NOAA Administrative Order (NAO) 216-105B:

Policy on Research and Development Transitions

Procedural Handbook

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NAO 216-105B Procedural Handbook: Policy on Research and Development Transitions

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1. **Explanation of Material Transmitted:** This Handbook establishes procedures for the planning, monitoring, implementation, evaluation, and reporting of Transition of Research and Development in support of NAO 216-105B.
2. **Filing Instructions:**
    a. Remove: NAO 216-105, Procedural Handbook, dated: 04/28/2014
    b. Insert: NAO 216-105B, Procedural Handbook, dated: 03/21/2017
3. **Additional Information**:
    a. For information on the content of the Handbook, contact the issuing office listed above.
    b. To access the Handbook chapters and appendices online, follow links available from this URL: http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105B.html

Chapter 1 – Purpose and Scope of the NAO for Research and Development Transitions (NAO 216-105B)

A. **Purpose**

This Handbook supports the NAO on Research and Development (R&D) Transitions (NAO 216-105B[1]). Chapters 2-4 of this Handbook are intended to provide additional guidance for the corresponding sections of the NAO.

This Handbook is established in accordance with NAO 200-3[2] which specifies that NOAA handbooks and manuals containing policy or procedures be elements of the NAO series, providing in-depth coverage of those subjects so complex or extensive as to benefit from coverage in the form of a handbook or manual, and shall have the same force and effect as that NAO.

The use of *Italics* throughout this Handbook indicates language quoted from NAO 216-105B.

B. **Policy Background and Scope**

The transition of R&D into operations[3], applications[4], commercial product or service, and other regular use (i.e., deployment) is a key process for NOAA as a science-based services and stewardship agency. Efficient conversion of the best available research and development into operations, applications, commercialization and other uses is critical to our mission (Dorman 1999; NRC 2000; NRC 2003; NOAA SAB 2004). NAO 216-105B establishes the process for identifying and transitioning R&D to operations, applications, commercial product or service, and other regular use. The policy outlines the roles and responsibilities of various officials, including Line Office Transition Managers (LOTMs), associated with R&D transition. Additionally, the policy identifies those entities with the authority to implement this policy and those who are accountable for R&D transitions.

NAO 216-105B applies to NOAA R&D activities, including those funded by NOAA but conducted by non-NOAA entities such as academic institutions and consortia. The standard for which R&D activities are subject to the NAO is left to the discretion of the respective Assistant Administrator (AA) or their delegate. The policy also recognizes that transitions can be either incremental improvements to existing products or applications or entirely new products or applications.

C. **References**

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[1] NAO 216-105B: http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105B.html
[2] NAO 200-3 (*The NOAA Administrative Order Series*): http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_200/200-3.html
[3] Operations: Sustained, systematic, reliable, and robust mission activities with an institutional commitment to deliver specified products and services.
[4] Applications: The use of NOAA R&D output as a system, process, product, service or tool. Applications in NOAA include information products, assessments and tools used in decision-making and resource management.

Please see Appendix A: References for NAO Procedural Handbook (alphabetical order)

D. **Abbreviations**

Please refer to Appendix B: Abbreviations Used in NAO Procedural Handbook

Chapter 2 – Key Terms and Understanding Transition

A. **Purpose**

This Chapter expands on the brief definitions provided in Section 2 of the NAO. Not all the terms and definitions from the NAO are included here, but the concepts that might benefit most from further discussion are presented in this Chapter.

B. **Core Concept of R&D Transition**

Transition of R&D[5] is *the transfer of an R&D output to an operation, application, commercial product or service, or other use*. While it varies from agency to agency or sector to sector, transition requires the evolution of a research project through a clearly defined series of stages. While these stages are set in serial fashion, transition may be achieved without completing all the stages.

C. **Understanding Readiness Levels**

Readiness levels (RLs) are a systematic project metric/measurement system that supports assessments of the maturity of R&D projects 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.

The concept of Technology Readiness Levels was developed by NASA (Mankins, 1995[6]) to manage technology development and risk. NAO 216-105B adapts this concept to NOAA. The NAO provides simple but minimalist definitions of each of nine Readiness Levels that describe the progression of an idea from the research stage to the point where the idea has become a product or tool in regular use. Despite some recent suggestions to define a tenth RL (e.g., Straub, 2015), the NOAA system is constrained to the widely-applied nine RLs described below. The word "technology" was dropped since much of what NOAA produces does not meet the definition of technology.

