

**MPR 1280.10
REVISION C-1**

**EFFECTIVE DATE: November 5, 2019
EXPIRATION DATE: November 5, 2024**

MARSHALL PROCEDURAL REQUIREMENTS

DA01

MARSHALL QUALITY MANAGEMENT SYSTEM *With Change 1 (11/18/20)*

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Change/ Revalidation/ Canceled)	Document Revision/ Change	Effective Date	Description
Baseline	Baseline	10/18/2011	MPD 1280.1, "Marshall Quality Management System Manual," has been split into MPD 1280.1, "Marshall Quality Management System Policy," and MPR 1280.10, "Marshall Quality Management System," to address policy and procedural requirements separately. MPD 1280.1W is being released concurrently with this directive baseline, which carries forward the content of the QMS manual. Revised the MSFC Organization Chart and the Process Model in Figures 2 and 3. Added Appendix C, AS9100C Requirements Clauses to MPR 1280.10 Paragraphs. Added new Figure 1. Minor revisions under P.1 Purpose. Deleted exemption from registration for MAF. Updated customer satisfaction review forum in 3.1.1.4.c. Updated 3.1.6.2.g. Updated 3.1.2.3. Minor edits/editorial changes.
Revision	A	9/26/2013	Revised all major section introductions so as not to imply a requirement for documented procedures; revised paragraphs throughout to clarify requirements; removed unnecessary requirements; revised Figures 2 and 3; updated document titles and made editorial updates as appropriate. Updated applicable documents in accordance with changes to other directives based on the 2011 annual review. Added new directive, MPR 7150.1 in appropriate sections.
Revision	B	1/11/2016	Re-formatted the table of contents to be left-justified; removed titles from document citations throughout text; revised the scope statements in P.1; Updated Applicable Documents in P.4 and all subsequent references corrected for MPR 8730.5, MPR 8070.1, MSFC-HDBK-3173, and cancellation of MPR 8040.2; Moved content of P.4.a-e to appropriate sections under 2.1.2.1.c; clarified P.5; updated web addresses for the Directives Master List and Charters; changed to "shall" statements for responsibilities in Chapter 1; updated the Quality Policy statement in 2.1.1.3; revised 2.1.1.4.c, including deletion of a reference to PPBE and CMC; changed "S&MA" to "SMA" throughout text; revised approval process for MCPs in the newly renumbered 2.1.2.1.c.(4); updated 2.1.4.1.d, 2.1.4.1.e, and Acronyms list to reflect the Standards and Technical Assistance Resource Tool used in the Technical Standards Program; updated 2.9.b(2) title; revised the process model in Figure 1 Updated the first block in Figure 3 for clarity.
Change	1	3/21/2016	On 3/21/16, at the request of the OPRD, an administrative change was made to replace MPR 7150.1 with NPR 7150.2 in coordination with cancellation of MPR 7150.1. Removed an extraneous "c" and extra spaces at 2.1.5.2.c(2).
Revision	C	11/5/2019	Updated various sections to reflect flow down of AS9100D requirements. Added item e. to P.2 to distinguish applicability of specific requirements for suborbital systems. In section 2.1, added a reference to NPD 1000.0 to describe how NASA defines the internal and external issues that affect NASA's strategic planning. Added a reference to MPR 7123.1 to define how programs/projects establish and manage stakeholder expectations. In section 2.1.2.5, added a reference to NPD 7120.6 for NASA Knowledge Management process and a link to NASA Lesson Learned database website. Added a reference to MPR 7120.1 for MSFC Lessons Learned process. In section 2.7.1.5, added references to NPD 8730.2 and MSFC-STD-3619 for prevention, control, and reporting of counterfeit EEE parts. Added reference to MSFC-STD-3012 and MSFC-STD-3620 for EEE parts obsolescence requirements. Added reference to NPR 8735.1 and MWI 1280.5 for the process for monitoring counterfeit parts reporting

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			from external sources. At 2.5.1.3, added a reference to new raw material verification test requirements in MPR 8730.1. At section 2.1.1.5.c, removed reference to ISO 9001 and AS9100 registration. At 2.1.1.6, incorporated additional text to define content of quality management system reviews. Added section 2.5.1.4 to reflect purchase card requirements moved from MWI 5113.1. At 2.8.4.4, added requirement to ensure that flight/GSE is not delivered to customer before the associated measuring equipment is validated to be within tolerance. In Appendix A, updated definition of flight hardware/software to reflect that hardware or software used only for suborbital flight may be designated as flight, if it includes critical and/or complex work, and added definitions for both critical work and complex work. In appendix D, added record retention reference for management review records. Updated Appendix F to reflect revision D of AS9100.
Change	1	11/18/2020	On 11/18/20, at the request of the OPRD, an administrative change was made to update references from NID 7120.99 to NPR 7120.7, NASA Information Technology Program and Project Management Requirements

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PREFACE

P.1 PURPOSE

a. To serve as the basic manual for the organizational structure, responsibilities, procedures, processes, and resources for implementing NPD 1280.1, NPD 8730.5, MPD 1280.1, ANSI/ISO/ASQ Q9001, and SAE AS9100. This MPR describes top-level requirements, providing references to lower-tier documents with more detailed requirements and instructions.

(1) This MPR documents/implements the Quality Management System (QMS) for MSFC to ensure consistent quality of NASA MSFC products and services and the safety of our customers, partners, employees, products and services.

(2) The design, development, production, test, installation and servicing of flight hardware, flight software, and associated ground support equipment interfacing with flight hardware and flight software are conducted in compliance with AS9100 or ISO 9001 requirements as required by NPD 8730.5.

(3) All flight hardware, flight software, and ground support equipment (GSE) previously grandfathered for ISO registration and surveillance audits, when readied for re-flight, are considered in scope to the ISO 9001 and AS9100 requirements (as specified above) and this MPR.

(a) Exceptions are addressed on a case-by-case basis utilizing the deviation/waiver process as defined in MPR 1410.2.

(4) NPR 7123.1 identifies Technology Readiness Levels (TRLs) for research and development leading up to flight. The program/project plan, test plan, or project quality assurance plan can provide tailoring of requirements for research and development activities as allowed by applicable procedures.

(5) As part of the integrated Marshall Management System, MSFC has also implemented an Environmental Management System (EMS), which is conducted in compliance with NPR 8553.1. (Refer to MPR 8500.2.)

(6) The MSFC Occupational Health and Safety (OH&S) Management System is conducted in compliance with MPR 8715.1, and is an integrated part of the Marshall Management System, as well.

b. This MPR includes or makes reference to the QMS procedures and outlines the structure of the documents used by Marshall in executing its activities. Provisions for tailoring, as allowed by the approval authority, are described within the various documents. Authority, applicable, and reference documents form a part of the citing document to the extent specified.

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P.2 APPLICABILITY

- a. This MPR applies to Center personnel, programs, projects, and activities, including contractors and resident agencies to the extent specified in their respective contracts or agreements. (“Contractors,” for purposes of this paragraph, include contractors, grantees, Cooperative Agreement recipients, Space Act Agreement partners, or other agreement parties.)
- b. This MPR applies to the MAF.
- c. This MPR applies the following: all mandatory actions (i.e., requirements) are denoted by statements containing the term “shall.” The following terms also apply: “may” or “can” denote discretionary privilege or permission; “should” denotes a good practice and is recommended, but not required; “will” denotes expected outcome; and “are/is” denotes descriptive material.
- d. This MPR applies the following: all document citations are assumed to be the latest version unless otherwise noted.
- e. This MPR applies certain specific requirements to “flight hardware” and “flight software” (as defined in Appendix A), which are not mandatory for hardware and software intended to fly only on suborbital systems (i.e. balloon flight, sounding rocket, or aircraft flight) unless specifically designated applicable by appropriate authorities.

P.3 AUTHORITY

- a. NPD 1000.0, NASA Governance and Strategic Management Handbook
- b. NPD 1280.1, NASA Integrated Management System Policy
- c. NPD 8730.5, NASA Quality Assurance Program Policy
- d. MPD 1280.1, MSFC Quality Management System Policy

P.4 APPLICABLE DOCUMENTS AND FORMS

- (a) Federal Acquisition Regulation (FAR)
- (b) NASA Federal Acquisition Regulation Supplement (NFS)
- (c) OMB Circular A-119, “Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities”
- (d) NPD 1050.1, Authority to Enter into Space Act Agreements

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- (e) NPD 1440.6, NASA Records Management
- (f) NPD 7120.4, NASA Engineering and Program/Project Management Policy
- (g) NPD 7120.6, Knowledge Policy on Programs and Projects
- (h) NPD 8730.2, NASA Parts Policy
- (i) NPR 8735.1, Exchange of Problem Data Using NASA Advisories and the Government-Industry Data Exchange Program (GIDEP)
- (j) NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts
- (k) NPR 1400.1, NASA Directives and Charters Procedural Requirements
- (l) NPR 1441.1, NASA Records Management Program Requirements
- (m) NPR 2810.1, Security of Information Technology
- (n) NPR 7120.5, NASA Space Flight Program and Project Management Requirements
- (o) NPR 7120.7, NASA Information Technology Program and Project Management Requirements
- (p) NPR 7120.8, NASA Research and Technology Program and Project Management Requirements
- (q) NPR 7123.1, NASA Systems Engineering Processes and Requirements
- (r) NPR 7150.2, NASA Software Engineering Requirements
- (s) NPR 8000.4, Agency Risk Management Procedural Requirements
- (t) NPR 8820.2, Facility Project Requirements
- (u) NRRS 1441.1, NASA Records Retention Schedules
- (v) MPD 1000.1, MSFC Governance
- (w) MPR 1100.1, Marshall Space Flight Center Organization
- (x) MPR 1280.2, Process Control
- (y) MPR 1280.4, MSFC Corrective Action System

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- (z) MPR 1280.6, Management Systems Internal Audits
- (aa) MPR 1280.8, Customer Satisfaction
- (bb) MPR 1410.1, Organizational Issuances
- (cc) MPR 1410.2, Marshall Directives System
- (dd) MPR 1420.1, MSFC Forms Management Program
- (ee) MPR 1440.2, MSFC Records Management Program
- (ff) MPR 2800.2, MSFC Information Technology Services
- (gg) MPR 3410.1, Training
- (hh) MPR 4000.2, Property Management
- (ii) MPR 5000.1, Purchasing
- (jj) MPR 6000.1, Transportation
- (kk) MPR 7120.1, MSFC Engineering and Program/Project Management Requirements
- (ll) MPR 7120.4, MSFC Center Management Council (CMC) Process
- (mm) MPR 7123.1, MSFC Systems Engineering Processes and Requirements
- (nn) MPR 8070.1, Administration of MSFC Technical Standards and MSFC Standard Data Requirements Descriptions
- (oo) MPR 8500.2, MSFC Environmental Management System (EMS)
- (pp) MPR 8715.1, Marshall Safety, Health, and Environmental (SHE) Program
- (qq) MPR 8730.1, Inspection and Testing
- (rr) MPR 8730.2, Inspection and Test Status
- (ss) MPR 8730.3, Control of Nonconforming Product
- (tt) MPR 8730.5, Metrology and Calibration
- (uu) MPR 8730.6, Inspection of Hazardous Test Facility Configuration Changes

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- (vv) MPR 8823.1, Design Control of Facilities
- (ww) MWI 1280.5, MSFC ALERT Processing
- (xx) MWI 1410.1, Processing Marshall Directives
- (yy) MWI 4530.1, Flight Hardware Support Operations (FHSO) Component Acquisition, Inventory Control, and Kitting Services
- (zz) MWI 7120.6, Program, Project and Institutional Risk Management
- (aaa) MWI 8060.4, Non-Flight and Non-Facility Design and Development
- (bbb) MWI 8730.3, MSFC Material Review System
- (ccc) MGM 1280.1, Guidance for Continual Improvement
- (ddd) MGM 7120.3, MSFC Data Management Guidance
- (eee) MGM 8040.1, MSFC Configuration Management Guidance
- (fff) MC-08, MSFC Center Management Council (CMC)
- (ggg) MC-21, MSFC Integrated Management System Council (IMSC)
- (hhh) MC-25, MSFC Strategic Planning Council (SPC)
- (iii) MSFC-HDBK-3173, MSFC Project Management and Systems Engineering Handbook
- (jjj) MSFC-STD-555, MSFC Engineering Documentation Standard
- (kkk) MSFC-STD-3012, EEE Parts Management and Control Requirements for MSFC Space Flight Hardware
- (lll) MSFC-STD-3620, EEE Parts Obsolescence Management & Control Requirements
- (mmm) MSFC-STD-3619, MSFC Counterfeit Electrical, Electronic, and Electromechanical Parts Avoidance, Detection, Mitigation, and Disposition Requirements for Space Flight and Critical Ground Support Hardware

P.5 MEASUREMENT/VERIFICATION

The measurements and verification are established in MPD 1280.1 and applicable documents.

