NATIONAL WEATHER SERVICE INSTRUCTION 80-305

October 28, 2004

Science and Technology

Systems Engineering

TEST & EVALUATION

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SUMMARY OF REVISIONS: None. This is the initial issuance.

SUMMARY: This instruction specifies the test and evaluation master plan template for all projects authorized under the Operations and Services Improvement Process (OSIP). Each program should establish and manage its test effort to ensure timely, efficient, and comprehensive data that supports evaluation processes, and through effectively managed processes, lead to systematic improvement. Each program test and evaluation process must ensure, to the maximum extent possible, that the end item fulfills the established requirements and is operationally acceptable. To support this goal, this instruction specifies the template for a Test and Evaluation Master Plan, and provides examples of Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) reports. This instruction relates to Policy Directive 80-3 *Systems Engineering*.

Signed by   October 14, 2004
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Test & Evaluation

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Test & Evaluation

1.   Introduction. Test and Evaluation (T&E) supports system engineering processes for Validation & Verification (V&V). Testing is a process of objective and repeatable use-based review of a system, subsystem or component that is the basis for evaluation and judgment. The purpose of evaluation is to review, analyze, and assess data obtained from testing and other means to aid in making systematic decisions. The purpose of T&E is to verify technical performance, operational effectiveness, operational suitability, sustainability, and to provide essential information to support decisions.

Developmental Test & Evaluation (DT&E) focuses on the verification of technical requirements primarily during the operational development phase. DT&E provides clarity about the system without introducing operational complexity by controlling the test environment. DT&E is conducted by system developers and integrators. Tests performed as part of DT&E trace to the system requirements specification.

Operational Test and Evaluation (OT&E) focuses on operational effectiveness and suitability, introducing realistic and actual operational considerations that may influence concepts of operation, requirements, design, and system use. OT&E includes testing in which varying degrees of the operational environment are introduced. It may include early operational assessment, operational assessment, initial operational test and evaluation, and follow-on operational test and evaluation. Representatives from the user and maintenance communities participate in operational testing. Tests performed as part of OT&E trace to operational requirements and lead to either commissioning of a system or to a decision to nationally deploy the system.

2.   Purpose and Scope. This instruction specifies the framework and functions that can be used for test and evaluation. Each program should establish and manage its test effort to ensure timely, efficient, and comprehensive data that supports evaluation processes, and through effectively managed processes, lead to systematic improvement. The context, framework, and schedule for test and evaluation is shown in Appendix A, Figure 1.

3.   Program Product Standards. This section defines the standard template for a Test and Evaluation Master Plan (TEMP), the guiding plan for a test and evaluation program. Table 1 below provides a summary of milestones associated with developing sections of the TEMP. The activities required to complete the TEMP will result in planning an appropriate test program to evaluate a system. Specific definitions supporting the information presented here are included in Appendix B.

Table 1. Summary of Milestones Associated with TEMP Sections

Test & Evaluation Master Plan Section	Preliminary Version	Complete Version
System Introduction	After Gate 3	Before Gate 4
Test & Evaluation Master Schedule and Management	After Gate 3	Before Gate 4
DT&E Plan	After Gate 3	Before Gate 4
OT&E Plan	After Gate 3	Before Gate 4
T&E Resource Summary	After Gate 3	Before Gate 4
Appendices	After Gate 3	Before Gate 4

3.1   System Introduction. Provide a summary of system objectives, measures of effectiveness and suitability, a system description, and an identification of critical technical parameters.

3.2   Test & Evaluation Master Schedule and Management. Provide an integrated test program schedule and description of the overall test and management process. This section should reference applicable test policies.

3.3   DT&E Plan. Provide an overview of the DT&E plan. Reference the Requirements Specification and trace testing to system requirements. For complex projects and programs, the DT&E Plan may be a separate document that is referenced in this section. The DT&E Plan will include the following:

- Background
- Purpose and objectives
- System under test description
- Test cases
- Use cases
- Assumptions and limitations of the test and system under test
- Applicable policies
- Test management
- Entrance criteria
- Success criteria
- Test schedule
- Planned test report(s). (An example is provided in Table 2.)

