GLENN PROCEDURAL REQUIREMENTS

Directive: GLPR 7120.5.50B
Effective Date: 09/27/2022
Expiration Date: 09/27/2027

COMPLIANCE IS MANDATORY

Responsible Office: F/Facilities, Test and Center Operations Directorate

Implementation - Experimental Testing w/Change 1 (06/04/2024)

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Preface

P.1 Purpose

The purpose of this document is to clearly define the testing process to effectively meet the overall program/project objectives, fully satisfy customer needs, effectively execute an efficient test effort, and to maximize the quality of the results.

P.2 Applicability

a. This procedure applies to all research testing conducted at Glenn Research Center (GRC). This includes all research test facilities, large and small, and for all types of testing (both for Space-related and Aeronautics-related endeavors). The experimental testing may have various objectives: exploration or development of a science or technology area without theoretical or experimental precedent, proving or disproving an existing scientific or technological theory or concept, or quantifying the performance of a system or design.

b. This document is the basis for all lower-level procedure documents developed to detail testing procedures at GRC, such as Glenn Procedure (GLP)-FT-8080.17.

c. This directive is applicable to documents developed or revised after the effective date of this Glenn Procedural Requirements (GLPR).

d. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The term “may” denotes a discretionary privilege or permission, “can” denotes statements of possibility or capability, “should” denotes a good practice and is recommended, but not required, “will” denotes expected outcome, and “are/is” denotes descriptive material.

e. In this directive, all document citations are assumed to be the latest version, unless otherwise noted.

P.3 Authority

a. NASA Procedural Requirement (NPR) 7120.5, NASA Space Flight Program and Project Management Requirements.

b. NPR 7120.8, NASA Research and Technology Program and Project Management Requirements

P.4 Applicable Documents and Forms

a. Glenn Procedure (GLP)-FT-8080.17, Planning and Execution of a Ground Test Project.

b. GLP-QS-8715.1, Glenn Safety Manual

P.5 Measurement/Verification

Requirements in this document are periodically verified through the GRC’s internal audit program and through Division/Branch audits.

P.6 Cancellation

This GLPR replaces GLPR 7150.5.50A, Implementation-Experimental Testing, dated July 27, 2017.

LAURENCE SIVIC *Digitally signed by LAURENCE SIVIC*
Date: 2022.09.27 08:54:16 -04'00'

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CHAPTER 1. Responsibilities

1.1 GRC Management and All Staff Associated with Experimental Testing

All organizations that participate in experimental testing shall be responsible for developing, conducting, and documenting their experimental tests in compliance with this procedure.

1.2 Customer

All customers shall be responsible for defining the scope and objectives of an experimental test, providing or arranging for: resources needed to carry out the test, the test article, data analysis, and the final reporting of the data in compliance with this procedure.

1.3 Test Provider

The Test provider shall be responsible for determining if and how the test request can be met, scheduling resources, test preparation, test procedure, and conducting the test. The Test provider will be responsible for appropriate control of data, documents, and test article(s) while they are within the scope of the experimental testing activity.

1.4 Product Assurance Contributor

The product assurance contributor, or contributors, shall provide an independent assessment during the life cycle of the testing activity, from test initiation through completion. The product assurance contributor provides feedback or corrective action to the testing organization to assure that the elements of product assurance are addressed appropriately.

1.5 Division of Roles and Responsibilities

The roles of the Customer, Test Provider and Product Assurance Contributor should be assigned to three different people or organizations as much as practical. It is possible that the same person could act in any two of these roles for any given test project, particularly tests that are conducted in labs and small test facilities. However, a single person shall not act concurrently in all three roles (Customer, Test Provider and Product Assurance Contributor) for any one test project. This is stipulated to ensure adequate oversight and to avoid conflicts of interesting in the execution of the test process and ensuring required data quality.

CHAPTER 2. Procedure

2.1 Test Request

2.1.1 Customer - Establish contact with the test provider. Develop, plan, document, and submit, as appropriate, for their scope and complexity, a description of the technical, schedule and other resource requirements for the experimental testing activity. The test request may be a part of a customer agreement. The test request may include:

a. Qualitative and quantitative objectives of the test.

b. Specifications or documentation, as required, for the facility(s), test article(s), test and support equipment, test materials or specimens, measurement instrument(s) and data acquisition device(s).

c. Operating parameters, as required, for the items in item 2.1.1.b above.

d. Specification of the technical data to be collected during the test.

e. Specification of the anticipated post-test data analysis or subsequent testing.

f. Post-test disposition, as required, of the items in items 2.1.1.b, d, and e above.

g. Product assurance requirements.

h. Resource constraints (schedule, money, labor, etc.).

i. Security or proprietary restrictions on any part of the testing activity or the resulting data.

j. Other relevant requirements.