The purpose of creating a single scale for all of NOAA is to encourage cross-disciplinary understanding of the challenges involved in developing an idea into something that serves a NOAA mission need. With appropriate flexibility in interpretation, it should be possible to successfully classify all relevant R&D projects across the NOAA enterprise by Readiness Level.

Many programs in NOAA run projects at a variety of Readiness Levels and a clear distinction between Readiness Levels and their applicability to each project may be difficult to identify. Program managers are therefore encouraged to use established Line Office, or program standards and benchmarks and engage in dialog with other program managers and their LOTM to define any questionable project Readiness Levels.

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[5] Note: In the NOAA context, R&D means Research and/or Development since not all development at NOAA begins with Research (e.g., new work being done on a more advanced system).

[6] Mankins (1995): http://www.hq.nasa.gov/office/codeq/trl/trl.pdf

At a given project level, the RL is defined at the lowest RL of any of the system components. For example, a project combining two commercial off-the-shelf (COTS) components (by definition, RL 9) with software for a new application that is at RL 4 is considered RL 4 as a project or system.

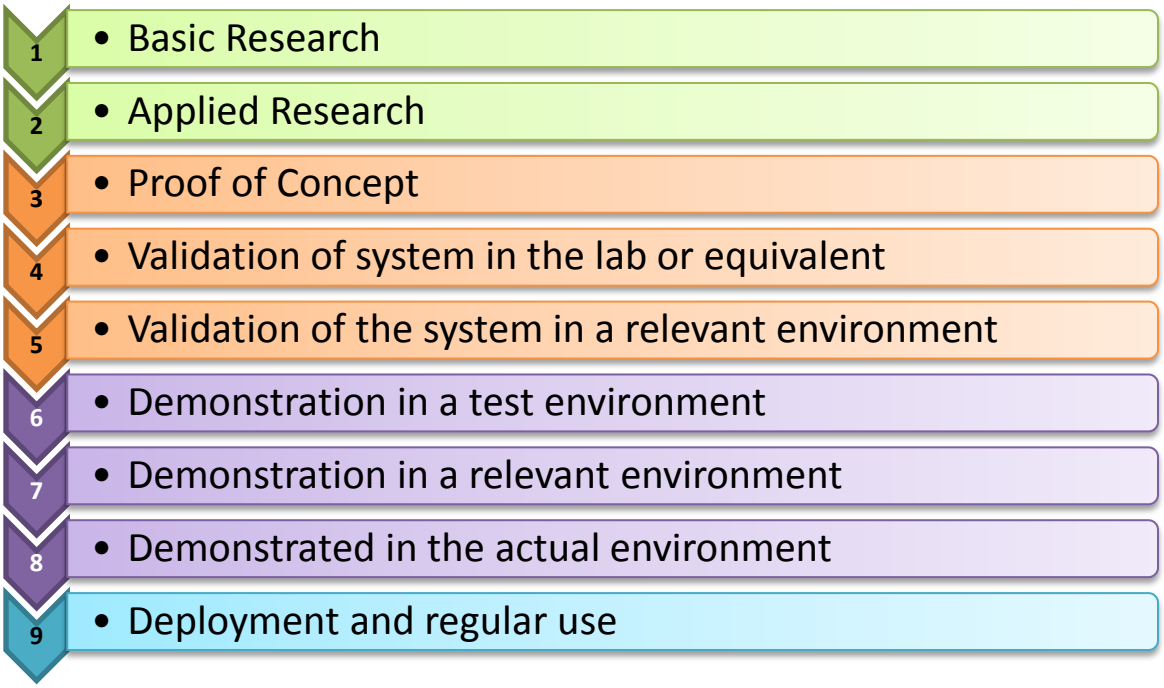

Figure 1. Summary of Readiness Levels (RLs) highlighting the key step for completion of each RL. Colors correspond to the different phases for transition of R&D and RLs are ordered as they would be in the transition funnel (research at the top and deployment at the bottom).

RL 1: Basic research: systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. Basic research, however, may include activities with broad applications in mind. (See Appendix C for further details)

RL 2: Applied research: systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met; invention and concept formulation.

