January 21, 2015

U.S. Department of Transportation
Docket Management System
1200 New Jersey Ave., SE
Washington, DC 20590

Re: Exemption Petition under Section 333 of the FAA Modernization & Reform Act, and Title 14 Part 11 of the Code of Federal Regulations (CFR)

14 CFR Part 21.191
14 CFR Part 45.23, 45.29
14 CFR 61.113, 61.133
14 CFR 91.9, 91.119, 91.121, 91.151
14 CFR 91 Subpart E (91.405, 91.407, 91.409, 91.417)

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization & Reform Act and 14 C.F.R. Part 11, Galaxy UAV Systems (Galaxy), a subsidiary of Galaxy Aviation Inc., a Part 145 FAA Certified Repair Station (FAA Air Agency # 5GXR127C), hereby applies for the grant of exemption from certain Federal Aviation Regulations for Universeye Penguin Unmanned Aircraft (Penguin) manufactured by Finwing Technology of China.
The requested exemption would support an application for a commercial Certificate of Authorization (COA) to use the Penguin to support agriculture and aerial surveying missions utilizing geographic referenced mapping system.
The Penguin consists of a lightweight (5 lb) battery operated fixed wing aircraft, a computer based ground control station (GCS), onboard cameras and associated communications equipment.
The Penguin Unmanned Aircraft has previously demonstrated to have successfully met the safety and operational requirements resulting in approval of a COA by FAA authorizing a major university in Texas to operate it.
The aircraft carries an onboard geographic referenced camera that allows it to perform precision photogrammetry and crop scouting at the resolutions necessary for precision agriculture. This high-resolution data can direct variable seeding rates as well as the precise application of fertilizer and chemicals reducing their use. This data helps farmers to maximize yields while reducing costs and impacts to the environment. By approving the exemption, the UAS will create benefits to both agriculture and the environment which are ultimately in the public interest.

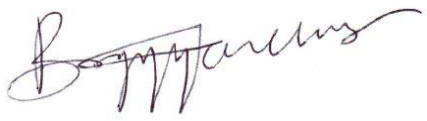
The aircraft will be operated in the field with both a Pilot in Command and a Visual Observer in accordance with FAA order 8900.1 Volume 16 "Unmanned Aircraft Systems" with the following additional restrictions:

- All operations will occur in Class G airspace at no more than 400' AGL
- Operations will be operated over private property with the permission of the land owner
- When necessary, applicable permits will be acquired from local authorities
- The aircraft will not be operated over urban or populated areas
- The aircraft will not be operated at air shows or over an open-air assembly of people
- The aircraft will not be operated over heavily trafficked roads
- The aircraft will not be operated within 5 NM of an airport or heliport
- Operations will be limited to day, visual meteorological conditions
- Aircraft will remain within Visual Line of Sight at no greater than 1/2 NM of the PIC at all time
- While the aircraft is airborne, the VO will be positioned within voice distance to the PIC
- When necessary and applicable, Galaxy will file a NOTAM providing radial/DME, radius, and a date/time group for each operation
- The PIC and VO will meet the requirements outlined in FAA Order 8900.1 Volume 16 “Airmen Certification”.

Additionally, PIC and VO will complete initial training course of maintenance instructions. Due to the simplicity of the system, we do not anticipate the need for a supplemental pilot.
For certain complex operations, Galaxy may assign one or two sensor/software operators near the GCS to process aerial maps utilizing separate computers and photogrammetry software.
We submit that the combination of ;
- Our demonstrated knowledge of Aviation Safety and FARs via our parent company ( Galaxy Aviation Inc. FAA Part 145 CRS # 5GXR127C ),
- Penguin UAV’s light weight and historically demonstrated safe operation and approval of COA
- fully qualified flight crew
- restricted operations under the guidelines established in FAA Order 8900.1,

the FAA can have confidence that Galaxy’s UAS the operations will have an equivalent or greater level of safety of manned aircraft performing the same mission.
We are prepared to modify or amend any part of this request to satisfy the need for an equivalent level of safety. Additional documents supporting this petition will be submitted following this request.
We look forward to working with your office. Please contact us at any time if you require additional information or clarification.

