

# **Evaluation of Unmanned Aircraft Systems (UAS) Observing Strategies Suitable for Transition into Routine NOAA Applications**

## **Internal NOAA FY2017 Request for Proposals from the NOAA UAS Program Office within the Office of Oceanic and Atmospheric Research**

### **Overview**

The NOAA Unmanned Aircraft Systems (UAS) Program, within the Office of the Oceanic and Atmospheric Research, is releasing a FY2017 Request for Proposals (RFP) to solicit NOAA Line Office assistance in the evaluation of UAS observing strategies for operational application.

The overall goal of the RFP across all of its objectives will be to identify UAS observing strategies or technologies that can be developed, tested and matured for transition into NOAA operations by one or more Line Offices. *A UAS observing strategy is simply how a Line Office will use UAS observations to meet its mission.* Based on observing requirements, the basic elements of a UAS observing strategy include:

- platform selection,
- payload selection,
- a concept of operations,
- information management plan,
- life-cycle management plan and
- staffing, safety, training and proficiency plans.

Evaluation studies proposed for this RFP could address any or all of these elements to advance the readiness of UAS observations for Line Office operations or routine applications.

How these observing strategy elements are implemented operationally depends upon the functions of the Line Office. Some Line Offices need to build internal NOAA expertise in UAS operations requiring specific planning for each observing strategy element. Other Line Offices may choose to contract UAS services or “data buys” from private industry vendors who have already addressed the observing strategy elements. The objectives of this RFP could be accomplished through a variety of approaches.

### **Background**

The NOAA UAS Program within the NOAA Office of Oceanic and Atmospheric Research (OAR) assists with the identification, evaluation, and transition of effective and

affordable UAS capabilities to satisfy NOAA Line Office observing requirements. Historically, the NOAA UAS Program has focused on science themes of high impact weather, marine, and polar observations to demonstrate science traceability to the goals of the NOAA Five-year Research Plan and the OAR Strategic Plan. Projects selected through this RFP will still be tracked within these three science focus areas to continue this science traceability.

The NOAA Office of Marine and Aviation Operations (OMAO) is a partner in this RFP and will oversee the development of safe UAS operations for NOAA. Proposers shall consult with the OMAO Aircraft Operations Center (AOC) during proposal preparation to discuss safety and operational feasibility of the proposed UAS observing strategy and to acquire an estimate of the OMAO resources (e.g. staff time, travel funding, ship time, manned aircraft time, etc.) needed to support the proposed project. After this discussion, AOC personnel will provide a letter, addressed to the proposal principal investigator stating the feasibility assessment and a resource estimate, to be included in the proposal package. The feasibility assessment is a brief statement explaining the likelihood that the proposal can be approved in the current regulatory environment. Additionally, AOC can support proposals selected for funding by submitting requests for flight authorization to the Federal Aviation Administration and providing licensed pilots, engineers and technicians for the selected projects. The AOC UAS Section email is [aoc.uas.office@noaa.gov](mailto:aoc.uas.office@noaa.gov)

## **Scope of the RFP**

The NOAA UAS Program requests proposals from Line Office civil servants to lead projects addressing one or more of the following RFP objectives for evaluation studies. Each proposal should clearly describe how the evaluation study will advance the overall readiness level (RL) of a UAS observing strategy. In general, advancement of readiness requires testing in relevant or operational environments. (See RL definitions in Appendix A). Successful transition projects will ultimately optimize the balance between the positive impact of UAS observations to serve the NOAA mission and the cost effectiveness and operational feasibility of UAS operations.

During the development of an observing strategy, the platform, payload, and component systems may each begin at different RLs. The total observing system will not be able to achieve RL 8 until all system components have been successfully tested in a robust operational environment. The UAS observing strategy will not be able to achieve operational status (RL 9) until:

1. all the elements of the observing strategy (i.e. platform selection, payload selection, concept of operations, information management plan, life-cycle management plan and staffing, safety, training and proficiency plans) are tested and finalized AND

2. the Line Office is prepared to make an institutional commitment by assuming financial and administrative ownership of the observing strategy.

