SECTION 1. PURPOSE.

.01 As a science-based services Agency, the National Oceanic and Atmospheric Administration (NOAA) maintains a robust, high-quality research and development (R&D) enterprise and portfolio that continually improves NOAA’s products and services in response to:

   a. Growing demand for new and improved services;
   b. Changes in NOAA’s mission needs in response to evolving environmental conditions;
   c. Directives from the Executive, Legislative, and Judicial branches of the Federal Government;
   d. Emerging understanding of the dynamic Earth system and its ecosystems; and
   e. Innovations in R&D methods, tools, and approaches.

.02 This guidance builds upon existing best practices to promote scientific and technological excellence and enables scientists and science leaders to pursue the R&D necessary to inform the Line Offices (LO) performing NOAA’s service and stewardship responsibilities.

.03 This Order provides guidance by which R&D throughout NOAA can be continually planned, reviewed, evaluated, and rebalanced according to evolving mission needs, thus allowing NOAA to apply a logical approach to its R&D investment portfolio.

.04 The coordinated efforts described in this Order include support for the successful transitioning of R&D into operations, applications, commercialization, and other uses as defined in NAO 216-105B, Policy on Research and Development Transitions.

.05 The NOAA Science Council, having the expertise to answer questions regarding the NAO’s provisions or subject matter, is responsible for developing and maintaining the content of this NAO, recommended to the Under Secretary.

.06 The implementation of this NAO will be guided by an associated Procedural Handbook.

SECTION 2. SCOPE.

This NAO applies to all NOAA R&D activities, internal and external, including R&D conducted or funded by NOAA.
SECTION 3. PRINCIPLES.

.01 The following principles will guide the planning, execution, evaluation, and reporting of NOAA’s R&D portfolio:

a. Mission alignment: The R&D portfolio will be focused on NOAA’s explicitly defined mission needs. All NOAA R&D efforts will be traceable to specific NOAA mission objectives and all participants will view each of their activities as directly relevant to one or more specific NOAA mission needs.

b. Transitioning research and development: Continually creating, improving, and extending NOAA’s products and services to meet the needs of the Nation is an integral part of NOAA’s R&D portfolio. These advances occur by conducting the most promising research; including new or improved observing, modeling, and information technologies, and from the results of field–and laboratory–based process studies. NOAA advances R&D to the point where they can be transitioned into operations, applications, commercialization, or other uses, while rigorously applying high standards of systems and software engineering practices. Participants in NOAA R&D will manage their activities in the framework of readiness levels, as defined in NAO 216-105B: Policy on Research and Development Transitions.

c. Research balance: Meeting NOAA’s evolving mission needs requires a vigorous and forward-looking R&D portfolio that includes a wide range of natural and social sciences. Careful planning will ensure that NOAA’s R&D portfolio is balanced across disciplines, across readiness levels, among interdisciplinary foci (infused with, and informed by social science), and between short-term and long-term efforts, and will tolerate a degree of risk commensurate with the goal of sustaining and advancing world-class capabilities in support of the NOAA’s mission needs. Different approaches to supporting R&D are appropriate for different degrees of maturity in each area of research and allow for considerable risk tolerance.

d. Partnerships: NOAA has a wide range of mechanisms for accomplishing R&D by engaging external partners. These include:
   i. contracts;
   ii. grants;
   iii. Sea Grant;
   iv. cooperative institute and cooperative science center agreements with universities;
   v. joint activities with other Federal agencies;
   vi. citizen science projects; and
   vii. cooperative research and development agreements and other arrangements with the private sector, and a variety of nontraditional partnerships such as with tribes, states, councils and commissions, non-governmental organizations, foreign and international organizations and partners within industries affected by NOAA management actions.

These tools and arrangements with partners provide considerable flexibility to the NOAA R&D portfolio as well as access to a diverse range of talented personnel.

e. Facilities and infrastructure: The complex, transdisciplinary and long-term R&D essential to accomplishing NOAA’s missions depends on sophisticated research facilities and hardware, including:
i. laboratories; ii. instrumentation; iii. ships; iv. aircraft; v. satellites; vi. moored platforms; vii. autonomous vehicles; viii. high performance supercomputing; ix. test beds; x. proving grounds; xi. data repositories; xii. computer models; and xiii. information systems.

