Unmanned Aircraft Systems Program Office Science Review
March 8-10, 2017
Charge to Reviewers

Purpose of the Review
Program science reviews are conducted every five years to evaluate the quality, relevance, and performance of research conducted in the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) programs. This review is for both internal OAR/NOAA use for planning, programming, and budgeting, and external interests. It helps the program in its strategic planning of its future science. These reviews are also intended to ensure that OAR research is linked to the NOAA Strategic Plan, is relevant to NOAA's research mission and priorities, is of high quality as judged by preeminence criteria, and is carried out with a high level of performance. Each reviewer will independently prepare his or her written evaluations of at least one research area. The chair, a federal employee, will create a report summarizing the individual evaluations. The chair will not analyze individual comments or seek a consensus of the reviewers.

Scope of the Review
This review will cover the research of UAS program over the last five years. The research areas and related topics for the review are: 1) High Impact Weather2) Marine Monitoring; and 3) Polar Monitoring.

Description of UAS Research Areas

Research Area #1: High Impact Weather

The UAS Program has evaluated a broad range of UAS platforms and sensors for meetings NOAA's research and forecasting needs for high impact weather events. This includes the use of high altitude UAS, such as the Global Hawk, for sampling large areas over oceanic storms including tropical cyclones with remote sensors and in situ observations, as well as the use of small UAS for improved marine boundary layer, inner eye sampling, and tornadic event prediction. The goal is to utilize UAS as a compliment to current manned assets, especially where the UAS can provide cost-effective and otherwise hard to obtain data in support of the National Weather Service.

Research Area #2: Marine Monitoring

The UAS Program has been involved in demonstrating various UAS systems, with a focus on small UAS for marine science and monitoring applications across NOAA including both rotary and fixed wing UAS. This work has supported the operational needs on NOS's Office of National Marine Sanctuaries, National Geodetic Survey, Office for Coastal Management and the

National Marine Fisheries Service Office of Science and Technology and Science Centers. The focus has included protected resource monitoring and research, turtle and bird counts, oil spill response, marine debris collection and collection of photogrammetric data. Other project areas include gravimetry for coastal mapping, as well as habitat characterization, wildfire damage assessments and digital elevation mapping.

Research Area #3: Polar Monitoring

The Arctic and Antarctic environments are a priority area for collecting hard to obtain environmental observations, and pose additional challenges for UAS systems to operate in these extreme environmental conditions. The UAS program has supported technology demonstrations of small UAS, jointly with partners in the US Coast Guard and private industry to evaluate performance, communication and ability to use small UAS for wildlife, sea ice mapping, rapid response and maritime domain awareness in Polar environments during ship-based operations. Other focal areas include Greenland/Norway mapping and monitoring of sea ice loss, and atmospheric distribution of black carbon for climate-cryospheric interactions.

Evaluation Guidelines

For each research area, each reviewer will provide one of the following overall ratings:

- *Highest Performance*--Program greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- *Exceeds Expectations*--Program goes well beyond the Satisfactory level and is outstanding in many areas.
- *Satisfactory*--Program meets expectations and the criteria for a Satisfactory rating.
- *Needs Improvement*--Program does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

Reviewers are to consider the quality, relevance, and performance of the program.

1. **Quality:** Evaluate the quality of the program's research and development. Assess whether appropriate approaches are in place to ensure that high quality work will be performed in the future. Assess progress toward meeting OAR's goal to conduct preeminent research as listed in the "Indicators of Quality, Relevance and Performance."
   - ➢ **Quality Rating Criteria:**
     - *Satisfactory* rating –Program-funded scientists and leadership are often recognized for excellence through collaborations, research accomplishments, and national and international leadership positions. While good work is done, program-funded scientists are not usually recognized for leadership in their fields.
   - ➢ **Evaluation Questions to consider:**
     - Does the program fund preeminent research? Are the scientific products and/or technological advancements meritorious and significant contributions to the scientific

community?