Respectfully,



Bryan Archer
President
Galaxy UAV Systems (a subsidiary of Galaxy Aviation Inc.)
6215 Kirby Lane, Frisco, Texas 75035
Tel: 469-766-0420
Email: bryan.archer@galaxyuav.com

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## NAME, ADDRESS AND CONTACT INFORMATION OF PETITIONER

Galaxy UAV Systems
Attn: Bryan Archer
6215 Kirby Lane
Frisco, Texas 75035
Tel: 469-766-0420
Email: bryan.archer@galaxyuav.com

## THE SPECIFIC SECTIONS OF 14 CFR TO BE RELIEVED FROM

14 CFR Part 21.191
14 CFR Part 45.23, 45.29
14 CFR 61.113, 61.133
14 CFR 91.9, 91.119, 91.121, 91.151
14 CFR 91 Subpart E (91.405, 91.407, 91.409, 91.417)

## THE EXTENT OF RELIEF GALAXY SEEKS AND THE REASONS GALAXY SEEKS THE RELIEF

### 14CFR Part 21.191 Experimental Certificates

This regulation establishes the procedures for the issuance of an airworthiness certificate. While the FAA continues to work to develop airworthiness standards for UAS, we request an experimental certificate be issued for the Penguin under either or both of the following provisions:

> 21.191 Experimental certificates.
> Experimental certificates are issued for the following purposes:
>
> **(a)** ***Research and development.*** Testing new aircraft design concepts, new aircraft equipment, new aircraft installations, new aircraft operating techniques, or new uses for aircraft.
>
> (b) ***Showing compliance with regulations.*** Conducting flight tests and other operations to show compliance with the airworthiness regulations including flights to show compliance for issuance of type and supplemental type certificates, flights to substantiate major design changes, and flights to show compliance with the function and reliability requirements of the regulations.

Since the experimental certificate can be used for commercial purposes such as market surveys, sales demonstrations, and customer crew training, we would expect that an experimental certificate would permit our commercial purpose as well.

The aircraft will not carry persons or property, will not carry fuel, and will only fly under strict operational requirements. Combined with the fact that the aircraft weighs only 5 pounds and is constructed primarily out of foam, we propose that the Penguin UA will be at least as safe, if not safer, than a conventionally certificated aircraft performing the same mission.

If an experimental airworthiness certificate is not appropriate for this application, then we request an exemption of 14 CFR Part 21, Subpart H, and the requirement for an

airworthiness certificate in general, citing the equivalent level of safety outlined in the previous paragraph.

**14 CFR Part 45.23 Display of Marks & 45.29 Size of Marks**

These regulations provide that each aircraft must display "N" and the aircraft's registration number in letters at least 3 inches high. Additionally, the aircraft must display the word "EXPERIMENTAL" in letters at least 2 inches high near the entrance to the cabin, cockpit, or pilot station. The 5 pound Penguin does not have an entrance in which the word "EXPERIMENTAL" can be placed, and may not have a registration number assigned to it by the FAA.

We propose to achieve an equivalent level of safety by including the word "EXPERIMENTAL" on the top of the aircraft, where the PIC, VO and others in the vicinity of the aircraft while it is preparing for launch will be able to see the designation.
If FAA assigns a registration number for the UA, we request that we will display registration “N” number on the aircraft by using proportionately sized letters for the Penguin’s size.
Additionally, we feel that the permanent placard discussed in the previous paragraph will provide the aircraft's registration information should it be found on the ground. Finally, we will display at the ground station a high contrast flag or banner that contains the words "Unmanned Aircraft Ground Station" in letters 3 inches high or greater. Since the aircraft will operate within 1/2 mile of the ground station, the banner should be visible to anyone that observes the aircraft and chooses to investigate its point of origin.