NOAA will prioritize infrastructure investments based on an evolving corporate view of mission needs and R&D.

f. Workforce excellence: A diverse, inclusive, creative, and vibrant scientific workforce is at the core of NOAA’s R&D and mission services enterprise. NOAA will recruit, develop, and retain a diverse scientific workforce in a range of relevant disciplines and provide opportunities for scientific staff to excel individually, as team members and leaders, and as mentors for the next generation of NOAA scientists, including those from underrepresented groups. Training, mentoring, and professional development will be made available so the scientific workforce can adapt and expand beyond traditional disciplinary boundaries and remain agile as mission needs change. NOAA will encourage and reward engagement with mission-relevant professional societies and communities of practice.

g. Scientific integrity: Scientific research sponsored or conducted by NOAA catalyzes innovative breakthroughs, informs regulatory and policy decisions, and enables the development of new industries. A robust scientific enterprise requires transparency, traceability, reproducibility, and scientific integrity at all levels of practice and management. To maintain NOAA’s place among the most trusted and credible sources of scientific information in the world, the NOAA R&D portfolio will embody both the NOAA Scientific Integrity Policy (NAO 202-735D-2: Scientific Integrity) and the NOAA Plan for Increasing Public Access to Research Results (NOAA PARR Plan, Feb. 2015).

h. Accountability: NOAA’s R&D will be regularly evaluated and adjusted based on objective reviews (see Section 5.07). Laboratory and program science reviews for the NOAA R&D enterprise are conducted by an independent review panel coordinated by the NOAA LO. Those responsible and accountable for R&D activities will be assigned authority to manage and direct the efforts. Accountability for NOAA’s R&D portfolio rests with the NOAA Science Council Chair in collaboration with LO Assistant Administrators (AAs). Refer to Section 6 for responsibilities of this Order, for effective governance and responsibilities guidance within the Agency.

SECTION 4. DEFINITIONS.

.01 Development: The systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes (Organization for Economic Co-operation and Development [OECD], 2015).

.02 Evaluation: A study conducted periodically or, on an ad hoc basis, to assess how well a program is working against specified benchmarks or standards.
Execution: The process through which NOAA allocates resources and executes planned activities to accomplish budgeted performance targets in accordance with corporate strategic objectives and annual priorities, as well as legal, administrative, and policy requirements.

External Research and Development (R&D): R&D conducted by any entity outside of NOAA (e.g., Cooperative Institute, academic institution, state or local government entity, other federal agency).

Internal Research and Development (R&D): R&D conducted at NOAA facilities and/or by NOAA employees, regardless of funding source.

NOAA Research and Development Database: A secure, internal, web-based enterprise tool to house project metadata for all R&D conducted by NOAA and its partners. The database (NOAA Research and Development Database [NRDD] or its successor) provides a single repository for consistent, comprehensive information on NOAA's R&D portfolio. The NRDD, or successor, is populated either directly by NOAA R&D units, or by data imported from other NOAA databases.

NOAA Research and Development Enterprise: NOAA's R&D Enterprise comprises the entirety of NOAA’s R&D efforts, infrastructure, data, and intellectual capital (NOAA scientific workforce, partners, grantees, and cooperative/joint institute programs), constituting an enterprise through planning, coordination, integration, execution, and traceability to NOAA’s mission and strategic R&D priorities.

Optimized R&D Portfolio: NOAA optimizes its R&D Portfolio through planning, coordination, integration, and execution, ensuring that its R&D serves as more than a collection of efforts: targeting specific objectives and priorities, balancing across dimensions (e.g., risk, maturity, scientific push-pull, incremental versus radical advance, topic, duration, cost), and integrating across NOAA to enable synergistic results.

Peer Review: A widely used, time-honored practice in the scientific and engineering community for judging and potentially improving a scientific or technical plan, proposal, activity, program, or work product through documented critical evaluation by individuals or groups with relevant expertise who had no involvement in developing the object under review [National Research Council (NRC), 2000].

Planning: The formal process of establishing missions, goals, and objectives (strategic planning), and identifying and coordinating how the goals and objectives are to be achieved by establishing performance expectations, resource requirements (implementation planning), and integration of cross-NOAA priorities and efforts.

Readiness Levels (RLs): A systematic project metric or measurement system that supports assessments of the maturity of R&D projects for transition from research to operation, application, commercial product or service, or other use and allows the consistent comparison of maturity between different types of R&D projects. A program may include projects at different RLs, depending on the goals of each project, and value can be extracted at any RL. The NOAA's Policy on Research and Development Transitions, including a general definition of RL1 through RL9, can be found in NAO 216-105B.
Research: Research can be classified as basic research or applied research.

