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Goddard Procedures and Guidelines

DIRECTIVE NO.	GPG 8730.3D	**APPROVED BY Signature:**	*Original Signed by*
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EXPIRATION DATE:	February 22, 2005	**TITLE:**	Director

Responsible Office: 300/Office of Systems Safety and Mission Assurance

Title: The GSFC Quality Manual

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PREFACE

P1. PURPOSE

The purpose of the GSFC Quality Manual is to define the Quality Management System (QMS) as implemented at the Goddard Space Flight Center (GSFC).

P2. APPLICABILITY

The Quality Manual applies to all organizational elements for the performance of work that is in-scope to the QMS and the ISO 9001 certification for the Center.

P3. AUTHORITY

NPD 8730.3, NASA Quality Management System Policy (ISO 9000)

P4. REFERENCES

a. ANSI/ASQC Q9001-1994, Quality Systems – Model for Quality Assurance in Design, Development, Production, Installation, and Servicing

b. ISO 8402-1994, Quality Management and Quality Assurance – Vocabulary

c. GSFC Strategic Implementation Plan

d. NASA Strategic Management Plan

e. QMS GPGs (see Table 1)

P5. CANCELLATION

GPG 8730.3C, The GSFC Quality Manual

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1. QUALITY POLICY

QUALITY POLICY

With customer satisfaction as our primary goal:

- GSFC is committed to meeting or exceeding our customer's requirements.
- We achieve excellence in all of our efforts.

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Director

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Deputy Director

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2. INTRODUCTION

2.1 Definitions

Unless otherwise addressed herein, the definitions given in ISO 8402-1994 apply to the implementation of the QMS. The following additional definitions are provided to assist in the understanding and application of the QMS:

a. Contractor - A non-federal entity that provides goods or services to GSFC as defined through a purchase order or contractual arrangement.

b. Customer - The recipient of a product provided by GSFC. For purposes of the Quality Management System, the customer is assumed to be external to GSFC.

c. Customer Agreement - Space Act Agreement, Program or Project Plan, Research Plan, or any other legal commitment entered into by GSFC to deliver a product.

d. Executive Council - Collectively, the Heads of all of the Directorates and Functional Offices that report directly to the Center Director.

e. Goddard Directives Management System (GDMS) - is the system that is used to develop, maintain and control GSFC documents that specify policy, procedures and guidelines. This is an electronic, on-line system accessible to the GSFC managers and workforce.

f. Goddard Space Flight Center (GSFC) - The NASA facility and organization at Greenbelt, MD, and at Wallops Flight Facility, Wallops Island, VA.

g. Office of Primary Responsibility (OPR) - The Goddard Directorate or Functional Level Office that has been assigned a lead and maintenance responsibility for a Center-level process by the Center Director.

h. Performing Directorate - The GSFC organization that is assigned the responsibility of producing a product or otherwise satisfying a customer's requirement.

i. Product - In this document, systems, hardware, software, data, documentation, services and/or processed material resulting from work activities at GSFC that have been defined to be in-scope to the QMS.

j. Product Design Lead (PDL) - The manager or leader with overall responsibility for managing the product design activity.

k. Product Manager - The individual designated as having management responsibility for a product.

l. Quality Management System Council (QMSC) - A group of representatives from all cognizant GSFC Directorates, chaired by the Quality Management System Representative (QMSR), responsible for advising the QMSR regarding Quality Management System administration, maintenance, status reporting, and corrective action.

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m. Quality Management System Representative (QMSR) - A GSFC manager, or a group of GSFC managers, designated by, and reporting directly to, the Center Director who have responsibility and authority for the effective implementation of the Quality Management System.

n. Supplier - An organization that provides a product to a customer.

2.2 Goddard Mission, Mission Objectives and Goals

The Goddard Space Flight Center (GSFC) is a NASA Center of Excellence for Scientific Research. In that capacity, GSFC plays a major role in performing and enabling research in Earth Science and Space Science. The Center develops Technology and implements Systems and Programs that support this role. In addition, GSFC has other responsibilities in the areas of NASA Programs and Enterprise support. Although much of the work is performed at GSFC in Greenbelt, Maryland, some of the work is also performed at the Wallops Flight Facility (WFF), located at Wallops Island, Virginia. WFF's primary areas of responsibility are sounding rockets, scientific balloons, observational science and scientific aircraft missions.

2.3 GSFC Organization

GSFC is organized into elements called Directorates. Designated Codes 200 and 400 through 900, the Directorates are established to perform specific functions such as engineering, scientific research and enabling, technology development and others. Each Directorate is responsible for the performance of a specific function for the Center. Functional Offices, designated as Code 300 and as sub-elements within Code 100, perform specific functional duties for GSFC.

Collectively, the Directorate heads and the Functional Office heads make up the Executive Council that provides advice and support to the Center Director for the management of the Center and for the implementation of the Quality Management System.

The GSFC organization chart is shown as Figure 1.