Proposals should clearly describe why UAS observations are needed by the Line Office to meet its mission and its documented NOAA observing requirements in the NOAA Consolidated Observing User Requirement List (COURL) database managed by the Technology, Planning, and Integration for Observation (TPIO) Program reporting to the NOAA Observing System Council (NOSC). The proposal should also outline how conducting one or more of the evaluation studies described below will prepare the Line Office to make an institutional commitment to begin using UAS observations operationally. The period of performance for selected projects will be no more than three years. Proposed projects expected to reach operational status (RL 9) with Line Office acceptance by the end of the period of performance are strongly encouraged.

Proposers are also strongly encouraged to consider how a proposed UAS observing strategy and/or UAS or instrument technology could be used beyond a single Line Office for wider NOAA benefit. Proposals with cross-Line Office teaming and cost sharing will receive favorable consideration during the proposal evaluation.

### **Description of RFP Objectives**

The RFP objectives described below have been informed by the Proceedings of the NOAA UAS Symposium conducted during October 25-27, 2016 at the NOAA Southwest Fisheries Science Center. The proceedings report may be found at [https://swfsc.noaa.gov/uploadedFiles/Events/Meetings/UAS\\_2016/UAS%20Symposium%20Proceedings.pdf](https://swfsc.noaa.gov/uploadedFiles/Events/Meetings/UAS_2016/UAS%20Symposium%20Proceedings.pdf). The proceedings report may provide useful information for potential proposers to this RFP, but does not represent the priority ranking for proposal selection or the full breadth of worthy UAS applications. All submitted proposals will be peer reviewed and scored based on their own merit using the evaluation criteria provided in this RFP document.

- **Evaluate observing strategies using medium endurance (i.e. > 30 minutes) rotary wing UAS**

NOAA Line Offices have interest in using rotary wing (i.e. multi-rotor vertical takeoff and landing) UAS for a variety of observing applications such as marine wildlife, hydrographic, and coastal surveys, atmospheric observations below 10,000 ft altitude, and satellite calibration and validation. This RFP seeks proposed projects that evaluate the readiness of observing strategies using medium endurance rotary wing UAS flying more than 30 minutes and up to 10,000 ft altitude from land, ship, or boat. Operations could be either within line of sight or beyond line of sight. UAS payloads could include high definition still

and video cameras, hyperspectral or infrared remote sensors, *in situ* sensors, or other mission specific payloads.

- **Evaluate observing strategies using hybrid fixed and rotary wing UAS**

NOAA Line Offices have interest in new UAS hybrid platform designs capable of vertical takeoff and landing using rotary wings and then conversion to fixed wing flight performance using one or more propellers for forward flight after takeoff. These types of UAS platforms may be efficient for NOAA ship operations and could be used for air quality and weather observations, long range living marine resource surveys, environment assessment, marine protected area and hydrographic surveys, and shoreline verification. This RFP seeks proposed projects that evaluate the readiness of observing strategies using hybrid fixed and rotary wing UAS suitable for shore or shipboard operations. Hybrid UAS should be capable of flying beyond line of sight and up 15,000 ft altitude. Payload options could be modular and swappable and could include air chemistry or atmospheric *in situ* sensors, synthetic aperture radars, visible cameras, infrared remote sensors or mission specific sensors.

- **Evaluate observing strategies using long endurance (i.e. >2 hours) fixed wing UAS**

NOAA Line Offices have interest in long endurance fixed wing UAS for a variety of observing applications such as gravity, marine wildlife, and marine protected area surveys. Flight operations could be from ship or shore. This RFP seeks proposed projects that evaluate the readiness of observing strategies for long endurance (i.e. >2 hours) fixed wing UAS capable of flying beyond line of sight and below 25,000 ft altitude. Payload options could be gravity sensors, air chemistry or atmospheric *in situ* sensors, synthetic aperture radars, visible cameras, infrared remote sensors or mission specific sensors.

- **Evaluate observing strategies using aircraft or balloon launched UAS**

NOAA Line Offices have interest in UAS that could be launched from aircraft or balloons for a variety of difficult or dangerous observing applications such as hurricane research, air chemistry observations, or volcanic ash monitoring. These UAS could be considered disposable or recoverable depending on the observing application. This RFP seeks proposed projects that evaluate the readiness of observing strategies for aircraft or balloon launched UAS capable of being launched from beyond line of sight at various altitudes. Payload options would be specific to the observing application.