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P.6 CANCELLATION

MPR 1280.10C, Marshall Quality Management System, dated November 5, 2019.

Electronically approved by

Jody Singer
Director

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CHAPTER 1. RESPONSIBILITIES

1.1 The MSFC Center Director shall be accountable for:

1.1.1 implementation of the QMS; and

1.1.2 assuring the QMS' performance, including providing sufficient resources for QMS activities.

1.2 The Management Representative shall be responsible for, and has the authority for, the day-to-day implementation of the QMS, including maintenance of this MPR.

1.3 All MSFC directors, program/project managers, and other personnel shall be responsible for understanding and complying with the QMS and MSFC's policy and objectives for quality. The directors and program/project managers may delegate authority for implementing the quality program, but they remain accountable.

1.4 All MSFC employees shall be responsible for understanding and complying with the QMS and MSFC's policy for quality.

Note: Also see Section 2.1.1.5.a, Responsibility and Authority.

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CHAPTER 2. MARSHALL QUALITY MANAGEMENT SYSTEM PROCEDURES

2.1 ORGANIZATION AND ADMINISTRATION (1000-1999)

a. MSFC shall establish safety, general, management, and administrative processes including methods to continually improve their effectiveness.

b. The following processes are primarily governed by the organization and administration series of Directives: (See paragraph P.4.b.)

- (1) General (10XX)
- (2) Organizational Structure (11XX)
- (3) Internal Management Controls (12XX)
- (4) External Relationships (13XX)
- (5) Administrative Management Programs (14XX)
- (6) Administrative Services (15XX)
- (7) Security (16XX)
- (8) Safety (17XX) and (87XX)
- (9) Occupational Health (18XX)
- (10) Standards of Conduct (19XX)

c. NASA has defined the external and internal requirements that shape the way NASA plans and conducts its missions and operations. The Agency has established a Strategic Management System, which consist of a set of policy documents and processes to ensure that all components of NASA are aligned with its strategic goals and direction; all programs and supporting functions are executable; and that progress toward plans is measurable. The Agency's planning phase is a continuous process of assessment and adjustment of NASA's mission objectives at both the strategic and detailed levels to reflect national priorities, Congressional guidance, and other stakeholder input, and to take into account applicable emerging trends. (Refer to NPD 1000.0.)

d. MSFC has established a process for identifying specific stakeholders, and documenting their requirements and expectation, as part of the program and project technical planning process. These stakeholder expectations are established and maintained throughout the program/project lifecycle to ensure that all program/project products and systems meet all applicable requirements. (Refer to MPR 7123.1.)

2.1.1 MANAGEMENT RESPONSIBILITY

2.1.1.1 MANAGEMENT COMMITMENT

a. MSFC senior management shall provide evidence of its commitment to the development and implementation of the QMS and continually improving its effectiveness by:

- (1) Communicating to the organization the importance of meeting NASA, customer, statutory, and regulatory requirements;

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- (2) Establishing the quality policy;
- (3) Ensuring that quality objectives are established;
- (4) Conducting management reviews; and
- (5) Ensuring the availability of resources.

b. MSFC senior management shall ensure that the integrity of the QMS is maintained when changes are planned and implemented.

c. MSFC senior management shall ensure that appropriate communication processes are established within MSFC and that communication takes place regarding the QMS documentation, changes, and effectiveness of the QMS.

2.1.1.2 CUSTOMER FOCUS

a. MSFC senior management shall ensure that product conformity and on-time delivery performance are measured and that appropriate action is taken if planned results are not or will not be achieved.

2.1.1.3 QUALITY POLICY

a. The MSFC Quality Policy is documented in MPD 1280.1.

MSFC policy is to provide quality products and services to our customers and partners through the NASA values: safety, integrity, teamwork, and excellence.

FIGURE 1.
MSFC Quality Policy Statement

- b. Each MSFC manager shall be responsible for ensuring the quality policy is understood, implemented, and maintained at all levels of the organization.
- c. The quality policy shall be communicated throughout the organization via employee training and quality reviews with management.

2.1.1.4 QUALITY OBJECTIVES (See definition in Appendix A.)

a. The MSFC Center Director shall ensure that quality objectives, including those needed to meet requirements for products and services, are established at relevant functions and levels within the organization.

b. The quality objectives shall be derived from NASA's strategic goals, measurable, and

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consistent with the quality policy.

c. Performance toward objectives is reviewed in the Center Management Council (CMC), Integrated Management System Council (IMSC), and Center-level performance meetings. Customer satisfaction is reviewed by the SPC and IMSC, in accordance with MPR 1280.8. Reference MPD 1000.1 for a description of the respective governing councils, as well as MC-08, MC-21, and MC-25.

d. Quality objectives for programs/projects are established and tracked through the normal flowdown of programmatic (mission) goals/objectives into the program/project planning. MPR 7120.1 requires projects to develop a Project Plan and a Safety and Mission Assurance (SMA) Plan. (See also NPR 7120.5.)

2.1.1.5 ORGANIZATION

a. RESPONSIBILITY AND AUTHORITY

(1) The MSFC Center Director shall be responsible for implementation of the QMS. While the Center Director has the ultimate authority and responsibility for establishing and maintaining the QMS (reference NPD 1280.1), the Management Representative has the day-to-day authority and responsibility for the QMS implementation. All MSFC directors, program/project managers, and other personnel are responsible for understanding and complying with the QMS and MSFC's policy and objectives for quality. The directors and program/project managers may delegate authority for implementing the quality program, but they remain accountable. (Figure 2 shows the organizational relationships at MSFC.)

(2) Process and procedural documentation describe the responsibilities of employees involved in the subject process or procedure. Individual performance plans also describe an employee's responsibilities and performance metrics. Responsibilities and level of authority are described in individual position descriptions. Organizational charters shall be documented in MPR 1100.1.

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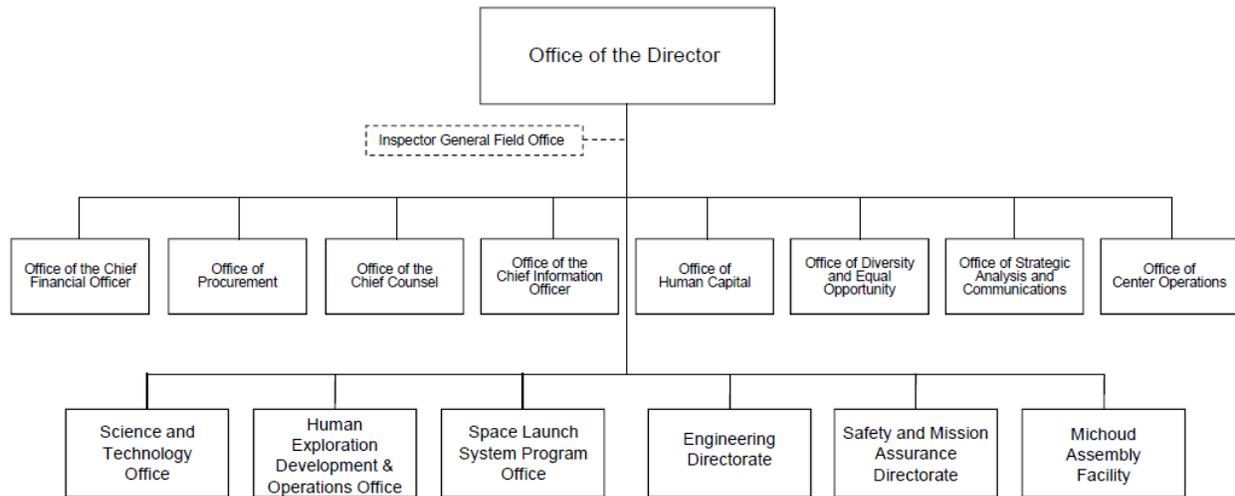


FIGURE 2.
George C. Marshall Space Flight Center Organizational Chart

b. RESOURCES

The MSFC Center Director shall be responsible for providing sufficient resources to implement and maintain the QMS and continually improve its effectiveness in order to enhance customer satisfaction by meeting customer requirements.

c. MANAGEMENT REPRESENTATIVE

The MSFC Center Director has appointed the Associate Director as the Management Representative. This position has the organizational authority to resolve matters pertaining to implementation of the QMS. The Management Representative shall:

- (1) Ensure that the QMS is established, implemented, and maintained in accordance with NASA Agency requirements, including those for ANSI/ISO/ASQ Q9001 and SAE AS9100.
- (2) Be responsible for reporting on the performance of the QMS to Center management for review and improvement.
- (3) Ensure the promotion of awareness of customer requirements throughout the organization.
- (4) Act as the primary communications point for liaison with external bodies affecting the MSFC QMS.

Note: The MSFC Center Director retains responsibility and authority to resolve matters pertaining to quality through the CMC process; in addition, the Director, SMA

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Directorate, also serves as the Center focal point for an alternative, independent SMA line of communication.

2.1.1.6 QUALITY MANAGEMENT SYSTEM REVIEW

a. The Management Representative ensures that management reviews of the status of the QMS are conducted as part of the Center governance process. (Refer to MPD 1000.1.)

(1) These reviews shall be conducted and records kept per Appendix D to ensure the continuing suitability, adequacy, and effectiveness of the QMS.

(2) Management reviews of the QMS shall be conducted over the course of each fiscal year.

(3) The governing council agendas are established to ensure that the various aspects of the QMS are scheduled for review by the appropriate council at least once each year, with an overall assessment of the continuing suitability, adequacy, and effectiveness of the QMS conducted by the IMSC.

(4) The IMSC shall assess opportunities for improvement and the need for changes to the QMS, including quality policy and quality objectives that involve the Center's capabilities that are used for delivering the Center's products and services. Reference MC-21.

b. The input to these quality management system reviews shall include information on results of audits, customer feedback, process performance and product conformity, status of preventive and corrective actions, follow-up actions from previous management reviews, changes that could affect the QMS, and recommendations for improvement.

c. The output from these quality management system reviews shall include any decisions and actions related to improving the effectiveness of the QMS and its processes, improving the products and services related to customer requirements, and resource needs.

2.1.2 QUALITY MANAGEMENT SYSTEM

2.1.2.1 GENERAL

a. MSFC shall establish, document, maintain, and continually improve a QMS as a means of ensuring that MSFC's products and services conform to specified requirements and to ensure conformance to the requirements of ANSI/ISO/ASQ Q9001 and SAE AS9100, as applicable. MSFC has prepared this MPR covering the requirements of ANSI/ISO/ASQ Q9001, SAE AS9100 and other NASA and MSFC requirements.

b. The Management Representative shall be responsible for maintenance of this MPR. The controlled version is available on the MSFC Directives Master List at <https://dml.msfc.nasa.gov/directives>. Refer to MPR 1410.2, for MSFC's process for control of documented information for this and other MSFC Directives.

