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POLICY 220-1-5

UNMANNED AIRCRAFT SYSTEMS (UAS) OPERATIONS

1. GENERAL

1.1 Contents - This policy includes the following sections:

- a. Section 1 General
- b. Section 2 Authority
- c. Section 3 Policy
- d. Section 4 Qualifications and Designations
- e. Section 5 Maintenance and Airworthiness
- f. Section 6 Flight Approval Procedures
- g. Section 7 Operations
- h. Appendix A UAS Operations in Uncontrolled (Class G) International Airspace
- i. Appendix B NOAA UAS Visual Observer Responsibilities and Guidelines

1.2 This policy provides guidance specific to the operation and management of Unmanned Aircraft Systems (UAS) where differences may exist from the utilization and management of manned aircraft.

1.3 In instances where UAS operations and/or management do not differ from manned aircraft, the policies outlined in *AOC Policy 220-1, Aircraft Operations Manual* shall apply. This policy further prescribes procedures for obtaining flight approval for National Oceanic and Atmospheric Administration (NOAA) UAS operations.

2. AUTHORITY

2.1 Current Federal Aviation Administration (FAA) policy identifies UAS as "aircraft" flown by a "pilot" regardless of where the pilot is located. *NOAA Administrative Order (NAO) 216-104A* mandates that all aircraft operated by NOAA are managed by the Aircraft Operations Center (AOC).

- 2.2 This policy does not supersede any of the regulations in the Federal Aviation Regulations (FAR) 14 Code of Federal Regulations (CFR) Chapter 1, Federal Management Regulation (FMR) Chapter 102, Part 33, or the Interagency Committee on Aviation Policy (ICAP). The General Services Administration (GSA) chairs ICAP and has determined that UAS will be managed the same way as manned aircraft under the aforementioned FMR.
- 2.3 The FAA has determined that Advisory Circular (AC) 91-57A, Model Aircraft Operating Standards, shall not be used as a basis of approval for commercial or government UAS operations and is applicable to recreational and hobbyists use only. All government UAS operations are considered public aircraft operations and may not be operated under AC 91-57A.

3. POLICY

3.1 Responsibility

- a. While the size, method of control and airspace utilization procedures for UAS may be different than manned aircraft, the overall responsibility for management within NOAA rests with the Office of Marine and Aviation Operations (OMAO). All NOAA UAS operations will be approved by the Commanding Officer (CO), AOC.
- b. AOC will:
1. Ensure that UAS operations do not pose unacceptable risks to persons and property.
 2. Ensure that UAS operations meet applicable statutory and regulatory requirements.
 3. Create a standardized process to review and approve UAS operations.
 4. Identify roles and responsibilities consistent with federal regulations.

3.2 Scope

- a. This policy applies to all UAS operations where NOAA has responsibility for safety of flight. This includes operations in which NOAA personnel and/or property are utilized or when NOAA vessels or manned aircraft are used as deployment platforms.
- b. This policy applies to all UAS owned or operated by any NOAA Line Office, Staff Office or any other NOAA entity.
- c. The following is a non-inclusive list of UAS operations to which this policy applies:
1. UAS owned by NOAA and/or operated by NOAA personnel.
 2. NOAA sponsored UAS missions that require a FAA Certificate of Authorization (COA) to obtain access to the U.S. National Airspace System (NAS).
 3. NOAA sponsored UAS missions that are conducted in accordance with the FAA/NOAA small UAS (sUAS) Class G COA to obtain access to the NAS.
 4. NOAA sponsored UAS missions that operate under the authority of "due regard" of state aircraft to obtain access to the international airspace.

5. UAS operations aboard a NOAA Vessel.
 6. UAS operations flown in coordination with NOAA manned aircraft.
 - d. UAS operations that this policy may not apply to:
 1. Demonstration flights where NOAA personnel are observers only.
 2. UAS operations conducted by another governmental organization, when the other organization has an established UAS management program and is responsible for the operation and NOAA assets are not involved.
 3. UAS operations owned and operated by external contractors, operated under a contract for UAS services.
 4. UAS operations owned and operated by external contractors as part of a NOAA "data buy."
 5. NOAA grants to external cooperative organizations where NOAA does not have any operational involvement.
- 3.3 FAA authorization is required for UAS operations in the National Airspace System (NAS) outside of exclusive use Special Use Airspace (SUA), e.g. Restricted, Prohibited, and Warning Areas.
- a. A Certificate of Authorization between NOAA and the FAA permits the operation of small Unmanned Aircraft Systems in Class G airspace up to 1200' AGL under certain conditions without requiring the full COA application process.
 - b. AOC is responsible for FAA coordination and developing COA applications for NOAA UAS operations. The project Principal Investigator (PI) is responsible for providing all the required supporting materials and documents.
 - c. UAS operations may be conducted in accordance with 14 CFR Part 107 for access to airspace for NOAA projects. The project PI shall closely coordinate with AOC to ensure all aspects of the flight envelope and project plan fully conform to the requirements of 14 CFR Part 107.
- 3.4 UAS Flights Outside of the National Airspace System
- a. Requirements for UAS flight in Special Use Airspace (SUA) - UAS operations in exclusive use SUA require permission of the appropriate authority or controlling agency. UAS operations in these airspaces typically require scheduling by the agency and may require significant lead-time.
 - b. UAS flights in Oceanic Flight Information Regions (FIR) where the FAA is the air traffic service provider require a COA.
 - c. For UAS flights in Oceanic FIRs where the air traffic service provider is a foreign government, coordination and approval with that government is required prior to flight. Additional diplomatic clearances may also be required.
 - d. For UAS flight in uncontrolled airspace (i.e. Class G below the FIR), and entirely conducted above international waters (i.e. beyond 12nm from shore), refer to *UAS Operations in Uncontrolled (Class G) International Airspace* (Appendix A of this policy).

