

CERTIFICATE OF WAIVER OR AUTHORIZATION

ISSUED TO

National Oceanic and Atmospheric Administration (NOAA) Unmanned Aircraft Systems Working Group

ADDRESS

P.O. Box 273, Mail Stop 4830A
NASA Dryden Flight Research Center
Edwards, CA 93523

Attn: (b) (6)

This certificate is issued for the operations specifically described hereinafter. No person shall conduct any operation pursuant to the authority of this certificate except in accordance with the standard and special provisions contained in this certificate, and such other requirements of the Federal Aviation Regulations not specifically waived by this certificate.

OPERATIONS AUTHORIZED

Operation of the Insight A-20, Scan Eagle, Unmanned Aircraft System (UAS) in Class G airspace surface to 3,000 feet Mean Sea Level (MSL) over the Bering Sea Icepack under the jurisdiction of the Anchorage ARTCC. See special provisions.

LIST OF WAIVED REGULATIONS BY SECTION AND TITLE

STANDARD PROVISIONS

1. A copy of the application made for this certificate shall be attached and become a part hereof.
2. This certificate shall be presented for inspection upon the request of any authorized representative of the Federal Aviation Administration, or of any State or municipal official charged with the duty of enforcing local laws or regulations.
3. The holder of this certificate shall be responsible for the strict observance of the terms and provisions contained herein.
4. This certificate is nontransferable.

Note-This certificate constitutes a waiver of those Federal rules or regulations specifically referred to above. It does not constitute a waiver of any State law or local ordinance.

SPECIAL PROVISIONS

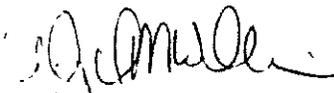
Special Provisions are set forth and attached.

This certificate 2009-WSA-60 is effective from May 13, 2009 through August 1, 2009, and is subject to cancellation at any time upon notice by the Administrator or his/her authorized representative.

BY DIRECTION OF THE ADMINISTRATOR

FAA Headquarters, AJR-36

(Region)



Ardyth Williams

(Signature)

May 13, 2009

(Date)

Air Traffic Manager, Unmanned Aircraft Systems

(Title)

ATTACHMENT to FAA FORM 7711-1

Issued To: National Oceanic and Atmospheric Administration (NOAA) Unmanned Aircraft Systems Working Group

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NASA Dryden Flight Research Center
Edwards, CA 93523
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Activity: Operation of the Insight A-20, Scan Eagle, Unmanned Aircraft System (UAS) in Class G airspace surface to 3,000 feet Mean Sea Level (MSL) over the Bering Sea Icepack under the jurisdiction of the Anchorage ARTCC.

Purpose: To prescribe UAS operating requirements (outside of restricted and/or warning area airspace) in the National Airspace System (NAS). This COA is issued on a one time basis to allow NOAA and FAA to conduct testing and evaluation of UAS Flights over the Bering Sea Icepack.

Dates of Use: This Certificate of Authorization (COA) 2009-WSA-60 is valid from May 13, 2009 through August 1, 2009. Should a renewal become necessary, the proponent shall advise the Federal Aviation Administration (FAA), in writing, no later than 60 days prior to the requested effective date.

General Provisions:

- The review of this activity is based on our current understanding of UAS operations, and the impact of such operations in the NAS, and therefore should not be considered a precedent for future operations. As changes occur in the UAS industry, or in our understanding of it, there may be changes to the limitations and conditions for similar operations.
- All personnel connected with the UAS operation must comply with the contents of this authorization and its provisions.
- This COA will be reviewed and amended as necessary to conform to changing UAS policy and guidance.