If new research is directly addressing a specific NOAA service or stewardship mission requirement, it is RL 2 by definition that it is research applied toward a specific need.

RL 3: Proof-of-concept for system, process, product, service or tool; this can be considered an early phase of development; feasibility studies may be included.

Beginning at RL 3, there should be increasing involvement of the deploying unit, receiving unit, or end user to aid in the focusing of the research on a mission application. The earliest version of a concept of operations (CONOPS) should be developed no later than RL 3. Depending on the scope of work and the amount of resources utilized (i.e., personnel, funding, equipment and facilities), the CONOPS could vary from a short addendum to a larger program research plan.

RL 4: Validation of system, subsystem, process, product, service or tool in laboratory or other experimental environment; this can be considered an intermediate phase of development.

A viable business case should be in place at RL 4 outlining projected costs and other organizational requirements to get from RL 4 to RL 9. The business case needs to also include a best estimate for total costs in operations or application, including the operations and maintenance "tail" (i.e., total life cycle costs). Depending on the scope of work and the amount of resources utilized (i.e., personnel, funding, equipment and facilities), the business case could vary from a short addendum to a larger program resource requirements plan.

If required by the relevant AAs or their delegates, projects needing a transition plan, should not be resourced beyond RL4 without an approved transition plan in place (NAO 216-105B §3.02-3.08). It is reasonable to expect that transition plans will be proportional in scale, scope, and level of detail relative to the scale, scope, and maturity of the project. Smaller, early RL projects will logically have smaller, less developed transition plans, (if at all) in comparison with larger, more mature projects.

RL 5: Validation of system, subsystem process, product, service or tool in relevant environment through testing and prototyping; this can be considered the final stage of development before demonstration begins.

At RL 5, validation should be done on a prototype of at least medium fidelity in a relevant test environment, to show attainment of pre-defined performance specifications. For certain applications, this would include integrating the system with realistic supporting elements so the system can be tested in a simulated end-use environment.

RL 6: Demonstration of prototype system, subsystem, process, product, service or tool in relevant or test environment (potential demonstrated).

At this stage, a high-fidelity system, component, tool, or service is demonstrated to work in a test environment that includes critical components of the end-use environment. RL 6 is a level where it often becomes necessary to engage with a testbed, research platform (e.g., research vessel), or other demonstration facility to have adequate access to critical components of the end-use environment.

RL 7: Prototype system, process, product, service or tool demonstrated in an operational or other relevant environment (functionality demonstrated in near-real world environment; subsystem components fully integrated into system).

Testbeds, while not required, continue to be a valuable demonstration environment for many transition projects at RL 7, and throughout transition testing, to provide stable access to a near-real world environment. Also, at RL 7, the research and deploying units can expect to fully depend on each other's resources to achieve the milestones to mature beyond this RL.

RL 8: Finalized system, process, product, service or tool tested, and shown to operate or function as expected within user's environment; user training and documentation completed; operator or user approval given.

By RL 8, the deploying unit can expect to be investing a significant fraction, likely the majority, of the resources needed to complete the milestones to advance the transition project.

RL 9: System, process, product, service or tool deployed and used routinely.

Once the system, product, process, service, or tool is fully deployed, it has completed the process transition of R&D. However, it is important to realize that the originating research unit will likely continue to be involved (at a greatly reduced level) to continue refinements or incremental improvements throughout the total life cycle of the system, tool, or service.

Not all transition projects will need to pass through all RLs as distinct steps. Many transition projects may start at a relatively high RL (e.g., several mature components being combined in a novel way). In other cases, some transition projects may start at RL 2 or RL 3, and move as a step function to RL 8 or RL 9 without passing through any intervening RLs. This may be particularly applicable for research conducted to better inform resource management decisions or to develop regulations.

The transition funnel is used within NOAA as a visual tool for understanding the overall process of transitioning R&D.