4. QUALIFICATIONS AND DESIGNATIONS

4.1 UAS Pilot Qualifications and Certification

a. General Responsibilities

1. The Mission Commander (MC) shall be a NOAA Federal Employee that has general oversight of the project and is considered the federal authority responsible for safe and efficient mission execution. The MC works in conjunction with the AOC UAS Section to ensure all crew members are properly trained/current.
2. The Pilot in Command (PIC) of a UAS is directly responsible for, and is the final authority with respect to the in-flight operation of the UAS.
3. Supplemental Pilot (SP) is a supporting pilot role as determined or required by the complexity of the system per the manufacturer recommendations. The SP if required may augment the PIC; however, the PIC retains complete and overall responsibility for the operation of the UAS.
4. The Visual Observer (VO) is an individual designated to supplement situational awareness and maintain Visual Line of Sight (VLOS), assisting with seeing and avoiding other air traffic/objects aloft or on the ground.
5. The Mission Systems Operators (MSO) are ancillary personnel that are not required UAS Flight Crewmembers, but assist the PIC in operating data collection systems.

b. UAS Pilot Certification Requirements

1. For operations in the FAA regulated National Airspace System, at a minimum the PIC is required to have a Remote Pilot Airman Certificate with a small UAS rating.
2. Depending on the size or complexity of the UAS and the type of operation, additional requirements may be detailed in the FAA issued COA document, ORM document, or AOC Flight Authorization Memo.

4.2 Regardless of FAA requirements, all NOAA UAS operations identified in section 3.2 of this Policy require a PIC designation in the platform being operated. The CO, AOC, will only designate NOAA employees as PICs. Non-NOAA PICs (e.g. contractors) will be required to meet the same criteria set forth for NOAA PICs and shall be designated in writing by their Agency, contracting vendor or the UAS manufacturer; AOC shall receive a copy of the PIC designation prior to flight operations commencing. Requirements for an FAA pilot certificate may be as required in the Certificate of Authorization for flight, approved ORM document, and any additional FAA regulations. The CO, AOC may determine an additional need for further certification based on the UAS characteristics, mission profile, or other operational parameters.

4.3 UAS Pilot Qualifications for International airspace and SUA

- a. For UAS flights in International and/or segregated airspace such as Restricted Areas, Warning Areas, Air Traffic Control Assigned Airspace (ATCAA) and Military Operating Areas (MOAs), pilot qualifications will be determined on a case-by-case basis by the CO, AOC.
- b. The nature of the operation, size and complexity of the UAS and geographical location of the SUA will be taken into consideration for determining pilot qualifications.

4.4 The following table summarizes the rating requirements set forth in sections 4.1 through 4.4:

Airspace	AOC PIC Designation	FAA UAS Rating	Notes:
NAS <400ft	X	X	Line-of-sight operations only. Additional requirements may be added as per COA.
NAS >400ft	X	X	Night operations: currency as per FARs Additional requirements may be added as per COA.
SUA/ Foreign	X		For complex operations, or due to foreign requirements, additional qualifications may be required by the CO, AOC.

4.5 UAS PIC Currency and Proficiency

- a. Pilots shall be current and proficient in the UAS being operated.
- b. Pilots shall receive training applicable to the UAS being operated inclusive of normal, abnormal and emergency procedures. At a minimum, the PIC must demonstrate three takeoffs (launch) and landings (recovery) in the UAS in the previous 90 days. Currency may be regained using an appropriate simulator if available. Currency may also be regained under the direct supervision of a qualified and current PIC in the specific UAS. If the above means are unavailable, currency may be regained with dedicated training flights on the UAS system prior to any operational flight.
- c. For operations approved for IFR in the NAS, the PIC shall maintain currency per 14 CFR 61.57, Recent Flight Experience, as applicable.
- d. In the case of low cost commercial UAS and prototype, experimental, or research UAS for which no formal schools are available, the services of the designers and manufacturers best qualified personnel shall be utilized to brief and familiarize the UAS pilots with the aircraft, UAS aircraft systems, and ground control stations. Existing UAS simulators and similar UAS platforms may be used to train pilots prior to flying a UAS research vehicle. The Chief, UAS Section, AOC shall determine the appropriate training required.
- e. Currency requirements that differ from the above will be specified in the UAS-specific training syllabus or individual Field Office Standard Operational Procedures (SOP) document. Where differences exist, the UAS-specific syllabus will take precedence.

