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**GODDARD HANDBOOK FOR MANAGEMENT
OF
PROGRAMS – PROJECTS – PRODUCTS**

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Volume 4

Product Management

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GODDARD SPACE FLIGHT CENTER

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GODDARD HANDBOOK FOR MANAGEMENT OF PROGRAMS – PROJECTS - PRODUCTS

Volume 1 – The NASA Program/Project Environment

Volume 2 - Program Management

Volume 3 - Project Management

Volume 4 - Product Management

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OF
PROGRAMS – PROJECTS – PRODUCTS

Volume 4: Product Management

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Purpose

This Handbook is designed to aid all Goddard personnel assigned to a program – project – product. The Handbook encompasses the Program – Project – Product Management environment, and how to successfully meet its demands and take advantage of its flexibilities, such as tailoring requirements to produce products which:

- a. Meet intended and specified customer requirements.
- b. Conform to NASA requirements for technical performance, schedule, budget, and management processes, including ISO 9001.
- c. Support the NASA initiatives for Faster – Better – Cheaper products.

Applicability

The Program – Project – Product Handbook applies to the hardware, software, material, and services delivered to customers as a result of the following NASA/GSFC core processes at both the Greenbelt and Wallops facilities:

- a. Science Enabling –The grants process; providing data to the science community; science support tools; the proposal support process; and the science research management process;
- b. Systems Development –Space flight systems; balloons; sounding rockets; aircraft experiments; ground systems; and data systems;
- c. Program/Project Management –Cost, schedule and technical control; review and reporting; budgets; procurement; contracts; and safety and mission assurance;
- d. Technology Enabling –New concepts studies; investment strategies; crosscutting developments; mission specific products; transfer; and commercialization;
- e. Mission Operations –Customer service commitments, including Project Service level Agreements and Project Commitment Documents.

Authority

GPD 7120.4 – Goddard Policy for the Conduct of Programs, Projects and Products

References

NPD 7120.4 – Program/Project Management
NPG 7120.5 – NASA Program and Project Management Processes and Requirements
GPG 7120.1 – Program Management
GPG 7120.2 – Project Management

VOLUME 4. Product Management

4.0 Introduction to Product Management

“Products” include all deliverables subject to GSFC Quality Management System (QMS), including all hardware, software, services, mission data, science, and technology output, to GSFC customers. All GSFC Product Management Teams and/or Product Design Lead’s (PDL’s) are to conduct business in accordance with the principles of GSFC QMS and NPG 7120.5.

This volume summarizes QMS (GPG) requirements as they apply to Product/Program/Project Managers and PDLs. A project is a very special, well-defined and disciplined product management system, which may have unique requirements not covered by the more generic discipline of product management. This volume does not, however, deal with requirements and responsibilities for a non-product manager. For non-product applications, or more detailed information, the reader should consult the QMS directives. This volume applies to every Product Manager and his product team, whether the product is as small as an aerospace item brought in for application of a special plating, a suborbital payload or experiment, or a major NASA spacecraft.

These requirements are a compilation of the ISO 9001 requirements derived from GSFC GPG’s, and add explanatory information where useful. ISO requirements define sound business practices, and enable an organization to understand and improve its services as related to a product. To the extent allowable by the GSFC Quality Manual (GPG 8730.3), these requirements may be tailored by the individual directorates Programs, Projects, and PDLs to meet their organizational needs and customer product requirements.

4.1 Management Responsibility (ISO 9001 Element 4.1)

GPG 1060.1 Management Responsibility

The Product/Project Manager must ensure that quality policies and procedures are in place that define the responsibilities, authorities, and interrelationships of personnel responsible for:

- a. Initiating preventive and corrective action
- b. Identifying and recording product, process/subprocess, and system problems
- c. Initiating, recommending, or providing solutions and verifying implementation
- d. Controlling further processing of non-conforming product prior to correction or formal disposition.

Uniform requirements for these policies and procedures may be developed by divisions and directorates.

4.2 Quality System (ISO 9001 Element 4.2)

GPG 8730.3 Quality Manual

This is the GSFC Quality Manual that implements ISO 9001 at GSFC. It summarizes the GSFC Quality System described in the GPG’s, but it does not impose any unique requirements for Product Managers. All requirements addressed in the Quality Manual are detailed in the GPG’s.