- Basic Research: Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, such as the study of how plant genomes change, but should exclude research directed towards a specific application or requirement, such as the optimization of the genome of a specific crop species [Office of Management and Budget (OMB) Circular No. A-11, 2021].
- Applied Research: Original investigation undertaken in order to acquire new knowledge. Applied research is, however, directed primarily towards a specific practical aim or objective (OMB Circular No. A-11, 2021).

Research and Development Portfolio: The NOAA R&D Portfolio comprises the entirety of internal and external R&D projects conducted by NOAA LOs and Staff Offices and/or for the Agency, as evidenced by the expenditure of NOAA resources or resources provided for NOAA’s execution. R&D occurs throughout NOAA under a wide variety of arrangements. Examples include, but are not limited to, R&D performed by NOAA laboratories and science centers, NOAA-funded long-term work through Cooperative Institutes, and NOAA-funded academic and industry researchers.

Science Council: The NOAA Science Council coordinates all matters of R&D within NOAA, providing strategic advice to NOAA leadership on matters of science and research, including social sciences. The Science Council Terms of Reference can be found at: https://sciencecouncil.noaa.gov/About (NOAA Science Council, 2020).

Science Advisory Board: The NOAA Science Advisory Board (SAB) is the only Federal Advisory Committee with responsibility to advise the Under Secretary of Commerce for Oceans and Atmosphere (Under Secretary) on strategies for research, education, and application of science to operations and information services. This advice will help NOAA to better understand and predict changes in Earth’s environment, and to better conserve and manage coastal and marine resources to meet the Nation’s economic, social, and environmental needs.

Scientific Integrity: The condition resulting from adherence to professional values and practices when conducting and applying the results of science that ensures objectivity, clarity, and reproducibility, and that provides insulation from bias, fabrication, falsification, plagiarism, interference, censorship, and inadequate procedural and information security as defined in NAO 202-735D-2.

Transition: The transfer of an R&D output to an operation, application, commercial product or service, or other use, as defined in NAO 215-105B.

SECTION 5. POLICY.

Managers and participants across the R&D portfolio will ensure that NOAA’s R&D efforts are planned, executed, monitored, evaluated, and reported in accordance with the principles articulated in this NAO, and comply with the NAO on Research and Development Transitions (NAO 216-105B) and the NAO on Scientific Integrity (NAO 202-735D-2).
Management of NOAA’s R&D enterprise will be reliant upon NOAA’s R&D planned foci (captured in NOAA’s R&D strategic plan), documents describing NOAA’s execution plans, and NOAA’s evaluation of both to accomplish NOAA’s R&D use in achieving its mission.

A long-range vision is essential to a thriving R&D portfolio. The Science Council, in consultation with the NOAA Science Advisory Board, if needed, shall publish and periodically update NOAA’s R&D strategic plan and long-range research vision document.

The Science Council may develop multi-year R&D foci and priorities to facilitate alignment of NOAA’s R&D with NOAA’s corporate strategic plan and the Department of Commerce (DOC) strategic plan.

The Science Council provides a venue for highlighting areas needing cross-cutting R&D. Science Council members are expected to identify challenges and opportunities associated with R&D in their respective LOs and to seek areas of cross-LO collaboration.

Consistent with the principle on accountability expressed in Section 3.08, the Science Council will maintain information on planned and actual NOAA R&D investments in a database for NOAA research and development that can be monitored and queried for awareness, planning, and accountability.

Evaluation of NOAA’s R&D activities will include regular, independent peer reviews performed at least every five years. These reviews shall assess R&D activities for quality of the science, as well as how well the activities meet NOAA’s mission needs and/or requirements (e.g., relevance and performance). These reviews shall be separate from, and not duplicative of, existing reviews for grants, cooperative agreements, contracts, purchase orders, interagency agreements, or project agreements. Science managers may seek assistance from NOAA’s SAB to conduct or participate in laboratory, cooperative institute, or program reviews, in accordance with their charter and concept of operations (SAB, 2021).