4.6 UAS PIC Training Requirements

- a. UAS pilots will receive training in all specific details of the UAS being operated including normal, abnormal, and emergency procedures.
- b. Training must include manufacturer specific training (or recognized equivalent), demonstrated proficiency, and testing in the UAS being operated.
- c. A training syllabus will be developed for each UAS to prescribe requirements for initial qualification, proficiency, and currency for each pilot. All training will be retained in training records maintained by AOC UAS Section.

4.7 UAS PIC Designation

- a. The CO, AOC, will issue a PIC designation letter for NOAA employees and the letter will be kept on file by the AOC UAS section. PIC designation may be limited in scope to the requirements of the UAS, particular project, and/or operating environment.
- b. If practicable and/or required, Instructor Pilot designation for a given UAS will be issued at the discretion of the CO, AOC.

4.8 Supplemental Pilot Requirements

- a. SPs are those pilots assigned UAS flight duties to augment the PIC based on the particular requirements as specified in the UAS system operator's manuals.
- b. SPs will assist the PIC with flight duties and are authorized to operate the UAS under the guidance and supervision of a fully qualified and rated PIC.
 1. If an SP assumes the role of PIC, they must comply with the PIC rating, currency and training requirements listed in this policy.
 2. Training - UAS SPs must have:
 - a) Training in all specific details of the UAS being operated, including normal, abnormal, and emergency procedures;
 - b) Manufacturer-specific training (or recognized equivalent); and
 - c) Demonstrated proficiency and successful testing in the UAS being operated.

4.9 Visual Observer (VO) Qualifications and Certification:

- a. A dedicated Visual Observer (VO) is required for operations above 400 feet AGL, or in congested areas. Operations below 400 feet AGL and in non-congested areas will maintain traffic separation with the situational awareness of the PIC. Additional VO requirements may be detailed in the FAA issued COA, ORM document, or AOC Flight Authorization Memo.
- b. VO duties/requirements/training requirements include, but are not limited to the stipulations of Appendix B of this policy.

4.10 Mission Systems Operator (MSO) - Ancillary personnel such as MSOs or mission specialists must be thoroughly familiar and possess operational experience with the equipment being utilized.

4.11 The Mission Commander (MC) will be designated for each UAS project. The MC must be a NOAA Federal employee that has functional oversight of the UAS project. The MC is the focal point for project coordination, incident reporting, HAZREP investigations, and regular operational reporting.

5. MAINTENANCE AND AIRWORTHINESS

5.1 Maintenance

- a. The PIC will ensure the aircraft has been inspected and maintained in accordance with the manufacturer's procedures, FAA UAS guidelines and/or AOC Maintenance Policies. Note: Many sUAS typically operate on a "fly to failure" maintenance schedule.

- b. Flight critical parts will be inspected at least once per day prior to flight activities (normally accomplished during the first preflight of the day).
 - c. Field Offices will work with the AOC UAS Section to set and adhere to an inspection schedule for critical components based on the UAS manufacturer's guidance. Note: the FAA has no official guidance at this time governing the maintenance of UAS. In the event no manufacturer maintenance guidance exists, industry recognized best practices shall apply.
 - d. Individual aircraft logbooks for corporate UAS assets will be maintained by the AOC UAS Section. Individual aircraft logbooks for field UAS assets will be maintained by the operating UAS field office. At a minimum, these logbooks shall include flight hours, software or firmware updates, any malfunctions such as lost link, damage of parts, and serial numbered parts that require replacement. UAS maintenance logbooks should be submitted to AOC UAS Section annually for review and archive.
 - e. A preflight inspection must be performed by the PIC per the manufacturer's guidelines.
 - f. Software, firmware, and hardware changes should be documented as part of the normal maintenance procedures.
 - g. For unmanned aircraft system discrepancies and payload changes, a record entry should be made in the logbook.
- 5.2 Radio Spectrum Usage Requirements - UAS missions must have appropriate National Telecommunications and Information Administration (NTIA) approval for radio spectrum usage prior to commencing. This is accomplished through the NOAA Office of Radio Frequency Management. Receipt of approval may take in excess of 50 days. AOC is responsible for spectrum management, coordination, and approval.
- 5.3 Airworthiness - Airworthiness requirements for UAS are dependent on the operational requirements of the UAS and the regulatory requirements of the airspace. For airspace that requires an airworthiness evaluation, AOC will make the final determination regarding whether the UAS has sufficient airworthiness substantiation. UAS Airworthiness Statements will include, at a minimum: the date(s) of effectiveness and any warnings and/or limitations.
- 5.4 Flight Clearances or airworthiness determinations from other federal agencies such as NASA, Naval Air Systems Command (NAVAIR), etc., may be used by AOC to provide airworthiness justification. Typically, mature UAS programs have undergone an airworthiness process of some kind. Additionally, there are various civilian and DOD organizations that can be used to provide airworthiness justification.
- 5.5 Examples of acceptable airworthiness policy/criteria include, but are not limited to:
- a. DOD: MIL-HDBK 516C, Airworthiness Certification.
 - b. U.S. Air Force: AFD 62-6, United States Air Force (USAF) Aircraft Airworthiness Certification.
 - c. U.S. Army: AR 70-62, Airworthiness Qualification of US Army Aircraft Systems (Level 1).
 - d. U.S. Navy and Marine Corps: NAVAIRINST 13034.1C, Flight Clearance Policy for Air Vehicles and Aircraft Systems.
 - e. National Aeronautics and Space Administration (NASA) Dryden Handbook DHB-X-001, Airworthiness and Flight Safety Review.