- **Evaluate, test, calibrate, and validate UAS payloads**

NOAA Line Offices have interest in modular, lightweight, and small payloads that are easy to integrate onto a variety of UAS platforms. Additionally, calibration

and validation of UAS payloads is also necessary to develop community standards and confidence in UAS observations for NOAA observing requirements. This RFP seeks proposed projects that evaluate, test, calibrate, and validate UAS payloads in order to develop best practices for UAS observations. Evaluation of UAS observations should be compared against the requirements maintained COURL database managed by the TPIO Program reporting to the NOSC.

## **Proposal Submission Requirements**

- This RFP is an internal NOAA competition. The Principal Investigator of the proposal must be a NOAA Line Office civil servant. Co-Investigators may be Federal employees, private industry personnel, NOAA Cooperative Institute partners or other academic personnel. Proposal teams are strongly encouraged to include a representative from the Line Office expected to operationally implement the UAS observing strategy.
- Questions regarding this RFP may be sent to [uas.oar@noaa.gov](mailto:uas.oar@noaa.gov). Responses to all questions will be posted to Goggle Folder FY2017 UAS RFP (located at <https://drive.google.com/drive/folders/0B2hpbqEhRcZv1Y0dRRTY4c1pIVkU>).
- An Initial Transition Plan for the proposed project will serve as a Letter of Intent to propose to this RFP. The initial Transition Plan should be considered an endorsement by key Line Office stakeholders that the proposed UAS observing strategy may be considered for Line Office institutional commitment and operationally implementation if the proposed project is successful. The Initial Transition Plan will also be used to help guide the selection of written reviewers for the Full Proposal.
- The Initial Transition Plan should be no more than four pages long. Initial Transition Plans should be submitted electronically in Adobe Acrobat PDF format with 12-point font, single spacing, and 1 inch margins. The Initial Transition Plan should be signed by the Line Office Transition Manager and the Line Office Approving Official with authority to make an institutional commitment to the proposed UAS observing strategy. The format for the Initial Transition Plan is found in this RFP document.
- The Initial Transition Plan should be emailed to [uas.oar@noaa.gov](mailto:uas.oar@noaa.gov) by **11:59 pm Pacific on March 13, 2017**. The subject line of the email should begin with "FY2017 UAS RFP Transition Plan Submission."
- Full proposals should be no more than 10 pages long excluding the title page, budget breakdown section, OMAO feasibility assessment, and transition plan. Proposals should be submitted electronically in Adobe Acrobat PDF format with 12-point font, single spacing, and 1 inch margins. The format for the Full Proposal is found below.

- Proposals should be emailed to [uas.oar@noaa.gov](mailto:uas.oar@noaa.gov) by **11:59 pm Pacific on March 27, 2017**. The subject line of the email should begin with “FY2017 UAS RFP Full Proposal Submission.” Proposals arriving after the deadline will be returned without review.
- The responsibility to transfer award funding to external NOAA partners belongs to the Principal Investigator. This risk should be discussed in the risk mitigation section.
- Salary and overhead for NOAA employees will not be funded through this solicitation.
- Ship-time and manned aircraft flight hours will not be funded through this solicitation.
- The responsibility to ensure procurement, contract, and grant actions do not adversely impact the project schedule belongs to the Principal Investigator. This risk should be discussed in the risk mitigation section.
- The proposed project may be a multi-year effort with a total period of performance no more than three years. The budget structure of the proposal should include the funding estimate needed for each year of the project. The budget structure, project schedule and the proposal risk mitigation plan should take into account that FY2017 funding may not be delivered until after May 11, 2017. Long lead time procurement, contract, and grant actions, or Interagency Agreements may have to be planned for FY2018 in order to meet NOAA deadlines.
- Line Office cost sharing for UAS platform and payload procurements are very strongly encouraged.
- The proposal should clearly define which Line or Staff Office will own procured equipment after the end of the project performance period.

### **Required Content for Initial Transition Plan**

**Title Page** – Should list the project title, principal investigator and affiliation, co-investigators and affiliation, proposed period of performance, proposed total budget, name of Line Office Transition Manager, and name of Line Office Approving Official with authority to make an institutional commitment to the proposed UAS observing strategy.