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Goddard Space Flight Center Organization

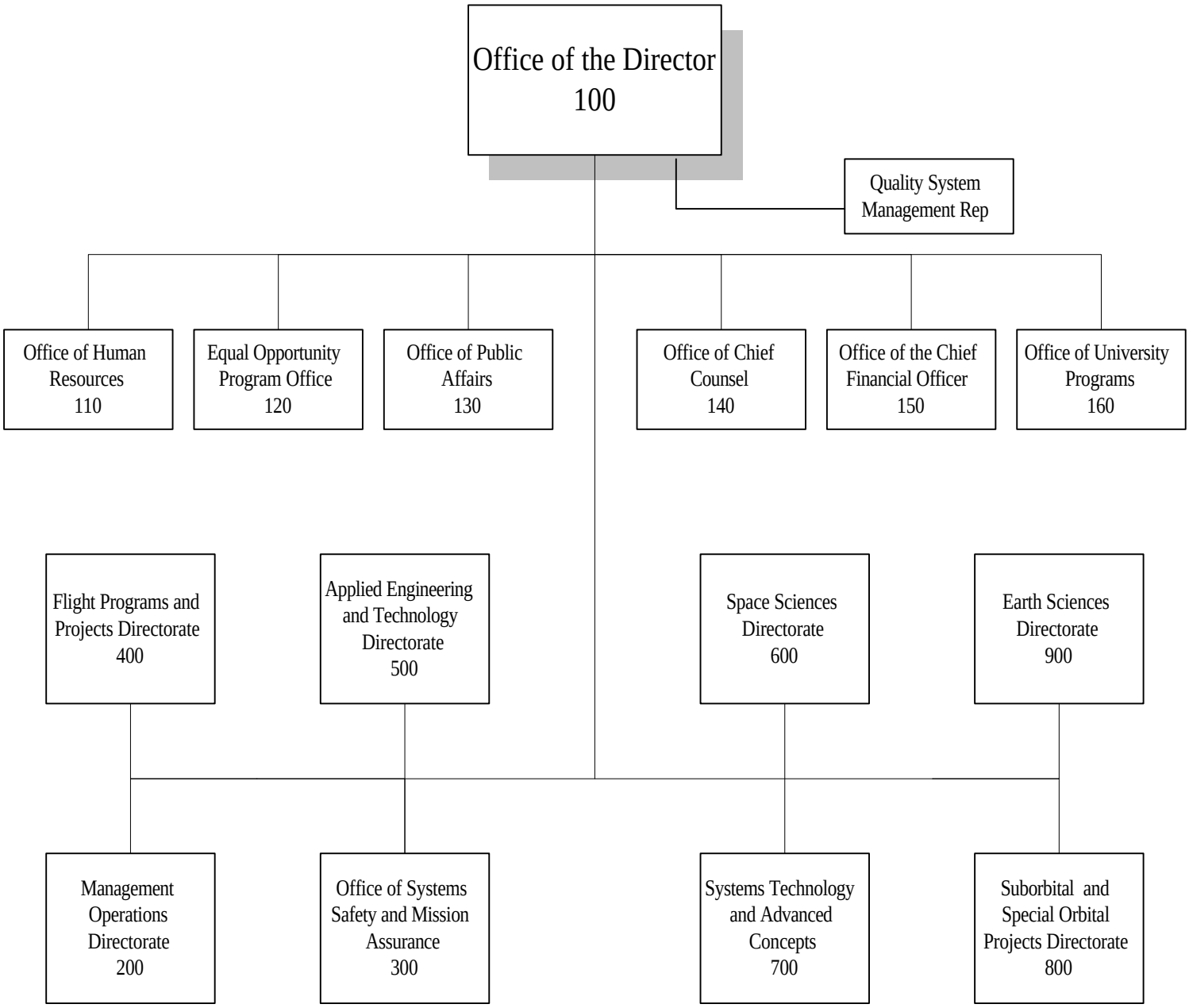

Figure 1

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3. SCOPE OF THE QUALITY MANAGEMENT SYSTEM AND ISO 9001 CERTIFICATION

The scope of the QMS and the GSFC ISO 9001 certification includes all products resulting from the following GSFC core processes:

a. Science Enabling - This includes the grants process; providing data to the science community; science support tools; the proposal support process; and the science research process.

b. Systems Development - This includes space flight systems; sounding rocket, aircraft and balloon carrier systems; and ground based mission operating and data acquisition systems. Only sounding rocket, aircraft and balloon payloads that are provided in response to NASA Announcements of Opportunity or provided as a formal obligation to an external Principal Investigator are in scope.

c. Program/Project Management - This includes cost, schedule and technical control; review and reporting; budgets; procurement; contracts; and safety and mission assurance.

d. Technology Enabling - This includes the technology research and development management process; mission-specific products; transfer; and commercialization.

e. Mission Operations - This includes operations of on-orbit spacecraft; maintenance of on-orbit operations systems; collection and preservation of all data from on-orbit spacecraft; and communications support to other NASA mission operations.

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4. QUALITY SYSTEM REQUIREMENTS

4.1 Management Responsibility

4.1.1 Quality Policy

The Quality Policy is stated in Section 1 of this document. The principle objective of this policy is to enhance GSFC ability to achieve program, institutional and Agency goals as stated in the GSFC Strategic Implementation Plan and the NASA Strategic Management Plan. Immediate specific objectives for quality are:

a. systematic measurement, improvement, uniformity and consistency in our work processes;
b. early definition/incorporation of customer requirements;
c. improved risk assessment capability;
d. increased customer involvement; and
e. accountability

The Quality Policy is disseminated throughout the organization via awareness campaign material, ISO/QMS orientation and training, organizational meetings, and Internet Home Page postings.