- 5.6 Continued Airworthiness - Each UAS must be inspected and maintained per the manufacturer's guidelines/procedures. To ensure continued airworthiness, a configuration control program must be in place for hardware and/or software changes made to the UAS. Additionally, UAS logbook entries shall be made to certify compliance with all inspection/maintenance requirements and to demonstrate continued airworthiness.

6. FLIGHT APPROVAL PROCEDURES

6.1 UAS Flight Readiness Review (FRR) Board

- a. All NOAA UAS operations shall be approved by the CO, AOC, through the issuance of an AOC Flight Authorization Memorandum. Any UAS operation may require an FRR Board at the discretion of the Chief, UAS Section.
- b. If required, the FRR Board may include representatives from AOC Operations, Safety, SEB, and Maintenance Branches. The Chief, UAS Section, will designate a chairman for the FRR Board. Personnel from the UAS Section will schedule the FRR Board, ensure the PI is appropriately prepared, and act as Board secretary
- c. Briefing material should be made available to the board members one week prior to the scheduled board date. The project PI will provide a briefing to the FRR Board (in person, or via telephone conference). The FRR Board shall review the provided mission materials and make a recommendation to the CO, AOC.
- d. The FRR Board will focus on, but not limit its scope to the following areas:
 1. Operational Risk Management (ORM)/hazard analysis and mitigations.
 2. Operations Plans, Cruise Plans (if required) and Airspace/Safety Plans.
 3. Emergency Procedures (to include incident notification).
 4. COA provisions.

6.2 Flight Approval

- a. A NOAA AOC Flight Authorization Memo, signed by the CO, AOC, is required prior to commencing any UAS operation.
- b. UAS flights will be approved for a specific flight envelope. This may include restrictions on weather, daylight, dates, airframe, location, or other operational parameters.
- c. Requests for deviations from the signed AOC Flight Authorization Memo must be submitted in writing by the PI to the Chief, UAS Section.
- d. Changes to the Flight Authorization Memo may require an updated operations plan, ORM and other materials, as appropriate. The Chief, UAS Section has the discretion to request an additional FRR Board to review changes and reissue a modified Flight Authorization Memo.

6.3 UAS Flight Reporting Requirements

- a. Once an operation has been approved, the project shall record daily flight information in accordance with normal AOC aircraft and project reporting requirements (e.g. SITREPs, flight logs, maintenance discrepancies, etc.). These flight records will be transmitted to AOC via the most expedient means available. In cases where UAS activity occurs in remote environments with limited internet access, daily flight activity will be transmitted at the earliest availability, in no case less frequent than weekly.
- b. In the event of any incidents or mishaps, the Mission Commander and/or PIC shall make immediate positive contact with the Chief, UAS Section. If the Chief, UAS Section, is unavailable, positive contact shall be made with the AOC Staff designees in the AOC UAS Section. Voice mail and e-mail messages are not considered positive contact. All UAS operations will be halted until positive clearance is given from the Chief, UAS Section or designee. All further reporting and response will adhere to the procedures described in *AOC Safety Policy 220-1-4*.
- c. The PIC shall take photographic evidence of any damages to the UAS or GCS that occur during training exercises or operational missions.
- d. The PIC shall secure any flight telemetry data available after a UAS incident and provide it to the AOC UAS Section. The MC and/or PIC will work with the investigation to process and interpret the data to analyze the incident.
- e. The Chief, UAS Section, AOC, will determine how incident investigations will be conducted in accordance with NOAA, OMAO, and AOC procedures. The Mission Commander will be primary point of contact as the federal authority in charge of the project.