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c. The MSFC documentation of the QMS and its hierarchy is defined as follows:

(1) External documents. External documents are flowed down into NASA Agency and MSFC Directives and other documentation as necessary. Multiple external documents apply and are accessed through various appropriate means, including government agency websites and the technical standards system described below.

(2) NASA Agency Directives System. NPDs, NPRs, and NIDs (refer to NPR 1400.1). (All NASA Directives are accessible at <http://nodis3.gsfc.nasa.gov/>)

(3) Marshall Directives System. MPDs, MPRs, MWIs, and MIDs (refer to MPR 1410.2). Directives are generally numbered based on the subject numbers found in the Agency Filing Scheme (which can be found in NPR 1441.1). All MSFC Directives are accessible at <https://dml.msfc.nasa.gov/directives>:

(a) MPD. MPDs state policy and formal delegations of authority; identify responsibilities and principal policy relationships; and are approved/signed by the Center Director or designee.

(b) MPR. MPRs document procedural requirements for how Center-level activities are conducted to implement NASA and/or MSFC policy and are approved/signed by the Center Director or designee.

(c) MWI. MWIs provide detailed instructions on performing specific duties that apply to all or numerous MSFC organizations and are approved/signed by the Center Director or designee.

(d) MID. MIDs provide an immediate, short-term statement of the Center's policies and/or requirements, and responsibilities for implementation.

(4) Marshall Center-wide Plans. Center-wide plans are plans that are required by an MSFC, NASA or other Federal or State Government document. These plans have the potential to affect several or all MSFC organizations and are approved by MSFC senior management. Center-wide plans do not include Program/Project management plans. Center-wide plans are reviewed and approved through the Directives Review process and posted on the Marshall Integrated Document Library (MIDL) at <https://dml.msfc.nasa.gov/directives>. Refer to MWI 1410.1 for specific instructions and requirements concerning MSFC's Directives Review Process,

(5) Marshall Guidance Manuals (MGMs). MGMs supplement directives (NASA and/or MSFC) and provide more instruction about how to carry out the provisions of those directives at MSFC. They contain information helpful to implement or understand the process(es), but do not establish requirements. Contents may include: acceptable methods for implementing requirements, guidelines, best practices, process-oriented lessons learned, and helpful hints. MGMs are approved/signed by the Center Director or designee. MGMs are available at <https://dml.msfc.nasa.gov/directives>.

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(6) Organizational Issuances (OIs). OIs provide detailed instructions for internal use within an organization. OIs may apply to two or more organizations if issued jointly by heads of the organizations involved. OIs are not maintained in the Marshall Directives System, but are available through the MIDL. OIs include, but are not limited to, Organizational Work Instructions, processes, procedures, memoranda, and organizational forms. (Refer to MPR 1410.1.) Master Lists for OIs can be accessed at <https://sharepoint.msfc.nasa.gov/sites/shared/OI/Pages/Homepage.aspx>.

(7) Program/Project Data. Program/Project data includes all data required for the definition of the product and the management of the Program/Project. (Refer to MPR 7123.1 and MGM 7120.3 for the management of Program/Project data.) Program/Project data is made available for those with a valid need. Points of contact are available through https://midl.msfc.nasa.gov/project_docs.html.

(8) MSFC Technical Standard. A descriptive standard, specification, or handbook that is developed, sponsored, or adopted for common use by MSFC. MSFC Technical Standards in existence prior to the approval of this standard may be other document types (e.g., procedures, reports, requirements, plans, drawings). (Refer to MPR 8070.1.) NASA and MSFC Standards are accessible through <https://standards.nasa.gov/>.

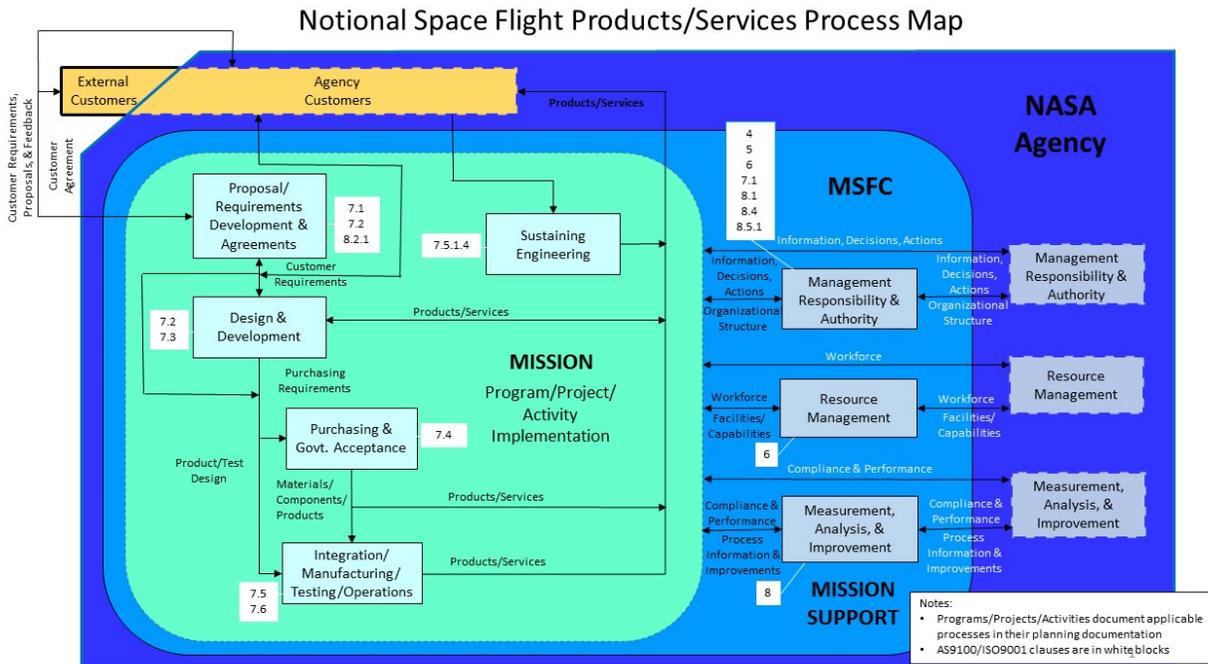
(9) Records. All documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the Government or because of the informational value of the data in them. (Refer to NPD 1440.6, NPR 1441.1, NRRS 1441.1, and MPR 1440.2.)

2.1.2.2 QUALITY MANAGEMENT SYSTEM PROCEDURES

a. MSFC activities can be represented as a process or set of processes. Processes and their interactions are identified at all levels of the organization in order to manage and document the quality system effectively.

b. The following model illustrates the process approach:

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**FIGURE 3.
PROCESS MODEL FOR MSFC QMS**

Note: See also Appendix F, AS9100D Requirements Clauses to MPR 1280.10 Paragraphs.

c. The QMS is a formally-documented system of planned activities established to provide evidence of compliance to the requirements of applicable regulations, codes, standards, specifications, drawings, and the MSFC Quality Policy and quality objectives. All of these activities are governed by procedures and written instructions supported with records of objective evidence of satisfactory compliance. MSFC organizations shall establish measures to implement the requirements contained in this MPR. This includes the preparation of procedures and documentation that assures compliance with the MPR, and continual improvement of these processes.

d. The range and detail of the procedures that form part of the QMS depend on the complexity of the work, the methods used, and the skills and training needed by personnel involved in carrying out the activity. Procedures may make reference to work instructions that define how an activity is performed.

2.1.2.3 ANALYSIS OF DATA

a. MSFC organizations shall determine, collect, and analyze appropriate data to demonstrate the suitability and effectiveness of the QMS and to evaluate where continual improvement of the effectiveness of the QMS can be made.

(1) This shall include data generated as a result of monitoring and measurement and from other

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relevant sources.

b. As a minimum, the analysis of data shall provide information relating to:

- (1) Customer satisfaction (see paragraph 2.1.3.5);
- (2) Conformity to product, service, and customer requirements (see paragraph 2.8.3);
- (3) Characteristics and trends of processes and products including opportunities for preventive action (see paragraph 2.1.5.5); and
- (4) Suppliers (see paragraphs 2.5.1.1 and 2.5.1.3).

2.1.2.4 CONTINUAL IMPROVEMENT

- a. MSFC shall continually improve the effectiveness of the QMS through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management review. (Refer to MGM 1280.1.)
- b. MSFC monitors the implementation of improvement activities and evaluates the effectiveness of the results. Incorporation of lessons learned, lean six sigma events, benchmarking, and routine problem-solving efforts are all opportunities for continual improvement.

2.1.2.5 KNOWLEDGE MANAGEMENT AND LESSONS LEARNED

- a. NASA has established a knowledge management process and a lessons learned database to capture and share information from experiences, and continuously improve the performance of NASA in implementing its mission. (Refer to NPD 7120.6 and to the NASA Engineering Network, Lesson Learned Website at <https://nen.nasa.gov/web/ll/>.)
- b. MSFC has established a process for managing knowledge, observations, and lessons learned from past project experiences, and for infusion into future projects and institutional processes. (Refer to MPR 7120.1.)

2.1.3 CUSTOMER-RELATED PROCESSES

2.1.3.1 GENERAL

The directors and program/project managers shall ensure that customer requirements are determined and met with the aim of enhancing customer satisfaction. Procedures/instructions for customer-related processes, including contract (customer agreement) review and the coordination of these activities, are detailed in MPR 7120.1 and NPD 1050.1.

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2.1.3.2 DETERMINATION OF REQUIREMENTS RELATED TO PRODUCTS

MSFC shall determine requirements specified by the customer, including the requirements for delivery and post-delivery activities; requirements not stated by the customer but necessary for specified or intended use, where known; statutory and regulatory requirements related to products; and any additional requirements determined by MSFC.

2.1.3.3 REVIEW OF REQUIREMENTS RELATED TO PRODUCTS

a. MSFC shall review the requirements related to products and services. For significant technical products and services, as determined by MPR 7120.1, NPR 7120.5, NPR 7120.7, NPR 7120.8, and MPR 7120.4; these reviews occur in the CMC forum. (Refer to MC-08.)

b. This review shall be conducted prior to MSFC's commitment to supply a product or provide a service to a customer (e.g., submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders).

c. This review shall ensure that product and service requirements are defined; contract or order requirements differing from those previously expressed are resolved; MSFC has the ability to meet the defined requirements; and risks (e.g., new technology, short delivery time frame) have been identified. (See paragraph 2.7.1.2.)

d. Special requirements of the product are determined.

Note: The term, "special requirements," is not used in the implementing procedures and processes, although the intent of the term is addressed.

e. Records of the results of these reviews and actions arising from these reviews shall be maintained. (See paragraph 2.1.7.)

f. Where the customer provides no documented statement of requirement, the customer requirements shall be confirmed by MSFC before acceptance.

g. Where product or service requirements are changed, MSFC shall ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

2.1.3.4 CUSTOMER COMMUNICATION

MSFC shall determine and implement effective arrangements for communicating with customers in relation to product or service information; inquiries, contracts, or order handling, including amendments; and customer feedback, including customer complaints.

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2.1.3.5 CUSTOMER SATISFACTION

a. As one of the measurements of the performance of the QMS, MSFC shall monitor information relating to customer perception as to whether MSFC has met customer requirements. The methods for obtaining and using this information are defined in MPR 1280.8.

(1) Information to be monitored and used for the evaluation of customer satisfaction shall include, but is not limited to, product conformity, on-time delivery performance, customer complaints, and corrective action requests.

(2) MSFC shall address deficiencies identified by these evaluations and follow up with customers to ensure the effectiveness of the results.