**14 CFR 61.113 Private pilot privileges and limitations: Pilot in command and 61.133 Commercial pilot privileges and limitations**

Part 61.133 provides;
“A person who holds a commercial pilot certificate may act as pilot in command of an aircraft—
(ii) For compensation or hire, provided the person is qualified in accordance with this part and with the applicable parts of this chapter that apply to the operation.”

Since there are currently no means available for the pilot of a UAS to gain the experience in an equivalent category and class in order to apply for a commercial pilot's license, we propose to generate an equivalent level of safety by requiring our pilots meet the qualification described by the order 8900.1 volume 16 chapter 4.

Our proposed operations meet the requirements of 8900.1 volume 16 Chapter 4 Section 1 Airman Certification (16-4-1-3-B) subpart (5). It states ;
"Operations without a pilot certificate may be allowed when all of the following conditions are met:" ( conditions “a” through “g” )
Condition (a) states that the PIC is required to complete "FAA private pilot ground instruction" and pass "the FAA Private Pilot written examination or FAA-recognized equivalents".

Since our operations will meet all the conditions listed , we propose to comply in accordance with the FAA order 8900.1 ( 16-4-1-3-B-5 : “a” through “g” ). We believe and request that equivalent safety can be achieved by having our pilots complete,

(1) FAA private pilot ground instruction, and pass the FAA private pilot written examination, and
(2) hold a Student Pilot Certificate along with current Third Class medical certificate, and complete logging minimum 5 hours of dual flight instruction time with Certified Flight Instructor.

If relief from part 61.133 by means of FAA Order (16-4-1-3-B-5 ) is not appropriate, we subsequently request the exemption from 61.113.
Part 61.113 provides that no person that holds a private pilot certificate may act as pilot in command of an aircraft for compensation or hire. Subparagraph (b) allows a private pilot to act as pilot in command of an aircraft in connection with any business or employment if;

(1) flight is only incidental to that business or employment; and
(2) The aircraft does not carry passengers or property for compensation or hire.

Since the aircraft cannot carry passengers or property, we request to be relieved from this regulation if our pilots at minimum,
(1) hold at least a current private pilot certificate and,
(2) hold a current third class medical certificate.
By meeting conditions (1) and (2), we believe that equivalent level of safety can be achieved by complying with 61.113 Subparagraph (b) even though the intent of this application is to conduct a business.

**14 CFR 91.9 Civil aircraft flight manual, marking, and placard requirements.**

This regulation provides that no person may operate an aircraft unless a current, approved flight manual is in the aircraft. We assume that the intent of this requirement is to ensure that flight manual information is available to the aircrew while operating the aircraft. We request an exemption to this requirement since the aircraft is not only too small to carry documentation, the documentation would not be available to the crew.

To obtain an equivalent level of safety and meet the intent of 91.9, we propose that a current, approved Airplane Flight Manual must be available to the crew at the ground station anytime the aircraft is in, or preparing for flight.

**14 CFR 91.119 Minimum safe altitudes: General.**

This regulation provides that over sparsely populated areas the aircraft cannot be operated closer than 500 feet to any person, vessel, vehicle, or structure. Since the aircraft will be operating at a maximum of 400 feet AGL, we cannot comply with this requirement.

To provide an equivalent level of safety we will only fly over private property with the permission of the land owner. The land owner will be briefed of the expected route of flight and the associated risks to persons and property on the ground. We maintain that due to the small size of the Penguin, the hazard to persons, vessels, vehicles, and structures is not comparable to manned aircraft and should be considered in granting the exemption.
The aircraft will not be operated over congested areas or over any open air assembly of persons. The aircraft will be operated at an altitude allowing, if a mechanical system fails, an emergency landing without undue hazard to persons or property on the surface.