GPG 8730.4 Quality System

This GPG requires the performing directorate to assign a Product (or Project) Manager, responsible to establish or ensure availability of specific types of plans tailored to meet Center, directorate, and customer requirements for each product or project. The Product Manager is responsible for:

- a. Preparation or ensuring availability of applicable documented plans that address product/project requirements derived from customer requirements and Center or directorate requirements related to budget, schedule, risk management, acquisition, commercialization, and performance objectives (per NPG 7120.5)
- b. Development of controlled Quality System documentation per GPG 1410.1.
- c. Submission of plans for management review, approval, and implementation, such as:
 - 1) Project Plan
 - 2) Project Systems Plan
 - 3) Project Technology Requirements Plan, including development of unique quality requirements or processes
 - 4) Project Technology and Commercialization Plan
 - 5) Project Operations and Business Opportunities Plan
 - 6) Assessment of infrastructure and development of upgrade and new requirements for Infrastructure Plan (reflected in the Project Plan)
 - 7) Knowledge Capture Process Plan
 - 8) Quality Plan, tailored to meet customer requirements, defining the quality requirements, means of implementation, processes, Nonconformance Reports (NCR) and Material Review Board (MRB) requirements, etc.

All product and project managers (of products such as satellites, instruments, ground systems, software, etc.) within the scope of GSFC QMS must tailor these requirements to a level acceptable to the directorate, commensurate with customer requirements. Tailoring of requirements includes defining appropriate supporting documentation and is compatible with the requirements of ISO 9001 and NPG 7120.5. Performing directorates are required to review and evaluate Product/Project Formulation, Approval, and Implementation at scheduled intervals. A detailed definition of these requirements is found in Volume 3 of this Handbook.

Guidelines for product/project agreements and formulation may be issued by individual directorates for use by the PDL.

4.3 Contract Review (ISO 9001 Element 4.3)

GPG 1310.1 Establishing Customer Requirements

Product/Project Managers shall act as or obtain a sponsor/advocate at the directorate level supporting the customer's request for a product. Work shall proceed after an appropriate customer agreement has been established.

- a. Customer agreements with a full cost LCC of \$5 million or more, shall follow the procedures described in this GPG, including the sponsoring directorate's priority proposal for submission to the STAAC Director.
- b. For customer agreements of less than \$5 million, the directorate advocating the arrangement establishes the Center's commitment, including defining necessary documentation requirements.

4.4 Design Control (ISO 9001 Element 4.4)

GPG 8700.1 Design Planning and Interface Management

The following elements, taken collectively, constitute the Design Plan. It is important that these elements be tailored to a level acceptable to the directorate, commensurate with customer requirements. It is also important to note that some or all of this entire requirement may not apply, particularly with smaller products, because these requirements are fulfilled before delivery of the product to the performing organization. The following requirements apply to projects or products where the design is required of the performing organization.

The PDL is the product or project manager (or his/her designee), and has overall responsibility for managing the design activity, managing the technical and organizational interfaces identified during design planning, and leading the design team. He/she can be a Flight Project Manager, Mission Manager, Instrument Manager, Subsystem Manager, Lead Engineer, etc. The PDL defines the goals and objectives for the design requirements and the means for achieving them. These design requirements shall be traceable to the customer requirements/agreement in accordance with the directorate's commitment. The PDL will:

- a. Define a structure/organization chart and distribution of responsibilities for the product or project, and create a Work Breakdown Structure (WBS) if required.
- b. Determine needed logistics support interfaces as described in GPG 6400.1.
- c. Identify appropriate support organizations including personnel qualifications, training, and certifications.
- d. Generate a schedule of design activities, considering factors such as funding, parts and equipment lead times, and other items identified in GPG 8700.1.
- e. Establish a resource plan by developing a phased budget for manpower and dollars.
- f. Establish required and anticipated paths of communication between organizations/personnel, including the customer.

- g. Establish a method for defining, documenting, and controlling each technical design interface [e.g., Interface Control Document (ICD)].
- h. Document and maintain design plan information as quality record(s).