Safety Provisions:

Unmanned Aircraft (UA) have no on-board pilot to perform see-and-avoid responsibilities, and therefore, when operating outside of restricted areas, special provisions must be made to ensure an equivalent level of safety exists for operations had a pilot been on board. In accordance with 14 CFR Part 91, General Operating and Flight Rules, Subpart J-Waivers, 91.903, Policy and Procedures, the following provisions provide acceptable mitigation of 14 CFR Part 91.113 and must be complied with:

- For the purpose of see-and-avoid, visual observers must be utilized at all times except in Class A airspace, restricted areas, and warning areas. The observers may either be ground based or in a chase plane. The UA must remain within a lateral distance of no more than 5NM and 3,000 feet vertically from the visual observer. For operations that are greater than three nautical miles, two visual observers shall be used at all times per observation location. One observer shall be tasked with long range observation using binoculars or other aids to vision while the other observer shall be tasked with short range observation using no aids to vision. For operations at three nautical miles or less, the observer requirement may be reduced to one. The small size of this particular UA may not allow for adequate observation at the specified limit. It should be understood that this limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, it will remain the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions. Observers shall coordinate with the UA PIC at all times to verify the track and direction of the UA and its relative position to the observer's location. If the chase aircraft is operating more than 100ft above/below and or ½ nm laterally, of the UA, the chase aircraft PIC will advise the controlling ATC facility.
- UAS pilots will ensure there is a safe operating distance between manned and unmanned aircraft at all times in accordance with 14 CFR 91.111, *Operating Near Other Aircraft*, and 14 CFR 91.113, *Right-of-Way Rules & 14 CFR Part 91 115, Right of Way Rules Water Operations*. Cloud clearances and VFR visibilities for Class E airspace will be used regardless of class of airspace. Additionally, UAS operations are advised to operate well clear of all known manned aircraft operations.
- The dropping or spraying of aircraft stores, or carrying of hazardous materials (included ordnance) outside of active Restricted, Prohibited, or Warning Areas is prohibited unless specifically authorized in the Special Provisions of this COA.

Airworthiness Certification Provisions:

- UA must be shown to be airworthy to conduct flight operations in the NAS.
- Public Use Aircraft must contain one of the following:
 - A civil airworthiness certification from the FAA, or
 - A statement specifying that the Department of Defense Handbook "Airworthiness Certification Criteria" (MIL-HDBK-516), as amended, was used to certify the aircraft or
 - Equivalent method of certification.

Pilot / Observer Provisions:

- **Pilot Qualifications:** UA pilots interacting with Air Traffic Control (ATC) shall have sufficient expertise to perform that task readily. Pilots must have an understanding of and comply with Federal Aviation Regulations and Military Regulations applicable to the airspace where the UA will operate. Pilots must have in their possession a current second class (or higher) airman medical certificate that has been issued

- under 14 CFR 67, Medical Standards and Certification, or a military equivalent. 14 CFR 91.17, Alcohol or Drugs, applies to UA pilots.
- **Aircraft and Operations Requirements:**
 - **Flight Below 18,000 Feet Mean Sea Level (MSL).**
 - UA operations below 18,000 feet MSL in any airspace generally accessible to aircraft flying in accordance with visual flight rules (VFR) require visual observers, either airborne or ground-based. Use of ATC radar alone does not constitute sufficient collision risk mitigation in airspace where uncooperative airborne operations may be conducted.
 - **Flights At or Above 18,000 Feet Mean Sea Level (MSL)**
 - When operating on an instrument ATC clearance, the UA pilot-in-command must ensure the following:
 1. An ATC clearance has been filed, obtained and followed.
 2. Positional information shall be provided in reference to established NAS fixes, NAVAIDS, and waypoints. Use of Latitude/Longitude is not authorized.
 - **Observer Qualifications:** Observers must have been provided with sufficient training to communicate clearly to the pilot any turning instructions required to stay clear of conflicting traffic. Observers will receive training on rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft*, 14 CFR 91.113, *Right-of-Way Rules*, cloud clearance, in-flight visibility, and the pilot controller glossary including standard ATC phraseology and communication. Observers must have in their possession a current second class (or higher) airman medical certificate that has been issued under 14 CFR 67, Medical Standards and Certification, or a military equivalent. 14 CFR 91.17, Alcohol or Drugs, applies to UA observers.
 - **Pilot-in-Command (PIC) –**
 - **Visual Flight Rules (VFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC operating a UA in line of sight must pass at a minimum the required knowledge test for a private pilot certificate, or military equivalent, as stated in 14 CFR 61.105, and must keep their aeronautical knowledge up to date.
 - There is no intent to suggest that there is any requirement for the UAS PIC to be qualified as a crewmember of a manned aircraft.
 - Pilots flying a UA on other than instrument flight plans beyond line of sight of the PIC must possess a minimum of a current private pilot certificate, or military equivalent in the category and class, as stated in 14 CFR 61.105.
 - **Instrument Flight Rules (IFR) as applicable:**
 - The PIC is the person directly responsible for the operation of the UA. The responsibility and authority of the pilot in command as described by 14 CFR 91.3 (or military equivalent), applies to the UAS PIC.
 - The PIC must be a certified pilot (minimum of private pilot) of manned aircraft (FAA or military equivalent) in category and class of aircraft flown.