- How does the quality of the laboratory's research and technologydevelopment rank among Research and Development (R&D) programs in other U.S. federal agencies? Other science agencies/institutions?
- Are appropriate approaches in place to ensure that high quality work will be done in the future?
- Do Program-funded researchers demonstrate scientific leadership and excellence in their respective fields (e.g., through collaborations, research accomplishments, externally funded grants, awards, membership and fellowship in societies)?

➢ **Indicators of Quality:** Indicators can include, but not be limited to the following (note: not all may be relevant to each program)

- A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations.
- The number of citations for program-funded work by individual or some aggregate.
- A list of awards won by groups and individuals for research, development, and/or application.
- Elected positions on boards or executive level offices in prestigious organizations (e.g., the National Academy of Sciences, National Academy of Engineering, or fellowship in the American Meteorological Society, American Geophysical Union, or the American Association for the Advancement of Science etc.).
- Service of individuals in technical and scientific societies such as journal editorships, service on U.S. interagency groups, service of individuals on boards and committees of international research-coordination organizations.
- A measure (often in the form of an index) that represents the value of either funded? scientists or the program'ss integrated contribution of refereed publications to the advancement of knowledge (e.g., Hirsch Index).
- Evidence of collaboration with other national and international research groups, both inside and outside of NOAA including Cooperative Institutes and universities, as well as reimbursable support from non-NOAA sponsors.
- Significance and impact of involvement with patents, invention disclosures, Cooperative Research and Development Agreements, and other activities with industry.
- Other forms of recognition from NOAA information customers such as decision-makers in government, private industry, the media, education communities, and the public.
- Contributions of data to national and international research, databases, and programs, and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

2. **Relevance**: Evaluate the degree to which the research and development is relevant to NOAA's mission and of value to the Nation.

➢ **Relevance Rating Criteria:**

- *Satisfactory* rating --The R&D enterprise of the program shows linkages to NOAA's mission, Strategic Plan, and Research Plan, and is of value to the Nation. There are some efforts to work with customer needs but these are not consistent throughout the research area.

➢ **Evaluation Questions to consider:**

- Does the research address existing (or future) societally relevant needs (national and international)?
- How well does it address issues identified in the NOAA strategic plan and research plans or other policy or guiding documents?
- Are customers engaged to ensure relevance of the research? How does the program foster an environmentally literate society and the future environmental workforce? What is the quality of outreach and education programming and products?
- Are there R&D topics relevant to national needs that the program should be pursuing but is not? Are there R&D topics in NOAA and OAR plans that the program should be pursuing but is not?

➢ **Indicators of Relevance:** Indicators can include, but not be limited to the following (note: not all may be relevant to each program)

- Results of written customer survey and interviews.
- A list of research products, information and services, models and model simulations, and an assessment of their impact by end users, including participation or leadership in national and international state-of-science assessments.

3. **Performance**: Evaluate the overall effectiveness with which the program plans and conducts its research and development, given the resources provided, to meet NOAA Strategic Plan objectives and the needs of the Nation. The evaluation will be conducted within the context of three sub-categories: **a)High Impact Weather, b) Marine Monitoring, and c) Polar Monitoring (when applicable and/or appropriate)**.

➢ **Performance Rating Criteria:**

- *Satisfactory* rating --
- The program generally has documented scientific objectives and strategies through strategic and implementation plans (e.g., Annual Operating Plan) and a process for evaluating and prioritizing activities.
- The program management generally functions as a team and works to improve the operation of the program.
- The program usually demonstrates effectiveness in completing its established objectives, milestones, and products.
- The program often works to increase efficiency (e.g., through leveraging partnerships).
- The program is generally effective and efficient in delivering most of its products/outputs to applications, operations or users.

A. Research Leadership and Planning: Assess whether the program has clearly defined objectives, scope, and methodologies for its key projects.