GPG 8700.2 Design Development

To the extent necessary, and due to tailoring of requirements described for GPG 8700.1, the following requirements may apply. For instance, a flight project with full design responsibility would address all of the following. However, for smaller products, the performing directorate is responsible to ensure that these elements are addressed to an extent appropriate to meet the customer requirements, and remain compliant with the QMS.

The PDL convenes a Product Design Team (PDT) to:

- a. Review customer requirements (GPG 1310.1)
- b. Review the Design Plan (GPG 8700.1)
- c. Review scope of the product design
- d. Document derived requirements as design input
- e. Develop detailed product design schedules
- f. Perform design activities necessary to meet customer requirements and the Design Plan
- g. Produce design output documentation in terms that can be verified against design requirements, including:
 - Drawings, specifications, and/or procedures to develop and/or operate the product
 - Acceptance criteria for validation
 - Identification of characteristics essential to safe and proper functioning of the product

Design verification ensures the design output meets design input requirements, whereas design validation ensures that the product conforms to user needs and/or requirements. Design validation normally should directly involve the customer.

As part of PDL responsibility for the PDT, the PDL will also maintain product descriptions, configuration management records, analyses, reports, instructions, and test results as quality records.

GPG 8700.3 Design Validation

The PDL must ensure validation requirements are met, including customer involvement by reviewing and updating the Validation Plan to reflect the customer's full requirements, prior to product validation at each level of product development. The PDL and PDT shall be responsible for all phases of product validation. These requirements include:

- a. Evaluate the performance, durability, safety, reliability, and maintainability of the product under all customer-defined operational and storage conditions.
- b. Identify and document intermediate validation(s) on discrete portions (e.g., subassemblies, assemblies, and component(s) of the final product).
- c. Identify and document final validation required on the complete, integrated product.

After final validation, the PDL shall:

- a. Document successful completion of validation, and release the product for future processing in accordance with product plans (GPG 8730.4 and GPG 5330.3)
- b. Document validation nonconformance in accordance with GPG 5340.2.

GPG 8700.4 Technical Review Program

A flight project will frequently require a full review program, as described below. However, for smaller products, the product/project manager shall ensure that appropriate review programs are tailored commensurate with the product cost, design complexity, and customer requirements.

In support of the technical review program, the product/project manager shall:

- a. Work within the guidelines of the Systems Review Office (SRO) (Design Review Program Guidelines), to develop a System Review Plan (SRP) (see GPG 8730.4) that considers product complexity, criticality, new technology, flight history, mission objectives, mandated constraints, and maintenance of records.
- b. Ensure the PDL identifies the schedule and subject of peer reviews in a Peer Review Plan (PRP) that considers the same subjects as above. The PRP development process shall include the maintenance of peer review records.
- c. Approve the PRP (see GPG 8730.4).

The conduct of Peer Reviews and System Reviews are described below:

- a. Peer Reviews. The product/project manager shall appoint a chairperson for the Peer Review team, who is independent of the PDL. The chairperson shall:
 - Select appropriate technical experts who are independent of the PDL as review team members. Personnel outside the Center may serve as review team members or as a co-chairperson.
 - Lead the review. The PDL and the PDT shall present the review materials.
 - Document and transmit Requests for Actions (RFA's) to the PDL at the completion of the review.
 - Develop a schedule for RFA responses in coordination with the PDL.
 - Determine the acceptability of each RFA response and return unacceptable responses with appropriate annotations regarding remaining issues.
 - Document the results in a Peer Review Summary for the PDL and the Product Manager within 30 calendar days.
- b. System Reviews. The Chief, SRO, shall appoint the chairperson for the System Review team. The chairperson shall:
 - Select technical experts who are independent of the project or product team as review team members. Personnel outside the Center may serve as review team members or as a co-chairperson.
 - Lead the review. The PDL and the product design team shall present the review materials.
 - Document and transmit RFA's to the product/project manager PDL at the completion of the review.
 - Develop a schedule for RFA responses in coordination with the product/project manager.
 - Determine the acceptability of each RFA response and return unacceptable responses with appropriate annotations regarding remaining issues.
 - After the conclusion of the System Review, prepare a summary of the results for the Chief, SRO, and the Product Manager within 30 calendar days. The chairperson shall also prepare an assessment of Product status for approval by the Chief, SRO, and the Director, OSSMA and subsequent submission to Office of the Director (Code 100) (System Review Summaries).
 - After the conclusion of the final System Review, and after all RFA responses are approved by the chairperson, prepare a summary of the Product Group/Projects/System Review Program for approval by the Chief, SRO, and the Director, OSSMA and subsequent submission to Office of the Director (Code 100) (System Review Program Summary).