- The PIC must also have a current/appropriate instrument rating (manned aircraft, FAA or military equivalent) for the category and class of aircraft flown.
- **Pilot Proficiency – VFR/IFR as applicable:**
 - Pilots will not act as a VFR/ IFR PIC unless they have had three qualified proficiency events within the preceding 90 days.
 - The term “qualified proficiency event” is a UAS-specific term necessary due to the diversity of UAS types and control systems.
 - A qualified proficiency event is an event requiring the pilot to exercise the training and skills unique to the UAS in which proficiency is maintained.
 - Pilots will not act as an IFR PIC unless they have had six instrument qualifying events in the preceding six calendar months (an event that requires the PIC to exercise instrument flight skills unique to the UAS).
- **PIC Responsibilities:**
 - Pilots are responsible for a thorough preflight inspection of the UAS. Flight operations will not be undertaken unless the UAS is airworthy. The airworthiness provisions of 14 CFR 91.7, Civil Aircraft Airworthiness, or the military equivalent, apply.
 - One PIC must be designated at all times and is responsible for the safety of the UA and persons and property along the UA flight path.
 - The UAS pilot will be held accountable for controlling their aircraft to the same standards as the pilot of a manned aircraft. The provisions of 14 CFR 91.13, *Careless and Reckless Operation*, apply to UAS pilots.
- **Pilot/Observer Task Limitations:**
 - Pilots and observers must not perform crew duties for more than one UA at a time.
 - Chase aircraft pilots must not concurrently perform either observer or UA pilot duties along with chase pilot duties.
 - Pilots are not allowed to perform concurrent duties both as pilot and observer.
 - Observers are not allowed to perform concurrent duties both as pilot and observer.

Standard Provisions: These provisions are applicable to all operations unless indicated otherwise in the Special Provisions section.

- The UA PIC will maintain direct two-way communications with ATC and have the ability to maneuver the UA per their instructions, unless specified otherwise in the Special Provisions section. The PIC shall comply with all ATC instructions and/or clearances.
- If equipped, the UA shall operate with an operational mode 3/A transponder, with altitude encoding, or mode S transponder (preferred) set to an ATC assigned squawk.

- If equipped, the UA shall operate with position/navigation lights on at all times during flight.
- The UA PIC shall not accept any ATC clearance requiring the use of visual separation or sequencing.
- VFR cloud clearances and visibilities for Class E airspace will be used regardless of class of airspace the UAS is operating in.
- Special VFR is not authorized.
- Operations (including lost link procedures) shall not be conducted over populated areas, heavily trafficked roads, or an open-air assembly of people.
- Operations outside of restricted areas, warning areas, prohibited areas (designated for aviation use) and/or Class A airspace may only be conducted during daylight hours, unless authorized in the Special Provisions section.
- Operations shall not loiter on Victor airways, Jet Routes, or Q Routes. When necessary, transit of Victor airways shall be conducted as expeditiously as possible.
- Operations conducted under VFR rules shall operate at appropriate VFR altitudes for direction of flight (14 CFR 91.159).
- The UA PIC or chase plane PIC (whichever is applicable) will notify ATC of any in flight emergency or aircraft accident as soon as practical.
- All operators that use GPS as a sole source, must check all NOTAM's and Receiver Autonomous Integrity Monitoring (RAIM). Flight into GPS test area or degraded RAIM is prohibited without specific approval in the special provisions.
- At no time will TCAS be used in any mode while operating an unmanned aircraft.
- The NOAA and/or its representatives, is responsible at all times for collision avoidance with non-participating aircraft and the safety of persons or property on the surface with respect to the UAS.