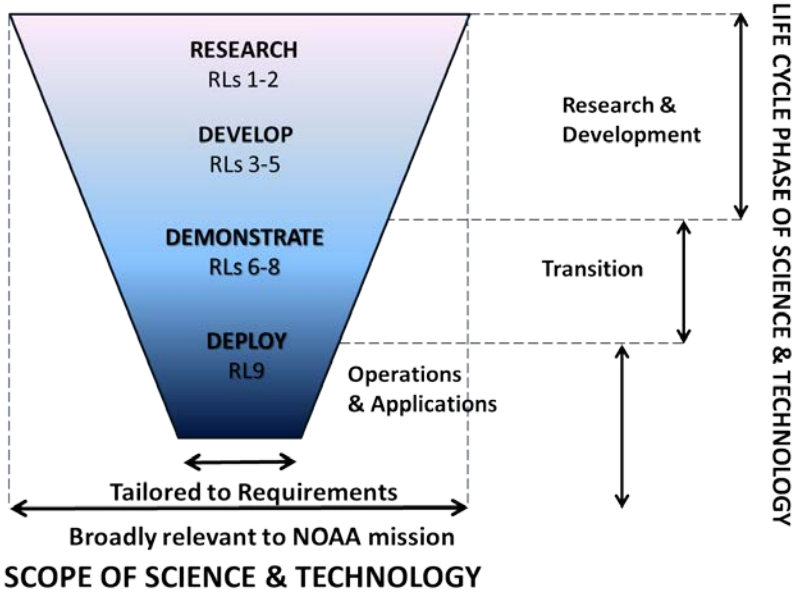

Figure 2. The NOAA transition funnel.

The transition funnel represents at the wide end the range of creative research ideas and projects that emerge in early stages of research. The narrow end reflects the limited number of those early stage research projects that will ultimately transition to deployment at RL 9. Implicit in this representation is that some research projects will fail to meet mission needs along the way towards RL 9 and will be terminated, transferred to an extramural partner, or otherwise divested.

D. Transition Project Leads and Transition Plans

1. Transition Project Leads

Transition Project Leads are the *individual(s) responsible and accountable for ensuring that the transition project is planned, programmed, budgeted, and executed per the Transition Plan*. At a minimum, on smaller transition projects, there would be one Transition Project Lead each for:

- The research and development of the system
- The deployment and regular use of the system

However, in more complicated cases, having more Transition Project Leads may be a useful management approach.

It is essential that the Transition Project Leads have sufficient authority and resources to be responsible and accountable for their portions of the transition project. Transition Project Leads will use established Line Office, or program standards and benchmarks to determine the appropriate oversight and coordinate reporting. The NOAA Technology Partnerships Office should be included as a consulting partner in all cases where a new and novel technology has been developed.

2. Transition Plans

Transition Plans are essential for describing and facilitating the transition of R&D to potential end use, and represent an agreement between researchers, operators and/or users that describes a feasible transition pathway and potential concept of operations (CONOPS). Transition Plans are recommended for projects that seek to progress beyond RL4 (NAO 216-105B §3.02-3.03; see also Ch. 2.C.RL4 in this Handbook).

Depending on the scope of work and the amount of resources utilized (i.e., personnel, funding, equipment and facilities), transition plans can vary from a list of milestones to a fully developed program plan. It is also reasonable to expect that projects that are less mature and many years from implementation may have less developed transition plans than those that are only a few years from deployment. Ultimately, each AA or their delegate can set the requirements and expectations for Transition Plans for their Line Office for the projects that require a transition plan.

A Transition Plan Should:

- Be developed once, and updated as necessary;

- Start simple, and gain complexity and detail as a project matures;
- Have complexity and level of effort proportional to the scale, risk, maturity and scope of the project;
- Be widely applicable to a range of planning or management needs;
- Be able to serve as a supporting document to articulate how a specific activity or funding (or lack of), will impact the Transition Project;
- Eventually cover all the expected activities, costs, milestones, etc. for the total life cycle (i.e., from the current RL of the Transition Project through deployment including operations and maintenance costs).

A Transition Plan Should NOT:

- Be tailored to a specific program, request for proposals (RFP), or data call;
- Be a scientific or technical proposal;
- Be an implementation or deployment plan.