4.5 Document and Data Control (ISO 9001 Element 4.5)

GPG 1410.1 Directives Management

The Product/Project Manager supports the generation, approval, distribution, and change of necessary directives as follows:

- a. Determines the need for directives
- b. Assigns the action to create, revise, or rescind the directive
- c. Coordinates and secures appropriate approval
- d. Cancels directives that are no longer applicable

Additionally, he/she shall:

- a. Designate a Directives Manager for the project/organization to manage document availability
- b. Support the generation of Procedures and Guidelines to implement GPG's
- c. Support the generation of WI for activities that require structured implementation
- d. Provide necessary controls to support NASA Online Directory Information System (NODIS) or an equivalent system and the Master Document List
- e. Ensure that all directives meet the format requirements of the GPG

The revision process includes review and approval by those who performed the initial review, or by designated individuals who have access to pertinent data to ensure a sound decision. New changes from prior documents will be outlined, whenever possible. Documents that are no longer current or applicable shall be removed and destroyed. Limited quantities may be retained, but shall be prominently marked as obsolete.

4.6 Purchasing (ISO 9001 Element 4.6)

GPG 5100.1 Procurement

- a. The Product/Project Manager provides management oversight of delegated functions, including support for quality and safety audits, in order to conduct purchasing in a manner which leads to procurement of materials which meet specified requirements. He/she ensures: Procurements are properly prepared and include performance requirements, the applicable quality standard, receiving and inspection requirements, and other requirements of GPG 5100.1.
- b. Proper Letters of Delegation are provided, as applicable.

GPG 5100.2 Supplier Performance Records

The Product/Project Manager ensures that supplier performance data is used in evaluating current and potential suppliers or subcontractors. To accomplish this responsibility, he/she ensures that:

- a. Supplier performance data is recorded, documented, retained, and maintained during and at completion of contract performance per GPG 1440.7 and GPG 5100.2.
- b. Supplier performance documentation is processed according to GPG 5100.2.
- c. Records of the supplier's evaluation shall be maintained as Quality Records.

The supplier evaluation process is useful in determining subcontractor performance acceptability based on the type of product being secured, past experience with the supplier, and the supplier's capabilities.

These requirements are tailored to meet product needs. The Directorate will ensure these requirements are met in cases where it is inappropriate to place this burden on the manager of a small product.

GPG 5100.3 Quality Assurance Letter of Delegation

The Program Manager ensures that Letters of Delegation are processed as required in GPG 5100.3. The Directorate will ensure these requirements are met, in cases where it is inappropriate to place this burden on the manager of a small product.

4.7 Control of Customer Supplied Product (ISO 9001 Element 4.7)

GPG 5900.1 Control of Customer-Supplied Product (CSP)

The Product/Project Manager is responsible to ensure that:

- a. The PDL identifies CSP expected for delivery at GSFC, and prepares receiving inspection requirements per this GPG, GPG 4520.2, and customer requirements.
- b. Upon receipt at GSFC, CSP is identified on the Work Order Authorization (WOA) and inspected as required. See GPG 5330.3.
- c. Ensure the rework/repair of CSP is only performed when authorized and as instructed by the customer.
- d. The CSP, which is damaged or malfunctions during GSFC processing is documented and handled as nonconforming material per GPG 5340.2.
- e. The PDL refers CSP damage to the customer for disposition instructions.
- f. The CSP is handled and stored per GPG 6400.1.

In general, these requirements ensure controls for CSP during inspection, storage, handling, and maintenance activities. It should be noted that GPG 5340.2 requires that, should this material become unusable for any reason, it must be segregated, identified, controlled, and reported to the customer.

4.8 Product Identification and Traceability (ISO 9001 Element 4.8)

GPG 5310.4 Identification and Traceability of Products

The Product/Project Manager is responsible to ensure that:

- a. WOA's (or acceptable equivalents) shall provide positive identification of a product (see GPG 5330.3 and GPG 5310.4).
- b. Identification and traceability of software product shall be as described in the applicable Directorate-Level Configuration Control Document (see GPG 8700.2) or Software Inspection and Test Status Identification Document (see GPG 5330.3).
- c. Product traceability, including location, application, disposition, or history of the product, is accomplished by the accumulated WOA's (or equivalent).
- d. The PDL maintains all WOA's (or equivalent) as quality records.