2.1.4 DATA MANAGEMENT, INCLUDING DOCUMENT AND DATA CONTROL

2.1.4.1 GENERAL

a. MSFC shall establish and maintain documented procedures to identify/define, prepare, control, and disposition all documents and data that are within the scope of MSFC's QMS including, to the extent applicable, documents of external origin such as standards and customer drawings. Procedural controls include requirements to periodically review and update as necessary and re-validate documents. (Refer to MPR 1410.2, MPR 1410.1, MPR 7123.1, MGM 7120.3, MPR 8070.1, and MPR 1420.1.)

b. All MSFC records shall be documented, managed, retained, and dispositioned in accordance with NPD 1440.6, NPR 1441.1, NRRS 1441.1 and MPR 1440.2. The MSFC Documentation Repository is the official receipt, storage, and distribution point for MSFC engineering drawings, specifications, standards, procedures, and handbooks.

c. The use of the word "shall" indicates mandatory requirements in the documentation of the QMS.

d. The NASA Technical Standards Program's Standards and Technical Assistance Resource Tool (START) serves as the master list for searching for information about various Technical Standards Products, including NASA Preferred Technical Standards. This system is accessible from the NASA Technical Standards Program's Website at <http://standards.nasa.gov> and the MIDL through the Technical Standards link.

e. Changes to technical standards can have major impacts on the safety and performance of MSFC Programs and Projects. The START provides users with the ability to request Alerts to notify NASA's Programs/Projects/Organizations and contractors within the <nasa.gov> domain of changes to standards products being used.

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f. MSFC and NASA master document lists shall be used to verify the correct version status of MSFC and NASA standards documentation and previous/obsolete versions authorized for use at MSFC.

2.1.4.2 DOCUMENT AND DATA APPROVAL AND ISSUANCE

a. The documents and data shall be reviewed and approved for adequacy and accuracy prior to issue to perform work by authorized management or designee, after having received concurrence by technical authorities and employee representatives performing the tasks.

b. Each organization shall maintain the documents and data or identify the repository location of the documents and data such that each employee who is performing the task can easily retrieve the applicable documents/data for use.

c. These documents can be in the form of any type of media; electronic media is recommended when available.

d. Master lists identifying the current revision status of documents, as well as previous versions authorized for use, shall be established and readily accessible from a central location to preclude the use of invalid and/or obsolete documents.

e. Pertinent issues of appropriate documents shall be available at all locations essential to the effective functioning of the QMS.

f. Invalid and/or obsolete documents shall be promptly removed from all points of issue or use, destroyed, or otherwise ensured against unintended use.

g. Any previous/obsolete version of any documents within the MSFC Master List system retained by the user (e.g., for limited applicability, for historical purposes, for reference) shall be marked or otherwise suitably identified.

2.1.4.3 DOCUMENT AND DATA CHANGES

a. Changes, revisions, and cancellations to documents and data shall be reviewed and approved by the same MSFC organizations that performed the original review and approval, unless designated otherwise.

b. Document changes shall be coordinated with customers and/or regulatory authorities in accordance with any customer agreement or regulatory requirements.

c. The designated MSFC organizations performing review and approval shall have access to pertinent background information upon which to base their review and approval.

d. Where practicable, a description of the change shall be identified in the document or in the appropriate attachments.

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2.1.5 PROCESS CONTROL

2.1.5.1 INFRASTRUCTURE

a. MSFC shall determine, provide, and maintain the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable:

- (1) Buildings, workspace, test facilities, and associated utilities;
- (2) Process equipment (both hardware and software); and
- (3) Supporting services (such as transport communication, pressure systems, or information systems).

b. Continuous risk management shall be performed for institutional risks per NPR 8000.4 and MWI 7120.6 to identify possible impacts to infrastructure and in-house activities.

2.1.5.2 CONTROL OF PRODUCTION AND SERVICE PROVISION

a. Processes, procedures and instructions shall be developed on an ongoing basis by responsible organizations to ensure functional activities are performed under controlled conditions. The methods for process controls for specific processes can be obtained through the MIDL.

- (1) Process controls for hardware and software products shall be carried out in accordance with MPR 1280.2.
- (2) Process controls for post-delivery activities shall be carried out in accordance with MPR 7120.1 and MPR 7123.1.

b. Controlled conditions shall include, as applicable:

- (1) The availability of information that describes the characteristics of the product or service, including criteria for workmanship, which will be stated in the clearest practical manner (e.g., written standards, representative samples or illustrations);
- (2) The availability of work instructions, as necessary;
- (3) The use of suitable equipment;
- (4) The availability and use of monitoring and measuring equipment;
- (5) The implementation of monitoring and measurement;
- (6) The implementation of release, delivery, and post-delivery activities;

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- (7) Accountability for all products during production and test;
- (8) Evidence that all production, test, and inspection/verification operations have been completed as planned, or as otherwise documented and authorized;
- (9) Provision for the prevention, detection, and removal of foreign objects; and
- (10) Monitoring and control of utilities and supplies such as water, compressed air, electricity and chemical products, to the extent they affect conformity to product requirements.

c. Planning shall consider, as appropriate:

- (1) Establishing, implementing, and maintaining appropriate processes to manage critical items, including process controls where key characteristics have been identified;
- (2) Designing, manufacturing, and using tooling to measure variable data;
- (3) Identifying in-process inspection/verification points when adequate verification of conformance cannot be performed at later stages of realization; and
- (4) Special processes (see paragraph 2.1.5.4).

2.1.5.3 WORK ENVIRONMENT

MSFC shall determine and manage the work environment needed to achieve conformity to product requirements. (Reference MPR 1280.2.)

2.1.5.4 VALIDATION OF PROCESSES FOR PRODUCTION AND SERVICE PROVISION

- a. MSFC shall validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered.
- b. Validation shall demonstrate the ability of these processes to achieve planned results.
- c. MSFC shall establish arrangements for these processes including, as applicable:
 - (1) Defined criteria for review and approval of the processes prior to use;
 - (2) Approval of equipment and qualification of personnel;
 - (3) Use of specific methods and procedures;
 - (4) Requirements for records (see paragraph 2.1.7); and

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(5) Revalidation.

2.1.5.5 MONITORING AND MEASUREMENT OF PROCESSES

- a. MSFC shall apply suitable methods for monitoring and, where applicable, measurement of the QMS processes.
- b. These methods shall demonstrate the ability of the processes to achieve planned results.
- c. When planned results are not achieved, correction and corrective action shall be taken, as appropriate, to correct the nonconforming process and ensure conformity of product.
- d. Any resulting nonconforming product shall be identified and controlled. (See paragraphs 2.1.6, 2.8.3, and 2.8.6.)

2.1.6 CORRECTIVE AND PREVENTIVE ACTION

2.1.6.1 GENERAL

- a. MSFC shall establish and maintain documented procedures to ensure consistent and effective methods for correction and prevention of recurrence of nonconformances. A consistent procedure to ensure that nonconformances are corrected is necessary for the delivery of quality products and services to the customer.
- b. Any corrective or preventive action taken to eliminate the causes of actual or potential nonconformities shall be to a degree appropriate to the magnitude of problems and commensurate with the risks encountered.
- c. Any changes to the documented procedures as a result of corrective or preventive actions shall be recorded and implemented.

2.1.6.2 CORRECTIVE ACTION

MSFC has established a documented procedure to define requirements for the following (refer to MPR 1280.4):

- a. Reviewing nonconformities (including customer complaints);
- b. Determining the causes of nonconformities;
- c. Evaluating the need for action to ensure that nonconformities do not recur;
- d. Determining and implementing action needed;
- e. Records of the results of action taken (see paragraph 2.1.7);

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- f. Reviewing the effectiveness of the corrective action taken;
- g. Flowing down corrective action requirements to a supplier when it is determined that the supplier is responsible for the cause of the nonconformity. Only the Contracting Officer can require a contractor to take corrective action (refer to MPR 5000.1);
- h. Specific actions where timely and/or effective corrective actions are not achieved; and
- i. Determining if additional nonconforming product exists based on the causes of the nonconformities and taking further action when required.

2.1.6.3 PREVENTIVE ACTION

- a. MSFC shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence.
- b. Preventive actions shall be appropriate to the effects of potential problems.
- c. Documented procedures define requirements for determining potential nonconformities and their causes, evaluating the need for action to prevent occurrence of nonconformities, determining and implementing action needed, records of results of actions taken, and reviewing effectiveness of preventive action taken. (Refer to MPR 1280.4, MWI 1280.5, and MWI 7120.6.)

2.1.7 CONTROL OF RECORDS

- a. Records are established and maintained to provide evidence of conformity to requirements and of the effective operation of the QMS.
- b. Records shall remain legible, readily identifiable and retrievable.
- c. MSFC shall establish documented procedures to define the controls needed for the identification, storage, protection, retrieval, retention time, and disposition of records, including those created by and/or retained by suppliers. (Reference MPR 1440.2, NPR 1441.1, and NRRS 1441.1.)
- d. Records shall be available for review by customers and regulatory authorities in accordance with customer agreements or regulatory requirements.

2.1.8 INTERNAL AUDITS

- a. SMA shall establish and maintain documented procedures for planning and conducting internal audits, establishing records of these audits, and reporting results. (Refer to MPR 1280.6.)

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- b. Internal audits shall be used to ensure conformity of the QMS, and to continually improve the effectiveness of the QMS through corrective actions taken by the audited organizations.
- c. MSFC shall plan and perform internal audits on a scheduled basis, taking into consideration the status and importance of the processes and areas to be audited, as well as results of previous audits.
- d. Records of the audits and their results shall be maintained by SMA. (See paragraph 2.1.7.)
- e. Nonconformances identified shall be tracked to ensure that timely corrections and corrective actions are taken by the management of the affected area.
- f. MSFC activities shall be audited by personnel independent of the activity under review to determine compliance with documented procedures, plans, instructions, regulatory requirements, and accepted customer agreements, and to determine the effectiveness of the QMS. Audits will include review for compliance with ISO 9001 and AS9100 as applicable.
- g. Follow-up activities shall be performed by MSFC to verify and record the implementation and effectiveness of the actions taken.
- h. The results of audits shall be an integral part of the input to the management review activities. (See paragraph 2.1.1.6.)

2.2 LEGAL AND TECHNICAL (2000-2999)

2.2.1 LEGAL

- a. The MSFC Chief Counsel's Office has established processes and maintains appropriate procedures, office issuances, and records for the implementation, generation, and control of legal and patent functions/processes.
- b. The Chief Counsel's Office activities are primarily governed by the Legal and Technical series of Directives: (See paragraph P.4.b.)

(1) General (Laws and Legal Matters) (20XX)

2.2.2 TECHNICAL

- a. MSFC shall establish processes for the management and operation of MSFC's Scientific and Technical Information programs, including the technology utilization office.
- b. Records shall be maintained.
- c. The following activities are primarily governed by the Legal and Technical series of Directives: (See paragraph P.4.b.)

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- (1) Technology Utilization (including Small Business Innovative Research (SBIR)) (21XX)
- (2) Scientific and Technical Information (22XX)
- (3) Management Information Systems (23XX)
- (4) Automatic Data Processing (ADP) Management (24XX)
- (5) Communications (25XX)
- (6) Photographic Services Management (26XX)
- (7) Information Technology (IT) Management (28XX)

2.3 HUMAN RESOURCES/PERSONNEL (3000-3999)

- a. MSFC shall establish processes for the management and operation of NASA personnel functions.
- b. The following activities are primarily governed by the Human Resources/Personnel series of Directives: (See paragraph P.4.b.)

- (1) Human Resources/Personnel (General) (30XX)
- (2) Executive Human Resources Management [Senior Executive Service (SES)] (31XX)
- (3) Personnel Provisions (General) (32XX)
- (4) Employment (General) (33XX)
- (5) Employee Performance and Utilization (34XX)
- (6) Position Classification, Pay, and Allowances (35XX)
- (7) Time and Attendance (36XX)
- (8) Personnel Relations and Services (37XX)
- (9) Insurance and Annuities (38XX)
- (10) General and Miscellaneous (39XX)

2.3.1 COMPETENCE, AWARENESS, AND TRAINING

- a. MSFC shall identify the competency and training needs and provide appropriate training of personnel. (Refer to MPR 3410.1.)
- b. Appropriate records of education, training, skills, and experience shall be maintained as records. (See paragraph 2.1.7.)
- c. Personnel performing work affecting conformity to product requirements shall be competent on the basis of appropriate education, training, skills, experience, and certifications.
- d. MSFC shall determine the necessary competence for personnel.
- e. MSFC shall provide training or take other actions to satisfy these needs and evaluate the effectiveness of the actions taken.