Special Provisions:

1. In the event of a lost link, the UAS pilot will immediately notify Anchorage ARTCC at 907-269-1103/1108, state pilot intentions, and comply with the following provisions:
 - See attachment #2
 - If lost link occurs within a restricted or warning area, or the lost link procedure above takes the UA into the restricted or warning area – the aircraft will not exit the restricted or warning areas until the link is re-established.
 - The UA lost link mission will not transit or orbit over populated areas.
 - When outside of restricted/warning area airspace, lost link programmed procedures will avoid unexpected turn-around and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.
 - Lost link orbit points shall not coincide with the centerline of Victor airways.
2. NOAA shall operate the ships radar to detect other ships in the operating area.
3. NOAA shall coordinate all operations with the Alaskan Northern Borough aviation search and rescue team. NOAA will be responsible for de-conflicting the operations.

4. NOAA shall coordinate all operations, within the Flight Information Region (FIR) with the Oceanic Air Traffic Supervisor, at phone 907-269-1103/1108 (NOTE) line must be recorded.
5. NOAA shall file a D-VFR flight plan prior to each operation.
6. NOAA shall maintain two-way communications with ATC at all times. Should communications with ATC become unavailable, UAS operations shall be immediately discontinued and the UA shall return for recovery to the launch location.
7. UAS operations are advised to operate well clear of all known manned aircraft Operations.
8. The UA pilot-in-command (PIC) shall hold, at a minimum, an FAA Private Pilot certificate or must have successfully passed the Private Pilot written examination within the past 24 months.
9. UAS flight operations shall not be conducted within 10 miles from any ship or vessel.
10. UAS Flight operations shall not be conducted within 20 miles from and Flight Information Region (FIR) boundary, Air Defense Identification Zone (ADIZ) boundary or international border.
11. UAS flight operations shall not be conducted within 20 miles from any offshore land mass within the approved operational area.
12. UAS flight operations shall not be conducted within 5 miles from the G583 and B327 airways.
13. Data plots from each flight shall be collected and submitted to the Unmanned Aircraft Program Office for evaluation. The pilot must include actual flight track, date, and time of day.
14. NOAA shall remain within the operating area depicted in attachment 1. Flight outside of this area is not authorized.

NOTAM: A International I-NOTAM shall be issued when UA operations are being conducted. This requirement may be accomplished through your local base operations or NOTAM issuing authority. You may also complete this requirement by contacting Flight Service Station at 1-877-4-US-NTMS (1-877-487-6867) not more than 72 hours in advance, but not less than 48 hours prior to the operation and provide:

- Name and Address of pilot filing NOTAM request
- Location, Altitude or the operating Area
- Time and nature of the activity