**14 CFR 91.121 Altimeter Settings**

The regulation provides that aircraft shall maintain cruising altitudes by reference to an altimeter setting available within 100 nautical miles of the aircraft.
The Penguin aircraft will fly below 400 feet AGL and will not need to maintain hemispherical cruising altitudes in order to de-conflict with other aircraft. As such, an appropriate altimeter measurement presented to the pilot should be Above Ground Level and should be based on the barometric pressure at the point of launch.

To provide an equivalent level of safety, the UAS's AGL altimeter will be set to zero on the ground prior to every flight. Since the aircraft will fly no more than 60 minutes, even rapid changes in barometric pressure will have limited effect on the safety of the flight.

**14 CFR 91.151 Fuel requirements for flight in VFR conditions.**

The regulation provides that no person may begin a flight in an airplane under day-VFR conditions unless there is enough fuel to fly to the first point of intended landing and to fly after that for at least 30 minutes. We feel the intention of this paragraph is to provide a reserve of energy as a safety buffer for go-arounds and other delays to landing.

The Penguin UAS is battery operated and the maximum duration of flight with full payload, from a single battery charge is 60 minutes. Since the aircraft will never fly more than 1/2 mile from the point of intended landing, a full battery charge at launch and landing the aircraft with 10% charge (6 minutes) remaining will ensure that we meet the intent of reserve energy requirement of this paragraph.
We believe that equivalent level of safety is achieved because from anywhere within 1/2 mile distance to launch/landing point during operation, 10 % charge (6 minutes) is more than enough for a few go-arounds if necessary.

**14 CFR 91 Subpart E ( 91.405, 91.407, 91.409, 91.417 )**
**Maintenance, Preventive Maintenance, and Alterations**

The regulation provides that the operator is primarily responsible for maintaining the aircraft in an airworthy condition, including compliance with part 39 and 43. Paragraphs 91.407 and 91.409 require that the aircraft be "approved for return to service by a person authorized under 43.7" after maintenance and inspection. It is our intention that the PIC, VO or authorized personnel to perform maintenance and inspection of the aircraft and "be authorized to approve the aircraft for return to service."

Due to the fact that our parent company Galaxy Aviation Inc. is a part 145 FAA certified Repair Station ( # 5GXR127C ), our core expertise is aviation maintenance. The resources from the Repair Station regarding safety training, quality control, developing maintenance procedures and other applicable resources, such as a certificated repairman, are made available to our UAS operations.

Galaxy requests that exemptions to the regulations under conditions below;

(1) Galaxy will develop and maintain Penguin UAS maintenance instructions by utilizing a combination of provided Finwing Technology's User Manual and FAA equivalent maintenance techniques and procedures

(2) Galaxy will designate, train, and document the personnel who will be authorized to perform Inspection, Maintenance and Alterations by means of above stated maintenance instructions. Such designated personnel may include PIC, VO or FAA equivalent trained persons, such as a FAA Certificated Repairman

(3) To ensure equivalent level of safety, PIC will inspect the UA before each flight looking for any structural or mechanical malfunctions, and document discrepancies

Due to the small size, light weight and simplicity of the Penguin UAS, we believe that the equivalent safety will be achieved by permitting any of the PIC, VO or FAA equivalent trained personnel, to perform maintenance, inspection and alterations of the aircraft and " be authorized to approve the aircraft for return to service. "

**THE REASONS WHY GRANTING GALAXY'S REQUEST WOULD BE IN THE PUBLIC INTEREST**

We believe that granting our exemption request from,
14 CFR Part 21.191
14 CFR Part 45.23, 45.29
14 CFR 61.113, 61.133
14 CFR 91.9, 91.119, 91.121, 91.151
14 CFR 91 Subpart E (91.405, 91.407, 91.409, 91.417), is in the public's interest and will benefit the public as a whole for the following reasons.