4.1.2 Organization

The GSFC organization is described in Section 2.3 of this document.

4.1.2.1 Responsibility and Authority

The Center Director is given the authority by the Agency to manage all aspects of GSFC within Government and Agency laws and regulations. This includes authority to implement and maintain the QMS. The Center Director has further delegated responsibility and authority over the QMS to the Executive Council and to all managers and supervisors at the Center.

The Center Director is responsible for ensuring that the Quality Policy and the QMS is understood and implemented at all levels of the organization that fall within the scope of the QMS.

Individually, the members of the GSFC Executive Council are responsible for the implementation and proper functioning of the QMS within their organizations.

The Center Director appoints the Quality Management System Representative (QMSR) who is responsible for ensuring that the QMS is established and maintained across the Center. The QMSR also is responsible for maintaining the GSFC Quality Manual in a current status.

The Center Director established a Quality Management System Council (QMSC) that consists of representatives from each Directorate and from each Functional Staff Office that can affect the quality of GSFC products. The QMSC advises the QMSR regarding the administration and maintenance of the QMS.

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All GSFC managers and supervisors that are involved in work that is applicable to the QMS are responsible for implementing the QMS within their organizations, including establishing and documenting the necessary procedures, guidelines, and work instructions. This responsibility also includes ensuring that their employees operate in compliance with the QMS and make appropriate notification of processes that do not produce the required quality.

4.1.2.2 Resources

GSFC allocates sufficient resources to manage and perform the work required to meet the commitments to our customers. The required resources are identified by the Product Manager and are provided by the Center Director through the Performing Directorate or Functional Staff Office.

The QMSR identifies the resources necessary to implement and maintain the QMS, including the Internal Audit function. The Center Director allocates the necessary manpower and other resources.

4.1.2.3 Management Representative

The Director of the Office of Systems Safety and Mission Assurance serves as the QMSR.

4.1.3 Management Review

The QMSR provides quarterly reports on the effectiveness of the QMS to the Center Director and the Executive Council. QMS metrics gathered through the reporting period shall be used to determine necessary improvements to the QMS.

Governing Procedure:
GPG 1060.1, Management Responsibility
GPG 1060.2, Management Review and Reporting for Programs and Projects

4.2 Quality System

4.2.1 General

The QMS is established to ensure that GSFC products conform to all specified requirements. The Quality Manual (this document) is approved by the Center Director and is the defining document for the implementation of the QMS. It provides a reference that shows how the QMS meets the requirements of ANSI/ASQC Q9001.

The documentation that defines the QMS is described pictorially in Figure 2.

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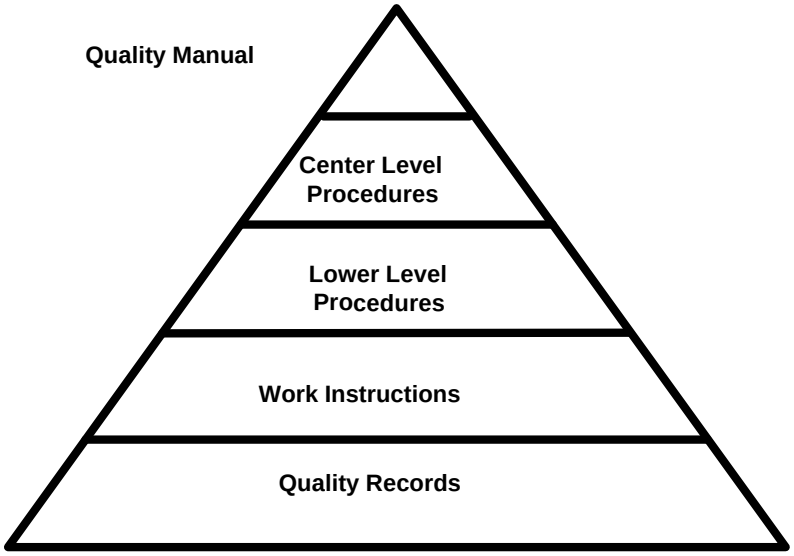

Fig.2 QMS Documentation Structure

4.2.2 Quality System Procedures

The QMS is implemented by the following procedures that are consistent with the ANSI/ASQC Q9001 and with Government and Agency requirements and regulations. The range and detail of the procedures is dependent upon the complexity of the work methods used and the skills and training needed to carry out activities. A description of the procedures is as follows:

a. Center-level QMS Goddard Policy Directives (GPDs) and Goddard Procedures and Guidelines (GPGs). These are approved by the Center Director and apply to all organizations across the Center. GPDs specify GSFC policy. GPGs provide direction on the implementation of Center processes. GPDs and GPGs are prepared and maintained by the GSFC organizations that are primarily concerned with the implementation of the specific policy or process being addressed. These organizations are called the Office of Primary Responsibility (OPR). Table 1 identifies the GPGs that are called Governing Procedures and are the QMS System Level Procedures.

b. Lower Level QMS procedures (PGs) are developed and approved by Directorates or Functional Offices (at any specified level within the Directorate or Functional Office organization) and are used, where appropriate, to tailor the implementation of the GPGs within the organization. PGs include plans and handbooks and are traceable to Center-level GPGs.

c. Work Instructions (WIs) are documents that delineate detailed activities to be carried out by an individual or group to accomplish a specific task or set of closely related tasks. WIs are required for activities that demand structured implementation, and for which generic training and skills are not, in themselves, sufficient to guarantee acceptable work. WIs can be forms, flowcharts, assembly procedures, inspection procedures, detailed process instructions, etc. WIs are developed, maintained and controlled by the manager responsible for the performance of the function or activity to be carried out by that WI.