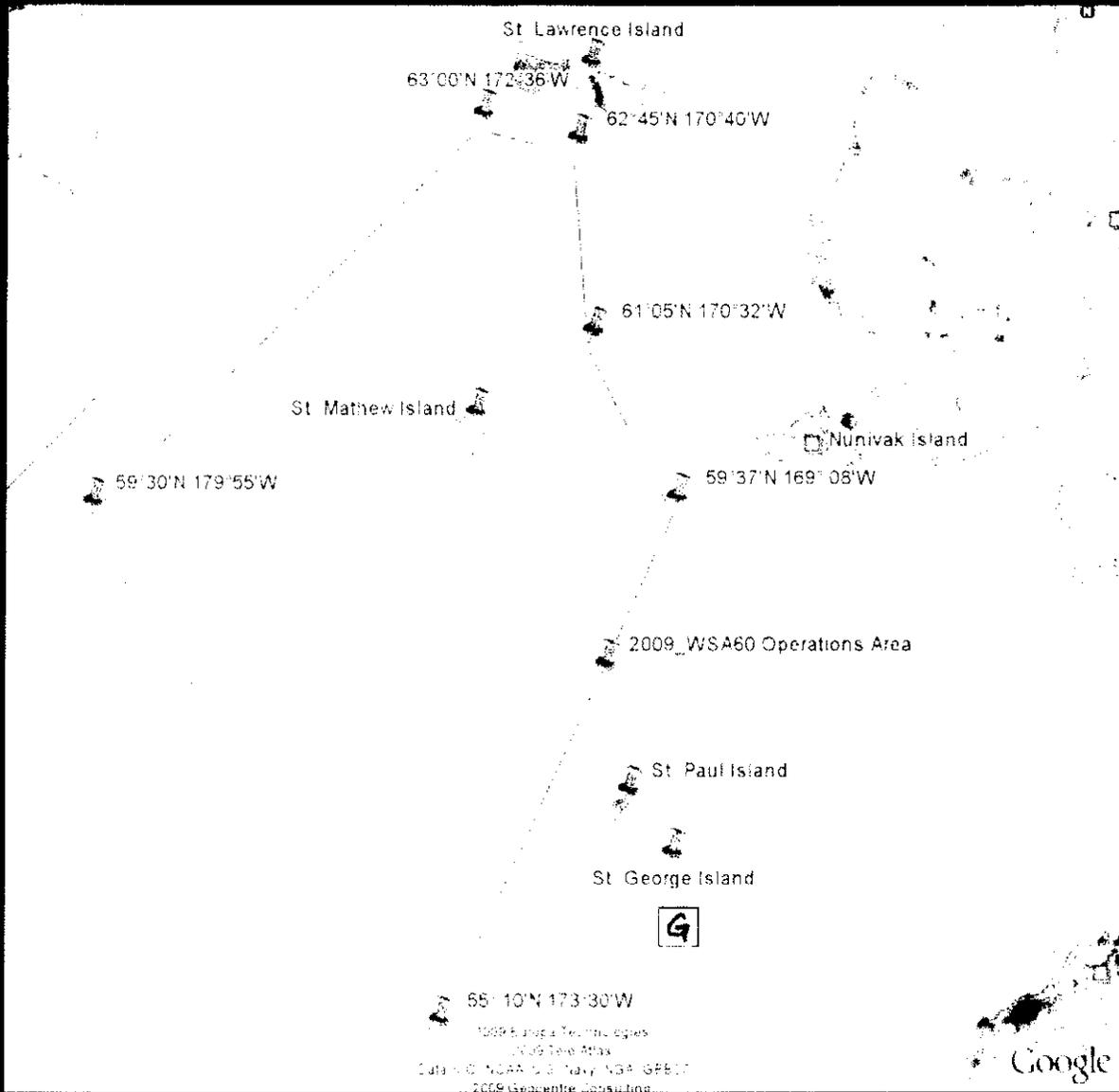
NOTE FOR PROPONENTS FILING THEIR NOTAM WITH DoD ONLY: This requirement to file with the AFSS is in addition to any local procedures/requirements for filing through DINS. The FAA Unmanned Aircraft Systems Office is working with the AFSS, and to eliminate the requirement to file a NOTAM with both the AFSS and DINS in the near future.

Incident / Accident Reporting Provisions: The following information is required to document unusual occurrences associated with UAS activities in the NAS.

- The proponent for the COA shall provide the following information to Donald.E.Grampp@faa.gov on a monthly basis:
 - Number of flights conducted under this COA.
 - Pilot duty time per flight.
 - Unusual equipment malfunctions (hardware/software).
 - Deviations from ATC instructions.
 - Operational/coordination issues.
 - All periods of loss of link (telemetry, command and/or control)
- The following shall be submitted via email or phone (202-385-4542, cell (b) (6) [REDACTED]) to Donald.E.Grampp@faa.gov **within 24 hours:**
 - All accidents or incidents involving UAS activities, including lost link.
 - Deviations from any provision contained in the COA.