The GPG 5330.3 require that events, including in-process and final inspection and test, shall reflect the detailed design and design validation plans resulting from GPG 8700.2 and GPG 8700.3.

These procedures will ensure clear and proper identification and traceability of materials as they move through the production, installation, delivery, and servicing (if required) processes to ensure that the customer's requirements are satisfied.

4.9 Process Control (ISO 9001 Element 4.9)

GPG 8072.1 Process Control

This section is aimed at ensuring that manufacturing processes, particularly special processes, are carried out safely and under well-planned, controlled conditions, so that these processes provide maximum assurance of process success. Examples of such processes are thermal-vacuum plating, dry bearing lubrication, lens grinding, contamination sampling, and the many other processes necessary to provide a quality aerospace product.

To ensure successful process control, the product/project manager is responsible to ensure that:

- a. The PDL identifies required processes during design to meet customer requirements (see GPG 1310.1) and project design plan (see GPG 8700.1). This includes the definition of overall quality management plans that are to be met.
- b. Process owners assess existing process capabilities in terms of specific process requirements needed to satisfy customer needs. Then, process owners use or develop, for each production, installation, and servicing process under their cognizance, Process Management Plans which address the following:
 - Documented procedures defining the manner of production, installation, and servicing, where the absence of such procedures could adversely affect quality.
 - Use of suitable equipment and a suitable working environment.
 - Compliance with reference standards/codes, quality plans, and/or documented procedures.
 - Identification, monitoring, and control of suitable process parameters and product characteristics.
 - Approval of processes and equipment, as appropriate.
 - Criteria for workmanship, documented and expressed in the clearest practical manner.
 - Suitable maintenance of equipment to ensure continuing process capability.
- c. Process Management plans for special processes address pre-qualification (pre-production) of the process operations, and:
 - Process operator training/qualification, and/or
 - Continuous monitoring and control of identified process parameters
- d. The PDL identifies product characteristics to be inspected and/or tested to verify results of the process applied. Such inspection/test events, criteria for workmanship and acceptance, and process events, as applicable to GSFC product, shall be documented in accordance with GPG 5330.3.
- e. Continuing process capability shall be evaluated by results of both product evaluation and the monitoring of process parameters identified in the Process Management Plan.
 - Processes, which yield unacceptable products are subject to corrective action, root cause analysis, and investigation in accordance with GPG 1710.1.
 - Process parameters are monitored and evaluated over time for evidence of negative trends or 'out of control' situations.
 - Specific statistical techniques to be employed are defined and documented in accordance with GPG 8070.2.
 - The process owner maintains records of process evaluation and process correction.

These requirements provide a controlled process environment that ensures that the quality of the product is adequate and in conformance with documentation and record requirements. This requires adequate and controlled written instructions (procedures) or representative samples that ensure proper assembly and workmanship standards. These standards should define the criteria for acceptable workmanship.

4.10 Inspection and Testing (ISO 9001 Element 4.10)

GPG 4520.2 Incoming Inspection and Test

The Product/Project Manager is responsible to ensure that:

- a. The procurement initiator prepares, as part of the procurement package, Receiving Inspection Instructions, documented on a WOA or equivalent (see GPG 5330.3), which include the following:
 - Who is to perform the inspection
 - Where it shall be performed
 - Verification of kind (correct part number), count (quantity as required), and condition (visual inspection to determine that items are undamaged)
 - Other conditions specified in the procurement package
- b. Received items shall be identified in accordance with GPG 5310.1. Customer-Supplied Product shall be identified in accordance with GPG 5900.1.
- c. Results of the Receiving Inspection are documented on the WOA. Receiving Inspection records are Quality Records and shall be controlled in accordance with GPG 1440.7.
- d. Items released prior to completion of Receiving Inspection are identified and controlled as Nonconforming Product in accordance with GPG 5340.2.