7. OPERATIONS

7.1 Standard Operating Procedures (SOP) Manual

- a. Each Line Office that operates UAS is required to have a Standard Operations Procedures (SOP) document to supplement the original equipment manufacturer's manual. This SOP document will be specific to an airframe, and could supplement more general information in an overarching program-wide operational manual.
- b. At a minimum, SOPs will include system specific operational procedures, maintenance practices, equipment and environmental limitations.
- c. The SOP will be tracked with a version number, effective date, review authority, and a review date no less frequent than every two years. The responsible party for SOP formulation and review will be clearly identified on the document.
- d. The requirement for an SOP is limited to operational systems. UAS platforms under an approved test and evaluation plan are not required to have a NOAA SOP, but should ensure all operations are using industry accepted best practices and all available OEM checklists and procedures.

7.2 Preflight

- a. Salt Accretion and Corrosion – Crews shall comply with operator's manual directions, if applicable, to minimize corrosion. Longer term anti-corrosion chemicals can be used with the guidance of the operator's manual and in consultation with AOC Maintenance. If not applied properly, many of the anti-corrosion products for electrical connections can cause delamination of the composite structure leading to premature structural failure.

- b. Contamination of Flight Surfaces – The platform shall not be launched if there are any traces of ice, snow or frost on any part of it. In air temperatures below freezing, do not launch a platform that has been rinsed recently or is wet. Ensure that the vehicle is completely dry after being rinsed if being launched on a successive mission in air temperatures near or below freezing.
- c. Fire – The highest risk of UAS lithium ion battery fires occurs during charging operations. At no point shall any UAS battery be on a charger without personnel trained in the charging procedures present. Fresh or salt water shall be available during battery charging operations to cool the battery in the event of a lithium battery fire.
- d. Propeller Safety – Preflight, launch and recovery pose the highest risk of injury from the propeller. All personnel that will work in the vicinity of the platform shall be briefed about propeller safety prior to operations.

7.3 Airborne Operations

- a. Sterile Cockpit – The PIC, SP, ancillary personnel and VOs shall not be distracted from their flight duties. The PIC shall remind all non-flight crew personnel of the requirement to maintain a sterile environment during all critical phases of flight.
- b. Operations Involving Non-Participating Persons – sUAS air vehicles will not operate over a human unless they are a participant in the operation, or if they are located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling small unmanned aircraft.
- c. Operation over Private Property – Written permission must be obtained for the launch and recovery locations for sUAS. Flight over private property is not permitted unless the operator has met NOAA UAS privacy requirements and has addressed all privacy, legal, and liability requirements.
- d. Bird/Wildlife Activity – If the PIC determines that wildlife poses a risk to the operation, the platform shall be recovered and operations shall cease until the threat is no longer present. Particular care will be exercised when flying over colonies of birds to avoid disturbing them.
- e. Battery Management – Li Po batteries do not provide ample warning before their charge runs low. The voltage tends to reduce very slowly at first and then drop rapidly as the battery nears depletion. Flight crews must be familiar with battery limitations listed in the operator's manual and the quick reference guide on the normal checklists. Published limitations shall not be exceeded. Batteries that have been determined to be unreliable shall be marked with tape and not used until they have been evaluated by authorized personnel.
- f. Loss of Link/Fly Away – The UAS shall be programmed with a loss of link (LOL) procedure that will provide safe passage to a predetermined location. This may change throughout the flight based on location and operational phase. A LOL event shall be reported immediately to all pertinent crew and all available Crewmembers shall assist in locating the vehicle. LOL time will be noted for mandatory FAA monthly reporting.
- g. Controlled Flight Into Terrain (CFIT) – Ancillary personnel shall continuously monitor the moving map display and platform altitude reading. All vertical features in the operational area shall be identified prior to flight and a minimum safe altitude shall be developed that will clear all obstacles.
- h. Weather Conditions – The UAS shall not be used to determine the weather conditions before commencement of operations. If there is any doubt about the weather conditions, the PIC shall delay or cancel operations.

- i. Fatigue – Flying a UAS for an extended period of time can cause considerable fatigue due to small screens, moving platforms and concentration when operating in confined areas. If at any point any member of the flight crew team experiences signs of fatigue, crew rest shall be taken until the fatigue has been eliminated
- j. Frequency Interference – Interference of the command and control link is dangerous to the safety of the UAS and operating crew. The immediate operational surroundings shall be considered for possible interference in addition to the frequency clearances required by the FAA and local agencies. This includes radars, cell towers, AIS, and communication equipment.