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f. MSFC shall ensure that personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives, including quality objectives.

2.4 PROPERTY AND SUPPLY (4000-4999)

a. MSFC shall establish processes for the management and operation of NASA property and supply management functions.

b. The following activities are primarily governed by the Property and Supply series of Directives: (See paragraph P.4.b.)

- (1) Property and Supply (General) (40XX)
- (2) Inventory Management (General) (41XX)
- (3) Equipment Management (General) (42XX)
- (4) Utilization and Disposal (43XX)
- (5) Supply Cataloging (44XX)
- (6) Storage and Distribution (45XX)
- (7) Expanded Supply Control (46XX)

2.4.1 CONTROL OF CUSTOMER-SUPPLIED PRODUCT

a. MSFC personnel shall exercise care with property belonging to an external customer while it is under MSFC's control or being used by MSFC.

b. MSFC shall establish and maintain documented procedures to control the verification, storage, and maintenance of customer-supplied products provided for use or incorporation into MSFC products, as well as any identified work to be performed on the article. (Refer to MPR 4000.2.)

c. Unless specified otherwise by the customer, all customer-supplied products, from time of receipt until the time they are transferred out of the MSFC custody, shall be verified, stored, processed, and maintained in accordance with the requirements and procedures applicable to MSFC hardware of the same classification.

d. External customer-supplied products which are lost, damaged, or are found to be otherwise unsuitable for use, shall be recorded and reported to the customer.

e. Customer property can include intellectual property, including customer-furnished data used for design, production and/or inspection, and personal data. Proprietary/confidential documentation received by MSFC shall be controlled in accordance with MSFC-STD-555, MPR 7123.1, MPR 8070.1, MGM 7120.3, NPR 2810.1, and MPR 2800.2.

2.5 PROCUREMENT/SMALL BUSINESS/INDUSTRIAL RELATIONS (5000-5999)

a. MSFC shall establish processes for the management and operation of NASA procurement and

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contracting functions.

b. The following activities are primarily governed by the Procurement/Small Business/Industrial Relations series of Directives: (See paragraph P.4.b.)

- (1) Procurement/Small Business/Industrial Relations (General) (50XX)
- (2) Procurement (Contracts) – General (51XX)
- (3) Contractor Labor Relations (52XX)
- (4) Reliability and Quality Assurance (53XX)
- (5) Contractor-Held Government Property (54XX)
- (6) Patent Waiver (55XX)
- (7) Statement of Work (56XX)
- (8) Awards, Inventions, and Contributions (57XX)
- (9) Grants and Cooperative Agreements (58XX)
- (10) Contractor Financial Management and Reporting (59XX)

2.5.1 PURCHASING

2.5.1.1 PURCHASING PROCESS

a. MSFC shall ensure that purchased products and services conform to specified requirements. (Refer to MPR 5000.1.)

b. Processes shall ensure that purchased products conform to specified purchase requirements.

c. Outsourced processes that can affect product conformity shall also be controlled by these processes.

d. The type and extent of control applied to the supplier and purchased products shall be dependent upon the effect of the purchased products on subsequent product realization or the final product.

e. MSFC shall be responsible for the conformity of all products purchased from suppliers, including product from sources defined by the customer.

f. MSFC shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. The various methods that may be used in this assessment include: quality system evaluations and/or surveys; past performance evaluations and customer questionnaires; and capability or mission suitability evaluations.

g. Criteria for selection, evaluation and re-evaluation shall be established.

h. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained. (See paragraph 2.1.7.)

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i. MSFC shall:

- (1) Adhere to the FAR and the NFS for all MSFC procurements;
Note: SMA maintains some registers of suppliers that include approval status (e.g., approved, conditional, disapproved) and the scope of the approval (e.g., product type, process family) that may be used in the procurement process.
- (2) Periodically review supplier performance; use the results of these reviews as a basis for establishing the level of controls to be implemented;
- (3) Define the necessary actions to take when dealing with suppliers that do not meet requirements;
- (4) Ensure where required that both the organization and all suppliers use customer-approved special process sources;
- (5) Define the process, responsibilities and authority for the approval status decision, changes of the approval status and conditions for a controlled use of suppliers depending on the supplier's approval status; and
- (6) Determine and manage the risk when selecting and using suppliers. (See paragraph 2.7.1.2.)

2.5.1.2 PURCHASING INFORMATION

a. Purchasing information shall describe the product to be purchased, including where appropriate:

- (1) Requirements for approval of product, procedures, processes and equipment;
- (2) Requirements for qualification of personnel;
- (3) Quality management system requirements (reference NPD 8730.5);
- (4) The identification and revision status of specifications, drawings, process requirements, inspection/verification instructions and other relevant technical data;
- (5) Requirements for design, test, inspection, verification (including production process verification), use of statistical techniques for product acceptance, and related instructions for acceptance by the organization, and as applicable, critical items including key characteristics;
- (6) Requirements for test specimens (e.g., production method, number, storage conditions) for design approval, inspection/verification, investigation, or auditing;
- (7) Requirements regarding any FAR, NFS, and MSFC flow-down provisions and clauses, including the need for the supplier to notify the organization of nonconforming product; obtain

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organization approval for nonconforming product disposition; notify the organization of changes in product and/or process, changes of suppliers, changes of manufacturing facility location and, where required, obtain organization approval; and, flow down to the supply chain the applicable requirements including customer requirements;

(8) Records retention requirements; and

(9) Right of access by the organization, their customer and regulatory authorities to the applicable areas of all facilities, at any level of the supply chain involved in the order, and to all applicable records.

b. MSFC organizations shall review and approve purchasing documents for adequacy of specified purchase requirements prior to their communication to the supplier.

2.5.1.3 VERIFICATION OF PURCHASED PRODUCT

a. MSFC shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements. (Reference MPR 8730.1.)

b. Where purchased product is released for production use pending completion of all required verification activities, it shall be identified and recorded to allow recall and replacement if it is subsequently found that the product does not meet requirements. (See paragraph 2.8.3.)

c. MSFC does not delegate government verification activities to the supplier. Delegations may be made to another government inspection agency. Per NPR 8735.2, verification of critical contract requirements may only be performed by (or under direction and supervision of) Federal agency personnel. Refer to NPR 8735.2, for additional requirements and guidance concerning which organizations may perform quality assurance functions on government contracts.

d. Where MSFC or its customer intends to perform verification at the supplier's premises, MSFC shall state the intended verification arrangements and method of product release in the purchasing information.

e. For work performed by MSFC, verification by the MSFC customer shall not absolve MSFC of the responsibility to provide an acceptable product, nor preclude subsequent rejection by the MSFC customer.

f. Raw material verification testing is required, when use of such raw material is determined to be a significant risk, in accordance with MPR 8730.1.

2.5.1.4 PURCHASE OF FLIGHT HARDWARE OR CRITICAL GROUND SUPPORT EQUIPMENT USING PURCHASE CARD

a. Purchase cards shall only be used for the purchase of flight hardware or critical ground support equipment in unusual or emergency situations, and where the cognizant Program/Project Manager and SMA Lead have authorized such use prior to purchase.

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(1). Such authorization shall be documented, signed by the cognizant Program/Project Manager and SMA Lead, and placed in the cardholder's file.

(2). MSFC has established the Flight Hardware Support Facility contract to acquire, kit, and store (as needed) flight hardware and related quality sensitive items that fall within the MSFC purchase card threshold. (See MWI 4530.1)

(3). The Space Systems Department Parts, Packaging, and Fabrication Branch (ES43) is exempt from the above requirement at 2.5.1.4.a. ES43 is authorized to purchase flight hardware materials via Government purchase card in non-emergency situations for those parts/materials that are used in the authorized build of flight hardware within the Branch. The Flight Hardware Support capability is still the preferred method for these purchases, but the ES43 Branch Chief is authorized to determine when it is most advantageous to utilize the purchase card.

b. In all purchases of flight hardware or critical ground support equipment on a purchase card, the purchase shall be routed through appropriate Quality Engineering for concurrence to ensure that proper procurement and inspection/receiving requirements are assigned and executed.

c. The cardholder shall note in the purchase card order log comment field if the order is for flight, or flight associated critical GSE, record the SMA Lead's name, and file the quality requirements bearing the signature of the SMA Lead in the purchase order log file.

d. The cardholder, or the purchasing organization, shall ensure that purchase request is screened against GIDEP and NASA Advisories for safety critical hardware and software, and any flight hardware and critical ground support equipment that meets the definition of critical work as defined in NPD 8730.5. Contact the MSFC Alert Coordinator for assistance, if needed.

e. In accordance with NPR 8735.1, Program, Project, and Operations/Institutional Managers are accountable for incorporating the requirement for contractor participation in GIDEP and the NASA Advisory System in contract statements of work specifications. This includes screening procurement requests against GIDEP and NASA Advisories for safety critical hardware and software, flight hardware, and critical ground support equipment being procured with a NASA purchase card and meeting the definition of critical work as defined in NPD 8730.5.

2.6 TRANSPORTATION (6000-6999)

a. MSFC shall establish processes for the management and operation of NASA transportation functions.

b. The following activities are primarily governed by the Transportation series of Directives: (See paragraph P.4.b.)

- (1) Transportation (General) (60XX)
- (2) Commercial Freight Services (61XX)

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- (3) Traffic Management Programs (62XX)
- (4) Transportation of Unusual or Hazardous Cargo (63XX)
- (5) Preparation and Handling of Cargo (64XX)
- (6) Special Airlift Services (65XX)
- (7) Transportation and Transport Engineering (66XX)
- (8) Motor Vehicle Operation and Management (67XX)
- (9) Passenger Transportation (68XX)

2.6.1 HANDLING, STORAGE, PACKAGING, PRESERVATION, AND DELIVERY

2.6.1.1 GENERAL

MSFC shall maintain processes for handling, storage, packaging, preservation, and delivery of products. (Refer to MPR 6000.1.)

2.6.1.2 HANDLING

Handling methods to prevent damage and deterioration, including such requirements as Program Critical Hardware, hazardous items, or electrostatic discharge (ESD) sensitive handling and precautions shall be implemented and updated routinely.

2.6.1.3 STORAGE

- a. Controlled storage and stock areas shall be utilized to prevent damage, loss, or deterioration of materials and products.
- b. Processes shall include authorization for the receipt and dispatch to and from these areas.
- c. Access to storage areas shall be limited to authorized personnel.
- d. Special provisions shall be established and implemented for ESD sensitive, age-sensitive materials, hazardous materials, and items stored requiring environmental controls.
- e. Periodic assessment of the condition of product in stock to detect deterioration shall be conducted.

2.6.1.4 PACKAGING

Documented procedures and/or packaging plans shall be initiated to define the controls and verification applied to the preservation, packaging, and marking processes (including materials used) to ensure compliance with specified requirements.

2.6.1.5 PRESERVATION

- a. MSFC shall apply appropriate methods for preservation and segregation of products when the

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product is under MSFC control.

b. Preservation of product shall include, where applicable in accordance with product specifications and applicable statutory and regulatory requirements, provisions for:

- (1) Cleaning and prevention, detection and removal of foreign objects;
- (2) Special handling for sensitive products and hazardous materials;
- (3) Marking and labeling including safety warnings; and,
- (4) Shelf life control and stock rotation.