At a minimum, the Transition Project Leads should review the Transition Plan on an annual basis, though semi-annual or more frequent review may be more appropriate for faster-paced or more complex Transition Projects. If there are any changes to milestones, timelines, or other aspects of the Transition Plan the respective LOTMs and Division Chiefs (or equivalents) should be consulted about whether the changes are substantial enough to require formal approvals for the updated Transition Plan. Minor changes to transition plans should only require Division Chief (or lower) level approvals for both the research and deployment units. More substantial changes in the transition plan to project milestones, costs, objectives, etc. require a proportionally greater level of approval as guided by the respective LOTMs and Line Office procedures.

A template for a Transition Plan can be found in Appendix D and the generalized process for approving Transition Plans can be found in Appendix E.

E. Additional Approvals that may be Necessary

The NAO recommends that transition projects should have an approved transition plan. However, there may be additional project specific requirements beyond a standard transition plan, including, but not limited to:

1. Testbeds and Proving Grounds

If using a testbed[7] or proving ground is part of a transition plan, a letter of support should be obtained from the testbed manager at the earliest practical time. The letter of support should indicate that the testbed manager has reviewed the project requirements, milestones, and transition plan, and that the testbed expects to be able to support the transition project in accordance with what the project requires.

2. Construction Projects

[7] http://www.testbeds.noaa.gov/

If the transition project includes construction, additional clearance will be required in accordance with guidance available from a designated Line Office Construction Work-In-Progress Project Manager, who will follow the process and procedures for constructed projects detailed in the NOAA CWIP Policy[8].

The NOAA CWIP Policy applies to "Property, Plant, and Equipment" (both real property and personal property) and "Internal Use Software Development" that

- Has an aggregate acquisition cost of $200,000 or more,
- Has an estimated service life of 2 years or more,
- Provides a long-term future economic benefit to the NOAA organization which maintains or obtains control, and
- Is not intended for sale.

3. High Performance Computing (HPC)

If a transition project is planning to make substantial demands on HPC resources, or plans to purchase new, or upgrade existing, HPC resources then Transition Project Leads and LOTMs should engage the relevant HPC management bodies within the agency for their approval as early as possible.

4. Invention Disclosure

Each new and novel technology developed should be disclosed to the NOAA Technology Partnerships Office prior to any public disclosure using the CD-240[9] invention disclosure form.

5. Sensitive or Secure Technology Approvals

All technology, software, and materials in transition projects need to be considerate of requirements to comply with DOC Export Administration Regulations (EAR)[10] and DOS International Traffic in Arms Regulations (ITAR)[11]. If a transition project involves any technology, software, or other materials subject to EAR or ITAR, that should be disclosed in the transition plan with approvals indicating that the transition plan will comply fully with those regulations.

[8] http://www.corporateservices.noaa.gov/~finance/documents/CWIPPolicy--March2017FINAL.pdf
[9] http://techpartnerships.noaa.gov/sites/orta/Documents/CD-240-2013.pdf
[10] https://www.bis.doc.gov/index.php/regulations/export-administration-regulations-ear
[11] https://www.pmddtc.state.gov/regulations_laws/itar.html

Chapter 3 – Implementing the Policy on Transition of Research and Development

A. **Purpose**

This Chapter provides details of the process of transition of R&D as it applies across NOAA's mission areas. Emphasis is placed on the essential steps in the implementation process in order to guide the transition practitioner as well as the officials responsible for evaluating transition of R&D in their program or Line Office.

B. **Planning for Transition of R&D**

Successful transition of R&D products to regular use or final deployment or implementation demands careful planning including:

- Early partnership between researchers and potential users/operators
    - The research unit requires a clear understanding of the mission need during the earliest phases of applied research (RL 2) or proof of concept (RL 3), and the deploying unit needs a good understanding of how the new research can address their mission requirements. This is accomplished best by the two organizational units working closely together at the earliest phase of the transition project, including forging clear communication of mission requirements from the deploying unit and clear communication of research potential from the research unit.
    - Where uncertainty exists in the research stage regarding the potential users/operators, a business case and transition plan should be developed as early as possible to ensure identification of the user/operator.
- Early engagement with social science and design experts
    - Recognizing that in many cases for NOAA, the ultimate end user is not the deploying unit, but rather the general public, it is important to engage with social scientists early in the R&D process to ensure that the final state is useful to the intended audience.
    - Recognizing that many applications have interactive interfaces that must be designed for ease of use by intended users.
- Developing an accurate and viable business case
    - A viable business case demonstrates that when the transition project reaches maturity, the deployment is desirable and warranted based on mission needs, and feasible and sustainable with anticipated levels of agency resources.
    - Not all research will have a viable business case for deployment. It is important to realize potential weakness in the business case very early so that changes to the transition project can be made to improve the business case for deployment.
- Incorporation of key decision points for determining progress
    - It is essential that transition projects undergo a thorough review at key decision points in line with Line Office and program office project review standards. These reviews should offer a real option for significant redirection or divestment

from the project if performance standards are not achieved or mission needs are not being met.