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Unless stated otherwise in the applicable document, revisions to quality system procedures must be implemented by affected organizations within 90 calendar days of the effective date of the document revision.

4.2.3 Quality Planning

GSFC defines and documents how requirements for quality will be met for each product within the scope of the QMS. Quality planning is consistent with all Government, Agency, and Center requirements and documented in organizational procedures and in product plans and procedures. Quality planning includes, as appropriate to the organizational element or to the product:

a. Preparation of quality plans that define compliance with the customer requirements.

b. Identification and acquisition of controls, processes, equipment, fixtures, resources, and skills necessary to achieve the required quality of the product.

c. Ensuring the compatibility of the design, production, process, servicing, inspection and test procedures, and other applicable documentation.

d. Preparation of the necessary updates of quality control, inspection, and testing techniques, including the development of new instrumentation.

e. Identification of any measurement requirement involving capability that exceeds the known state of the art so that the needed capability can be developed.

f. Identification of suitable product verification at appropriate stages in the realization of the product.

g. Definition of standards of acceptability for all features and requirements, including those that contain a subjective element.

h. Identification and preparation of quality records.

If the product manager determines that it is in the best interest of the Center or that the customer commitment requires that specific QMS requirements be waived entirely or in part, the product manager shall prepare a memorandum for management concurrence. The memorandum shall identify the reasons for requesting a waiver, requirements to be waived, alternate procedures or processes that will be used, and potential effects on product quality. All such waiver requests require the approval of the performing directorate and the approval authority of any procedure or work instruction addressing requirements, which are to be waived in whole or in part.

Governing Procedures:
GPG 1410.1 Directives and Documentation Management
GPG 7120.1 Program Management
GPG 7120.2 Project Management

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9001 ELEMENT	GPG NO.	TITLE
4.1	1060.1	Management Responsibility
	1060.2	Management Review and Reporting for Programs and Projects
4.2	8730.3	The GSFC Quality Manual
4.3	1310.1	Customer Commitments and Review
4.4	8700.1	Design Planning and Interface Management
	8700.2	Design Development
	8700.3	Design Validation
	8700.4	Technical Review Program
4.5	1410.1	Directives Management
	1410.2	Configuration Management
4.6	5100.1	Procurement
	5100.2	Supplier Performance Evaluations
	5100.3	Quality Assurance Letter of Delegation
	5100.4	Supplier Quality Audits
4.7	5900.1	Control of Customer-Supplied Product
4.8	5310.4	Identification and Traceability of Products
4.9	8072.1	Process Control
	7120.1	Program Management
	7120.2	Project Management
4.10	4520.2	Incoming Inspection and Test
	5330.1	Product Processing, Inspection, and Test
4.11	8730.1	Calibration and Metrology
4.12	5330.1	Product Processing, Inspection, and Test
4.13	5340.2	Control of Nonconforming Product
	5340.3	Preparation and Handling of Alerts and Safe Alerts
4.14	1710.1	Corrective and Preventive Action
4.15	6400.1	Handling, Storage, Packaging, Marking, Preservation, and Transportation
4.16	1440.7	Control of Quality Records
4.17	9980.1	Internal Audit System
4.18	3410.2	Employee Training and Qualification
4.19	NA	(Not Applicable to GSFC)
4.20	8070.2	Identification and Application of Statistical Techniques

Table-1

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4.3 Customer Commitments and Review

4.3.1 General

GSFC has established and documented procedures for the review and coordination of customer commitments. These procedures vary depending upon the type of product, the value of the product and the resources required to be committed by the Center.

4.3.2 Review

GSFC has established and documented procedures that ensure that the appropriate level of review has been undertaken and that only authorized persons make commitments for the Center to deliver QMS products.

4.3.3 Amendments to Customer Commitments

GSFC has established and documented procedures that identify how amendments to existing customer agreements are made and approved and how the amendments are flowed to all affected GSFC organizations.

4.3.4 Records

GSFC maintains the records of all customer commitments, reviews of commitments, and amendments to these commitments.

Governing Procedure:
GPG 1310.1, Customer Commitments and Review

4.4 Design Control

4.4.1 General

GSFC has designated the Applied Engineering and Technology Directorate to be responsible for establishing and maintaining a documented process for the design of GSFC products.