3.4   OT&E Plan. Provide an overview of the OT&E plan. Reference the Operational Requirements Document and trace testing to operational requirements. For complex projects and

programs, the OT&E Plan may be a separate document that is referenced in this section. The OT&E Plan will include the following:

- Background
- Purpose and objectives
- System under test description
- Assumptions and limitations of the test and system under test
- Applicable policies
- Test management
- Entrance criteria (including completed DT&E with test report)
- Success criteria
- Test schedule
- Planned test report(s). (An example is provided in Table 3.)

3.5   T&E Resource Summary.   Identify the necessary physical resources and activity responsibilities. The following items may be included: test articles, test sites, test instrumentation, test support equipment, test targets and other expendables, operational force test support, simulations, models, test data, test-beds, special requirements, funding, and training.

3.6   Appendices. Appendices may contain additional information used in supporting test program planning.

Appendix A – Test Report Outlines

Table 2. Example of DT&E Report Outline

No.	Development Test & Evaluation Report Outline	
1	Component / Subsystem / System Description	A brief description of the system component to be tested. *Component* is used broadly in this context to include physical, logical, and process elements of the system.
2	Test Objectives	A brief statement of test objectives traceable to requirements.
3	Test and Use Cases	Test and use cases designed to objectively develop information to support test objectives.
4	Test Tools and Resources	A summary of all tools and resources required to execute the tests including identification of test sites.
5	Test Procedure	Reference the appropriate procedures executed, and identify the sequence steps used during the test.
6	Test Constraints/Limitations	Describe any test constraints or limitations (i.e., test platform).
7	Test Results, Schedule, and Success Criteria	A report of all test results, including those not anticipated during the procedure.
8	Test Anomalies	A description of anomalies identified during the test and (if any) workarounds.
9	Recommendations	A list of recommendations based on the test outcomes.
10	Conclusions	A list of conclusions drawn from the test outcomes and success criteria.