This COA does not, in itself, waive any Federal Aviation Regulation (FAR) nor any state law or local ordinance. Should the proposed operation conflict with any state law or local ordinance, or require permission of local authorities or property owners, it is the responsibility of the NOAA to resolve the matter. This COA does not authorize flight within Special Use Airspace without approval from the Using Agency. The NOAA is hereby authorized to operate the Insight A-20, Scan Eagle Unmanned Aircraft System.

Attachment 1



Maritime Lost Link/Mission Procedures

The Insight A-20 UAS has a series of mission parameters that are physically loaded into the aircraft's flight control computer's memory prior to flight. These parameters define the locations of emergency runways, lost link flight plans, and timing and safety limits used by the UAS in the event of a lost link or lost-navigation event occurs. Although configurable in flight, these parameters are typically designated for a given launch and recovery site and are configured for the anticipated flight environment and mission(s). However, during maritime operations the coordinates for the way-points in the lost link route plan are updated as the ship changes position so if a lost-link mission is executed the aircraft returns to an updated, more recent, location rather than the location suitable for lost link prior to launch. Additionally, in maritime operations the coordinates for an emergency runway are updated periodically so the aircraft will ditch in the water a reasonable but safe distance from the ship rather than near where the ship was at takeoff. All holding points, belly landing points, and launch and recovery points are within the boundaries of the area requested in the COA application.

For this COA request the aircraft will be programmed to enter a ¼ mile diameter orbit approximately ½ mile to either the port or starboard side and ½ mile aft of the ship. These parameters will be updated just prior to launch, anytime the ship's location becomes a hazard (such as in the event of backing up the ship to ram ice) or when the points are more than 2 miles in error from the current ship location. Given the expected ship's cruise speed this will require the pilot to update these parameters every fifteen to twenty minutes. The update process takes less than 30 second to complete, and is not a significant workload for the pilot.

The Insight A-20 follows an autonomous lost-uplink procedure if communications from the control station fail. This procedure ends in a belly-landing at a specified location that was regularly updated if communications are not re-established by the predestinated time limits.

Insight A-20 Lost-Link Procedure	
1	The lost-uplink procedure begins after 60 seconds has passed without the aircraft receiving any messages from the ground. The aircraft then flies at approximately 50 knots true airspeed, holds its current altitude, and starts a periodic reset of its communications channels.
2	The aircraft continues tracking its current flight-plan for 60 seconds.
3	The aircraft climbs for 90 seconds towards the highest of three altitudes: its current altitude, a safe altitude of 1,500 feet MSL, or the altitude calculated for line-of-sight communications with the ground-station provided it is below the COA ceiling.
4	The aircraft continues tracking its current-flight plan for 60 seconds.
5	The aircraft flies directly to the nearest waypoint that is closer to home from its current location in the Lost Link Flight Plan. This flight plan will be a rectangular loiter pattern oriented aft of the ship approximately ½ mile. In addition this flight plan will have a "tail" that consists of at least two waypoints that are dragged along with the UAS during operations

	so that the return to the loiter location will avoid over flying the ship itself. The aircraft climbs to the new flight-plan altitude if it is higher than the current altitude.
6	After reaching the home holding pattern, the aircraft waits for (1) hour to allow the crew time to re-establish communications and/or prepare to recover the ditched aircraft. In other words, the UAS will continue to a loiter pattern for an hour prior to ditching if communications are not re-established.
7	If communications have still not been re-established the aircraft selects an appropriate approach and touchdown point for a belly-landing aft of the ship. The approach direction will be determined based on the winds calculated by the aircraft.