2.1.2 Test Provider - Document, in an appropriate manner, any changes to the test request that may be made at any point during the experimental testing procedure. This documentation should also include impacts to the test project in terms of schedule slip or cost impacts.

2.2 Resources and Capabilities

Test Provider and/or Customer - Decide to conduct the test if resources and capabilities are available to meet the objectives and requirements of the test request.

2.3 Revised or New Test Request

Customer - Decides whether to revise the test objectives, requirements, or resources, to formulate a new test request; or to cancel the test request.

2.4 Scheduling

Test Provider – Develop overall plan including task schedule and resource allocation to achieve customer test objectives.

2.5 Test Preparation

Test Provider - Develop, plan, document, and execute preparations for conducting the test. Appropriately ensure:

a. The test article meets the requirements of the test request (development or acquisition of test article(s) is not part of this procedure).

b. A test procedure is developed that satisfies the test request.

c. The fixturing will provide the test conditions required by the test request.

d. The kind and quantity of instrumentation proposed for the test satisfies the test request.

e. The appropriate calibration of instrumentation, test article(s), test equipment, and facility(s).

f. The kind and quantity of data to be collected and analyzed during the test satisfies the test request.

g. The type and level of controls that satisfy product assurance requirements defined in the test request.

h. The development of data analysis tools.

i. The preparation and installation of the test article in the test facility.

j. The final checkout of instrumentation.

k. Safety requirements have been satisfied throughout test preparation per the GLP-QS-8715.1, Glenn Safety Manual, and if a safety permit is required it has been coordinated with the appropriate Safety Committee.

l. If applicable, complete an Operational Readiness Review (ORR) of the test facility. An ORR may be needed if the test facility has been dormant for an extended period of time, or if significant changes have been made to the facility since it was last operated.

m. Complete a Test Readiness Review (TRR) to ensure that all aspects of the test are ready for execution.

n. Changes made to the test request, test procedure and/or test article are documented including all impacts to the test project in terms of cost, schedule, and achievement of objectives.

o. Customer agreements have been documented and approved.

p. Training has been obtained.

q. Test removal and facility baselining as required.

r. Other required actions.

2.6 Conduct the Test

2.6.1 Test Provider - Execute and document the test according to the test procedure, ensuring that all required provisions for safety are observed (including any in applicable safety permits), and the test facility is operated in accordance with the test procedure.

2.6.2 Test Provider - The instrumentation is operated in accordance with the test procedure.

2.6.3 Test Provider - The collected data and the performance of the test article, instrumentation, and the test facility are monitored.

2.6.4 Product Assurance Contributor - The test results and data collected are validated by the product assurance contributor to meet the test request.

2.6.5 Test Provider - The resources provided for conducting the test are monitored.

2.6.6 Test Provider - At the completion of the test procedure or between repetitions of an iterative test procedure, the testing may be repeated, continued, modified, or interrupted, as appropriate, based upon:

a. Unexpected test results (reviewed by the customer).

b. Performance abnormalities or failures of the test article, instrumentation, or test facility.

c. Consumption of resources; the technical judgment of the customer or Test Provider.

2.6.7 Test Provider - Will document and report any issues that occur during the test, including any data anomalies or nonconformances (working with the Product Assurance Contributor) and any performance abnormalities or failures with the test article, instrumentation or test facility.

2.7 Evaluate Status

2.7.1 Customer - At the completion or interruption of the test procedure, evaluate the available test results, then decide and document whether to stop testing. Testing may be stopped because:

a. The test objectives are satisfied.

b. Available resources are insufficient.

c. Performance abnormalities or failures of the test article, instrumentation, or test facility cannot be rectified.

d. In the technical judgment of the customer further testing is not warranted.

2.7.2 Customer - The test request may be revised to:

a. Obtain more resources.

b. Modify the test objectives, requirements, operating parameters, etc.

c. Modify the test article.

2.8 Post-test Tasks

2.8.1 Test Provider – Remove and disposition the test hardware from the test facility.

2.8.2 Test Provider – Secure the test facility and support systems, complete any post-test inspections and maintenance, and return the facility to operational readiness mode.

2.8.3 Test Provider – Complete all post-test documentation. This includes capturing and reporting any lessons learned and suggested best practices that were developed during the testing.