- Development of "off ramps" in the event that development or demonstration is not successful
    - Even well planned transition projects may fail at any RL for a wide range of reasons, but part of the transition plan should include steps to mitigate the risk of failure.
    - Divestment from failed transition projects, or those that no longer are critical for mission deployment, is essential to preserve the available agency resources for other potentially successful transition projects.

C. How to Handle Invention(s)

Prior to any public disclosure of a new and novel technology, the technology manager should contact the NOAA Technology Partnerships Office and discuss the need to disclose project details using the form CD-240. Disclosure kicks off the process for determining ownership and inventorship of any new technology and may help to indicate new pathways for getting a technology into use

D. Considerations for Dealing with Failure of a Transition Project

Transition projects have a specific set of performance metrics and milestones to complete each RL. If a transition project has failed to meet the performance metrics or milestones as expected, the project should be carefully reviewed by appropriate lab/office leadership to analyze the root cause of underperforming or missing the milestones. If the transition project is increasing the risk of failure, remedial steps may be taken to salvage the project. If remedial steps prove to be unsuccessful at correcting project shortcomings, the transition project should be considered for divestment.

Divestment from a transition project can occur in several ways, including termination of the project or transfer of the project to an extramural partner. Any decisions to divest from a transition project should proceed in accordance with Line Office standards and policies.

E. Cadence of Transition and for Monitoring Transition

1. Cadence of Transition

Movement through the R&D phases and individual RLs is specific to each project and seldom at a linear pace. The early stages of development (RL 3) might require much more time than the late stages of demonstration (RL 8), or for some projects the opposite might be the case. Given the irregular pace of progress through the stages, program managers, supervisors, and other reviewers must be cautious when using rate of maturation as part of the monitoring process.

2. Cadence of Monitoring Transition

The cadence of monitoring progress towards R&D transition to regular use or final deployment or implementation depends on several factors including, but not limited to: total cost of the project (e.g., more expensive projects may require more review), federal government budget cycles, seasonal cycles (e.g., hurricane season), internal NOAA or Line Office planning or review cycles, and sponsoring program review cycles. The cadence of monitoring will also be influenced by the duration of the transition project and the timeline for transition milestones.

3. The Concept of Key Decision Points

Within the transition process for a given project there are logical key decision points for significant review. These key decision points are an essential part of the process that establishes approval to continue with and move to the next step in the transition pathway. Planning to advance a transition project can often represent a commitment of one or more years of dedicated resources. Having project-specific key decision points are thus critical to organizational excellence by serving as pre-planned, and agreed on, opportunities for reviews with respective program managers and project supervisors, course corrections, or even potential divestment from a project with no likelihood of successful transition. The Transition Project Leads should agree on the key decision points and scale them proportionally to the scale and scope of the project. These agreed-upon key decision points could be formally included in the transition plan if desired.

Chapter 4 – Governance, Roles, and Responsibilities for Transition of Research and Development

A. Purpose

This Chapter outlines some of the key aspects for managing transition projects through their total lifecycle. The information highlighted in this Chapter is in addition to standard project or program management practices that are more widely used and should be followed routinely with any project.

B. Who Should Monitor Transition of R&D

1. Transition Project Leads

Transition Project Leads and their immediate supervisors are the first line of oversight on a transition project, and as such are the most responsive and engaged for governance and monitoring progress of the project. Transition Project Leads are responsible for setting milestones and managing the resources for a transition project on a day-to-day basis. In their capacity, they should maintain a good working relationship with their respective LOTMs as well as all partnering units from other parts of the agency.

2. Line Office Transition Managers (LOTMs)

LOTMs or their delegates are responsible for periodic transition monitoring within and between line offices (in the case of projects transitioning from one line office to another). The LOTMs should work together to monitor the NOAA transition portfolio.