4.4.2 Design Planning and Interface Management

Design control is the responsibility of the Product Design Lead (PDL). The PDL establishes design process goals and objectives by documenting the planned mode of implementation, including, but not limited to:

a. Make or buy decisions;
b. Using partnerships and agreements with other government, academic, or industry partners;
c. Selecting existing or new designs.

In addition to the above, the PDL's design plan defines:

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a. Organizational structure, technical interfaces, and individual responsibilities established to develop, control, and verify the product design;
b. Logistics support and interfaces needed;
c. Personnel qualifications and certifications needed;
d. Design activities schedule;
e. Phased budgets for manpower and dollars;
f. Communication paths with the customer and within the design activity;
g. Methods for defining and documenting technical design interfaces.

4.4.3 Design Development

The PDL and supporting design team members document design inputs derived from customer, regulatory, and statutory requirements and develop detailed design schedules.

The PDL documents design output in terms of drawings, specifications, and/or procedures which:

a. Meet the design input requirements;
b. Contain or make reference to acceptance criteria;
c. Identify those characteristics essential to the safe and proper functioning of the product.

The PDL verifies the design via various activities, such as:

a. Drawing checks;
b. Finite element analysis;
c. Breadboard/prototype tests;
d. Software code walk-throughs;
e. Mathematical simulation.

Designs are base-lined and design changes are identified, documented, reviewed, and approved in accordance with applicable configuration control procedures.

4.4.4 Design Validation

For each design activity, the PDL documents a Validation Plan addressing applicable environmental tests, functional tests, final analysis, and test reviews. Validation events are planned at intermediate and final stages of product development.

4.4.5 Technical Review Program

In accordance with documented Technical Review Plans for each Project, the design and technical status of products is subject to both system reviews and peer reviews. The Technical Review Plans identify the schedule and subject of each planned review. Review teams are composed of appropriate specialists who are independent of the Project (systems reviews) or PDL (peer reviews). When warranted, technical reviews will result in requests for action from the team chairperson to the Product Manager (systems review) or PDL (peer review). The recipient shall disposition such actions with the approval of the review chairperson.

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Governing Procedures:
GPG 8700.1, Design Planning and Interface Management
GPG 8700.2, Design Development
GPG 8700.3, Design Validation
GPG 8700.4, Technical Review Program

4.5 Document and Data Control

4.5.1 General

GSFC has established and documented procedures to control all Center-generated and external documentation and data. Policies, procedures, guidelines, and work instructions are prepared and maintained as GPDs, GPGs, PGs, or WIs within the Goddard Directives Management System (GDMS). Documents or data that define requirements, plans, or design, build, interface, and production information are controlled documents that are subject to approval before issuance or alteration.

Controlled documents are prepared and maintained in accordance with configuration management procedures that are defined and documented by the organization that is responsible for the document or data. External documentation, such as standards or test equipment instructions, is maintained by the using organization as controlled documents.

4.5.2 Document and Data Approval

An authorized person or an authorized designee approves all QMS documents and data.

The Center Director approves all GPDs and GPGs. The person responsible for management of the work to which a PG or WI applies approves the PG or WI. Other controlled documents and data will be approved in accordance with the documented configuration control procedure of the responsible organization. All documents and data carry the signature of the approving authority and the date of approval.

The GSFC maintains a master list of all the GPDs, GPGs, PGs, and WIs in the GDMS. Each organization, program, and project maintains a controlled document master list for the documents and data for which it is responsible. All employees involved in the generation of a QMS product have access to the GDMS master list and its documents and to the controlled document master list and documents and data related to the product on which they are working.

4.5.3 Document and Data Changes

Changes are reviewed and approved by the individual or authorized designee who had responsibility for approving the original document or data in accordance with the processes defined for the GDMS or the appropriate configuration management procedure. In the event that another individual becomes responsible for approving changes, the new individual will have access to pertinent background information to ensure that approved changes are appropriate for the proper implementation of the QMS.

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Governing Procedures:
GPG 1410.1, Directives and Documentation Management
GPG 1410.2, Configuration Management

4.6 Purchasing

4.6.1 General

GSFC has established and documented procedures to ensure that purchased items conform to specified requirements. Where applicable, these GSFC procedures also conform to the Federal Acquisition Regulations (FAR) and the NASA FAR Supplement.

4.6.2 Evaluation of Contractors

Suppliers for GSFC-purchased items are evaluated and selected on the basis of their ability to meet requirements including quality system and quality assurance requirements. The type and extent of control exercised by GSFC over the supplier is specified in the contract or the purchase order. GSFC has established and maintains records that identify acceptable contractors.

4.6.3 Purchasing Data

GSFC purchasing documents meet all applicable FAR and NASA FAR Supplement requirements and, as a minimum, contain the following information:

a. Precise identification of the product to be purchased;

b. Positive identification of all applicable specifications, drawings, process requirements, inspection instructions and other relevant technical data, including requirements for approval or qualification of product, procedures, process equipment, and personnel;

c. Identification of the quality-system standard to be applied.

The supplier reviews and approves all purchasing documents.

4.6.4 Verification of Purchased Product

Where GSFC proposes to verify the purchased item at the supplier's premises, GSFC specifies the verification arrangement and the method of item release in the purchasing documents.