Note: Should an item(s) be received without proper Receiving Instructions, the item(s) will be delivered to the GSFC Receiving Officer, who will notify the PDL or his/her designee before further processing. The Receiving Officer will identify, segregate, and retain the item(s) as nonconforming product as specified in GPG 5340.2.

GPG 5330.1 In-Process and Final Inspection and Test

The Product/Project Manager is responsible to ensure that:

- a. The PDL documents the work, including inspections and tests, to be conducted on the product on a WOA. Special items or equipment needed for inspections or tests are identified on the WOA.
- b. No work event is performed prior to its planning and approval on the WOA.
- c. No work event is performed until all required prior work has been completed and documented as quality records.
- d. No item is released for further processing until the required inspections/tests and documentation (including quality records) are completed.
- e. The responsible work performer or inspector shall document the work events, inspections, and tests completed, results, and any nonconformance in accordance with GPG 5330.3 and GPG 5340.2.
- f. All nonconforming products are processed in accordance with GPG 5340.2.
- g. For final release to the customer or launch site, the PDL verifies and documents, on the applicable WOA, the following:
 - Product has satisfactorily completed all planned activities
 - Nonconforming product has been dispositioned in accordance with GPG 5340.2
 - Documentation/quality records are complete, authorized, and available

4.11 Control of Inspection, Measuring, and Test Equipment (ISO 9001 Element 4.11)

GPG 8730.1 Calibration and Metrology

The GSFC has a support contractor that provides calibration and metrology services that meet the requirements of this GPG. The organization using the equipment in the processing of aerospace products is responsible to ensure that the equipment is made available to the contractor, as required, to meet these requirements.

The Product/Project Manager is responsible to ensure that his organization uses pre-established, documented procedures for the calibration, maintenance, storage, and use of Inspection, Measuring, and Test Equipment (IMTE). He/she ensures that users or Property Custodians:

- a. Verify that the IMTE is appropriate for the measurements to be made (see GPG 8730.4).
- b. Properly store and maintain IMTE.
- c. Verify that IMTE is properly calibrated before use.
- d. Ensure that IMTE is labeled regarding its calibration status. If unlabelled, notify the calibration and metrology lab per established procedures and get it labeled before use.
- e. Develop and implement appropriate control procedures for IMTE whose calibration status may change during a period of use.
- f. Respond to Calibration Due Notices in a timely manner.
- g. Assess validity of work done with IMTE found to be out of calibration, and develop, document, and implement additional testing if required.
- h. A product, which was inspected or tested by IMTE subsequently, found to be out of calibration shall be controlled as a nonconforming product in accordance with GPG 5340.2.
- i. Ensure that only authorized personnel make adjustments to IMTE that may affect its calibration.
- j. Ensure that newly purchased IMTE is labeled and is calibrated (if required) before using.

4.12 Inspection and Test Status (ISO 9001 Element 4.12)

GPG 5330.3 Inspection and Test Status

The Product/Project Manager is responsible to ensure that:

- a. Software meets inspection and test requirements of GPG 5330.3, or documents an alternate process per GPG 1410.1.
- b. Processing of product is documented as follows:
 - Inspection and test status is documented and traceable by WOA.
 - Applicable WOA's, and other required associated information generated throughout the development of a product, shall remain with the product and be continuously traceable to the product's current configuration and location.
 - Applicable WOA's shall ensure that events, including in-process and final inspection and test, shall reflect the detailed design and design validation plans resulting from GPG 8700.2 and GPG 8700.3.
 - The PDL generates a WOA, after the initial Receiving Inspection WOA, prior to further product handling or processing.
 - The PDL generates all subsequent WOA's.
 - Receiving personnel shall complete a WOA upon receipt of product from a vendor. Note: see note under 4.10 above, GPG 4520.2, for clarification in the event product is received without a WOA.
 - Completion of planned events is annotated on applicable WOA's prior to proceeding with subsequent events.
 - The PDL maintains WOA's as quality records
 - A nonconforming product is documented on a Nonconformance Report, annotated on the WOA, and a copy attached to the WOA, in accordance with GPG 5340.2.
 - The product/project manager is responsible for a continual product test status related to conformance or nonconformance of the materials.