➢ **Evaluation Questions to consider:**

- Does the program have clearly defined and documented scientific objectives, rationale, and methodologies for key projects?
- Does the program have an evaluation process for projects: selecting/continuing those projects with consistently high marks for merit, application, and priority fit; ending projects; or transitioning projects?
- Does the program have the leadership and flexibility (i.e., time and resources) to respond to unanticipated events or opportunities that require new research and development activities?
- Does the program provide effective scientific leadership to, and interaction with, NOAA and the external community on issues within its purview?
- Does program management function as a team and strive to improve operations? Are there institutional, managerial, resource, or other barriers to the team working effectively?
- Has the program effectively responded to and/or implemented recommendations from previous science reviews?

●**Indicators of Leadership and Planning:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each program).

- Program Strategic Plan.
- Program/Project Implementation Plans.
- Active involvement in NOAA planning and budgeting process.
- Final report of implementation of recommendations from previous program review.

B. Efficiency and Effectiveness: Assess the efficiency and effectiveness of the laboratory's research and development, given the program's goals, resources, and constraints and how effective the program is in obtaining needed resources through NOAA and other sources.

➢ **Evaluation Questions to consider:**

- Does the program execute its research in an efficient and effective manner given the program goals, resources, and constraints?
- Is the program organized and managed to optimize the conduct and planning of research, including the support of creativity? How well integrated is the work with NOAA's and OAR's planning and execution activities? Are there adequate inputs to NOAA's and OAR's planning and budgeting processes?
- Is the proportion of the external funding appropriate relative to its NOAA base funding?
- Is the program leveraging relationships with internal and external collaborators and stakeholders to maximize research outputs?
- Are human resources adequate to meet current and future needs? Is the program

organized and managed to ensure diversity in its workforce? Does the program provide professional development opportunities for staff?
- Are appropriate resources and support services available? Are investments being made in the right places?
- Is infrastructure sufficient to support high quality research and development?
- Are projects on track and meeting appropriate milestones and targets? What processes does management employ to monitor the execution of projects?

➢ **Indicators of Efficiency and Effectiveness:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each program).
- List of active collaborations
- Funding breakout by source
- Lab demographics

C. Transition of Research to Applications: How well has the program delivered products and communicated the results of their research? Evaluate the program's effectiveness in transitioning and/or disseminating its research and development into applications (operations and/or information services).

➢ **Evaluation Questions to consider:**
- How well is the transition of research to applications and/or dissemination of knowledge planned and executed?
- Are end users of the research and development involved in the planning and delivery of applications and/or information services? Are they satisfied?
- Are the research results communicated to stakeholders and the public?

➢ **Indicators of Transition:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each program).
- A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations/applications.
- Significance and impact of involvement with patents, Cooperative Research and Development Agreements (CRADAs) and other activities with industry, other sectors, etc.
- Discussions or documentation from program stakeholders

Proposed Schedule and Time Commitment for Reviewers:
The review will be conducted March 8-10, 2017, in Silver Spring, Maryland. One or two teleconferences before the review are planned with the Deputy Assistant Administrator for OAR, who will be the liaison with the review team and for the completion of the report. All relevant information requested by the review team will be provided on the review website at least two weeks before the review.

Each reviewer is asked to independently prepare their written evaluations on each research theme, including an overall rating for the theme and provide these to the Chair with a copy to

Philip Hoffman in OAR headquarters. The Chair, a federal employee, will create a report summarizing the individual evaluations. The Chair will not analyze individual comments or seek a consensus of the reviewers. We request that within 45 days of the review, the review team provide the draft summary report to the Deputy Assistant Administrator, OAR. Once the report is received, OAR staff will review the report to identify any factual errors and will send corrections to the review team. The final individual evaluations and the summary report are to be submitted to the Assistant Administrator, OAR.

Review Team Resources:

OAR will provide resources necessary for the review team to complete its work.

1. Review Team Support: Information to address each of the program's research themes to be reviewed will be prepared and posted on a public review website. A copy of all the information on the website will also be provided to reviewers at the review.

2. Travel arrangements for the onsite review will be made and paid for by OAR.