2.8.4 Test Provider – Prepare and deliver the final data package to the Customer per the test request or customer agreement.

2.9 Final Data Analysis

Customer - The data emerging from the test are subjected to a documented data analysis process in accordance with the test request or standard scientific or engineering principles. This can range from visual inspection of the test article or data to complex statistical analyses. The data and the data analysis results are reported per the test request or customer agreement.

NOTE: See Appendix B. Experimental Testing Flow Diagram

Appendix A. Definitions

Calibration. The set of operations that establishes, under specified conditions, the relationship between values indicated by a measuring or generating instrument or system and the corresponding standard or known values derived from the standard. This definition may also be broadened to describe the performance or attributes of a collection of measuring and generating instruments acting together, such as a testing facility.

Controls. Control or control systems consist of systems which vary or maintain a parameter to a desired value. Controls apply to both the test facility and the test article.

Customer. The person or organization that requested the test, either internal or external, to GRC. For test projects in labs and small test facilities, the customer can be the same person as the test provider.

Customer Agreement. The customer agreement defines what each party will do/provide. The parties involved are the customer and the test provider. This agreement can have a wide range of forms and formalities. A customer agreement can be as simple as a (documented) verbal discussion between the customer and the test provider defining what is to be done and by whom. The other extreme of a customer agreement are defined in other GRC procedures and could be a formal legal document in which the Center is the test provider, and the customer is a group/organization/company external to GRC. In this case, document approval and signature may come from high levels in the external organization and at the Agency level for the Government.

Data Acquisition. The collection of information from electronic sensors into a recording device.

Data Analysis. A technical evaluation of the quantitative and qualitative data emerging from the testing. This evaluation may include determinations of the validity, accuracy, and precision of measurements, a statistical analysis of measurement variance, computations that convert data into other relevant forms or units, and comparisons to related experimental, theoretical, or simulation results.

Facility Manager. The person responsible for coordinating all activities at a given test facility. Primary point-of-contact with the Customer for the develop of a test agreement.

Instrumentation. Device(s) used to measure processes or properties, either qualitatively or quantitatively, necessary to satisfy the test request.

Operational Readiness Review. An independent review requested by the Test Provider to determine the state of readiness for a test facility following any extended downtime, such as after a major facility rehabilitation or upgrade, or being returned to service following an increase in readiness level rating. This is similar to a Test Readiness Review, but focused on facility operations and readiness, rather than a specific test project.

Product Assurance. Activities performed at GRC that demonstrate the adequacy of safety, reliability, or quality.

Product Assurance Contributor. An organization, person, system, or device which performs a product assurance function as defined in this document. It may be the customer, the testing organization, engineering and manufacturing personnel, Safety and Mission Assurance Directorate, a system, device, data, or controls software that controls and supervises the testing operation.

Resources. Items required in order to perform the experimental testing activity including funding, labor, facility time, material, utilities, etc.

Safety Permit. A document issues by a designated area safety committee after it has been reviewed and approved showing that the test can be performed safely. See GLP-QS-8715.1 for further details.

Test Article. The item of material, hardware, software, or system that is being tested.

Test Provider. The person(s) or organization(s) responsible for implementing the various phases of the test. For test projects conducted in labs or small facilities, the Test Provider can be the same person as the Customer.