1- According to research done by US Department of Agriculture, Precision Agriculture in crop production helps farmers **yield more crops** and offers **less impact on environment** by applying chemicals more efficiently. Galaxy's Penguin UAS offers as one of the tools to support Precision Agriculture. Penguin UAS carries an onboard geo-referenced camera system that provides high-resolution data to direct variable seeding rates as well as the precise application of fertilizer and chemicals, reducing their use. This data helps farmers maximize yields while reducing costs and impacts to the environment, which is in the public interest.

2- Galaxy's UAS operations will contribute to a **positive aggregate economic impact** resulting in **creation of jobs** both direct and indirectly. Economic Research estimates that the UAS market will grow from $6 billion to $ 94 billion over the next decade resulting in a new workforce development.
Because Galaxy's operations will create new jobs such as pilots, flight operation staff, and administrative supporting staff, it will directly impact positive economic outcome, hence granting Galaxy's petition will benefit the public as a whole.

3- **Congress has already proclaimed** that it is in the public's interest to integrate Commercially flown UAS(s) into the national airspace system, hence the passing of the FAA Modernization and Reform Act of 2012.
Granting Galaxy's petition furthers the public's interest as a demonstrated progression of integrating Unmanned Aircraft Systems into National Air Space, thus it will benefit public as a whole.

**THE REASONS WHY GRANTING GALAXY THE EXEMPTION WOULD NOT ADVERSELY AFFECT SAFETY**

Galaxy believes that the grant of exemption from,
14 CFR Part 21.191
14 CFR Part 45.23, 45.29
14 CFR 61.113, 61.133
14 CFR 91.9, 91.119, 91.121, 91.151
14 CFR 91 Subpart E (91.405, 91.407, 91.409, 91.417), will not adversely affect safety by a combination of the reasons listed below.

(a) We have stated in the above section **" THE EXTENT OF RELIEF GALAXY SEEKS AND THE REASONS GALAXY SEEKS THE RELIEF "** on pages 4 to 8 by describing how we intend to mitigate risk and accomplish FAA equivalent and acceptable level of safety for each 14 CFR part.

(b) As a result of Penguin unmanned aircraft's size, weight, speed, operational capability, proximity to airports and populated areas, operation within visual line of sight, plus a combination of operational conditions and limitations, we believe that granting Galaxy's exemption request will not adversely affect safety.

(c) Our parent company has demonstrated, and been certified by FAA to comply with the Part 145 FARs.
Because enjoying the available resources from our parent company (Galaxy Aviation Inc. FAA Part 145 CRS) provides a unique advantage to ensure aviation safety, hence we believe that granting Galaxy will not adversely affect safety.

(d) Galaxy will develop, train and document the completion of "Human Factors " Training to the PIC, VO and authorized maintenance personnel.
Research data suggests that 80% of all Aviation Accidents are caused by "Human Factors". By requiring our flight crew and maintenance personnel to complete "Human Factors Training", Galaxy will further mitigate safety risk, thus the grant will not adversely affect safety.

**SUMMARY THAT CAN BE PUBLISHED IN THE FEDERAL REGISTER**

Department of Transportation
Federal Aviation Administration

Petitioner:
Galaxy UAV Systems (Subsidiary of Galaxy Aviation Inc.)

Petition of exemption from section of
14 CFR Part 21.191
14 CFR Part 45.23, 45.29
14 CFR 61.113, 61.133
14 CFR 91.9, 91.119, 91.121, 91.151
14 CFR 91 Subpart E (91.405, 91.407, 91.409, 91.417)

Description of relief sought;

Galaxy UAV Systems seeks an exemption for commercial operation of the Penguin unmanned aircraft manufactured by Finwing Technology of China.
The Penguin unmanned aircraft system has an onboard georeferenced mapping camera system capable of acquiring high resolution data.
Proposed operations will offer precise aerial surveillance to help farming, agriculture, and other commercial industries.