**Brief Project Description** - The brief project description in less than 750 words should include: (a) statement of which RFP objectives are being evaluated; (b) brief description of the proposed work; (c) brief statement describing how the proposed evaluation will advance the readiness of a proposed UAS observing strategy; (d) brief statement of how the proposed UAS observing strategy will relate to Line Office mission and documented observing requirements.

**Acceptance Criteria and Timeline for Transition** – Should briefly describe what criteria need to be met in order for this project to be transitioned into operations and the expected timeline for the transition to occur

**Readiness Level Worksheet** – The worksheet in Appendix B should be included to provide a statement of the current readiness level of the UAS platform, payload, the combined UAS observing system, and the UAS observing strategy within the Line Office along with an estimate of the expected readiness level of the UAS platform, payload, the combined UAS observing system, and the UAS observing strategy for the Line Office after completion of the proposed project.

**Signature Block** - Should include the signature of the Line Office Transition Manager and the Line Office Approving Official with authority to make an institutional commitment to the UAS observing strategy

### **Required Content for Full Proposal**

**Initial Transition Plan** – The Initial Transition Plan should be included to serve as the Title Page and the Proposal Abstract. The Initial Transition Plan may be updated from the previously submitted version if key elements (e.g. goals, acceptance criteria, budget, etc. ) have been modified during the development of the full proposal. *(These pages will not be included in the total page count.)*

**Concept of Operations (CONOPS) Feasibility Assessment** – Provide a feasibility assessment and OMAO resource estimate signed by an AOC staff member. This assessment is a brief statement stating the likelihood that the proposal can be approved in the current regulatory environment. *(This page is not included in the total page count)*

**Project Scope** – Provide a statement of work that describes which RFP objective is addressed by the proposed project and the overall scope of the evaluation study. Briefly describe the key milestones to be accomplished in the course of the evaluation study and the success criteria associated with each milestone.

**Expected Significance** – Describe the expected significance of the project to assist a Line Office to meet its mission. A description of the science traceability from the Agency Priorities to the Line Office mission goals to Line Office observing requirements to UAS observing capabilities is strongly encouraged. Explain how the Line Office will improve operations or other routine applications of UAS based on the results of the evaluation study.

**Technical Project Plan** – Provide a detailed description of the work that will be performed, how information will be collected, analyzed, and reported, and how readiness will be demonstrated, tested, or assessed. Evaluation studies could include technical capabilities assessments, business case analysis, cost effectiveness and operational feasibility appraisals, training plans, life-cycle management projections, field demonstrations, and data plans. For proposals conducting field demonstrations, the proposed concept of operations (CONOPS) plan should be discussed including where, how and when the UAS will be flown and the total number of flight hours needed to accomplish the project goals.

**Management Plan** – Describe the management structure of the project for overall project coordination, decision-making, communication, and reporting. Include description of expected procurements, airspace access and clearances, travel, and shipping needs. Include a schedule chart that identifies critical milestones and expected deliverables.

**Deliverables** – Provide a description of expected project deliverables. Minimum deliverables needed before funding is released will include a written project plan and National Environmental Policy Act (NEPA) analysis. Other minimum deliverables include monthly project status reports, annual progress report, and a final project report at the end of the performance period.

**Key Personnel** – Describe key personnel needed to accomplish the project goals including level of effort, organizational affiliation, and project role for each person in the personnel list. Briefly describe qualifications of key personnel.

**Comparative Technology Assessment**– Describe the anticipated advantages of the UAS technology compared to current observing capabilities (e.g., reduction of size, mass, power, volume or cost, improved performance, or enabling new observing capabilities.) Explain why UAS observations are expected to be beneficial over other observing technologies such as manned aircraft, satellites or surface-based networks. Describe how the platform and payload selections were made for the proposed UAS observing strategy and how these selections relate to comparative UAS technology. Describe the state of maturity of the UAS technology proposed and how the proposal will evaluate and advance the operational readiness of technology, operations, and personnel expertise. Make sure this description is consistent with the Readiness Level Worksheet in the Initial Transition Plan.

**Project Risk Mitigation** – Describe the major risks to the project success and how they could be mitigated. For each risk, provide a description of how likely the risk could be (high, moderate, and low), the potential impact to the project (great, moderate, and little), and what steps could be taken to mitigate the risk. Examples of risk may be procured equipment delivered behind schedule, key personnel leaving the project

during the period of performance, cost overruns, platform failure during field testing or concerns related to NEPA.