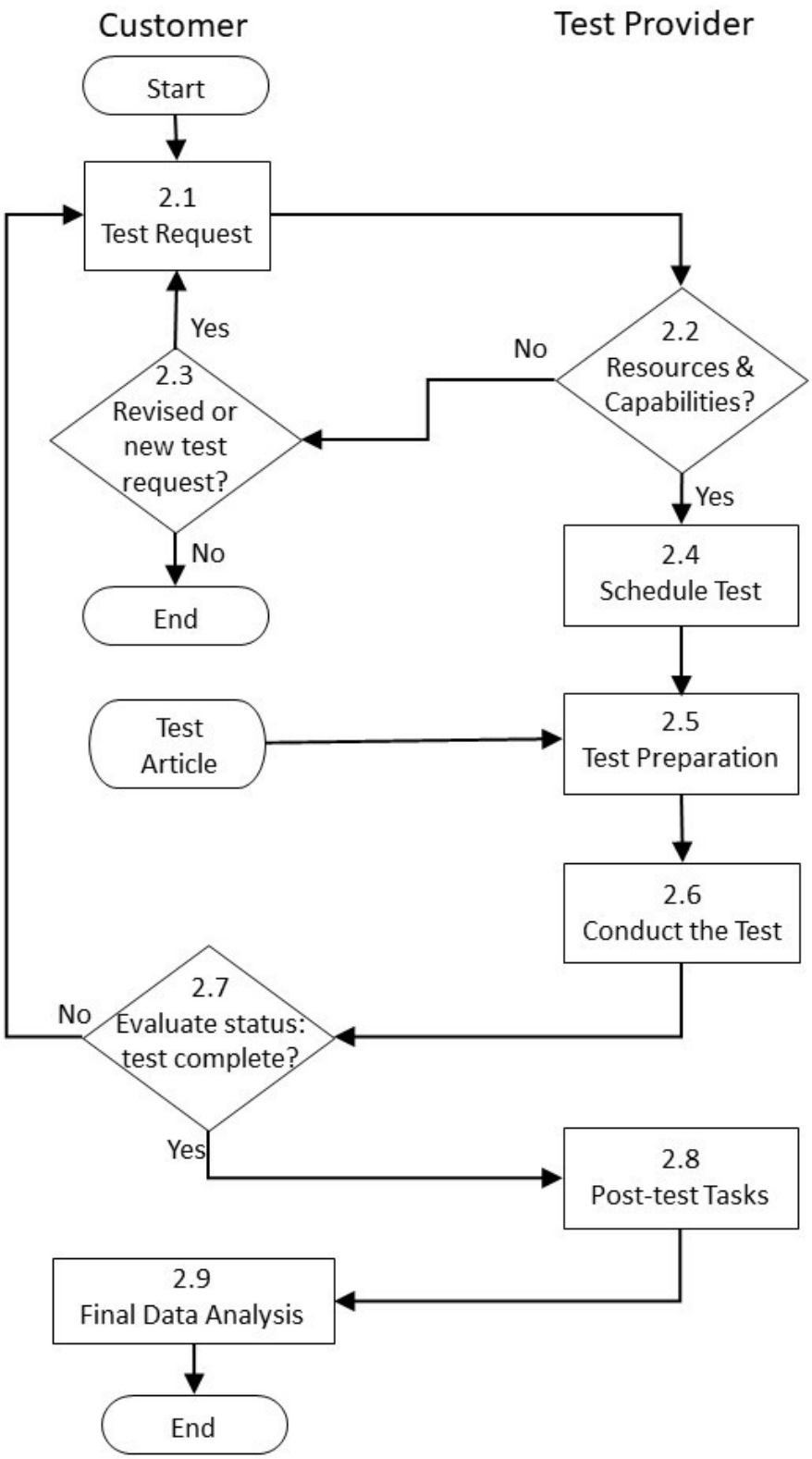
Test Facility. The place where the test is performed. This can be of any size from a single piece of equipment (i.e., an oven) up to a major research facility (i.e., wind tunnel).

Test Procedure. How the test is performed. This typically contains the conditions and actions to be performed and directed by the test provider.

Test Readiness Review. An independent review requested by the Test Provider to determine the state of readiness for a test project and if the research test objectives are achievable. This is done by reviewing the test objectives against the readiness of the test article, facility, data acquisition systems, data reduction program, and test article safety. This is similar to an Operational Readiness Review which is focused on the facility operational preparedness.

Test Request. A request from a customer, either internal or external, for test support in a GRC test facility. The request should include the detailed requirements for the proposed test project as well as details about the desired timing of the test. The request will be the basis for estimates created by the facility manager and line management used in negotiations with the customer.

Appendix B. Experimental Testing Flow Diagram



Appendix C: Acronyms

GLP	Glenn Procedure
GLPR	Glenn Procedural Requirement
GRC	Glenn Research Center
NPR	NASA Procedural Requirement
ORR	Operational Readiness Review
TRR	Test Readiness Review

Change History

Revision	Date	Description/Comments
Basic	06/18/07	Document converted from CLP (GRC-P2.6.1) to GLPR
A	05/21/12	The following changes were made: Applicable document numbers/titles change and updated to conform to the current content and format requirements per GLPR 1410.1
Change 1	07/27/17	Administrative revision of renumbering the GLPR 8080.1A to coincide with the NPR. Renumbered to GLPR 7120.5.50A. No other revisions were
B	09/27/2022	· Deleted Introduction chapter (material in the Introduction was covered in the Preface or Appendices). Renumbered remaining chapters and flow diagrams accordingly. · Updated nomenclature to match standard testing terminology. · Updated to meet requirements of GLPR 1410.1
Change 1	6/04/2024	Administrative change: Responsible organization name change