**ANY ADDITIONAL INFORMATION, VIEWS, OR ARGUMENTS AVAILABLE TO SUPPORT GALAXY'S REQUEST**

Penguin Unmanned Aircraft System consists;

1- Penguin Unmanned Aircraft made by Finwing Technology of China

2- Pixhawk Autopilot Controller made by 3D Robotics of California, and other onboard equipment such as receivers, batteries, transmitters, antennas

3- Onboard Mapping Payload
(a) Downward facing high resolution camera

(b) Optional front facing camera to aid missions

4- Ground Control Station with a computer and other related communication equipment including
(a) Manual Control link utilizing a transmitter on 2.4 Gigahertz radio frequency
(b) Data Control link utilizing GPS and Telemetry radios on 915 Megahertz radio frequency
(FCC license not required for above radio frequencies)

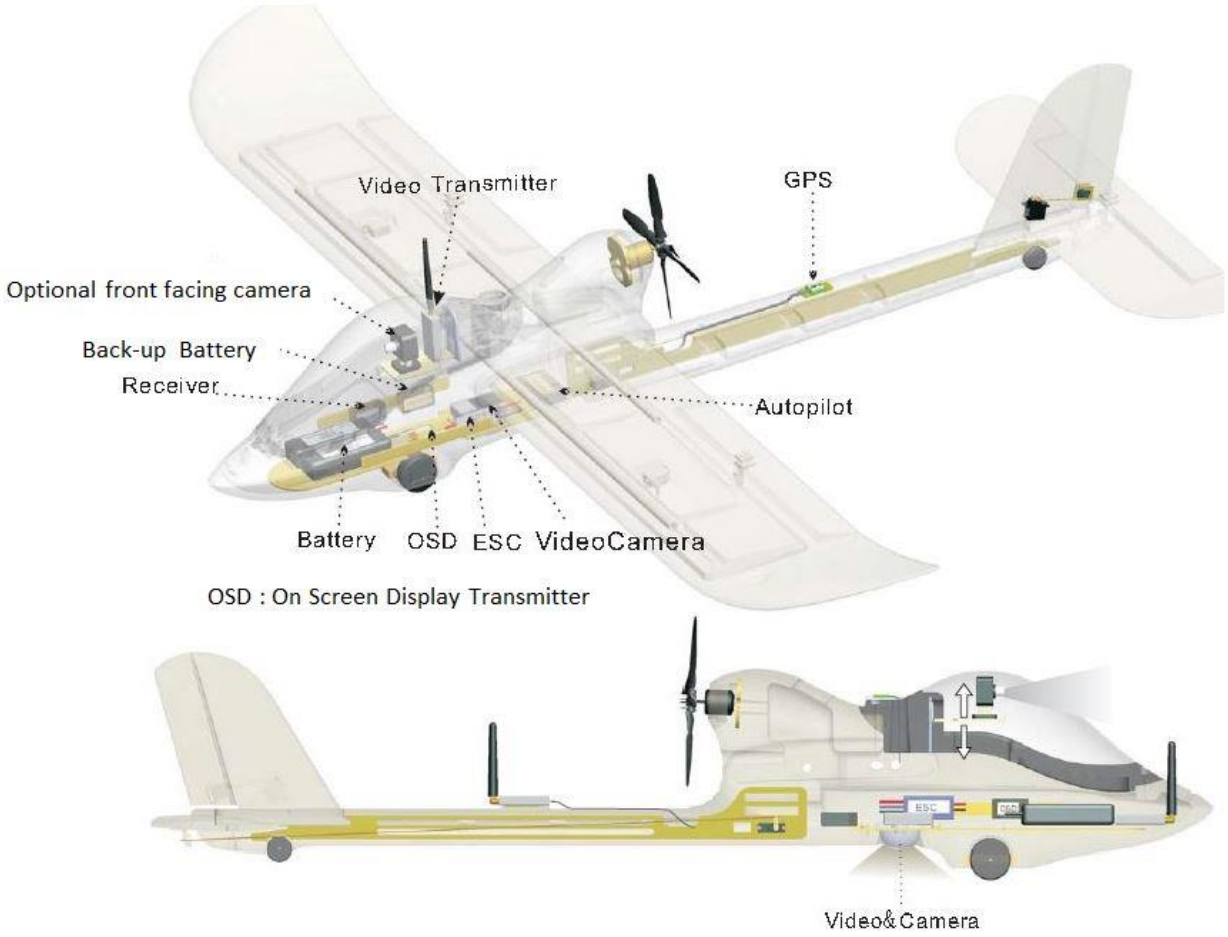
5- Qualified flight crew and optional one or two sensor/ software operators