If specified in the GSFC customer agreement, the GSFC customer shall be afforded the right to verify at the GSFC supplier's premises and at GSFC that the purchased item conforms to specified requirements. Verification by the customer does not absolve GSFC of the responsibility to provide an acceptable product, nor shall it preclude subsequent rejection by the GSFC customer.

Governing Procedures:
GPG 5100.1, Procurement
GPG 5100.2, Supplier Performance Evaluations
GPG 5100.3, Quality Assurance Letter of Delegation
GPG 5100.4, Supplier Quality Audits

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4.7 Control of Customer-Supplied Product

GSFC has established and documented procedures for the control of verification, storage, and maintenance of customer-supplied product provided for incorporation into GSFC supplies or for related activities.

If a customer-supplied product is lost, damaged or is otherwise unsuitable for use, that information is recorded and reported to the customer.

Verification by GSFC does not absolve the customer of the responsibility to supply an acceptable product.

Governing Procedure:
GPG 5900.1, Control of Customer-Supplied Product

4.8 Product Identification and Traceability

GSFC identifies product and documents traceability from receipt and during all stages of production, delivery and installation by means of the Work Order Authorization (WOA) system or the Fabrication Engineering Management System (FEMS). The traceability and identification of software product which does not employ the WOA or FEMS systems is accomplished in accordance with product or organization-unique documented procedures.

When required, permanent product identification marking is accomplished in accordance with applicable design documentation.

Governing Procedure:
GPG 5310.4, Identification and Traceability of Products

4.9 Process Control

GSFC identifies and plans the production, installation, and servicing processes which directly affect quality and we ensure that these processes are carried out under controlled conditions. Controlled conditions include the following:

a. documented procedures defining the manner of production, installation, and servicing, where the absence of such procedures could adversely affect quality;
b. use of suitable equipment, and a suitable working environment;
c. compliance with reference standards/codes, quality plans, and/or documented procedures;
d. monitoring and control of suitable process parameters and product characteristics;
e. the approval of processes and equipment, as appropriate;
f. criteria for workmanship, stipulated in the clearest practical manner;
g. suitable maintenance of equipment to ensure continuing process capability.

In addition to the above, for those processes which result in product characteristics which cannot be fully verified by subsequent inspection or testing (special processes), the applicable Process Management Plans shall also address pre-qualification of the process operations, including associated equipment, and:

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a. Process operator training/qualification and/or;
b. Continuous monitoring and control of identified process parameters.

Records of qualified processes, equipment, and personnel are maintained.

Based upon the results of product verification and monitoring of process parameters, the continued effectiveness of processes is evaluated and processes are revised as necessary.

Governing Procedures:
GPG 8072.1, Process Control
GPG 7120.1, Program Management
GPG 7120.2, Project Management

4.10 Inspection and Testing

4.10.1 General

GSFC has established and documented procedures for inspection and test activities of QMS products in order to verify that specified requirements for the product are met. In those cases where specified requirements cannot be verified by inspection and test, other appropriate means of verification such as analyses are used.

The required inspection and testing (or other appropriate means of verification) are detailed in the product quality plan or in other documented procedures.

4.10.2 Receiving, Inspection and Testing

GSFC has established and documented procedures to ensure incoming items that are to be used in QMS products meet specified requirements. Such items are not used or processed as a part of the QMS product until it has been inspected or otherwise verified to be in accordance with the quality plan. Verification of the specified requirements shall be in accordance with the product quality plan and/or in other documented procedures.

In determining the amount and nature of receiving inspection, consideration is given to the amount of control exercised by GSFC at the subcontractor's premises and the recorded evidence of conformance provided.

Where incoming product is released for urgent use prior to verification, it is positively identified and recorded in order to facilitate recall and replacement in the event of nonconformity to specified requirements.

4.10.3 In-Process Inspection and Testing

GSFC inspects and test products as required by the quality plan and/or documented procedures.

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4.10.4 Final Inspection and Testing

GSFC carries out all final inspection and testing in accordance with the quality plan and/or documented procedures to complete the evidence of conformance of the finished product to the specified requirements.

The quality plan and/or documented procedures for final inspection and testing require that all specified inspection and tests, including those specified either on receipt of products or in process, have been carried out and that the results meet specified requirements.

No product is dispatched until all the activities specified in the quality plan and/or documented procedures have been satisfactorily completed and the associated data and documentation are available and authorized.

4.10.5 Inspection and Test Records

GSFC has established and documented procedures regarding records that provide evidence that products have been inspected and/or tested. These records show clearly whether the products have passed or failed the inspections and/or tests according to defined acceptance criteria. Where the product fails to pass any inspection and/or test, the procedures for control of nonconforming product apply. Records identify the inspection authority responsible for the release of the product.

Governing Procedures:
GPG 4520.2, Incoming Inspection and Test
GPG 5330.1, Product Processing, Inspection, and Test

4.11 Control of Inspection, Measuring, and Test Equipment

4.11.1 General

GSFC has established and documented procedures to control, calibrate, and maintain inspection, measuring, and test equipment (including test software) used by GSFC to demonstrate conformance of product to the specified requirements. Inspection, measuring, and test equipment is used in a manner which ensures that the measurement uncertainty is known and is consistent with the required measurement capability.