4.13 Control of Nonconforming Product (ISO 9001 Element 4.13)

GPG 5340.2 Control of Nonconforming Product

The Product/Project Manager is responsible to ensure applicable, documented procedures are in place to control nonconforming products as described below:

- a. The project or product organization has Quality Planning documentation as required in GPG 8730.4 addressing:
 - Procedures for evaluation and disposition of nonconforming product.
 - Project MRB membership, including chairperson.
 - MRB operation.
 - Restrictions on who can document an NCR.
 - Responsibility for tagging and segregating nonconforming product.
 - Identification and operation of segregation areas(s)/facilities(s).
 - Project interface with the on-line Nonconformance Reports/Corrective Action (NCR/CA) database, including NCR disposition/corrective action roles and authorities and identification of nonconformance scenarios requiring customer approval.
- b. Quality Planning documentation meets the requirements of GPG 5340.2. This shall include establishment of product/project procedures for nonconforming product evaluation and disposition.
- c. Nonconforming product is tagged with a Nonconformance Tag (or equivalent) in accordance with GPG 5340.3, and physically segregated from conforming product.
- d. Nonconformances are entered into the NCR/CA database, documented on applicable WOA's, and the NCR and WOA's cross-referenced to each other.
- e. Product-oriented NCR's are dispositioned prior to processing that would make the nonconformance inaccessible without disassembly.
- f. Nonconforming product disposition shall be one of the following:
 - Rework
 - Repair
 - Use-as-is
 - Reclassify
 - Return to vendor
 - Scrap
- g. Requirements for customer notification are met.
- h. All NCR's are properly closed and appropriate corrective action is taken.
- i. All customer complaints are documented and entered into the NCR/CA database.
- j. Corrective action is completed, documented, and verified effective by follow-up action in accordance with GPG 1710.1.

GPG 5340.3 Preparation and Handling of Alerts and Safe Alerts

As part of project management (GPG 8730.4), the Product/Project Manager plans an appropriate level of participation in the Alert process, considering:

- a. Development and update of Parts Identification Lists (PIL's) in the Alert system
- b. Technical support for preparing an Alert for disposition of nonconformances
- c. Disposition of Safe Alerts
- d. Other matches between the PIL's and the Alert database

The Systems Assurance Manager usually performs these functions. The Product or Project Manager is responsible for ensuring that the procedures are in place, individuals are designated to perform the necessary steps in the process, and the process is working as expected.

4.14 Corrective and Preventive Action (ISO 9001 Element 4.14)

GPG 1710.1 Corrective and Preventive Action

The Product/Project Manager must ensure that documented procedures are in place for dealing with identification, segregation, evaluation, and disposition of non-conformances as defined in GPG 5340.2. The Product/Project Manager is responsible to ensure that, when nonconformances have been identified, appropriate corrective and/or preventive action is taken as follows:

- a. PDL or other appropriate designees determine and implement corrective action for nonconformances identified in the NCR/CA database in accordance with GPG 5340.2.
- b. For NCR's documenting product nonconformances, corrective action shall be determined, documented, and approved in accordance with the organization or project's Quality Plan. Determination of corrective action shall include consideration of ALERT/SAFE ALERT requirements.
- c. For NCR's generated as a result of an audit, corrective action shall be determined, documented, and approved in accordance with the project Quality Plan.
- d. Verification of corrective and/or preventative action implementation and effectiveness shall be scheduled and approved as required in GPG 1710.1.
- e. Support proper and timely follow-up to NCR's and MRB actions.
- f. Verify that nonconformances traceable to suppliers are reported and corrected as appropriate.

The Product/Project Manager is required to take corrective and/or preventative actions based on unsatisfied customer requirements, in-service failures, audits of operations, management direction, and NCR's as described above. This action must look for the root cause of the problem and put corrective procedures and practices in place that will prevent future occurrences. The responsible organization should put controls in place to ensure that all corrective actions are carried out, that they are effective, and that the associated effort is commensurate with the potential risk to the customer.