6- Required operation manuals which are located near ground control station ( the operation manuals will be submitted following this petition request )

## Penguin UAS Specifications

| | |
|---|---|
| Wing Span | 67.7 inches |
| Length | 48.5 inches |
| MTOW | 5 pounds (Maximum Takeoff Weight) |
| Flight Time | 30 to 60 minutes |
| Speed Range | 15 knots to 50 knots |
| Manual Control Frequency | 2.4 Gigahertz |
| Manual Control Range | Line of sight 1.5 mile |
| Data Control Link Frequency | 915 Megahertz |
| Data Control Link Range | Line of sight 2 mile |
| Launch Options | Hand Launch or Conventional Runway |
| Landing Options | Belly Land or Conventional Runway |

# Penguin Unmanned Aircraft



# Sample Mapping Mission Flight Patterns


**No Privacy Issues**

Galaxy's proposed operations will create no privacy issues because the Penguin UAS will be operating in rural areas within the boundaries of private property with the land owner's permission.
Galaxy will also obtain any permits or authorizations from local authorities when necessary.

## ACRONYMS

| | |
|---|---|
| AGL | Above Ground Level |
| ALoS | Acceptable Level of Safety |
| AMOC | Alternative Method of Compliance |
| ASI | Aviation Safety Inspector |
| ATC | Air Traffic Control |
| ATCAA | Air Traffic Control Assigned Airspace |
| ATS | Air Traffic Service |
| AVS | Aviation Safety |
| CFR | Code of Federal Regulations |
| COA | Certificate of Waiver or Authorization |
| CRM | Crew Resource Management |
| CS | Control Station |
| CRS | Certified Repair Station |
| DCP | Divert/Contingency Point |
| DHS | Department of Homeland Security |
| DME | Distance Measuring Equipment |
| DOD | Department of Defense |
| DSA | Detect, Sense, and Avoid System |
| FAA | Federal Aviation Administration |
| FCC | Federal Communications Commission |
| FARs | Federal Aviation Regulations |
| FIR | Flight Information Region |
| FL | Flight Level |
| FSIMS | Flight Standards Information Management System |
| FTP | Flight Termination Point |
| FTS | Flight Termination System |
| Galaxy | Galaxy UAV Systems |
| Galaxy | A subsidiary of Galaxy Aviation Inc. |
| GHz | Gigahertz |
| GCS | Ground Control Station |
| MHz | Megahertz |
| MTOW | Maximum Takeoff Weight |
| NAS | National Airspace System |

| | |
|---|---|
| NM | Nautical Mile |
| NOTAM | Notice To Airman |
| OPA | Optionally Piloted Aircraft |
| PIC | Pilot in Command |
| Penguin | Penguin Unmanned Aircraft System |
| Penguin | Penguin Unmanned Aircraft |
| R&D | Research and Development |
| RF | Radio Frequency |
| RM | Risk Management |
| RNAV | Area Navigation |
| RTB | Return to Base |
| RVSM | Reduced Vertical Separation Minimum |
| TAS | Traffic Advisory Systems |
| TC | Type Certificate |
| UA | Unmanned Aircraft |
| UAS | Unmanned Aircraft System(s) |
| UAV | Unmanned Aerial Vehicle |
| VFR | Visual Flight Rules |
| VMC | Visual Meteorological Conditions |
| VO | Visual Observer |