Where test software or comparative references such as test hardware are used as suitable forms of inspection, they are checked to ensure they are capable of verifying the acceptability of product prior to release for use during production and are rechecked at prescribed intervals. GSFC has established the extent and frequency of such checks and maintains records as evidence of control.

Where the availability of technical data pertaining to the measurement equipment is a specified requirement, such data is made available, when required by the customer or customer's representative, for verification that the measuring equipment is functionally adequate.

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4.11.2 Control Procedure

GSFC determines the measurements to be made and the accuracy required, and selects the appropriate inspection, measuring, and test equipment that is capable of the necessary accuracy and precision.

GSFC identifies all inspection, measuring, and test equipment that can affect product quality, and calibrates and adjusts them at prescribed intervals, or prior to use, against certified equipment having a known valid relationship to internationally or nationally recognized standards. Where no such standards exist, the basis used for calibration is documented.

GSFC defines the process employed for the calibration of inspection, measuring, and test equipment, including details of equipment type, unique identification, location, frequency of checks, check method, acceptance criteria, and the action to be taken when results are unsatisfactory.

GSFC identifies inspection, measuring, and test equipment with a suitable indicator or approved identification record to show the calibration status.

GSFC maintains calibration records for inspection, measuring, and test equipment.

GSFC assesses and documents the validity of previous inspection and test results when inspection, measuring, and test equipment is found to be out of calibration.

GSFC ensures that the environmental conditions are suitable for the calibrations, inspections, measurements, and tests being carried out.

GSFC ensures that the handling, preservation, and storage of inspection, measuring, and test equipment is such that the accuracy and fitness for use are maintained.

GSFC safeguards inspection, measuring, and test facilities, including both test hardware and test software, from adjustments that would invalidate the calibration setting.

Governing Procedure:
GPG 8730.1, Calibration and Metrology

4.12 Inspection and Test Status

GSFC has established and documented procedures to ensure that the inspection and test status of the products is identified by a suitable means that indicates the conformance or nonconformance of products with regard to inspection and tests performed. The identification of inspection and test status is maintained as defined in the quality plan and/or documented procedures, throughout product processing to ensure that only products that have passed the required inspections and tests or released under an authorized concession are released.

Governing Procedure:
GPG 5330.1, Product Processing, Inspection, and Test

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4.13 Control of Nonconforming Product

4.13.1 General

GSFC has established and documented procedures to ensure that a product that does not conform to specified requirements is prevented from unintended use. Controls provide for identification, documentation, evaluation, segregation, and, when practicable, disposition of nonconforming product and for notification to the functions concerned.

4.13.2 Review and Disposition of Nonconforming Product

Responsibility for review and authority for the disposition of nonconforming product is defined. Nonconforming product is reviewed according to documented procedures for rework to meet requirements, accepted with or without repair by concession, re-graded for alternative applications, or rejected or scrapped. The proposed use or repair of product that does not conform to specified requirements is reported to the customer or customer's representative for approval as required. A description of the nonconformity that has been accepted and all repairs are recorded. Any repaired or reworked product is re-inspected in accordance with the quality plan or documented procedures. Quality records for the identification, documentation, evaluation, segregation, and disposition of nonconforming product/services are maintained.

Governing Procedures:
GPG 5340.2, Control of Nonconforming Product
GPG 5340.3 Preparation and Handling of Alerts and Safe Alerts

4.14 Corrective and Preventive Action

4.14.1 General

GSFC has established and documented procedures to ensure consistent and effective methods for correction and prevention of recurrence of nonconformances. Any corrective or preventive action taken to eliminate the causes of actual or potential nonconformities is commensurate with the magnitude of problems and with the risks encountered. Any changes to documented procedures as a result of corrective or preventive actions are recorded and implemented.

4.14.2 Corrective Action

GSFC has established and documented procedures for the effective handling of customer concerns or complaints and reports of product nonconformances. Disciplined problem-solving methods are used during investigation of cause of nonconformance to specification or requirement relating to product, process, and Quality System. Results of the investigation and analysis are recorded. Procedures have been established for determination of corrective action needed to eliminate the cause of nonconformances, and define corrective action follow-up activity to ensure documented corrective action is taken and that it is effective.

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4.14.3 Preventive Action

GSFC has established and documented procedures for preventive action that uses appropriate sources of information such as processes and work operations which affect product quality, concessions, audit results, quality records, service reports, and customer complaints to detect, analyze, and eliminate potential causes of nonconformances. The steps necessary to effectively deal with problems requiring preventive action are determined and implemented and controls are applied to ensure that preventive action is effective. All relevant information is submitted for management review.

Governing Procedure:
GPG 1710.1, Corrective and Preventive Action

4.15 Handling, Storage, Packaging, Preservation, and Delivery

4.15.1 General

GSFC has established and documented procedures for handling, storage, packaging, preservation, and delivery of products.

4.15.2 Handling

GSFC has established and documented handling procedures that prevent damage and deterioration, including special procedures for handling Electrostatic Discharge Sensitive (EDS) items.

4.15.3 Storage

Controlled storage and stock areas are used to prevent damage, loss, or deterioration of materials and products. Procedures are documented for authorizing the receipt and dispatch to and from these areas.