LOTMs or their delegates are also the key line office point of contact for Transition Project Leads with respect to the transition process. In this capacity, LOTMs will be informed on all aspects of the transition by the Transition Project Leads.

LOTMs or their delegates will monitor progress and status of transition projects compared to their approved Transition Plan, and are empowered to recommend changes to the transition plans as needed.

3. Line Office Assistant Administrators (AAs)

Line Office Assistant Administrators (AAs) are responsible for promoting the goals and implementing the requirements of this NAO on transition, and appointing the respective LOTMs to ensure appropriate oversight of transition projects for the Line Office.

Chapter 5 – Reporting on Transition of Research and Development

A. **Purpose**

This Chapter describes the recommended approach for reporting on transition projects throughout their total life cycle.

B. **Who Reports on Transition**

LOTMs, program managers, and Transition Project Leads are responsible for reporting on the execution status of transition projects. Depending on programmatic or Line Office requirements, this may be necessary as often as quarterly. At a minimum, reporting should be done in line with the requirements of Line Office level annual operating plans (AOPs). There may also be additional reporting requirements specific to the program that is funding the transition project.

Appendix A – References for this Handbook

Dorman, C., 1999. Technology Infusion Panel - Summary Report, Memorandum to Jack Kelly, 15 March, 1999, National Weather Service, Silver Spring, Maryland.

Mankins, J.C. (6 April 1995). Technology Readiness Levels: A White Paper (PDF). NASA, Office of Space Access and Technology, Advanced Concepts Office.

NRC, 2000. From Research to Operations in Weather Satellites and Numerical Weather Prediction: Crossing the Valley of Death. Board on Atmospheric Sciences and Climate, National Research Council, 96 p.

NRC, 2003. Satellite Observations of the Earth's Environment: Accelerating the Transition of Research to Operations. Space Studies Board, National Research Council, 182 p.

SAB, 2004, Review of the Organization and Management of Research in NOAA: A Report to the NOAA Science Advisory Board, August 6, 2004. ftp://ftp.oar.noaa.gov/SAB/sab/Reports/RRT_Report-080604.pdf

Straub, J., 2015. In search of technology readiness level (TRL) 10. Aerospace Science and Technology 46, p. 312-320.

Appendix B – Abbreviations used in this Handbook

AA	Assistant Administrator
AGM	Annual Guidance Memorandum
AOP	Annual operating plan
CONOPS	Concept of operations
COTS	Commercial off-the-shelf
DAA	Deputy Assistant Administrator
DoC	U.S. Department of Commerce
DoD	U.S. Department of Defense
LOTM	Line Office Transition Manager
LOTMC	Line Office Transition Managers Committee
NAO	NOAA Administrative Order
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
R&D	Research and/or development
RFP	Request for proposals
RL	Readiness level
SRGM	Strategic Research Guidance Memorandum

Appendix C – Example Milestones For Each Readiness Level (RL)

Below is a figure adapted from NASA[12] to illustrate the requirements for a project to be cited as "at RL X." To be at a given RL, all components of your project must have completed all of the preceding milestones. For example, to be considered RL 5, all project components must have completed every milestone indicated above RL 5 in this figure. While the project is at RL 5, it should be working on any of the milestones at or below RL 5.

[12] http://www.nasa.gov/sites/default/files/files/ARLMilestonesFigure10712.pdf


Baseline research conducted and documented
Technology or application components formulated and created
RL 2
Ideas for mission application developed
All technology or application components tested individually
Technical or application components formulated and created
Prospective business case for the technology or application
Transition project reviewed by relevant leadership (transition phase checkpoint)
RL 3
Components of eventual system brought together and technical integration issues worked out
Convincing business case for the viability of technology or application
Initial CONOPS developed
Organizational challenges identified and managed
RL 4
Application or technology components integrated into a functioning prototype system with realistic supporting elements
Well-developed business case for complete life cycle
Formal Transition Plan developed
RL 5
Prototype system beta-tested in a simulated relevant environment
Projected improvements over existing systems achieved in a simulated relevant environment
Transition project reviewed by relevant leadership (suggested key decision point)
RL 6
Prototype system integrated into a relevant environment
Prototype system tested for functionality and initial demonstration potential in a relevant environment
RL 7
Prototype system tested and demonstrated full potential in a relevant environment
RL 8
Finalized system tested and demonstrated full potential in a relevant environment
System qualified for deployment by end user
End user documentation and training completed
RL 9
Sustained deployment

Appendix D – Example Transition Plan Template

A Transition Plan should be as concise as possible and commensurate with scope/complexity/maturity of the project. An example Transition Plan for a more mature project is outlined below. A transition plan for a less mature project might be expected to only address a few of the elements outlined below per guidance from the respective AA or their designee, and/or respective LOTM(s).

