR rTK UAS Standard Operating Procedures - Proprietary

MTSI Bramor UAS Standard Operating Procedures

Civil and Commercial Business Unit
National Security Division
MTSI

March 2015

Prepared by:

MODERN TECHNOLOGY SOLUTIONS, INC.
5285 Shawnee Road, Suite 400
Alexandria, VA 22312

6. MTSI-BRAMOR rTK Maintenance Action Form - Proprietary

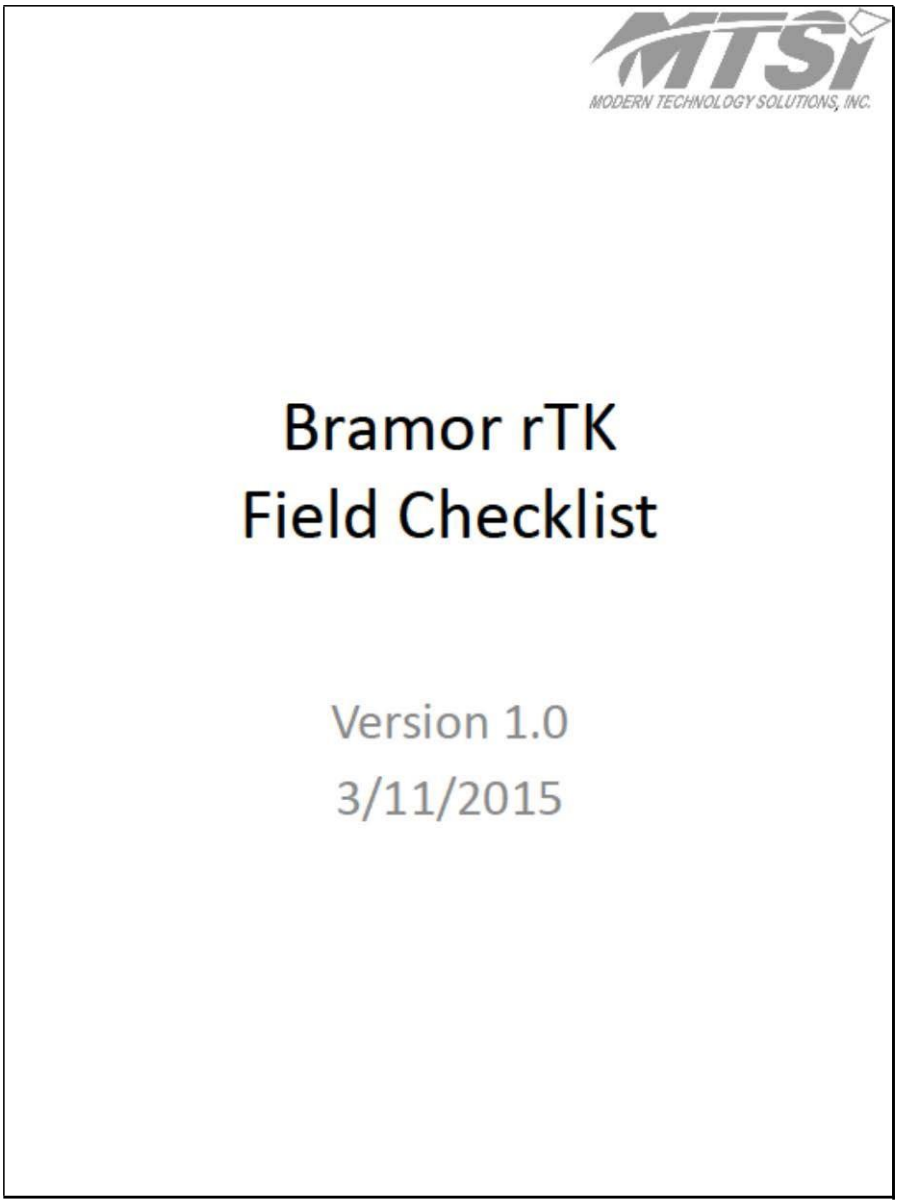
MTSI Maintenance Action Form

Bramor rTK - N-Number:

1	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
2	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
3	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
4	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
5	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
6	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N
7	Date	Maintained By	Component(s)	Maintainence Activity
	Test Flight Y / N	Flight Date	Flown By	Return to Service / Comments Y / N

Sheet Number

7. BRAMOR rTK Pre-flight Checklist & Emergency Checklists - Proprietary



8. MTSI Safety Management System - Proprietary