4.15 Handling, Storage, Packaging, Preservation, and Delivery (ISO 9001 Element 4.15)

GPG 6400.1 Handling, Storage, Packaging, Marking, Preservation, and Transportation

The product/project manager shall:

- a. Identify and document requirements for handling, storage, packaging, marking, preservation, and transportation of product, addressing:
 - Environmental Control
 - Special Storage
 - Packaging
 - Safety
- b. Update the above requirements, as necessary, to address design changes, schedule changes, or other factors that affect handling, storage, packaging, marking, preservation, and transportation of product.
- c. Coordinate these requirements with the Center Transportation Officer (CTO) or his/her designee.
- d. Establish appropriate, documented processes and procedures for project storage areas.
- e. Submit storage and transportation requirements to the CTO, sufficiently in advance to provide adequate planning and coordination.
- f. Ensure that:
 - Product is monitored for condition and deterioration during storage and transportation.
 - Appropriate records (GPG 5330.3 and GPG 5340.2) are kept and maintained.
 - Product handlers are properly trained, qualified, and certified.
 - Product and material is handled and stored as required by the product/project manager and GPG 6400.1.
 - Handling devices are certified and maintained before use.

4.16 Control of Quality Records (ISO 9001 Element 4.16)

GPG 1440.7 Control of Quality Records

The Product/Project Manager ensures that organization-specific quality record controls are adequate and addressed in appropriate directorate-level procedures or WI. In the absence of such organization-specific requirements, the following shall apply:

- a. When a quality record is identified in a QMS document, that document shall also identify the record custodian and the location(s) where the quality records are maintained. If a specific recording media or special environmental controls for record storage required, these shall also be identified.
- b. Quality records shall be filed by a method that enhances accessibility and retrieval by the record user.
- c. Records maintained on site shall be retrievable within 1 hour from the request.
- d. Quality records shall be preserved, maintained, and disposed of in accordance with NPG 1441.1.

The above requirements place extremely stringent controls over quality records, unless directorate-level procedures are produced. If such procedures are produced, the requirements identified above do not apply, but the elements of these requirements must be addressed to ensure compliance with the requirements of Element 4.16 of ISO 9001, while at the same time providing adequate indexing, control, storage, and retrievability of these records. The directorate should also identify the types of documents that are to be designated as quality records.

Records, including WOA's or equivalents, demonstrate requirements and their satisfaction, and the effectiveness of operations through internal audits, corrective actions, senior management reviews, assessment of suppliers, calibration, training, customer contracts, design reviews, product nonconformances, inspection and testing, and product identification.

4.17 Internal Quality Audits (ISO 9001 Element 4.17)

GPG 9980.1 Internal Audit System

The Product/Project Manager is responsible to ensure that:

- a. Personnel and documentation are available to support audit activities as necessary.
- b. A schedule of corrective actions resulting from NCR's is established.
- c. Corrective actions are completed and documented according to the schedule and to GPG 9980.1.
- d. Follow-up audit activities verify and record the implementation and effectiveness of the corrective action taken.

4.18 Training (ISO 9001 Element 4.18)

GPG 3410.2 Employee Training and Qualification

The Product/Project Manager ensures that work is performed only by qualified personnel through:

- a. Defining training and requirements for each position
- b. Identifying knowledge, skills, and abilities required for specific tasks
- c. Identifying special processes requiring qualification
- d. Communicating applicable training requirements to Office of Human Resources (OHR)

The Product/Project Manager integrates these requirements to provide qualified personnel to perform the required tasks. The Product/Project Manager requires training and associated documentation for all personnel whose activities affect product quality. Personnel must be trained in the specific tasks assigned, qualified to perform these tasks, and supported with documentation and records of training and certifications. These records must be maintained as quality records.

4.19 Servicing (ISO 9001 Element 4.19)

Servicing is not within the scope of the GSFC Quality System, so this element is not applicable.

4.20 Statistical Techniques (ISO 9001 Element 4.20)

GPG 8070.2 Identification and Application of Statistical Techniques

The Product/Project Manager is responsible to ensure that:

- a. The PDL's determines when statistical techniques may be used to verify product characteristics in lieu of 100 percent inspection or test.
- b. The PDL's identifies product-unique process-control statistical techniques, when different from those determined by the process owners, and document/reference on WOA's.
- c. Process Owners determine (and document in process control documents) statistical techniques to be applied to measurement and maintenance of process controls.
- d. The PDL and Process Owner documents and maintains as quality records:
 - How the statistical techniques are applied
 - What outputs (quality records) are expected
 - How the outputs will be used to effect decisions on acceptability of processes and products
 - The appropriate inspection/test instructions