(a) Should it become necessary to revalidate material with expired shelf life for use in flight hardware, the process to revalidate this material shall be documented in the project's quality plan or by the Material Review Board.

2.6.1.6 DELIVERY

- a. MSFC shall protect the quality of product after inspection and test are completed.
- b. This protection shall be extended to include delivery to destination.

2.7 PROGRAM FORMULATION (7000-7999)

a. MSFC shall establish processes for the management, planning, and administration of space flight programs, Research and Development programs, groups of projects and laboratory-type organizations.

b. The following activities are primarily governed by the Program Formulation series of Directives: (See paragraph P.4.b.)

- (1) Program Formulation (General) (70XX)
- (2) Research and Development Planning and Approval (71XX)
- (3) Institutional Planning and Approval (72XX)
- (4) Facility Planning and Approval (73XX)
- (5) Approval and Management of Financial Reports for Contracts and Grants, Allotments, and Resources/Appportionment Files (74XX)
- (6) Commercialization (of NASA Technology and Systems) (75XX)
- (7) Program Operating Plans (76XX)
- (8) Human Resources Utilization (77XX)
- (9) Resources Authority Allocation System (78XX)
- (10) Aircraft Operations and Management (79XX)

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2.7.1 PROGRAM/PROJECT AND QUALITY PLANNING

- a. MSFC defines and documents how requirements shall be met for each project, program, or activity.
- b. Program/Project and Quality planning shall be consistent with all other requirements of MSFC's QMS.
- c. Program/Project and Quality planning shall be documented in a format to suit MSFC's method of operation.
- d. Program/Project and Quality planning shall be performed per MPR 7120.1.
- e. In planning product realization, MSFC shall determine the following, as appropriate:
 - (1) Objectives, including quality objectives, and requirements for product;
 - (2) The need to establish processes, documents, and provide resources specific to the product;
 - (3) Required verification, validation, monitoring, inspection, and test activities specific to the product and the criteria for product acceptance;
 - (4) Records needed to provide evidence that the realization processes and resulting product meet requirements;
 - (5) TRL;
 - (6) Configuration management appropriate to the product; and
 - (7) Resources to support the use and maintenance of the product.

2.7.1.1 PROJECT MANAGEMENT

- a. MSFC shall plan and manage product realization in a structured and controlled manner, as appropriate to the product, to meet requirements at acceptable risk, within resource and schedule constraints. (Reference MPR 7120.1, MPR 7120.4, MWI 7120.6, NPR 7120.5, NPR 7120.7, and NPR 7120.8.)

2.7.1.2 RISK MANAGEMENT

- a. MSFC shall establish, implement and maintain a process (refer to MWI 7120.6) for managing risk to the achievement of applicable requirements, that includes as appropriate to the organization and the product:
 - (1) Assignment of responsibilities for risk management;

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- (2) Definition of risk criteria (e.g., likelihood, consequences, risk acceptance);
 - (3) Identification, assessment and communication of risks throughout product realization;
 - (4) Identification, implementation and management of actions to mitigate risks that exceed the defined risk acceptance criteria; and
 - (5) Acceptance of risks remaining after implementation of mitigating actions.
- b. All programs, projects, and institutional organizations shall prepare a risk management plan in accordance with NPR 8000.4. This plan may be a supplement of the program/project plan, as applicable.
- c. Each program, project, and institutional organization shall follow a continuous risk management process which is iterated throughout the program, project, or institutional activity life cycle.

2.7.1.3 CONFIGURATION MANAGEMENT

- a. MSFC shall establish, implement and maintain a configuration management process that includes, as appropriate to the product:
- (1) Configuration management planning;
 - (2) Configuration identification;
 - (3) Change control;
 - (4) Configuration status accounting; and
 - (5) Configuration audit.
- b. Configuration management and data management shall be applied, with the optimum degree of uniformity, to all programs and projects procured through contracts or acquired through in-house activities.
- c. The configuration management and data management activities that fulfill the requirements of NPD 7120.4, NPR 7120.5, and NPR 7120.7 shall be documented and implemented in accordance with MPR 7123.1, MGM 7120.3, MGM 8040.1, and MSFC-STD-555.

2.7.1.4 CONTROL OF WORK TRANSFERS

- a. MSFC plans and controls the temporary or permanent transfer of work (e.g., from one organization facility to another, from the organization to a supplier, from one supplier to another

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supplier) and verifies the conformity of the work to requirements in accordance with NPR 7120.5, MPR 7120.1, and MPR 1280.2.

2.7.1.5 PREVENTION OF COUNTERFEIT PARTS

a. NASA has established requirements and guidelines for the prevention, control, and reporting of counterfeit electrical, electronic, and electromechanical (EEE) parts. (Refer to NPD 8730.2.)

b. MSFC specific requirements, guidelines, and practices for the avoidance, detection, mitigation, disposition, and reporting of counterfeit, and suspect counterfeit, EEE parts in space flight and critical ground support hardware are established in MSFC-STD-3619.

c. EEE parts obsolescence program requirements are established in MSFC-STD-3620 and MSFC-STD-3012.

d. Requirements for monitoring counterfeit parts reporting from external sources are established in NPR 8735.1 and MWI 1280.5.

2.8 PROGRAM MANAGEMENT (8000-8999)

a. MSFC shall establish processes for the management, operation, and performance of Research and Development Projects, including basic and applied research and engineering development projects.

b. MSFC shall also establish and maintain documented procedures and instructions for the management and operation of NASA construction of facilities, architectural and engineering design functions.

c. The following activities are primarily governed by the Program Management series of Directives: (See paragraph P.4.b.)

- (1) Program Management - General (80XX)
- (2) Advanced Studies (81XX)
- (3) Supporting Research and Technology (SRT) (82XX)
- (4) Grants and Research Contracts (83XX)
- (5) Tracking and Data Acquisition - General (84XX)
- (6) Environmental Management (General) (85XX)
- (7) Operations (86XX)
- (8) Safety and Mission Assurance (87XX) and (17XX)
- (9) Real Property and Facilities (88XX)
- (10) Program Medical Support (89XX)

2.8.1 DESIGN AND DEVELOPMENT

2.8.1.1 GENERAL

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- a. MSFC departments and offices shall control and verify the design of all products (hardware and software) and facilities, as well as control Research, Technology and Development activities, in order to ensure that specified requirements are met.
- b. Procedures pertaining to design of flight hardware, flight software, and flight-associated GSE (i.e., the space flight program/project end products) are defined in NPR 7120.5, NPR 7150.2, MPR 7120.1, MPR 7123.1, MSFC-HDBK-3173, MSFC-STD-555, and MGM 8040.1. Design of facilities is addressed in NPR 8820.2 and MPR 8823.1.
- c. MSFC procedures for design of non-flight and non-facility products (e.g., the supporting products that enable the development of flight end products) are defined in MWI 8060.4 and NPR 7150.2.
- d. Procedures for research, technology, and development activities are defined in NPR 7120.8.

2.8.1.2 DESIGN AND DEVELOPMENT PLANNING

- a. Design and development activities shall be assigned to qualified personnel equipped with adequate resources.
- b. MSFC shall prepare plans commensurate with contracts or other agreements and TRL for each design and development activity.
 - (1) For flight-related design, the plans shall describe or reference the design and development activities and define the tasks, necessary resources, responsibilities, authority for their implementation, design content, input and output data, and planning constraints.
 - (2) For flight-related design, the different design and development tasks to be carried out shall be based on the safety and functional objectives of the product in accordance with customer, statutory, and regulatory requirements.
 - (3) For flight-related design, the design and development planning shall consider the ability to produce, inspect, test, and maintain the product.
 - (4) The design and development stages and the appropriate reviews, verification, and validation shall be determined during planning.
 - (5) Each flight project shall develop preliminary system requirements, a risk management plan, and a configuration management plan during project formulation.
 - (6) The plans for flight projects shall be in accordance with NPR 7150.2, MPR 7123.1, MPR 7120.1, and the guidelines established by OMB Circular A-119 for selection of design specifications and standards.
- c. In the formulation phase, MSFC Programs/Projects shall evaluate use of non-Government voluntary consensus standards in lieu of Government-unique standards in their procurements and

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regulatory activities, except where inconsistent with law or otherwise impractical, per OMB Circular A-119 and NPD 7120.4. Use of non-Government voluntary consensus standards is not required where they would demonstrably fail to serve NASA's Program/Project needs.

d. Non-flight hardware and facility design planning shall be in accordance with MWI 8060.4 and MPR 8823.1 respectively.

e. These plans shall be updated as the design evolves.

2.8.1.3 ORGANIZATIONAL AND TECHNICAL INTERFACES

Organizational and technical interfaces between groups which input into the design process shall be managed to ensure effective communication and clear assignment of responsibility.

2.8.1.4 DESIGN AND DEVELOPMENT INPUTS

a. Design and development inputs shall be identified, documented, and reviewed by each appropriate department or office for adequacy and accuracy.

b. These inputs shall include functional and performance requirements, applicable statutory and regulatory requirements, information derived from previous similar designs (where applicable), and other requirements essential for design and development.

c. Ambiguous, incomplete, or conflicting requirements shall be resolved with those responsible for imposing the requirements.

d. The results of the contract or other agreement review shall be considered during design input.

e. Any changes agreed to shall be documented and approved in accordance with paragraph 2.8.1.9.

2.8.1.5 DESIGN AND DEVELOPMENT OUTPUTS

a. Design and development outputs shall be documented and expressed in terms that can be assessed against the design and development input requirements.

b. The design outputs shall:

(1) Meet the design and development input requirements;

(2) Provide appropriate information for purchasing, production, and service provision;

(3) Contain or reference acceptance criteria;

(4) Specify design characteristics crucial for the safe and proper functioning of the product; and

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(5) For flight-related design, specify any critical items, including key characteristics, and specific actions to be taken for these items.

c. For flight-related design, the design output shall include appropriate information for identification, purchasing, production, inspection, and for service provision, as well as, operating, storage, handling, maintenance, and disposal requirements.

d. All design output documentation shall be reviewed and approved prior to release, in accordance with paragraph 2.8.1.9.

e. Records of the review and any necessary actions shall be maintained. (See paragraph 2.1.7.)

2.8.1.6 DESIGN AND DEVELOPMENT REVIEW

a. At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangements to:

- (1) Evaluate the ability of the results of design and development to meet requirements;
- (2) Identify any problems and propose necessary actions; and

(3) For flight-related design, authorize progression to the next stage.

b. Participants in such reviews shall include representatives of functions involved with the design and development stages being reviewed.

c. Records of the results of the reviews and any necessary actions shall be maintained. (See paragraph 2.1.7.)

2.8.1.7 VERIFICATION

a. Verification shall be performed in accordance with planned arrangements (see paragraph 2.8.1.2) to ensure that the product meets the design and development input requirements.

b. Records of the results of the verification and any necessary actions shall be maintained. (See paragraph 2.1.7.)

2.8.1.8 VALIDATION

a. Design and development validation shall be performed in accordance with planned arrangements (see paragraph 2.8.1.2) to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, where known.

b. Wherever practicable, validation shall be completed prior to the delivery or implementation of the product.

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c. Records of the results of validation and any necessary actions shall be maintained. (See paragraph 2.1.7.)

2.8.1.9 CONTROL OF DESIGN AND DEVELOPMENT CHANGES

a. Design and development changes shall be identified and records maintained.

b. The changes shall be reviewed, verified, and validated, as appropriate, and approved before implementation.

c. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and products already delivered.

d. Records of the results of the review of changes and any necessary actions shall be maintained. (See paragraph 2.1.7.)

e. Changes and modifications to flight designs and specifications shall be in accordance with MPR 7120.1, MPR 7123.1, MSFC-STD-555, and MGM 8040.1.

f. Non-flight hardware and facility design changes shall be in accordance with MWI 8060.4 and MPR 8823.1 respectively.