Federal Aviation Administration

Memorandum

Date:

To: Ardyth Williams, Manager, Unmanned Aircraft Systems, AJR-36

From: James Sizemore, Acting Manager, Unmanned Aircraft Program Office, AIR-160

Subject: Application for Certificate of Waiver or Authorization for the National Oceanic and Atmospheric Administration Scan Eagle Unmanned Aircraft to Operate in the Bering Sea; Avery Control #09-0512-40768 (ATO Case #2009-WSA-60)

We have reviewed the application for a certificate of waiver or authorization (COA) from the National Oceanic and Atmospheric Administration (NOAA) to operate the Scan Eagle unmanned aircraft (UA) in an area offshore Alaska in the Bering Sea. This operation is considered to be a test case for evaluating UAS operations in remote areas.

Although the UA is not equipped with an approved sense-and-avoid system, risks appear to be adequately mitigated and, provided the following additional criteria are observed, the proposed flight operations generally conform to policy guidelines.

- All operations shall be conducted in visual meteorological conditions (VMC) during daylight hours only and in compliance with Title 14 of the Code of Federal Regulations (CFR) section 91.155, *Basic VFR Weather Minimums*. Special visual flight rules (VFR) operations are not authorized.
- The applicant shall maintain two-way communications with the appropriate air traffic control (ATC) facility at all times. Should communications with ATC become unavailable, UAS operations shall be immediately discontinued and the UA shall return for recovery to the launch location.
- Visual observers must be positioned within five nautical miles laterally and 3000 feet vertically to exercise see-and-avoid responsibilities required by 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*. For operations that are greater than three nautical miles, two visual observers shall be used at all times per observation location. One observer shall be tasked with long range observation using binoculars or other aids to vision while the other observer shall be tasked with short range observation using no aids to vision. For operations at three nautical miles or less, the observer requirement may be reduced to one. See note below.
- The UA pilot shall ensure there is a safe operating distance between manned and unmanned aircraft at all times in accordance with 14 CFR 91.111, *Operating Near Other Aircraft*, and 14 CFR 91.113, *Right-of-Way Rules*. UAS operations are advised to operate well clear of all known manned aircraft operations.

- The UA pilot-in-command (PIC) shall hold, at a minimum, an FAA Private Pilot certificate or must have successfully passed the Private Pilot written examination within the past 24 calendar months.
- All UA pilots and observers shall hold a valid FAA Class 2 medical certificate issued under 14 CFR Part 67 and have it in their possession.
- A defense visual flight rules (DVFR) flight plan must be filed for each flight.
- UAS flight operations shall not be conducted within 10 miles from any ship or vessel.
- UAS flight operations shall not be conducted within 20 miles from any Flight Information Region (FIR) boundary, Air Defense Identification Zone (ADIZ) boundary, or international border.
- UAS flight operations shall not be conducted within 20 miles from any offshore land mass within the approved operational area.
- UAS flight operations shall not be conducted within 5 miles from the G583 and B327 airways.
- Data plots from each flight shall be collected and submitted to the Unmanned Aircraft Program Office for evaluation. The plots must include actual flight track, positions, date, and time of day.

Note: Although this COA application is within policy guidelines, the small size of this particular UA may not allow for adequate observation at the specified limit. It should be understood that this limit is the maximum range allowed and that a practical distance may be something less, with the determination of such at the discretion of the applicant. Therefore, it will remain the responsibility of the applicant to ensure the safety of flight and adequate visual range coverage to mitigate any potential collisions. Due to the extended visual range of this operation, the use of two visual observers is required to enhance coverage when operating greater than three nautical miles. The long range observer shall scan the area for potential traffic conflicts using binoculars or other aids to vision. The short range observer shall observe the UA and scan for other traffic using unaided vision. For operations at three nautical miles or less, the observer requirement may be reduced to one. Observers shall coordinate with the UA PIC at all times to verify the track and direction of the UA and its relative position to the observer's location.

The Unmanned Aircraft Program Office, AIR-160 has no objection to the planned operations described in the COA application, provided the additional mitigations described above are observed. The Flight Technologies and Procedures Division, AFS-400, concurs with this memorandum.

If we can be of further assistance, please contact Mr. Marcello Mirabelli, Aviation Safety Inspector, Future Flight Technologies Branch, AFS-430, at (202) 385-4610.