Free and open scientific communication is a fundamental element of the NOAA Scientific Integrity Policy (NAO 202-735D-2: Scientific Integrity). NOAA’s dissemination of research results adheres, and is fully responsive, to all appropriate statutes and guidance, including but not limited to: Departmental Administrative Order (DAO) 219-1: Public Communications; the Information (or Data) Quality Act (Section 515 of Public Law 106-554) and NOAA’s Plan for Public Access to Research Results (NOAA, 2015). The NOAA Science Council shall develop and maintain guidance for internal review and approval of fundamental research communications to assist participants in NOAA R&D in complying with appropriate statutes and guidance within NAO 202-735D-2.

The Science Council will ensure procedures for NAOs and Handbooks are followed as specified by the NOAA Office of the Chief Administrative Officer (OCAO).

SECTION 6. RESPONSIBILITIES.

The Under Secretary of Commerce for Oceans and Atmosphere and the NOAA Chief Scientist shall provide top management support for the implementation of this Order. Furthermore, the NOAA Chief Scientist will:
a. Influence policy and program direction for science and technology priorities for the NOAA R&D enterprise and portfolio;
b. Chair the NOAA Science Council;
c. Oversee the implementation of this NAO to continually strengthen and optimize the quality, relevance, and performance of NOAA’s R&D enterprise and portfolio;
d. Be accountable to the Undersecretary for maintaining an optimized R&D portfolio;
e. Provide direction to the Science Council and LOs regarding execution of this NAO; and
f. Champion the NOAA R&D portfolio in interactions with NOAA, DOC, OMB, Congress, other Federal agencies, other parties, and the public.

.02 The NOAA Science Council will assist the NOAA Chief Scientist in the execution of this NAO, and the Assistant Administrator for the Office of Oceanic and Atmospheric Research will provide additional support for execution, including serving as Vice Chair for the Science Council. The Science Council will:

a. Advise the Chief Scientist concerning R&D priorities;
b. Ensure the intent of this NAO is being fulfilled;
c. Review, approve, and promulgate a Procedural Handbook as needed to facilitate implementation of this NAO;
d. Maintain a website to provide access to relevant R&D plans, reviews, and reports;
e. Oversee the production of an annual science NOAA Technical Memorandum; and
f. Represent their LO and serve as a liaison between their AA and the Science Council.

.03 LO AAs and the Director of the Office of Marine and Aviation Operations (OMAO), will:

a. Ensure R&D activities comply with the intent of this NAO;
b. Oversee input to the Science Council for plans, reports, and actions;
c. Ensure evaluations are conducted and reported in accordance with this NAO; and
d. Ensure appropriate interaction across LOs with and through NOAA’s Councils, Boards, and committees. Activity should include ensuring Annual Operating Plan (AOP) milestones are synergistically aligned to advance the R&D priorities of the organization.

.01 In accordance with their charter and concept of operations (SAB, 2021), the NOAA SAB will:

a. Advise the Under Secretary on strategies for research and application of science to operations and information services, to better understand and predict changes in the Earth’s environment and conserve and manage coastal and marine resources to meet the Nation’s economic, social, and environmental needs;
b. Advise the Under Secretary on other matters upon request;
c. Submit reports to the Under Secretary; and
d. Conduct or participate in laboratory, cooperative institute, and program reviews, as requested.
SECTION 7. REFERENCES.


.02 Information Quality Act (IQA). Public Law 106-554, Section 515. 2001. [See also “Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of information Disseminated by Federal Agencies” (67 FR 8452)].


SECTION 7. EFFECT ON OTHER ISSUANCES.

.01 This Order supersedes NOAA Administrative Order (NAO) 216-115A, effective October 2016.

.02 The Under Secretary of Commerce for Oceans and Atmosphere signs because there is no delegation of authority for this NAO.
An electronic copy of this Order will be posted in place of the superseded Order on the NOAA Office of the Chief Administrative Officer website under the NOAA Administrative Issuances Section. http://www.corporateservices.noaa.gov/~ocao/index.html

For definitions and guidance concerning NOAA Testbeds and Proving Grounds, see https://www.testbeds.noaa.gov

An electronic copy of this Order will be posted in accordance with Chapter 100 of the NOAA Records Control Schedule on the NOAA Office of the Chief Administrative Officer website under the Administrative Programs’ NOAA Administrative Issuances Section. https://www.noaa.gov/organization/administration/noaa-administrative-orders

Dr. Richard W. Spinrad
Under Secretary of Commerce for Oceans and Atmosphere
and NOAA Administrator

Offices of Primary Interest:
Office of Oceanic and Atmospheric Research