2.8.2 PRODUCT IDENTIFICATION AND TRACEABILITY

a. Where appropriate, MSFC shall identify the product throughout product realization. (Refer to MPR 1280.2, MPR 7123.1, and MSFC-STD-555.)

b. MSFC shall maintain the identification of the configuration of the product in order to identify any differences between the actual configuration and the agreed configuration.

c. MSFC shall ensure unique identification of individual products or batches requiring traceability. (Refer to MPR 7123.1, MSFC-STD-555, and MPR 1280.2.)

d. Records of such identification shall be maintained. (See paragraph 2.1.7.)

2.8.3 MONITORING AND MEASUREMENT OF PRODUCT

a. MSFC shall monitor and measure the characteristics of products to verify that product requirements have been met.

(1) This shall be carried out at appropriate stages of the product realization process in accordance with the planned arrangements. (See paragraph 2.7.1.) MSFC also routinely provides test services to external customers as a part of their product realization process.

(2) Evidence of conformity with the acceptance criteria shall be maintained.

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b. Records shall indicate the authority that is authorizing release of product. (See paragraph 2.1.7.)

c. Product release and service delivery shall not proceed until all the planned arrangements (see paragraph 2.7.1) have been satisfactorily completed, unless otherwise approved by a relevant authority, and where applicable by the customer.

(1) Inspection and testing of flight products, critical and/or complex work, associated flight support equipment and other quality-sensitive products shall be conducted in accordance with MPR 8730.1.

(a) Measurement requirements shall include criteria for acceptance and/or rejection; where in the sequence inspection and testing operations are to be performed; required records of the measurement results; and, any specific measurement instruments required, with any specific instructions for their use.

(b) The required inspection and testing, including monitoring and control of any key characteristics identified, and the records to be established, shall be detailed in the quality plan or documented procedures.

(c) When sampling inspection is used as a means of product acceptance, the sampling plan shall be justified on the basis of recognized statistical principles and appropriate for use (i.e., matching the sampling plan to the criticality of the product and to the process capability).

(d) Where product is released for production use pending completion of all required verification/measurement and monitoring activities, it shall be identified and recorded to allow recall and replacement, if it is subsequently found that the product does not meet requirements.

(e) Verification and validation of flight products shall be performed and records kept in accordance with MPR 7123.1 and MSFC-HDBK-3173.

(f) All documents required to accompany the product shall be present at delivery.

(2) Inspections of hazardous facility configuration changes shall be performed in accordance with MPR 8730.6.

(a) Additional inspection instructions shall be documented in organizational issuances.

(3) Purchasing and acceptance of facilities construction shall be accomplished through procedures in MPR 5000.1 and MPR 8823.1.

(a) Additional inspection instructions shall be documented in organizational issuances.

(4) Inspections and tests of other products shall be conducted in accordance with procedures, work instructions, plans, and/or specifications developed by the responsible MSFC

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organizations.

(a) These activities may be described in the overall process documentation, and do not have to be documented separately; however, all requirements in this section shall be addressed.

2.8.4 CONTROL OF MONITORING AND MEASURING EQUIPMENT

2.8.4.1 MSFC shall control monitoring and measuring equipment in accordance with MPR 8730.5 and implement the following specific requirements:

- a. Determine the monitoring and measurement activities to be undertaken and the monitoring and measuring equipment needed to provide evidence of conformity of product to determined requirements.
- b. Ensure that monitoring and measurement can be accomplished and is accomplished in a manner that is consistent with the monitoring and measurement requirements.
- c. Maintain calibrated equipment databases and define the processes for calibration/verification, including details of equipment type, unique identification, location, frequency of checks, check method, and acceptance criteria. This is accomplished through the MSFC Calibration Laboratory database, the MAF Metrology Laboratory database, and other databases maintained by the user organizations for user-calibrated equipment.
- d. Ensure that environmental conditions are suitable for the calibration, inspection, measurement and testing being carried out.
- e. Establish the process for recall of monitoring and measuring equipment based on equipment category. (Refer to MPR 8730.5.)
- f. Assess and record the validity of the previous measuring results when the equipment is found not to conform to requirements.
 - (1) Take appropriate action on the equipment and any product affected.
- g. Maintain records of the results of calibration and verification. (See paragraph 2.1.7.)

2.8.4.2. Where necessary to ensure valid results, measuring equipment shall:

- a Be calibrated or verified, or both, at specified intervals or prior to use, against measurement standards traceable to international or national measurement standards;
 - (1) Where no such standards exist, the basis used for calibration or verification shall be recorded.
- b Be adjusted or re-adjusted as necessary;

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- c Be identified to enable the calibration status to be determined;
- d Be safeguarded from adjustments that would invalidate the measurement result; and
- e Be protected from damage and deterioration during handling, maintenance and storage.

2.8.4.3. When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application shall be confirmed.

- a. This confirmation shall be undertaken prior to initial use and reconfirmed as necessary.

2.8.4.4. Measuring equipment shall be recalibrated, or (as a minimum) verified to be within specified tolerance, following use and prior to delivery of the associated product to the customer, whenever there is a potential that an out-of-tolerance condition could result in an impact to one or more of the following:

- a. conformance of flight hardware, or associated ground support equipment, with specified requirements,
- b. directly affect the design of flight hardware, or associated ground support equipment, or
- c. result in a risk to the customer's product.

2.8.5 INSPECTION AND TEST STATUS

- a. The inspection and test status of the products shall be identified by suitable means, which indicate the conformance or nonconformance of products with regard to inspection and tests performed.
- b. The identification of inspection and test status shall be maintained, as defined in the quality plan and/or documented procedures, throughout production, installation, and servicing of the product to ensure that only products that have passed the required inspections and tests or released under an authorized concession (see paragraph 2.8.6.2) are dispatched, used, or installed.
- c. Activities relating to inspection and test status shall be performed in accordance with MPR 8730.2 and MPR 8730.5.

2.8.6 CONTROL OF NONCONFORMING PRODUCT

2.8.6.1 GENERAL

- a. SMA shall establish and maintain documented procedures to ensure that product that does not conform to specified requirements is prevented from unintended use, delivery, or installation. (Refer to MPR 8730.3.)

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b. Controls shall provide for: identification; documentation; evaluation; segregation; establishment of Material Review Boards (refer to MWI 8730.3); disposition of nonconforming product; and timely notification to the directorates and other parties concerned, including when nonconforming product is detected after delivery or use has started.

2.8.6.2 REVIEW AND DISPOSITION OF NONCONFORMING PRODUCT

a. Responsibility for review and authority for the disposition of nonconforming product shall be defined.

b. Where applicable, MSFC shall deal with nonconforming product by one or more of the following ways:

- (1) by taking action to eliminate the detected nonconformity;
- (2) by authorizing its use, release or acceptance under concession by the relevant authority and, where applicable, by the customer;
- (3) by taking action to preclude its original intended use or application;
- (4) by taking action appropriate to the effects or potential effects of the nonconformity, when nonconforming product is detected after delivery or use has started; and
- (5) by taking actions necessary to contain the effect of the nonconformity on other processes or products.

c. Dispositions of use-as-is or repair shall only be used after approval by the Material Review Board, which includes an authorized representative of the organization responsible for design. (Refer to MWI 8730.3.)

d. MSFC shall not use dispositions of use-as-is or repair, unless specifically authorized by the customer, if the nonconformity results in a departure from the contract requirements.

e. Product dispositioned for scrap shall be conspicuously and permanently marked, or positively controlled, until physically rendered unusable.

f. When nonconforming product is corrected, it shall be re-inspected by the SMA Directorate and re-tested as required in accordance with the quality plan and/or documented procedures.

g. Records of the nature of nonconformities and any subsequent actions taken, including any concessions obtained, shall be maintained. (See paragraph 2.1.7.)

2.8.7 STATISTICAL TECHNIQUES

a. MSFC shall identify where statistical techniques are required for establishing, controlling, and

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verifying process capabilities and product characteristics.

b. MSFC shall implement and control the application of the statistical techniques as needed.

2.9 FINANCIAL MANAGEMENT (9000-9799)

a. MSFC shall establish processes for the management and operation of NASA Accountable Officer's accounts.

b. The following activities are primarily governed by the Financial Management series of Directives: (See paragraph P.4.b.)

- (1) Principles and General Policies (90XX)
- (2) Financial Management and Budgeting Systems (91XX)
- (3) Accounting (92XX)
- (4) Financial Reports (93XX)
- (5) Budget Formulation and Execution (94XX)
- (6) Contractor Financial Management Reporting (95XX)
- (7) Fiscal Operations (96XX)
- (8) NASA Travel Regulations (97XX)

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Appendix A - Definitions

In general, the definitions given in ANSI/ISO/ASQ Q9000 apply. However, the following definitions are offered to assist the user in understanding the application of the ANSI/ISO/ASQ Q9001 and AS9100 standards in this MPR.

Complex Work. Involves either: a) the design, manufacture, fabrication, assembly, testing, integration, maintenance, or repair of machinery, equipment, subsystems, systems, or platforms; or b) the manufacture/fabrication of parts or assemblies which have quality characteristics not wholly visible in the end item and for which conformance can only be established progressively through precise measurements, tests, and controls applied. See NPD 8730.5 for more information about complex work. See NPR 7150.2 for more information about software complexity.

Contractor. The organization that provides a product or service to MSFC in a contractual situation.

Critical Items. Those items (e.g., functions, parts, software, characteristics, processes) having significant effect on the product realization and use of the product; including safety, performance, form, fit, function, producibility, service life, etc.; that require specific actions to ensure they are adequately managed. Examples of critical items include safety critical items, fracture critical items, mission critical items, key characteristics, etc.

Critical Work. Any hardware task that, if performed incorrectly or in violation of prescribed requirements, could result in loss of human life; serious personal injury; loss of a Class A, B, or C payload (see NPR 8705.4); loss of a Category 1 or Category 2 mission (see NPR 7120.5); or loss of a mission resource valued at greater than \$2M. See NPD 8730.5 for more information about critical work. See NPR 7150.2 for more information about software criticality.

Customer. The recipient of a product or service provided by MSFC organizations. A customer may be another organization within MSFC or external to MSFC.

Data. Any electronic or written information/statement which represents policies, procedures, instructions, instructional material, drawings, plans, specifications, requirements, handbooks, manuals, reports, standards, or other correspondence. (These may be stored in a variety of media such as magnetic tapes, computer disks, data sheets, log books, strip charts, photographs, and videocassettes.)

Data Management. The timely and economical identification/definition, preparation, control, and disposition of documents and data required by a program, project, or activity.

Environmental Management System (EMS). A system that (1) incorporates people, procedures, and work practices in a formal structure to ensure that the important environmental impacts of the organization are identified and addressed; (2) promotes continual improvement by regularly evaluating environmental performance; (3) involves all disciplines throughout the Center as appropriate; and (4) has Senior Management commitment to support environmental programs.

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Flight Hardware, Flight Software. Any hardware or software that is intended to fly in, or as part of, a space flight system. Hardware and software that is intended to fly only on a suborbital flight system (i.e. a balloon flight, sounding rocket, or aircraft flight), and that does not involve any work that is both critical and complex, are excluded from this definition. In cases where suborbital hardware or software does involve work that is both critical and complex, the program/project manager and applicable technical authorities determine the appropriate requirements to be invoked/applied within the SMA Plan, the Software Management Plan, or other program/project planning documents, as described in NPR 7120.5, NPR 7150.2, NPD 8730.5, and MPR 7120.1.

Ground Support Equipment (GSE). Non-flight systems, equipment, or devices (with a physical or functional interface with flight hardware) necessary to routinely support the operations of transporting, receiving, handling, assembly, inspection, test, checkout, servicing and launch of space vehicles and payloads at launch, landing, or retrieval sites.

Key characteristic. An attribute or feature whose variation has a significant effect on product fit, form, function, performance, service life, or producibility, that requires specific actions for the purpose of controlling variation.