7.4 Marine Operations

- a. UAS operations from all ships and small boats will occur using documented and approved vessel operational procedures. These procedures should be demonstrated under controlled non-mission training flights before deployed in the field. Increased risk from hand launching and recovering a multi-rotor UAS from a vessel will be mitigated through these documented procedures in addition to the applicable ORM document.
- b. The marine portions of UAS operations conducted on NOAA Ships will be subject to the policies, procedures, and risk mitigation guidance of the NOAA Ship safety and environmental compliance procedures and any applicable ship standing orders.
- c. The marine portions of UAS operations conducted on NOAA Small Boats will be subject to the policies, procedures, and risk mitigation guidance of the NOAA Small Boat Standards and Procedures Manual.
- d. The marine portions of UAS operations conducted on ships or small boats of other government organizations will be subject to the policies, procedures, and risk mitigation guidance of the sponsoring agency.
- e. The ORM team and FRR Board members should be adequately briefed and familiar with the risk mitigation framework available from the marine operations unit that provides support to a NOAA UAS flight crew.
- f. Water Recovery – No person shall wade more than waist deep into the water for the recovery of a platform. A kayak may be utilized in recovery, if the kayaker has proper flotation gear, is not exposed to the surf line, and is within a very short distance (approximately 300 feet) from the beach.

Appendix A

UAS Operations in Uncontrolled (Class G) International Airspace

This Appendix applies to UAS owned and operated by the National Oceanic and Atmospheric Administration (NOAA). It follows the guidance from Department of State Memorandum, *Designation of Other Agency Aircraft as State Aircraft* (Policy 220-1-1-1, Appendix A) and Director, OMAO Memorandum to Executive Secretary, Department of State (Policy 220-1-1-1, Appendix B). It establishes policy and operating procedures for NOAA UAS operating “due regard” within international airspace.

The procedures and operational restrictions in this Appendix allow for safe UAS operations over international waters (i.e. UAS launch and recovery from a NOAA or other AOC-approved vessel) in uncontrolled (Class G) airspace. Additional appendices will be developed for other operational scenarios.

A FAA Certificate of Authorization or Waiver (COA) is *not* required as long as the Pilot-in-Command (PIC) complies with this Appendix.

These procedures and operational restrictions *do not* permit the PIC to deviate from applicable UAS flight manuals, checklists, SOPs and shipboard manuals while operating in uncontrolled international airspace.

The following procedures and operational restrictions shall be complied with during UAS “due regard” international operations:

1. The Ground Control Station (GCS) and UAS shall remain within uncontrolled (Class G) airspace at all times.
2. The GCS and UAS shall remain greater than 12nm (i.e. international waters) from the U.S. coastline or U.S. territory during all phases of flight. (*Note:* for UAS operations conducted off another country’s coastline, the U.S. Department of State shall be consulted for minimum standoff, which may be greater than 12nm).
3. The UAS shall be operated at or below 2,000ft MSL, provided the UAS remains within Class G airspace at all times.
4. The UAS shall remain within 5nm of the GCS at all times.
5. The UAS shall be operated in VMC only. If IMC is encountered unintentionally, VMC shall be regained by the safest and most expeditious means possible.
6. Day or night operations are permitted, and associated risks and mitigation measures shall be addressed in each project-specific Operational Risk Management (ORM) document.
7. Flight operations shall be selected so as not to interfere with established air routes and ocean shipping lanes.
8. Due Regard UAS operations shall *not* be conducted under the Mode C veil of Class B or C airspace.
9. Notices to Airmen (NOTAMs) and Notices to Mariners (NOTMARs) shall be issued for the affected airspace/body of water.
10. The launch vessel should conduct a surface search using its radar no later than 10 minutes prior to the launch of the UAS in order to identify other vessels within the operational area. A qualified radar operator should monitor the ship’s radar display whenever the UAS is airborne. If another vessel is identified within the 5nm UAS operational range, the UAS shall remain at least 2nm from that vessel at all times unless identification of

vessels is a requirement of the mission flight (e.g. during National Marine Sanctuaries missions). Specifics shall be addressed in each project-specific ORM assessment.

11. At least one observer shall be posted during all UAS operations to assist with separation from other aircraft. The observer shall be provided binoculars, or another visual enhancement device, and shall have the means to be able to clearly communicate with the PIC.
12. Each project-specific ORM document shall comply with the above items, as well as identify and address any newly identified risk(s).

Appendix B

NOAA UAS Visual Observer Responsibilities and Guidelines

Purpose: Separation of air traffic in the US National Airspace System (NAS) relies on two principles: separation via radar through Air Traffic Control (ATC) and self-separation between pilots during visual weather conditions (see-and-avoid). Both of these tactics can be combined or used independently during flight depending on weather and operational conditions. Unmanned aircraft operations in the NAS are not exempt from these requirements and must provide an equivalent level of safety to manned aircraft operations. Small UAS (sUAS) operations are: 1) typically flown in uncontrolled airspace outside of ATC radar or radio contact, and 2) the airframes typically do not have a significant radar return. Visual Observers (VOs) can be used to enhance the UAS pilot's situational awareness to maintain safety of flight and provide see-and-avoid capability.