Access to storage areas is limited to authorized personnel. Special provisions have been established and implemented for EDS, age-sensitive materials, and items stored requiring environmental controls. Periodic assessments of the condition of product in stock to detect deterioration are conducted.

4.15.4 Packaging

GSFC has established and documented procedures or packaging plans that define the controls and verification applied to the preservation, packaging, and marking processes (including materials used) to ensure compliance with specified requirements.

4.15.5 Preservation

GSFC determines, documents, and implements the appropriate methods for preservation and segregation of products when the product is under GSFC control.

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4.15.6 Delivery

GSFC protects the quality of product after inspection and test is ensured. Where specified by customer agreement, this protection is extended to include delivery to destination.

Governing Procedure:
GPG 6400.1, Handling, Storage, Packaging, Marking, Preservation, and Transportation

4.16 Control of Quality Records

GSFC has established and documented procedures for the identification, collection, indexing, filing, storage, accessing, maintenance, and disposition of quality records.

Quality records, including pertinent quality records from GSFC customers and suppliers, are maintained to demonstrate conformance to specified requirements and the effective operation of the Quality System.

GSFC ensures that quality records are legible and are stored and retained in such a way that they are readily retrievable and not subject to damage, deterioration, or loss. Retention times are established and recorded.

Where agreed with the customer, quality records are made available to the customer for evaluation for an agreed period.

Governing Procedure:
GPG 1440.7, Control of Quality Records

4.17 Internal Quality Audits

GSFC has established and documented procedures for planning and implementing internal quality audits. GSFC plans and performs internal audits on a scheduled basis, according to the status and importance of the activity to determine the effectiveness of the QMS. The results are documented and maintained as quality records and are distributed to affected organizations. Nonconformances identified are tracked to ensure that timely corrective action is taken by the management of the affected area.

GSFC activities are audited by personnel independent of the activity under review for compliance with documented procedures, plans, instructions and accepted customer agreements, and to determine the effectiveness of the QMS.

Follow-up audit activities are performed by GSFC to verify and record the implementation and effectiveness of the corrective action taken and are maintained as quality records. Corrective action commitments made in response to audit findings are assessed to ensure implementation and effectiveness of the action.

GSFC includes the results of the initial audit, follow-up audit, and any action taken as an integral part of the input, in management review activities.

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Governing Procedure:
GPG 9980.1, Internal Audit System

4.18 Training

GSFC has established and documented procedures that identify the training needs and provide appropriate training of personnel performing services directly affecting quality. Personnel performing specific assigned tasks are qualified on the basis of appropriate education, training and/or experience, as required. Appropriate training records are maintained as quality records.

Governing Procedure:
GPG 3410.2, Employee Training and Qualification

4.19 Servicing

The servicing element is not applicable under the scope of the GSFC quality system.

4.20 Statistical Techniques

4.20.1 Identification of Need

GSFC identifies where statistical techniques are required for establishing, controlling, and verifying process capabilities and product characteristics.

4.20.2 Procedures

GSFC has established and documented procedures to implement and control the application of the statistical techniques when they are applicable.

Governing Procedure:
GPG 8070.2, Identification and Application of Statistical Techniques

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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	08/18/98	
A	02/02/99	Total document revision. Changed GPG 7120.5 and GPG 7120.6 to reflect GPG 7120.1 and GPG 7120.2, respectively, on pages 11 and 18.
A	03/10/99	Re-write of 4.2.3 and cancellation of GPG 8730.4B.
A	03/15/99	Modified “Customer” definition as it appeared in the original version of the Quality Manual.
B	08/18/99	Manual references updated throughout to reflect changes to GPGs 5330.1 (replacing GPG 5330.3)and 5100.2 and addition of GPGs 1060.2 and 5100.4. Added P4(e) reference. 2.1 - definition of "contractor" modified. Capitalized "Functional Offices" in "Executive Council" definition. Figure 1 - Code 400 name changed. Section 3 Scope statement for Systems Development updated. 4.1.1 - Deleted "official documents" from last sentence. 4.1.2.1 - Last paragraph rewritten for clarity. 4.2.2(c) - Third sentence, changed "Work instructions" to "WI's". 4.2.3 - Last sentence of last paragraph modified for clarity. 4.2 and 4.5 Governing Procedures GPG 1410.1 title updated. 4.3.3 - "impacted" changed to "affected". 4.4.5 - Last sentence reworded for grammar. 4.6 Governing Procedures GPG 5100.1 reference title corrected to "Procurement". 4.10.2 - Second sentence, inserted "with". 4.11.1 - Second paragraph, Changed "prove" to "ensure".
C	08/26/99	Modified **3. SCOPE OF THE QUALITY MANAGEMENT SYSTEM AND ISO 9001 CERTIFICATION**, item 1, last line, to read ... and the science research process.
D	02/22/00	Page 3 and Org.Chart - Revised Code 800 title Table 1 – Revised title of GPG 1410.1 4.1.2.3 - QMSR: deleted Directors of AETD and Flight Projects 4.2.2 - Added last paragraph requiring change implementation within 90 days 4.5 -- Revised to incorporate GPG 1410.2 regarding control of documents and data by configuration management systems