Management System. A system of organizations, policies, procedures, and processes that is documented in a set of directives and requirements delineating how we conduct business at Marshall. The QMS, EMS, and OH&S Management System are components of the Center’s overall management system.

Occupational Health and Safety (OH&S) Management System. Part of the overall management system that facilitates the management of OH&S risks associated with the business of the organization. This includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the organization’s OH&S policy.

Organization. Group of people and facilities with an arrangement of responsibilities, authorities, and relationships.

Process. Set of interrelated resources and activities which transform inputs into outputs. Resources may include personnel, finance, facilities, equipment, techniques, and methods.

Product. The result of activities or processes which is delivered to the customer.

Quality Management System (QMS). Management system to direct and control an organization with regard to quality. (See Figure 3 in 2.1.2.2 for the QMS process model.)

Quality Objective. Something sought, or aimed for, related to quality. Quality objectives are generally derived from NASA’s strategic goals and consistent with the MSFC Quality Policy.

Risk. An undesirable situation or circumstance that has both a likelihood of occurring and a

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potentially-negative consequence.

Service. The results generated by activities at the interface between the supplier and the customer and by supplier internal activities to meet customer needs.

Special Requirements. Per AS9100C, “Those requirements identified by the customer, or determined by the organization, which have high risks to being achieved, thus requiring their inclusion in the risk management process. Factors used in the determination of special requirements include product or process complexity, past experience and product or process maturity. Examples of special requirements include performance requirements imposed by the customer that are at the limit of the industry’s capability, or requirements determined by the organization to be at the limit of its technical or process capabilities.”

Supplier. The organization that provides a product/service to the customer. A supplier can be internal or external. In a contractual situation, a supplier is sometimes called a “contractor.”

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Appendix B - Acronyms

ALERT. Acute Launch Emergency Restraint Tip

ANSI. American National Standards Institute

AS. Aerospace Standard

ASQ. American Society for Quality

CMC. Center Management Council

DCB. Directives Control Board

EMS. Environmental Management System

ESD. Electro-Static Discharge

FAR. Federal Acquisition Regulation

GSE. Ground Support Equipment

HDBK. Handbook

IMSC. Integrated Management System Council

ISO. International Organization for Standardization

IT. Information Technology

MAF. Michoud Assembly Facility

MC. Marshall Charter

MGM. Marshall Guidance Manual

MID. Marshall Interim Directive

MIDL. Marshall Integrated Document Library

MPD. Marshall Policy Directive

MPR. Marshall Procedural Requirements

MSFC. Marshall Space Flight Center

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MWI. Marshall Work Instruction

NASA. National Aeronautics and Space Administration

NFS. NASA FAR Supplement

NPD. NASA Policy Directive

NPR. NASA Procedural Requirements

OH&S. Occupational Health and Safety

OI. Organizational Issuance

OMB. Office of Management and Budget

QMS. Quality Management System

SAE. Society of Automotive Engineers

SBIR. Small Business Innovative Research

SES. Senior Executive Service

SHE. Safety, Health, and Environmental

SMA. Safety and Mission Assurance

SPC. Strategic Planning Council

SRT. Supporting Research and Technology

START. Standards and Technical Assistance Resource Tool

STD. Standard

TRL. Technology Readiness Level

WWW. World Wide Web

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Appendix C – Reserved for Verification Matrix

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Appendix D – Records

D.1 Management review records are maintained in Executive Information System in accordance with NRRS 1441.1, Schedule 1/14/B/1, Permanent.

D.2 Other records requirements are defined in the appropriate referenced documents.

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Appendix E - References

E.1 NPR 8553.1, “NASA Environmental Management System”

E.2 ANSI/ISO/ASQ Q9000, “American National Standard, Quality Management Systems – Fundamentals and Vocabulary”

E.3 ANSI/ISO/ASQ Q9001, “American National Standard, Quality Management Systems – Requirements”

E.4 SAE AS9100, “Quality Management Systems – Requirements for Aviation, Space and Defense Organizations”

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Appendix F – AS9100D Requirements Clauses to MPR 1280.10 Paragraphs

AS9100D Requirements	MPR 1280.10 Revision C
QUALITY MANAGEMENT SYSTEM – REQUIREMENTS <i>(no content)</i>	N/A
4. CONTEXT OF THE ORGANIZATION <i>(no content)</i>	N/A
4.1 Understanding the organization and its context	2.1 Organization and Administration. Section 2.1.c.
4.2 Understanding the needs and expectations of interested parties	2.1 Organization and Administration Section 2.1.d.
4.3 Determining the scope of the quality management system	P.1 PURPOSE
4.4 Quality management system and its processes	2.1.2 Quality Management System 2.1.2.1 General (Quality Management System) 2.1.2.2 Quality Management System Procedures 2.1.4 Data Management, Including Document and Data Control
5. LEADERSHIP <i>(no content)</i>	2.1.1 Management Responsibility <i>(no content)</i>
5.1 Leadership and commitment	2.1.1.1 Management Commitment
5.1.1 General	
5.1.2 Customer focus	2.1.1.2 Customer Focus
5.2 Policy	2.1.1.3 Quality Policy
5.2.1 Establishing the Quality Policy	
5.2.2 Communicating the Quality Policy	
5.3 Organizational roles, responsibilities and authorities	2.1.1.5 Organization 2.1.1.5.a Responsibility and Authority 2.1.1.5.c Management Representative
6. PLANNING <i>(no content)</i>	N/A
6.1 Actions to address risks and opportunities	2.7.1.2 Risk Management 2.1.6.3 Preventive Action
6.2 Quality objectives and planning to achieve them	2.1.1.1 Management Commitment 2.1.1.4 Quality Objectives
6.3 Planning of changes	2.1.1.1 Management Commitment 2.1.1.4 Quality Objectives
7. SUPPORT <i>(no content)</i>	N/A
7.1 Resources <i>(no content)</i>	N/A
7.1.1 General	2.1.1.5 Organization 2.1.1.5.b Resources
7.1.2 People	2.3 Human Resources/Personnel 2.3.1 Competence, Awareness, and Training
7.1.3 Infrastructure	2.1.5.1 Infrastructure
7.1.4 Environment for the Operation of Processes	2.1.5.3 Work Environment
7.1.5 Monitoring and Measuring Resources	2.8.4 Control of Monitoring and Measuring Equipment
7.1.5.1 General	2.8.4 Control of Monitoring and Measuring Equipment
7.1.5.2 Measurement Traceability	2.8.4 Control of Monitoring and Measuring Equipment
7.1.6 Organizational knowledge	2.1.2.5. Knowledge Management and Lessons Learned
7.2 Competence	2.3 Human Resources/Personnel 2.3.1 Competence, Awareness, and Training
7.3 Awareness	2.3 Human Resources/Personnel 2.3.1 Competence, Awareness, and Training

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7.4 Communication	2.1.1.1 Management Commitment 2.1.1.5.c Management Representative 2.1.3.4 Customer Communication
7.5 Documented Information	2.1.4 Data Management, Including Document and Data Control
7.5.1 General	2.1.4.1 General
7.5.2 Creating and Updating	2.1.4.2 Document and Data Approval and Issuance 2.1.4.3 Document and Data Changes
7.5.3 Control of Documented Information	2.1.4.2 Document and Data Approval and Issuance 2.1.4.3 Document and Data Changes 2.1.7 Control of Records
8. OPERATION (<i>no content</i>)	N/A
8.1 Operational Planning and Control	2.7.1 Program/Project and Quality Planning 2.7.1.1 Project Management
8.1.1 Operational Risk Management	2.7.1.2 Risk Management
8.1.2 Configuration Management	2.7.1.3 Configuration Management
8.1.3 Product Safety	2.8.1.2 Design and Development Planning 2.8.1.3 Organizational and Technical Interfaces
8.1.4 Prevention of Counterfeit Parts	2.7.1.5 Prevention of Counterfeit Parts
8.2 Requirements for products and services (<i>no content</i>)	2.1.3 Customer-Related Processes
8.2.1 Customer communication	2.1.3.4 Customer Communication
8.2.2 Determination of requirements related to products and services	2.1.3.2 Determination of Requirements Related to Products
8.2.3 Review of requirements related to products and services	2.1.3.3 Review of Requirements Related to Products
8.2.4 Changes to requirements for products and services	2.1.3.3 Review of Requirements Related to Products
8.3 Design and Development of Products and Services (<i>no content</i>)	2.8.1 Design and Development
8.3.1 General	2.8.1.1 General
8.3.2 Design and Development Planning	2.8.1.2 Design and Development Planning 2.8.1.3 Organizational and Technical Interfaces
8.3.3 Design and Development Inputs	2.8.1.4 Design and Development Inputs
8.3.4 Design and Development Controls	2.8.1.6 Design and Development Review 2.8.1.7 Verification 2.8.1.8 Validation
8.3.5 Design and Development Outputs	2.8.1.5 Design and Development Outputs
8.3.6 Design and Development Changes	2.8.1.9 Control of Design and Development Changes
8.4 Control of Externally Provided Processes, Products, and Services (<i>no content</i>)	2.5.1 Purchasing
8.4.1 General	2.5.1.1 Purchasing Process
8.4.2 Type and Extent of Control	2.5.1.1 Purchasing Process 2.5.1.3 Verification of Purchased Product
8.4.3 Information for External Providers	2.5.1.2 Purchasing Information
8.5 Production and Service Provision (<i>no content</i>)	N/A
8.5.1 Control of Production and Service Provision	2.1.5.2 Control of Production and Service Provision
8.5.1.1 Control of Equipment, Tools, and Software Programs	This level of detail is in MPR 1280.2, which is referenced in section 2.1.5.2 of this MPR.
8.5.1.2 Validation and Control of Special Processes	2.1.5.4 Validation of Processes for Production and Service Provision

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8.5.1.3 Production Process Verification	This level of detail is in MPR 1280.2, which is referenced in section 2.1.5.2 of this MPR.
8.5.2 Identification and Traceability	2.8.2 Product Identification and Traceability 2.8.5 Inspection and Test Status
8.5.3 Property Belonging to Customers or External Providers	2.4.1 Control of Customer-Supplied Product
8.5.4 Preservation	2.6.1 Handling, Storage, Packaging, Preservation, and Delivery
8.5.5 Post-Delivery Activities	This level of detail is in MPR 7120.1 and MPR 7123.1, which are referenced in section 2.1.5.2 of this MPR.
8.5.6 Control of Changes	2.8.1.9 Control of Design and Development Changes This level of detail is also addressed in MPR 1280.2, which is referenced in section 2.1.5.2 of this MPR.
8.6 Release of Products and Services	2.5.1.3 Verification of Purchased Product 2.8.3 Monitoring and Measurement of Product
8.7 Control of Nonconforming Outputs	2.8.6 Control of Nonconforming Product
9. PERFORMANCE EVALUATION (<i>no content</i>)	N/A
9.1 Monitoring, Measurement, Analysis, and Evaluation (<i>no content</i>)	N/A
9.1.1 General	2.1.5.5 Monitoring and Measurement of Processes 2.8.3 Monitoring and Measurement of Product 2.8.7 Statistical Techniques
9.1.2 Customer Satisfaction	2.1.3.5 Customer Satisfaction
9.1.3 Analysis and Evaluation	2.1.2.3 Analysis of Data
9.2 Internal Audit	2.1.8 Internal Audits
9.3 Management Review (<i>no content</i>)	N/A
9.3.1 General	2.1.1.6 Quality Management System Review
9.3.2 Management review input	2.1.1.6 Quality Management System Review
9.3.3 Management review output	2.1.1.6 Quality Management System Review
10. IMPROVEMENT (<i>no content</i>)	N/A
10.1 General	2.1.6.3 Preventive Action
10.2 Nonconformity and Corrective Action	2.1.6.2 Corrective Action
10.3 Continual Improvement	2.1.2.4 Continual Improvement