Visual Observer Definition: A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. Collision avoidance includes, but not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness. Observers are considered Flight Crewmembers and must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as UAS pilot and observer. Science or ship personnel may be used as VOs only if this becomes their primary duty during UAS flight operations.

Visual Observer Qualifications: All observers must have an understanding of the following Federal Aviation Regulations (FARs):

- a. 91.111 Operating Near Other Aircraft
- b. 91.113 Right-of-Way Rules: Except Water Operations
- c. 91.115 Right-of-Way Rules: Water Operations
- d. 91.155 Basic Visual Flight Rules (VFR) Weather Minimums

Responsibilities: The VO must be positioned to assist the Pilot in Command (PIC), to exercise the see-and-avoid responsibilities required by 14 CFR 91.111, 91.113 and 91.115 by visually scanning the area around the aircraft for potentially conflicting traffic and assisting the PIC with navigational awareness. The VO must:

- a. Assist the PIC in not allowing the UAS to operate beyond the visual line-of-sight limit.
- b. Be able to see the aircraft and the surrounding airspace sufficiently to assist the PIC with:
 - 1. Determining the UAS's proximity to all aviation activities and other hazards including terrain, weather and structures.
 - 2. Exercising effective control of the UAS.
 - 3. Complying with FAR 91.111, 91.113, and 91.115.
 - 4. Preventing the UAS from creating a collision hazard.
- c. Inform the PIC before losing sufficient visual contact with the UAS or previously sighted collision hazard.
 - 1. This distance is predicated on the observer's normal vision. Corrective lenses, spectacles and contact lenses are permitted.

2. Due to field of view limitations and distortion issues with aids to vision such as binoculars, field glasses, night vision devices, or telephoto lenses, these are allowed only for augmentation of the observer's visual capability; they cannot be used as the primary means of visual contact. When using other aids to vision, VO's must use caution to ensure the aircraft remains within normal visual line-of-sight of the observer.
- d. Be in a dark environment 30 minutes prior to night operations to ensure sufficient eyesight adaptation.
 - e. Have immediate and direct communication ability with the PIC

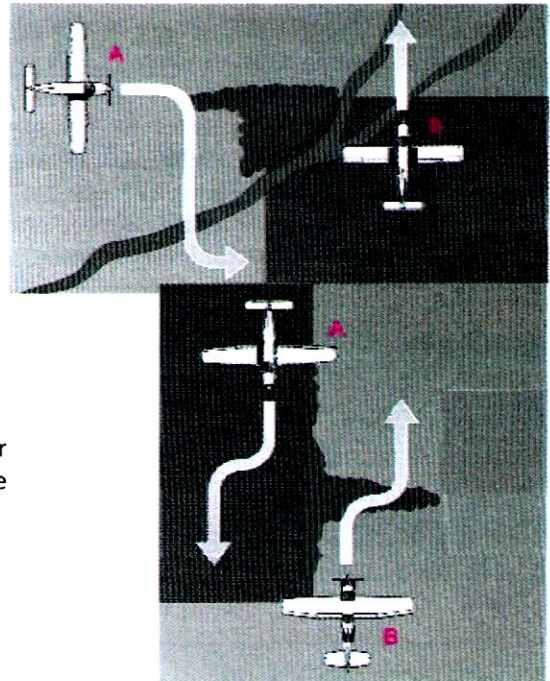
The PIC retains the responsibility of ensuring safety of flight and adequate visual range coverage to avoid any potential collisions. The PIC for each UAS operation must identify a location from which the observer will perform his/her duties. This location will be selected to afford the best available view of the entire area within which the operation is to be conducted.

Federal Aviation Regulations 14 CFR as applicable to sUAS Operations:

91.111, Operating Near Other Aircraft – No person can operate an aircraft so close to another aircraft as to create a collision hazard.

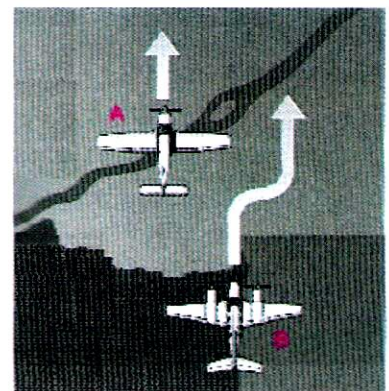
91.113, Right-of-Way Rules: Except Water Operations – ...vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

Converging: When aircraft ... approximately the same altitude (except head-on, or nearly so), the aircraft to the other's right has the right-of-way.



Approaching head-on: When aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft shall alter course to the right to pass well clear.

Overtaking: Each aircraft that is being overtaken has the right-of-way, and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.



Practical operational note: While operations in the NAS rely on equal responsibility between manned and unmanned pilots to see-and-avoid each other, sUAS are very difficult to spot from manned aircraft. The VO and PIC should anticipate this and be proactive to identify a conflict and maneuver the UAS well before a close quarters situation occurs.