**Budget Breakdown** – Provide a budget breakdown for each year for all major project expenses including personnel, platform flight hours, sensors, other hardware, shipping, travel, and data management. The budget breakdown should be prepared using the standard NOAA object classes. *(These pages are not included in the total page count.)*

### **Funding Availability**

Total funding provided by the NOAA UAS Program for this RFP is approximately \$1M subject to FY2017 appropriations. The total number of projects selected is anticipated to be about seven, but this number may vary depending on the total budget of highly rated proposals. A proposal budget can be as small or as large as needed as long as the total budget does not exceed \$1M. Additionally, a winning proposal may not be selected for each RFP objective depending on the quality of proposals submitted for other objectives.

### **Review Process and Evaluation Criteria**

The deadlines for proposal submission and review are listed in Appendix C. A pool of expert reviewers and external subject matter experts will be selected by the UAS Program Director to provide written reviews. Each proposal will receive three written reviews. Next, the written reviews will be forwarded to the UxS Executive Oversight Board (EOB) who will analyze the results of the written reviews and develop a consensus score for each proposal. The UAS Program Director will use the written reviews and the UxS EOB consensus score to rank the proposals based on available funding. The final proposal rankings recommended by the UAS Program Director will be provided to the OAR Deputy Assistant Administrator for Science who will make the final proposal selection. All reviewers will sign non-disclosure forms before the review process starts. All written reviewers and members of the UxS Executive Oversight Board will not be asked to review or score any proposals submitted by their respective Line Offices to avoid any potential conflicts of interest.

Proposals will be evaluated based on the following criteria:

1. Technical/scientific merit based on Project Scope and Technical Project Plan sections of the proposal (35 points)
2. Importance and/or Relevance and applicability to NOAA mission based on Expected Significance section of the proposal: (20 points)

3. Potential for successful transition to applications based on the Comparative Technology Assessment section of the proposal. (20 points)
4. Feasibility of project costs and schedule based on the OMAO CONOPS Feasibility Assessment, Management Plan, Budget Breakdown, Project Risk
5. Overall qualifications of applicant based on the Management Plan and Key Personnel sections of the proposal (5 points)
6. Likelihood that FY17 flights can be conducted and initial findings provided based on the Technical Project Plan and Deliverables sections of the proposal (5 points)

## Appendix A

### Definitions of Readiness Levels (RL)

Transition Index	Readiness Level	Description
Research	RL 1	Basic or fundamental research
Research	RL 2	Technology concept and/or application
Development	RL 3	Proof-of-concept or feasibility study
Development	RL 4	Concept validated in laboratory or other experimental environment
Development	RL 5	Concept validated in relevant environment
Demonstration	RL 6	Prototype system demonstration in relevant environment
Demonstration	RL 7	Prototype system demonstration in operational environment
Demonstration	RL 8	Finalized system demonstration in an operational environment
Application	RL 9	System totally operational and used routinely

## Appendix B

### Readiness Level Worksheet

	Readiness Level at Beginning of Proposed Project				Expected Readiness Level at End of Proposed Project			
Readiness Level (RL)	UAS Platform	UAS Payload	UAS Observing System	UAS Observing Strategy	UAS Platform	UAS Payload	UAS Observing System	UAS Observing Strategy
RL 1								
RL 2								
RL 3								
RL 4								
RL 5								
RL 6								
RL 7								
RL 8								
RL 9								

## Appendix C

### Table of RFP Deadlines

Date	Action
February 13, 2017	Release of RFP on UAS Program Web Site
March 13, 2017	Signed transition plans and Line Office recommendations for reviewers due to UAS Program Office by 11:59 pm Pacific
March 27, 2017	Proposals due to UAS Program Office by 11:59 pm Pacific
April 17, 2017	Written reviews due to UAS Program Office by close of business
April 27, 2017	UxS Executive Oversight Board develops consensus score for each proposal and forwards these scores to the UAS Program Director. (Note: A Line Office representative may not participate in the discussion or voting related to a proposal from his/her Line Office.)
May 4, 2017	Proposal selection approved by OAR Deputy Assistant Administrator for Science
May 11, 2017	Decision letters delivered to proposal teams