Table 3. Example of OT&E Report Outline

| No.	**Operational Test and Evaluation Report Outline**	
1	System Capability Description	A brief description of the system capabilities that will be tested and assessed.
2	Test Objectives	A brief description of test objectives traceable to the requirements.
3	Test Method	A description of the test and data collection method.
4	Test Tools and Resources	A summary of required tools and resources including identification of test sites.
5	Test Constraints/Limitations	Describe any test constraints or limitations (i.e., test platform)
6	Test Results, Schedule, and Success Criteria	A report of all test results, including those not anticipated during the test planning or method.
7	Test Evaluation	An evaluation of the test results.
8	Test Anomalies	A description of anomalies identified during the test and (if any) workarounds.
9	Recommendations	A list of recommendations based on the test outcomes.
10	Conclusions	A list of conclusions drawn from the test outcomes and success criteria.
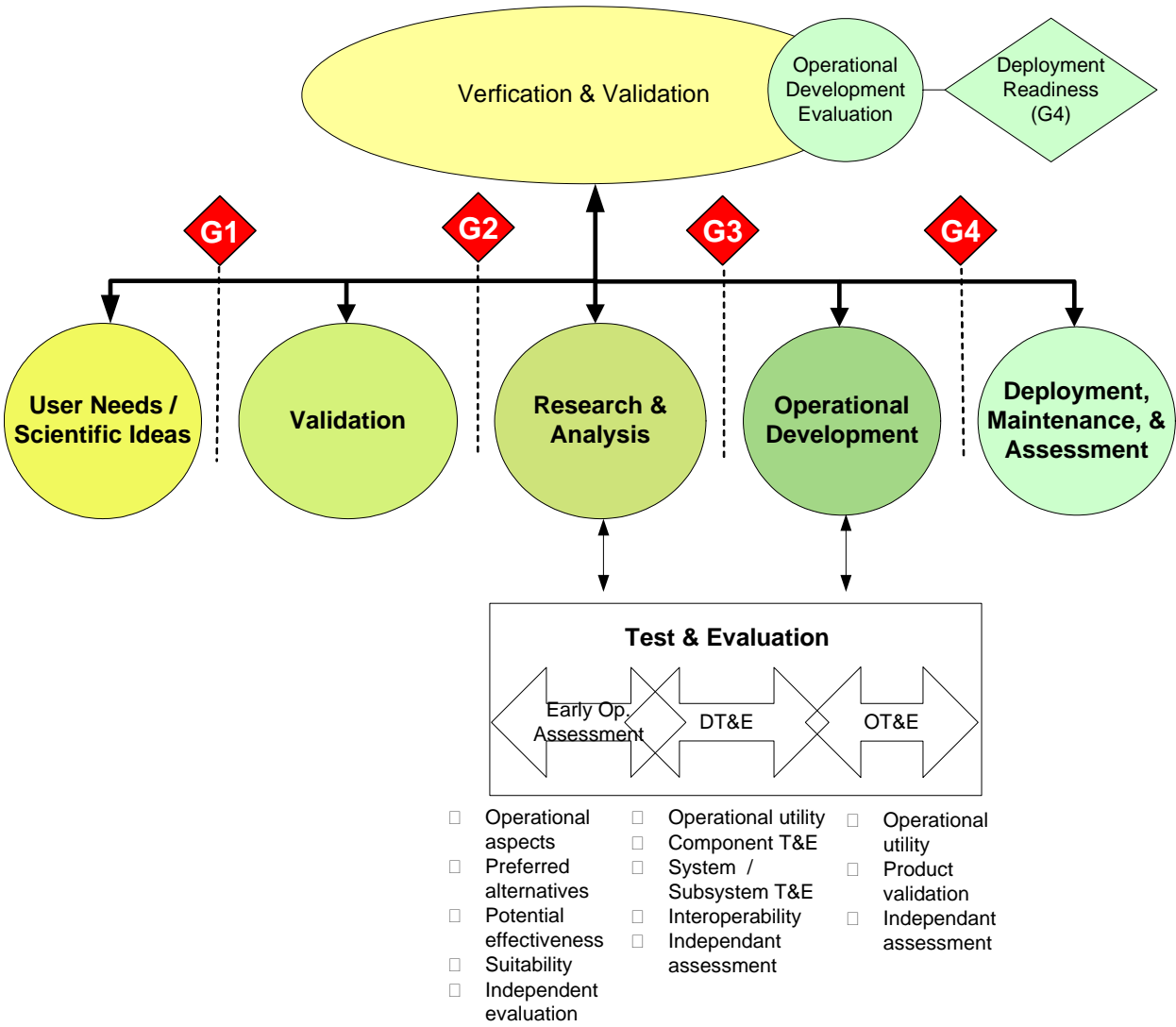
Figure 1.   Test & Evaluation Links to the Operations and Services Improvement Process

Appendix B - Definitions

Test   The use of system, subsystem, or component operation to obtain detailed data to verify performance or to provide sufficient information to verify performance through further analysis. Testing is the detailed quantifying method of verification, and as described later in this chapter, it is ultimately required in order to verify the system design.

DT&E   Development Test and Evaluation verifies that the design solution meets the system technical requirements and the system is prepared for successful Operational Test and Evaluation (OT&E). DT&E activities assess progress toward resolving critical operational issues, the validity of cost-performance tradeoff decisions, the mitigation of acquisition technical risk, and the achievement of system maturity.

OT&E   Operational Test and Evaluation programs are structured to determine the operational effectiveness and suitability of a system under realistic conditions, and to determine if the minimum acceptable operational performance requirements as specified in the Operational Requirements Document (ORD) and reflected by the key performance parameters have been satisfied. **Please note in the National Weather Service OT&E is used in the System Commissioning process and Operational Acceptance Test (OAT) for the test process leading to national deployment of a system, subsystem, or component.**

Use Case   Use cases are detailed, structured, text-based descriptions of interactive usage.

Appendix C - References

1. NWS Policy Directive 10-1 *Operations and Services Improvement Process* (in process).
2. NWS Policy Directive 80-3, *Systems Engineering.*
3. NWS Instruction 80-301, *Systems Engineering for New Development* (in process).
4. NWS Instruction 80-304, *Software Development* (in process).
5. US DoD, Systems Engineering Fundamentals, 2001.
6. *IEEE 1012-1998 Standard for Software Verification and Validation*, 1998.
7. NWS Instruction 30-302, *Field Test Process* (in process).
8. NWS Instruction 80-201, *System Commissioning Process*.