Example Transition Plans are available on the NOAA Research Council website[13]. More examples will be added there as they become available.

1. Purpose/Objective
2. Research background
3. Business case
   - 3.1. Who are the possible end users?
   - 3.2. Societal and economic benefits
   - 3.3. User Requirements
   - 3.4. Current (demonstration) system
   - 3.5. Justification/acceptance criteria for transition
   - 3.6. Optional transition project rejection release statement[14]
4. Capabilities and Functions
   - 4.1. Current (where is it now?)
   - 4.2. Operational/Application (description of intended end state)
   - 4.3. Data collection and management
5. Transition Activities:
   - 5.1. Identify any "gates" and associated documentation for accomplishing progress from one readiness level to another required to be met by the appropriate Line Offices
   - 5.2. Identify any testbed and proving ground that will be involved
   - 5.3. Identify any possible new technology development
6. Schedule and deliverables
   - 6.1. Implementation Plan
   - 6.2. Milestones
   - 6.3. Training manuals
   - 6.4. Mechanism for updating the plan
7. Roles and Responsibilities (for the Transition)
8. Budget overview
   - 8.1. Cost of current system
   - 8.2. Cost of transition
   - 8.3. Cost of operational system and maintenance

[13] http://nrc.noaa.gov/NOAARDPolicies/ExampleTransitionPlans.aspx

[14] Example: Either Party may at any stage of the transition project terminate plans for further development or final transition acceptance by giving 60 days written notice authorized by the AA or their delegate.

8.4. Optional financial release statement[15]

9. Impacts of Transition
   9.1. Budget- spend plan (proportional resolution appropriate to scale, scope, and maturity of project)
   9.2. Risks and mitigation
10. References
11. Signature page

[15] Example: The Parties specifically acknowledge that this transition plan does not constitute an obligation of funds.

Appendix E – Recommended Process for Completing a Formal Transition Plan

1. Purpose:

The purpose of this document is to describe the process involved in the official review and approval of Transition Plans by the NOAA management.

2. Background:

The NOAA Administrative Order (NAO) 216-105B states that all projects that seek to advance beyond Readiness Level 4 are recommended to have a transition plan. It is reasonable to expect that projects that are less mature and many years from implementation may have less developed transition plans that may not require the full review or approval process outlined below. Ultimately, each AA or their delegate can set the requirements and expectations for Transition Plans for their Line Office, and that will directly influence any review or approval process.

3. Review and Approval Process:

There are three stages in the transition plan review and approval process if the AA or their delegate decide that a particular transition project warrants a full or formal transition plan. The first stage is the working level review and approval, the second stage is the affected Line Office Transition Manager's (LOTM) review and approval, the third stage is the affected Line Office Assistant Administrator's (AA) review and approval with signature for the record.

I. In the working level stage, the Transition Project Lead (i.e., principal investigator) of the project, in coordination with the transition team, is responsible for development of a draft transition plan. This draft transition plan must be reviewed and approved by the division chiefs or other resource managers of both R&D and receiving sides. Once the draft transition plan is approved at the division chief's level, it will be submitted to the responsible LOTM to start the formal review and approval process.

II. In the second stage, the affected LOTMs coordinate the review and approval process of the draft transition plan following his/her Line Office's procedures. For projects involving multiple Line Offices, the LOTMs will coordinate the review and approval across the Line Offices.

III. In the third stage of the review process, the affected LOTM coordinates with the Line Office (LO) clearance process to start the formal review and approval process by the affected LO Assistant Administrator (AA) or their delegate(s), to produce the finalized transition plan, signed by the relevant AA(s) or their delegate(s).