91.115 Right-of-Way Rules: Water Operations: Each person operating an aircraft on the water shall, insofar as possible, keep clear of all vessels and avoid impeding their navigation, and shall give way to any vessel or other aircraft that is given the right-of-way by any rule of this section. When aircraft, or an aircraft and a vessel, approach so as to involve risk of collision, each aircraft or vessel shall proceed with careful regard to existing circumstances, including the limitations of the respective craft.

91.155 Basic VFR Weather Minimums: no person may operate an aircraft under VFR when that flight visibility is less, or at a distance from the clouds that is less than that prescribed for the corresponding altitude and class of airspace:

Class A Airspace: Not applicable for sUAS operations. Controlled airspace that includes all altitudes between 18,000ft and 60,000ft. Only flights operated under ATC control are allowed.

Class B Airspace: Not applicable for sUAS operations. Controlled airspace includes airspace within 30 nautical miles (nm) and up to 10,000ft around and above the busiest US airports (e.g. New York, Dallas and Los Angeles).

Class C Airspace: Controlled airspace that includes areas within 10nm and up to 4,000ft above moderate traffic density airports (e.g. Santa Barbara, Oklahoma City, and Charleston).

Class D Airspace: Controlled airspace that includes areas within 4nm and up to 2,500ft above low density airports that have an operating air traffic control tower (e.g. San Luis Obispo, Waco and Hyannis).

Class E Airspace: Controlled airspace that typically starts at 700ft or 1200ft above the ground and extends up to 18,000 ft. It does not include any airspace already designated as Class B, C or D.

Class G Airspace: Uncontrolled airspace from the surface up to the floor of controlled airspace. Most sUAS operations in the NAS will occur in this airspace.

Airspace	Flight Visibility	Distance from Clouds
Class A (N/A for sUAS)	N/A	N/A
Class B (N/A for sUAS)	3 statute miles	Clear of Clouds
Class C, D & E (below 10,000 ft.)	3 statute miles	500 ft. below 1,000 ft. above 2,000 ft. horizontal
*Class G (below 1,200 ft.):		
*Day	1 statute mile	Clear of Clouds 500 ft. below
*Night	3 statute miles	1,000 ft. above 2,000 ft. horizontal

*The FAA usually mandates the use of Class E VFR weather minima for UAS operations in Class G airspace. The PIC will brief the mission crew prior to flight on the applicable airspace and weather rules.

Record of Changes/Revisions

This policy is a living document that is modified to reflect changes in Federal policy and/or organizational strategic goals and objectives. Modifications made to this document are recorded in the Change/Revision Record below. Only the changes from the current and most recent version are required.

Change / Revision Record			
Version No.	Date	Section	DESCRIPTION OF CHANGE
7.0	23 Aug 2018	ALL	Multiple significant changes throughout document. Consider as new policy.
6.0	19 Dec 2016	ALL	Multiple significant changes throughout document. Consider as new policy.
5.0	28 Oct 2014	3.2.c.3.	Insert 3. Para and renumber.
5.0	28 Oct 2014	3.3.c.	Remove 'FAA has released interim guidance' and ' Additional information can be found at www.faa.gov/UAS '. Insert 'latest FAA guidance'.
5.0	28 Oct 2014	3.3.d.	Add Class G sUAS information.
5.0	28 Oct 2014	3.3.d.2.	Insert ' NTIA Spectrum analysis'.
5.0	28 Oct 2014	3.3.e.1.	Replace 'warning areas' with 'SUA'
5.0	28 Oct 2014	3.3.e.4.	Replace '(Draft Beyond ... Policy)' with 'of this policy'
5.0	28 Oct 2014	4.4	Add 'International'
5.0	28 Oct 2014	5.2	Add 'Prior to commencing operations, each UAS mission must have appropriate National Telecommunications and Information Administration (NTIA) approval for radio spectrum usage. This is accomplished through NOAA's Office of Radio Frequency Management and may take in excess of 50 days to receive approval'.
5.0	28 Oct 2014	6.1.b.	Add 'An officer from the UAS Section will' and 'schedule the FRR board and'.
5.0	28 Oct 2014	6.1.c.	Add 'provided mission materials'.
5.0	28 Oct 2014	6.3.c.	New re: obtaining photographic evidence of damages to UAS or GCS.
5.0	28 Oct 2014	7.1.b.	Add 'A "Return to if found" card with AOC's address and phone number shall be placed in each case that is shipped.
5.0	28 Oct 2014	Appendix A	Delete 'this Appendix is included for ... "State Aircraft" designation.' Add 1st paragraph that defines scope of Appendix A as it relates to the AOC Due Regard Policy 220-1-1-1 2nd para, delete 'APH-22 and aerial launched platforms.' 3rd para, delete 'are being established to' and 'and wholly remaining within uncontrolled airspace (i.e. Class G).'